

Ripley View Residential Subdivision

Preliminary Documentation Report EPBC Referral 2020/8615

VOLUME 7 – APPENDICES 22-28

23/02/2024 - version 7.1 Report prepared for Arxhe Ripley View Investment Trust

ENVIRONMENTAL PLANNING ° ENVIRONMENTAL MANAGEMENT ° ECOLOGICAL SURVEY & ASSESSMENT THREATENED SPECIES MANAGEMENT ° VEGETATION MANAGEMENT ° BUSHFIRE MANAGEMENT



Appendix 22

Corridors and Habitat Connectivity Assessment



19 September 2023

Brooke Parr Senior Assessment Officer DCCEEW By Email: <u>brooke.parr@dcceew.gov.au</u>

RE: REFERRAL 2020/8615 (RIPLEY VIEW RESIDENTIAL SUBDIVISION) – TECHNICAL NOTE ON CORRIDORS AND HABITAT CONNECTIVITY ARISING FROM THE SITE VISIT OF 30 AUGUST 2023

During our site visit on 30 August 2023, we detected a concern DCCEEW (the **Department**) held in regard to maintenance of corridors and habitat connectivity at the impact site (herein **Subject Site**), specifically that:

- (i) the proposed action did not provide sufficient north-south connectivity through the site, and that movement opportunities to the north in particular were likely to be limited; and
- (ii) opportunities for movement from the site across Fisher Road to more extensive habitat to the east would be restricted by the proposed action (Inset 1).



Inset 1 – Corridors and Habitat Connectivity Areas in Question

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The purpose of this technical note is to commence 'a discussion' with the Department on these issues, with a view to providing a fully informed response in the next information request response. We have used plans¹ provided in the Version 3 PD report (**Attachment 1**) and new information to hand (as referenced) to support our analysis².

Issue 1 – North-South Connectivity

Figure 1 of the Version 3 PD Report shows that the Subject Site is at the northern end of the Ripley Valley Priority Development Area (**PDA**). **Figure 6** shows that the Site is not within a Biodiversity Planning Assessment-defined regionally significant corridor, but consideration at finer scale illustrates that the Site does play a role in providing local habitat connectivity insofar that:

- (i) the Ripley Valley Urban Development Area Development Scheme 'Natural Areas' map shows the Site to contain a '*Significant Natural Corridor*' (**Inset 2**); and
- (ii) the Draft Ipswich Planning Scheme 2024 (Inset 3) shows a narrow corridor of 'Environmental Management' zoned land extending north from the Subject Site to Bundamba Creek.



Inset 2 – PDA Development Scheme Natural Values Map

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¹ With minor updates in some cases.

² PD Report figure numbering has been preserved herein





Inset 3 – Draft Ipswich Planning Scheme 2024 – Zone and Precincts Map Extract

The corridor identified by (i)-(ii) follows the western arm of Bundamba Creek (**Figure 2**). This arm is a 2nd order watercourse from its confluence with the main branch of Bundamba Creek to a point just south of the Subject Site. From here, the 2nd order watercourse splits into three further 1st order watercourses. The westernmost arm has been lost to recent development (to the west of Carpenter Drive). The remaining two (western and eastern arms) are maintained in the approved and proposed Hayfield development discussed below.

The proposed action responds to this connectivity requirement by retaining a vegetated corridor of at least 140 m (and up to 220 m) (**Figure 5a**). Connectivity under the internal road is to be maintained by providing a dedicated 'dry passage' fauna underpass (**Inset 4**) consisting of a 2.4 m X 2.4 m reinforced concrete box culvert with climbing rails / ledges for koala.

Revegetation on either side of the culvert will be provided to establish cover from predators at the culvert portals (minimising predator / funnel effect), ensuring that tall trees are established on the batters of the road such that there is an aerial connection for birds and arboreal mammals across the road.

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Inset 4 – Example of fauna underpass to be provided

The corridor will be effective for the Matters of National Environmental Significance (**MNES**) it is intended to convey (primarily koala), as it is considerably wider and more robust than the connecting habitat continuing north through Rourkes Park³ (**Figure 2**) and the urban / light industry areas extending towards the Cunningham Highway (**Figure 5b** and **Plates 1-7**).

To the south, the proposed action's corridor connects into the Hayfield development site (**Inset 5**⁴ **and Figure 5c**). Vegetation retention is proposed for the two 1st order watercourses on this site. The westernmost corridor is well-defined by the approved (and now largely cleared) footprint for this development (**Figure 7**). As shown, this corridor extends south to Monterea Road and Ripley

³ Note that the corridor is 160 m wide at the northern edge of the development site, but narrows to 60m a short distance further north.



Road (corridor width ~ 120 m). Existing development precludes connectivity further south **Plates 8-9**).



Inset 5 – Hayfield Masterplan⁵

The easternmost corridor is not yet fully defined. The current proposed extent (**Figure 7**) is in line with Council endorsed Context Plan amended 2019 (Council Ref: 34/2015/MAPDA/A & 34/2015/MAPDA/B). This shows a corridor ~ 70 m wide only extending partially through the Hayfield development site and then ending in recently cleared land subject to development approvals⁶. Remnant vegetation remains on the eastern side of this corridor, providing good opportunity for fauna (including koala) movement to the east into more extensive bushland beyond Fisher Road (hosting the eastern branch of Bundamba Creek corridor). However, this connecting habitat is identified as the development footprint of the Hayfield School Site⁷.

⁵ Masterplan derived from approved Context Plan (Council Ref: 34/2015/MAPDA/A & 34/2015/MAPDA/B)

⁶ Not shown on current Nearmap imagery but shown by the video provided in relation to Issue 2.

⁷ EPBC Referral No. 2021/9070.



There is no information in the EPBC referral material for the school development identifying connections from the easternmost Hayfield corridor through the school to the habitat east of Fisher Road. If the school development is approved (as proposed without vegetation retention), connectivity into the Subject Site from the areas of greatest ecological value will be lost, and the only connections remaining will be to the corridor stumps in the Hayfield development, and through Roukes Park to the north. This would seem to be quite a serious limitation for species sensitive to habitat fragmentation such as Greater glider; an issue requiring discussion in regard to the long term suitability of the Subject Site for this species, and need for offsets.

In light of approved and proposed development for this locality, the corridor provided by the proposed action is adequate and is at least as wide (and often much wider) than that approved by DCCEEW for the Hayfield development site to the south.

Issue 2 – East-West Connectivity

Presently, there is a vegetated connection from the proposed action's corridor to the eastern edge of the Site adjoining Fisher Road. The connection is strongest in the southeast where there are no houses. However, the eastern side of Fisher Road supports a continuum of largely cleared (160 m deep) rural residential lots with large houses. These create a significant impediment to movement from the Site to more substantial habitat to their east.

To the southeast of the Subject Site⁸ the connection east is much stronger, because the substantial vegetation on the western side of Fisher Road (the school site) is directly aligned to large, well-vegetated lots to the east of the road. This is clearly the most important fauna movement pathway between the Subject Site and important habitat to the south east. This is illustrated by the video provided at this link (refer <u>Ripley View Corridor Technical Note Supporting</u> Material). Key time stamps for the progression of the video, are indicated on **Figure 8**.

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⁸ South of the unformed Boyland Way road reserve.



Please give me a call if you have any further questions regarding this matter.

Kind regards,

M

Wayne Moffitt Director Ph 0417 672 227

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PLATES

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Dage 8





Plate 1 – View from Swanbank Road, south into Rourkes Park



Plate 2 – ~ 1m Culverts under Swanbank Road (northern end of Rourkes Park)





Plate 3 – Swanbank Road



Plate 4 – Corridor continuation north of Swanbank Road

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Plate 5 – Corridor vegetation to the north of East Owen Street



Plate 6 – Cunningham Highway underpass (good movement opportunities)





Plate 7 – Cunningham Highway fauna exclusion fencing



Plate 8 – Corridor vegetation near the southern end of the western arm of the Highfields corridor





Plate 9 – View west along the unformed Monterea Road from intersection with Fischer Road with development in the left of view (end of the corridor

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ATTACHMENT 1

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2020); Watercourse (DNRME,

2020); Contours (DNRME 2016).

ENVIRONMENTAL

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Flinders View

Legend

Figure 7 - Ecological Connectivity

28 South Project Ref: 2018-079C

 $Source: Dropbox \ (d) \ Projects \ 2018 \ 2018 - 079C \ (Ripley \ View \ PD) \ (d) \ Data \ (d) \ G$

Data Sources: Aerial Imagery (Nearmap/Qld Globe); Digital Cadastre 28° Database (DNRME, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contours (DNRME 2016).

| Connectivity | | Impact Site Boundary | npact Site Boundary Surrounding Development Zoning | | Issue Date | Dwg No. | Author | |
|--------------|----|-------------------------|--|------------------------------------|------------|------------|---------|--------------------|
| | // | Hayfields Development | | Open Space and Ecological Corridor | | 19-09-2023 | | тс |
| | | Cadastre | | Residential | | Approved | Revisio | n Note |
| a\(d) GIS | | Roads & Tracks | | Low Impact Industry | | WM | | |
| C. S. Maria | | Fauna Corridor | | EPBC 2021/9070 | I | 6042020 | MGA 56 | |
| 2ºS | | Existing Fauna Linkages | | Commercial | | 1:8,000 | | $\mathbf{\Lambda}$ |
| VIRONMENTAL | ¢ | Corridor Dimensions | | Emergency Services | 0 | 100 200 | 300 m | |
| | | | - | Numbered Photo Points | Lı | | | N |
| | | | | | | | | |

Point 1 - 20sec Lot 2 RP186053 (View to the East)

Point 2 - 1min 16sec Unformed Boyland Way Road Reserve Lot 2 RP186053

Point 3 - 1min 27sec Dwelling on Lot 1 RP120181

Point 4 - 1min 34sec North Western Corner of Lot 172 S151839

Point 5 - 1min 49sec South Western Corner of Lot 172 S151839

Point 6 - 2min 0sec Driveway to Lot 173 S151839

Point 7 - 2min 14sec Driveway to Lot 5 RP880158

Point 8 - 2min 32sec Gravel-Formed Monterea Rd

Point 9 - 2min 50sec Turnaround at Falvey St

Point 10 - 3min 10sec Unformed Monterea Rd (View to the West)

Point 11 - 3min 12sec Comencement of clearing on Lot 901 SP321876 (Not apparent in current nearmap imagery)

Point 12 - 4min Pulled over to let cars pass

Point 13 - 4min 26sec 4x4 Track

Point 14 - 4min 42sec Unformed Boyland Rd West South Eastern Corner of the Site

Point 15 - 4min 57sec Dwelling on Lot 208 SL11067

Point 16 - 5min 5sec Dwelling on Lot 5 RP845600

Point 17 - 5min 21sec Dwelling on Lot 1 RP906067 West North Eastern Corner of the Site

Point 18 - 5min 37sec Landscape Yard

Legend

| Site Boundary | | | | | | |
|-----------------------|----------------------|--|--|--|--|--|
| | Cadastre | | | | | |
| — | Roads & Tracks | | | | | |
| <u> </u> | Waterways | | | | | |
| +++ | Rail_network | | | | | |
| \longleftrightarrow | Corridor Diamentions | | | | | |
| | | | | | | |
| | | | | | | |









Appendix 23

Brisbane SAM Sign Review



Attachment 19 – SAM Sign Review – Brisbane

Referenced from Burke, A. (2015) Effectiveness of portable speed warning signs, Proceedings of the 2015 Australasian Road Safety Conference, Brisbane City Council: Brisbane Australia, <u>http://acrs.org.au/files/papers/arsc/2015/BurkeA%20280%20Effectiveness%20of%20portabl</u> <u>e%20speed%20warning%20signs.pdf</u>

Pers Comms: Herson , N (2018), nick.herson@brisbane.qld.gov.au

How SAMs Work

The portable speed warning signs measure the speed of each motorist then displays a message dependent on their speed. The signs also record the initial entering speed and the final or exiting speed of each motorist.

The following naming convention for the speed records used within this report is as follows:

- V1 initial speed of the vehicle entering the radar range of the sign
- V2 final speed of the vehicle exiting the radar range of the sign



Figure 19.1 – How the Portable Speed Signs Function

The default setting for the sign is blank and as a motorist approaches the sign, the vehicle's speed is detected by the sign's radar and one of the following three messages displayed:

- If the motorist is driving at or below the speed limit, a smiley face message is displayed;
- If the motorist is driving above the speed limit by up to 9 km/h, the vehicle's speed is displayed below a 'YOUR SPEED' message as shown;

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• If the motorist is driving 10 km/h or more above the speed limit, the sign is programmed to display a 'SLOW DOWN' message as shown;



Figure 19.2 – SAM sign displays

Additionally, the message changes as the vehicle's speed changes whilst within the radar range of the sign. There are several key aspects in relation to the messaging and operation of the portable speed warning signs in Council's program:

- the third message doesn't display excessive speeds so motorists don't try and display a high speed reading,
- the signs remain at each location for at least one month before being moved to a new location. This is to allow the speed warning signs to have a positive effect on motorists driving behaviour,
- the speed readings are not used for the issuing of any infringement notices as the purpose of the speed radar is only to enable feedback to motorists of driver speed. The signs also don't have a camera to photograph vehicles. If a site shows excessive and continual speeding, then we do however recommend to the local councillor that Queensland Police Services (QPS) assesses the location to their criteria and undertakes enforcement if considered appropriate.

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Installation

Installation of the portable speed warning signs involves the construction of a small concrete foundation below the ground on Council owned footpath/verge or sometimes median as shown in Figure 19.3.



Figure 19.3 – Portable Speed Warning Sign Footing Installed on Council Footpath/Verge

Once the concrete has cured, the sign is installed on a slip based pole and the solar panel connected as shown in Figure 19.4.



Figure 19.4 – Portable Speed Warning Sign Installed on Council Footpath/Verge

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Once the speed sign is removed, the lid will remain and sits flush with ground level as shown in Figure 19.5. This means that the site can be used again if speeding at this location becomes an

issue.



Figure 19.5 – Portable Speed Warning Sign Removed

Placement Considerations

Considerations for the placement of SAM signs:

- Ensure adequate sight distance to read the sign.
- As signs are solar powered, ensure adequate sunlight for all months of the year, that is, in winter the sun is lower on the horizon.
- Ensure adequate distance from the start of street or from major traffic inflow to enable travel at or above the speed and not still accelerating.

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Analysis of Results

The portable speed warning signs have been operational since November 2013. The sites are spread across 106 suburbs within Brisbane City Council. Based on the 171 sites, Table 19.1 provides a high-level summary of result for the program round by round and as a total.

| Table 19.1 SAM Statistics 2013 - 2013 | Table | 19.1 | SAM | Statistics | 2013 - | 2015 |
|---------------------------------------|-------|------|-----|------------|--------|------|
|---------------------------------------|-------|------|-----|------------|--------|------|

| Statistics | Result (2013 – 2015) |
|--|----------------------|
| Total Number of Vehicle Trips (,000) | 25,125 |
| Average reduction of speed of all vehicles (km/h) | 5.2 |
| Reduction of average speed of vehicles with V1 speeds over the speed limit (km/h) | 9.5 |
| Percentage of total vehicles with V1 speeds over the speed limit (%) | 22.1 |
| Percentage of total vehicles with V2 speeds over the speed limit (%) | 8.7 |

Notes on Results

- The program has delivered a reduction of average speed for vehicle travelling over the speed limit of 9.5 km/h across all sites since the program began.
- The signs are effective at reducing speeds on all road types. Additionally, approximately half the sites for each road hierarchies have a reduction of average speed of 10 km/h or greater.

Results by Duration Installed

As part of the program development, research was undertaken which showed results of electronic speed signs in terms of speed reductions and compliance to the speed limit

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improved over time. In fact, some studies showed locations with signs installed for several years with nearly all vehicles adhering to the speed limit. Despite the signs being warning signs and not enforceable, motorists observed the signs messaging over time.



Figure 19.6 shows the trend line for the reduction of average speed over time.

Figure 19.6 - SAM reduction in average speed over extended durations

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Conclusions

SAM portable speed warning signs have reduced vehicle speeds by an average of 5.2 km/h for all vehicles and 9.5 km/h for vehicles travelling above the speed limit at V1. The visual reminder has delivered a significant reduction in motorists travelling above the speed limit from 22.1% of 25.1 Million vehicles to 8.7%.

The data from each site no matter what speed limit, road hierarchy, or school or non-school zone has shown a marked decrease in the number of motorists travelling over the speed limit because of being advised of their entering speed.

Reports show the three primary conclusions. SAMs are:

- effective at reducing speeds which increases the compliance of vehicles over the speed limit,
- effective at reducing speeds and increasing the number vehicles adhering to the speed limit for all types of sites no matter their road hierarchy, speed limit or if a school zone, and
- continually effective at reducing speeds and percentage speeding whilst in place for at least 23 weeks.

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Appendix 24

Fauna Underpass Concept Engineering Plans





Appendix 25

Offset Area Management Plan



Ripley View Residential Subdivision (EPBC 2020/8615)

Draft Offset Area Management Plan

ENVIRONMENTAL PLANNING * ENVIRONMENTAL MANAGEMENT * ECOLOGICAL SURVEY & ASSESSMENT THREATENED SPECIES MANAGEMENT * BUSHFIRE MANAGEMENT


DOCUMENT CONTROL

| Project No. | 2018-079c |
|-------------|--|
| Project | Ripley View Residential Development (EPBC 2022/8615) |
| Document | Draft Offset Area Management Plan |
| Client | Arxhe Ripley View Investment Trust |

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Document history and status

| Revision | Date | Description | Ву | Review |
|----------|------------|------------------------------|--------------|--------------|
| 1.0 | 09/082023 | First draft | M. Barnett | A. Dickinson |
| 2.0 | 12/01/2024 | Second draft | A. Dickinson | W. Moffitt |
| 3.0 | 02/02/2024 | Third draft | A. Dickinson | W. Moffitt |
| 4.0 | 09/02/2024 | Fourth draft with minor edit | A. Dickinson | W. Moffit |

Approval for Issue

| Name | Position | Date | |
|--------------|-----------------|------------|--|
| A. Dickinson | Project Manager | 12/01/2024 | |



Declaration of Accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

| Signed: | at |
|---------------|--------------------------------|
| Full name: | Andrew Dickinson |
| Organisation: | 28 South Environmental Pty Ltd |
| Date: | 09/02/2024 |



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1 Introduction

1.1 Background

Arxhe Ripley View Investment Trust (**the Proponent**) will be required to deliver an environmental offset as compensation for residual significant impacts to habitat for Matters of National Environmental Significance (**MNES**) as part of the Ripley View Residential Development (**the Proposed Action**).

A draft Offset Area Management Plan (**OAMP**, this document), prepared in accordance with the Commonwealth Government's Department of Climate Change, Energy, the Environment and Water (**DCCEEW**) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (**EPBC Offset Policy**), is a requested requirement of the Preliminary Documentation submission for EPBC Application 2020/8615.

1.2 Purpose of Offset Area Management Plan

The overarching purpose of this draft OAMP is to address the information requirements specified in Section 6 of the Additional Information request received from DCCEEW on 6 August 2020 (then the Department of Agriculture, Water and Environment). In summary, this draft OAMP provides details of:

- The environmental offset required to be delivered by the Proponent as a consequence of anticipated residual significant impacts of the Proposed Action
- The proposed offset receiving site (**ORS**), including location, size, condition, and relevant ecological/species values present
- How the nominated ORS will be legally secured
- The nature of the conservation gain, including completion criteria, to be achieved over the nominated offset period for relevant MNES on the proposed ORS
- Land management actions required over the offset period to support progress towards achieving the completion criteria
- A monitoring program required to measure progress towards achieving the completion criteria, including corrective actions
- Adaptive management, including corrective actions, and reporting requirements for the duration of the offset period.

1.3 Limitations

This draft OAMP is to be read in conjunction with the Preliminary Documentation Report, Version 6 (28 South Environmental, 2024) and generally aligns with relevant principles and sections of the Environmental Management Plan Guideline (Department of Environment, 2014).

Values that have been adopted for use in calculations for Modified Habitat Quality Assessment (MHQA), using the *Offsets Assessment Guide* (Department of Environment, 2012), are introduced and justified within the Preliminary Documentation Report (28 South Environmental, 2023). Quality value changes in this assessment reflect implementation of the specific actions listed in this OAMP (**Section 6**).

Survey methods deployed over the ORS incorporated standard practices from the *Guide to Determining Terrestrial Habitat Quality: A toolkit for assessing land based offsets under the Queensland Government Offsets Policy Version 1.2* (Department of Environment and Science, 2020) combined with the specific stocking rate factors from the *How to Use the Offsets Assessment Guide* (Department of Environment, n.d.).

1.4 Responsible entities

The roles and responsibilities of relevant entities are provided in **Table 1**. The roles presented here exclude the regulatory role undertaken by the Commonwealth Government for the assessment and approval of the offset and the Queensland Government for registering and declaring the Voluntary Declaration over the nominated ORS.

| | Т | able | 1. | Roles | and | res | ponsib | oilities | of | relevant | entities |
|--|---|------|----|-------|-----|-----|--------|----------|----|----------|----------|
|--|---|------|----|-------|-----|-----|--------|----------|----|----------|----------|

| Role: | Proponent | Entity: | Arxhe Ripley View Investment Trust | | | | | |
|-------------------|---|---|--|--|--|--|--|--|
| Respon | Responsibilities: | | | | | | | |
| • Pr Go | eparation and lodgement of the Leg overnment. | ally Bindir | ng Mechanism (see Section 2) with the Queensland | | | | | |
| • Oł | tain and comply with all conditions of | f the EPB0 | Capproval for the Proposed Action. | | | | | |
| • Er | ter into a commercial agreement with | n an Offset | Provider for the delivering of EPBC compliant offsets. | | | | | |
| • Fu | nd all management obligations / active life of offset. | ons / tasks | s as listed in the approved OAMP at the offset site for | | | | | |
| • Re | port on the EPBC approval in Annua | I Compliar | nce Reports or as triggered within conditions. | | | | | |
| Role: | Environmental Consultant | 28 South Environmental (or future independent consultant) | | | | | | |
| Respon | Responsibilities: | | | | | | | |
| • Co va | Collection, interrogation and analysis of robust scientifically justified survey data for use as the baseline values at the offset site. | | | | | | | |
| • Re for | Repeating surveys as per the currency in this Offset Management Plan or as per conditions of approval for measuring improvement outcomes. | | | | | | | |
| • As Qu | • Assist with the preparation and lodgement of the Legally Binding Mechanism (see Section 2) with the Queensland Government. | | | | | | | |
| • Au Pr | • Audit offset reports against approval conditions as part of the Annual Compliance Reports for the Proposed Action. | | | | | | | |
| Role: | Offset Provider | Entity: | Koala Farmland Fund | | | | | |
| Responsibilities: | | | | | | | | |



- All on-ground implementation of the OAMP.
- Monitoring and reporting on OAMP actions, tasks and outcomes.
- Appointment of relevant experts or experienced contractors to undertaken specified tasks as required by the OAMP.
- Corrective actions for any non-compliance activities.
- Review, amendment and adaptive management changes of the approved OAMP over the life of the offset.

1.5 Descriptive terms and nomenclature

Key descriptive terms that have been adopted throughout this OAMP to describe aspects of offset delivery are presented in **Table 2**.

| Term | Definition |
|--------------------------------|--|
| The Proponent | Arxhe Ripley View Investment Trust |
| Proposed Action | Ripley View Residential Development |
| Offset property | Lot 271 CA311037 (part thereof) and Lot 127 CA31414 (part thereof) Little Kipper Creek Road, Biarra, Queensland 4313 |
| Offset Receiving Site (ORS) | Area to be secured for delivery of offset within the bounds of the offset property |
| Impact site | Lot 208 on SL11067, Lot 209 on SL11067, Lot 210 on SL9238, Lot 211 on RP906067 and Lot 2 on RP906067 Flinders View, Ipswich, Queensland 4305 |
| Disturbance footprint | The extent of clearing and development within the bounds of the impact site |
| Offset period | 20 years from the commencement of offset |



2 Legal security of proposed Offset Receiving Site

Lot 271 on CA311037 and Lot 127 on CA31414, on which the ORS is located, were purchased by the Offset Provider in 2021. The Proponent will contract the Offset Provider to manage the ORS for the offset period.

The ORS and its values will be legally secured through a Covenant (Statutory Covenant) within six months of an approval. A covenant is an enduring protection mechanism to provide ongoing conservation protection, on the title of the land under Chapter 6 Part 4 Division 8A of the *Land Act 1994* (Qld).

A Covenant protects land and values and is binding on current and future owners. It provides the highest level of protection to areas of land containing environmentally valuable native vegetation.

The declaration and management plan will be noted on the land title, which informs prospective buyers of current declarations and management plans and where copies are available. This information is important to the property market as future owners will be bound by the plan and declaration.

The Covenant will be lodged and legally secured by evidence of encumbrance on Registered Land Title prior to the commencement of any clearing works on the impact site. This protects the vegetation by way of purpose-built regulation on the title so all future land owners are aware of the restrictions prior to purchase.

3 Impact site

The following section provides a high-level summary of the Proposed Action and the MNES that have been identified, through assessment, as subject to residual significant impact due to the Proposed Action.

3.1 Impact site and Proposed Action

A summary of the Proposed Action is provided in **Table 3**. Further details on the Proposed Action, including timing, staging and infrastructure components, are provided in Section 2 of the Preliminary Documentation Report (28 South Environmental, 2023).

| ltem | Detail | | |
|--------------------------------------|--|--|--|
| EPBC Number | 2020/8615 | | |
| Project name | Ripley View Residential Subdivision | | |
| Proponent & ACN | Arxhe Ripley View I ABN: 47 167 495 56 | nvestment Trust 62 | |
| Proposed Action | The Proposed Action involves site clearing, earthworks and establishment of: Residential lots; Neighbourhood park; Childcare centre Internal roads; Ecological corridor, inclusive of: Bioretention basins and drainage reserve; Revegetated batters; Open forest. | | |
| Impact site address | Melrose Drive, Flinders View, Ipswich, Qld | | |
| Lot/Plan | Lots 208 and 209 on SL11067 Lot 210 on SL9238 Lot 211 on RP906067 Lot 2 on RP906067 | | |
| Impact site area | Total area: 47.47 ha; Impact area: 37.31 ha | | |
| Tenure | Freehold | | |
| Soils (Land Zone Classifications) | Land Zone 3 – Alluvium. On this site, this is associated with Bundamba Creek tributary Land Zone 9/10 – Undulating country on coarse to fine grained sedimentary rocks. On site this geology comprises the more elevated parts of the site. | | |
| Vegetation communities | Total: 21.75 ha Impact: 20.53 ha Avoided : 1.22 ha | Vegetation Community: AU1 – Open Paddocks with Scattered Native Trees Condition: Lower slopes are dominated by Queensland blue gum and the higher slopes are dominated by spotted gum. Associated species included pink bloodwood, smooth-barked apple and northern grey ironbark in the western extent of the community. Mature canopy trees occur over pasture greases. Regional Ecosystem equivalence: Contains non-remnant vegetation comprising canopy elements of former RE12.9- 10.2. Pre-clearance mapping identifies RE12.9-10.2 | |

Table 3. Summary of the impact site and Proposed Action



| Item | Detail | | |
|-----------------------|--|---|--|
| | Total: 13.97 ha Impact: 12.60 ha Avoided: 1.37 ha | Vegetation Community: AU2 - Regrowth Open Forest Condition: Contains both advanced regrowth and remnant vegetation of RE 12.9-10.2 Regional Ecosystem equivalence: Comprises mapped remnant RE12.9-10.2 and regrowth vegetation analogous with RE12.9-10.2 | |
| | Total: 11.75 ha | Vegetation Community: AU3 – Remnant Queensland Blue Gum Open Forest | |
| | 4.17 ha Avoided: | patchily distributed paddock trees over a modified understorey. | |
| | 7.06 ha | Regional Ecosystem equivalence: Contains all elements of mapped remnant RE12.3.3, regrowth RE12.3.3 and lower-slope Queensland blue gum elements of RE12.9-10.7 along the common boundary with Melrose Drive (northern boundary). | |
| Disturbance footprint | 37.31 ha, comprising of: | | |
| | Permanent impact of 31.62 ha, consisting of: | | |
| | o Reside | ntial lots | |
| | o Interna | l roads | |
| | • Childcare centre | | |
| | • Neighbourhood park | | |
| | Temporary Impact of 5.09 na, consisting of: Bioretention basins and drainage reserve | | |
| | Revegetated batters at the edge of the ecological corridor Northern overland flow channel 15.85 ha of the impact site will be designated as ecological corridor post- development. | | |
| | | | |
| | | | |

3.2 MNES impact summary

28 South conducted likelihood of occurrence assessments of MNES that may occur on, or adjacent to the impact site. The assessment was informed by previous assessment of values in proximity to the Proposed Action, mapped vegetation communities and targeted species surveys and site assessments for habitat characteristics and quality.

Assessment of the potential impacts to MNES concluded that, after exhaustion of all reasonable avoidance and mitigation measures, residual significant impacts to habitat for the following protected matters:

- Koala (Phascolarctos cinereus) Endangered: 38.40 ha new impact
- Grey-headed flying-fox (*Pteropus poliocephalus*) Vulnerable: 37.92 ha new impact
- Greater glider (*Petauroides volans*) Endangered: 47.47 ha new impact.

In addition to the extent of new impact, the Proposed Action incorporates 0.61 ha of habitat for all three species that was cleared by Queensland Urban Utilities in 2022.

Full details of these desktop and field assessments are provided in **Section 3** of the Preliminary Documentation Report (28 South Environmental, 2023).



4 Offset Receiving Site

This section provides a description of the nominated ORS and its suitability for providing the conditions necessary to maximise the likelihood of offset success.

4.1 Description of Offset Receiving Site

4.1.1 Overview

The area that is nominated for delivery of offset is summarised in **Table 4**. The location of the ORS relative to other natural features in the regional landscape is shown in Figure 1. The configuration of the ORS is shown in **Figure 2**.

| ltem | Detail | | | |
|---|--|--|--|--|
| Address | Little Kipper Creed Road, Biarra, Qld 4313 | | | |
| Lot/Plan | Lot 271 on CA31103 Lot 127 on CA31414 | 7 | | |
| Area | Total area of offset | properties = | | |
| | • Lot 271 on 0 | CA311037 = 258.6 ha | | |
| | • Lot 127 on C | CA31414 = 182.1 ha | | |
| | ORS area = 184.3 ha | 1 | | |
| | • Lot 271 on 0 | CA311037 = 88.2 ha (47.8% of property) | | |
| | • Lot 127 on 0 | CA31414 = 96.2 ha (52.2% of property) | | |
| Tenure | Freehold | | | |
| Land zoning | The entirety of the ORS is zoned as 'Rural' under the Somerset Planning Scheme | | | |
| Distance from impact site | The ORS is 64.8 km in a north-west direction from the impact site | | | |
| ORS Soils (Land Zone Classifications) | Land Zone 12 – Hills and lowlands on granitic rocks | | | |
| Vegetation | Lot 127: 7.1 ha | Assessment Unit: AU1a | | |
| communities within | Lot 271: 0 ha | Condition: Remnant | | |
| (Figure 3) | Total: 7.1 ha | RE Description: RE 12.9-10.2 <i>Corymbia citriodora</i> subsp. <i>variegata</i> +/- <i>Eucalyptus crebra</i> open forest on sedimentary rocks | | |
| | Lot 127: 7.2 ha | Assessment Unit: AU1b | | |
| | Lot 271: 13.9 ha | Condition: High Value Regrowth | | |
| | Total: 21.1 ha | RE Description: RE 12.9-10.2 <i>Corymbia citriodora</i> subsp. <i>variegata</i> +/- <i>Eucalyptus crebra</i> open forest on sedimentary rocks | | |
| | Lot 127: 36.6 ha | Assessment Unit: AU2 | | |
| | Lot 271: 34.6 ha | Condition: Young Regrowth | | |
| | Total: 71.2 ha | RE Description: Pre-clear RE 12.9-10.2. <i>Corymbia</i> <i>citriodora</i> subsp. <i>variegata</i> +/- <i>Eucalyptus crebra</i> open forest on sedimentary rocks | | |
| | Lot 127: 45.2 ha | Assessment Unit: AU3 | | |
| | Lot 271: 39.7 ha | Condition: Pastural Grassland | | |

Table 4. Summarised details of proposed Offset Receiving Site



| Item | Detail | |
|------|-----------------------|--|
| | Total: 84.9 ha | RE Description: Pre-clear RE 12.9-10.2. <i>Corymbia</i> <i>citriodora</i> subsp. <i>variegata</i> +/- <i>Eucalyptus crebra</i> open forest on sedimentary rocks |

4.1.2 Topography, terrain and aspect

The ORS is situated in the eastern foothills of the Great Dividing Range as it extends through Deongwar State Forest. The ORS itself consists of an undulating series of valleys (200 m AHD) and ridgelines (310 m AHD) with steep to moderately steep slopes associated with headwater tributaries of Little Kipper Creek on Lot 271, running in an east to west direction, and Gallanani Creek North Branch on Lot 127, running in a west to east direction, as shown on **Figure 4**.

4.1.3 Geology and soils

The 1:100k detailed surface geology across both lots is dominated by late Triassic to early Jurassic sedimentary rocks of the Woogaroo Subgroup (formerly Helidon Sandstone). Lithology includes sublabile to quartzose sandstone, siltstone, quartz-rich granule to cobble conglomerate and coal. *Corymbia citriodora* (spotted gum) is strongly associated with the deeper loamy soils of the Woogaroo Subgroup (Harms, 1999).

The floodplain of the Little Kipper Creek tributary, which flows across Lot 271, is mapped as later Tertiary-Quaternary colluvium comprising clay, silt, sand, gravel and soil; colluvial and residual deposits.

The floodplain of the Gallanani Creek North Branch tributary, which flows across Lot 127, is mapped as Quaternary alluvium comprising clay, silt, sand and gravel.

1:50,000 soils mapping from the Land Resource Assessment of the Brisbane Valley (Harms, 1999) indicates that most of the Lot 271 and the southern half of Lot 127 is dominated by the Hibiscus (Hb) Soil Profile Class (SPC) which is a red loamy soil (Red Kandosol). This soil type is associated with undulating to rolling rises and low hills.

The northeastern corner of Lot 271 and southern half of Lot 127 is mapped as being dominated by the Yellowbank (Yb) SPC which is a yellow or brown loamy soil (Brown or Yellow Kandosols). This soil type is associated with undulating to rolling low hills. Predominantly lower slopes and drainage depressions.

4.1.4 Invertebrate pest species

A range of ecological survey techniques have been implemented to ascertain the habitat suitability and the current fauna utility of the ORS. The course of conducting these surveys, various pest invertebrate species have been confirmed as utilising the ORS. These species are identified in **Table** 5 with the method of observation and a high-level summary of the risk each species poses to the offset species of relevance and the success of site rehabilitation efforts.



| Binomial name | Common name | Pest status | How recorded | Risk to offset species | Risk to rehabilitation success |
|-----------------------|----------------|-----------------------|-----------------|------------------------------|---|
| Canis lupis familaris | Wild dog | Restricted | C, O, CT | Predation | Nil |
| Felis cattus | Feral cat | Restricted | 0 | Spread of disease | Nil |
| Vulpes vulpes | Fox | Restricted | СТ | Predation | Nil |
| Lepus capensis | European hare | Invasive | СТ | Nil | Ringbarking, grazing and browsing, and preventing regeneration of seedlings |
| Cervus elaphus | Red deer | Restricted | O, CT | Nil | Ringbarking, grazing and browsing, and preventing regeneration of seedlings |
| Cervus timorensis | Rusa deer | Restricted | СТ | Nil | Ringbarking, grazing and browsing, and preventing regeneration of seedlings |
| Bos taurus | Cattle | N/A (domesticated) | СТ | Nil | Grazing on new growth; soil compaction |
| Rattus rattus | Black rat | Invasive | СТ | Nil | Nil |
| Sus scrofa | Wild pig | Restricted | Т | Nil | Uprooting of vegetation, turnover of soil |

Table 5. Invertebrate pest species confirmed utilising the ORS

Notes:

C = Calls (audible); O = Observation (in person); CT = Camera trap; T = Tracks

4.1.5 Weeds

Weed species that occur across the ORS have been surveyed by the following means:

- 19 x Bio-condition (MHQA) transects
- 29 x 50 m x 50 m plot assessments.

Surveys established that weeds are present across all assessment units that occur within the ORS, but are most prevalent (up to 70% of groundcover) in AU2 (young regrowth) and AU3 (pastural grassland). A total of 23 weed species were recorded across the ORS during surveys, with dominant weed species including *Lantana camara*, *Melinis repens* and *Cynodon dactylon*. All weed species recorded during field surveys are presented in **Table 6**.

| Binomial name | Common name | Pest status |
|---------------------------|-------------------|--------------------|
| Aster subulatus | Bushy starwort | Nil |
| Chamaecrista rotundifolia | Roundleaf cassia | Environmental weed |
| Cynodon dactylon | Bermuda grass | Environmental weed |
| Cyperus rotundifolia | Nut grass | Environmental weed |
| Cyperus sesquiflorus | Kyllinga weed | Environmental weed |
| Erigeron bonariensis | Flaxleaf fleabane | Environmental weed |
| Gamochaeta coarctata | - | Environmental weed |

Table 6. Weed species recorded across the ORS



| Binomial name | Common name | Pest status |
|---------------------------|---------------------|---|
| Gomphocarpus physocarpus | Balloon cotton bush | Environmental weed |
| Gomphrena celosioides | Gomphrena weed | Environmental weed |
| Heliotropium amplexicaule | Blue heliotrope | Environmental weed |
| Indigofera spicata | Creeping indigo | Environmental weed |
| Lantana camara | Lantana | WoNS, Restricted Matter, Environmental weed |
| Lantana montevidensis | - | Nil |
| Melinis repens | Red natal grass | Environmental weed |
| Opuntia tomentosa | Velvety tree pear | WoNS, Restricted Matter, Environmental weed |
| Praxelis clematidea | Mistflower | Environmental weed |
| Richardia brasiliensis | White eye | Environmental Weed |
| Senecio madagascariensis | Fireweed | WoNS, Restricted Matter, Environmental weed |
| Sida rhombifolia | Common sida | Environmental Weed |
| Solanum capsicoides | Devil's apple | Environmental Weed |
| Solanum elegans | Violet nightshade | Nil |
| Stylosanthes sp. | - | Nil |
| Verbena rigida | Veined verbena | Environmental Weed |

4.2 Offset Receiving Site suitability

The suitability of the nominated ORS for the provision of habitat for koala, grey-headed flyingfox and greater glider is discussed in **Section 7.5** of the Preliminary Documentation Report (28 South Environmental, 2023).

4.3 Compliance with EPBC Offset Policy criteria

The EPBC Act Environmental Offsets Policy details a number of principles that a suitable offset will achieve. **Table 7** demonstrates how the ORS meets and exceeds the Policy Principles.



Table 7. Suitability of Offset Receiving Area against the EPBC Act Environmental Offsets Policy

| EPBC Offset Suitability Criteria | Suitability of nominated Offset Area |
|--|---|
| Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter | The proposed management measures will deliver a significant upswing in vegetation quality and cover within the ORS (and immediate surrounds). Further, the ORS will ultimately increase both the extent and volume of foraging resources for koala, grey-headed flying-fox and greater glider, with a particular focus on establishing a self-sustaining open forest of RE12.9-10.2 containing <i>Corymbia citriodora subsp variegata</i> (spotted gum) and <i>Eucalyptus crebra</i> (narrow leaved ironbark) open forest with <i>Eucalyptus tereticornis</i> (Queensland blue gum) either as a subdominant or dominant canopy species on lower-slopes, and achieving remnant status within 20 years (time to acquittal of the matter). The total offset area will be 184.3 ha. |
| | When considered in the context of the ORS directly combining with additional offset lands owned by Koala Farmland Fund to the south, existing Queensland blue gum dominated vegetation along Kipper Creek west and higher order waterways surrounding the Site, a consolidated regionally significantly area of important foraging habitat will be established. |
| | The offset will be maintained in perpetuity as habitat protected by Statutory Covenant under Chapter 6 Part 4 Division 8A of the <i>Land Act 1994</i> (Qld). |
| | The cumulative mass of 184.3 ha of remnant status vegetation with scattered veteran trees flowing in unison will provide a significant beacon of intact foraging resources with low edge to volume ratio. |
| | Suitability for Koala |
| | Youngentob et al. (2021) identified locally important food trees for koala by geography. Two tree species recognised as important food trees for koala in south-east Queensland are present within the ORS, being <i>Eucalyptus crebra</i> (narrow-leaved ironbark) and <i>Eucalyptus tereticornis</i> (Queensland blue gum). These species will also be included in the planting palette for revegetation across the ORS. |
| | In order to ascertain current utilisation, spotlighting was conducted over two evenings in May 2023. Two koala were observed on contiguous habitat immediately to the south of the offset (on the Koala Farmland Fund land). Scat surveys identified koala utilisation of the ORS. |
| | It is clear that koala would benefit significantly from the increase in habitat quality and quantity over the ORS, particularly considering the wider linkages it would provide for koala, providing significant corridors for individual home ranges and the ability for uninterrupted dispersal (particularly younger males moving to new ranges attempting to avoid older established males). |
| | Suitability for Grey-headed flying fox |
| | Important winter flowering species (with high productivity and reliability scores) in the blossom diet of grey headed flying foxes include <i>Eucalyptus crebra</i> (narrow-leaved ironbark), <i>Eucalyptus tereticornis</i> (Queensland blue gum), <i>Corymbia citriodora subsp variegata</i> (spotted gum), <i>Corymbia intermedia</i> (pink bloodwood) and <i>Eucalyptus microcorys</i> (tallowwood) ¹ . All species are present within AU1 and AU2. |

1 Main flowering in spring and autumn (Stanley and Ross 2022)



| EPBC Offset Suitability Criteria | Suitability of nominated Offset Area | | |
|--|---|--|--|
| | Suitability for greater glider | | |
| | Regional ecosystem 12.9-10.2 contains canopy species that are dominant, codominant, subdominant and associated that represent greater glider habitat (Eyre 2022). | | |
| | Tree cover mainly occurs in AU1, patchy cover in AU2 and sparse paddock trees in AU3. Tree species of known value to the greater glider present at the ORS are: | | |
| | Angophora subvelutina (broad leaved apple) | | |
| | Corymbia citriodora subsp variegata (spotted gum) | | |
| | Corymbia clarksoniana (long fruited bloodwood) | | |
| | Corymbia intermedia (pink bloodwood) | | |
| | Corymbia trachyphoia (brown bloodwood) | | |
| | Corymbia tessellaris (Moreton Bay ash) | | |
| | Eucalyptus carnea (bread-leaved stringybark) | | |
| | Eucalyptus crebra (narrow leaved ironbark) | | |
| | Eucalyptus microcorys (tallowwood) | | |
| | Eucalyptus tereticornis (Queensland blue gum) | | |
| | Lophostemon suaveolens (swamp box). | | |
| | There are also a large number of large trees (1,199 >300 mm DBH, including 415 >500 mm). | | |
| | There are a number of potential habitat trees within parts of the site converted to improved pasture viz-a-viz AU2 and AU3 without ecological context, that is although present they are not accessible by greater glider. Under a status quo scenario in which the site continues to be managed as a grazing property, these trees would be lost or remain unengaged / unavailable to greater glider. Ecological restoration will result in the establishment of forage habitat which will provide context to these trees. The offset site therefore has a significant capacity to improve habitat quality for the greater glider over time by revegetation of cleared areas and the maturity of existing and future vegetation. | | |
| | Importantly, the Offset Site retains ecological connectivity with large areas of remnant and regrowth forest within the Koala Farmland Fund site (where two greater gliders were observed in May 2023) and with a broader block of State biodiversity significance on the eastern slopes of the Great Dividing Range where numerous National Parks and State Forests are present. Multiple contemporary records for greater glider are found in this area. | | |
| Suitable offsets must be built around direct offsets but may include other | The ORS can accommodate up to 184.3 ha of direct offset for koala, grey-headed flying-fox and greater glider with the express aim of achieving an increase in the quality and cover of habitat for these species with a 20 year time to ecological benefit. | | |
| compensatory measures | The ORS will, however, have tangible ecological benefits to many other species. The proposed intensive management measures will also aim at creating/ fabricating other habitat features such as course woody debris. | | |



| EPBC Offset Suitability Criteria | Suitability of nominated Offset Area |
|---|---|
| | Beyond this, the direct offset will have beneficial outcomes to other MNES. The offset will result in the expansion of habitat at the footslopes of Deongwar State Forest (Deongwar Range – eastern slopes of the Great Dividing Range to the east of the town Crows Nest) a noted ecological corridor. All three MNES are found within this area. |
| | Five farm dams present on the ORS will be modified for irrigation during restoration, firefighting and will remain in perpetuity as watering points for local wildlife. |
| Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter | The ORS is in proportion to the level of statutory protection because the offset assessment guide requires that the user selects the appropriate conservation status or extinction rate. The ORS will be the subject to a Statutory Environmental Covenant under the <i>Land Title Act 1994</i> , ensuring protection in perpetuity. Beyond this, the ORS will also be subject to a Statutory Covenant under Chapter 6 Part 4 Division 8A of the <i>Land Act 1994</i> (Qld) (afforded the same protection as National Parks in Queensland). |
| Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter | The ORS (184.3 ha) will be subject to ecological restoration works, eventually creating an open forest of <i>Corymbia citriodora subsp. variegata</i> (spotted gum) and <i>Eucalyptus crebra</i> (narrow-leaved ironbark) with <i>Eucalyptus tereticornis</i> (Queensland blue gum) and <i>Corymbia intermedia</i> (pink bloodwood) all significant resource for koala, grey-headed flying-fox and greater glider, and numerous other species and communities of conservation significance) within c 50 km of the ORS. |
| | The proposed offset of 184.3 ha represents a net gain of habitat of 4.86 times the significant residual impact (9.72 times the total quantum impact of 18.96 ha) at the impact site and achieves >100% offset result for all species. |
| Suitable offsets must effectively account for and | The Proponent is in advanced negotiations with the Koala Farmland Fund to acquire 184.3 ha of their larger South Kipper offset site as offset for residual impacts arising from the Ripley Valley Residential development. |
| manage the risks of the offset not succeeding | All works will be actively managed by Koala Farmland Fund, proven and reputable offset provider. The ORS will be subject to a detailed a management program to govern and guide success parameters. As required, Koala Farmland Fund will only contractors with an established track record for establishing and managing offsets (with similar approval EPBC approval conditions – periodic performance targets and offset establishment period) will be considered. |
| | The level of protection this ORS will be afforded on top of this intensive management will ensure that the ORS is managed and retained as a significant area of conservation in perpetuity. |
| Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs | The proposed ORS is specifically to acquit offset requirements under the EPBC Act and not any other law or planning regulation. The ORS is ideal for the Proponent to deliver an offset which meets the requirements of the EPBC Act Offset Policy and DCCEEW Approval Conditions. With respect to the Impact Area, the ORS represents an outstanding opportunity to deliver a high-quality offset and meet community expectations of this being locally sourced. |
| | The ORS will protect large area of land that provides current value to MNES. Despite the continued growth of the South East Queensland region the ORS is considered at low risk of threat from urban development; the locality in which the ORS is outside of the South East Queensland urban footprint and is part of the Rural Landscape. The ORS will be managed under an intensive works program and be subject to consistent and constant monitoring through transparent, reliable and trusted bio-condition and tertiary Site monitoring assessments. |
| Suitable offsets must be efficient, effective, timely, | The ORS is effective in that it is mapped as it is mapped as proximally close (has canopy connectivity with) a State and regionally significant area of vegetation containing important biodiversity corridors and therefore is efficient in contributing, at |



| EPBC Offset Suitability Criteria | Suitability of nominated Offset Area |
|--|--|
| transparent, scientifically robust and reasonable | scale, the realization of regional landscape ecological outcomes. Advanced restoration works and regrowth existing on the ORS will mean that the offset is timely in relation to the residual impacts of a Proposed Action. Beyond the regrowth areas being protected by the ORS, a component of the offset will result in a significant up-swing in habitat availability for MNES as these areas will be transitioning from completely cleared paddocks to remnant vegetation over the period they will be protected. By using the DCCEEW impact and offset calculators, the offset is transparent, scientifically robust and reasonable. |
| Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced | Sections 6, 7 and 8 of this OAMP provides clarity around the environmental objectives proposed, risks and risk management in achieving these goals and corrective actions identified should works not meet their envisaged target. This can be achieved through a) intensive ecological restoration works (i.e. full augmentation of habitats through intervention); b) intensive restoration and forestry management practices for the ORS; c) Yearly tertiary monitoring for the life of the ORS compliance; d) detailed monitoring at years 1, 2, 3, 4, 5, 7, 9, 11, 14, 17, 20; and e) Auditing events at years 5, 10, 15 and 20. |
| | This OAMP will be the responsibility of, managed and delivered by the Offset Provider (Koala Farmland Fund) to ensure works meet this policy item and regulators will be informed of ongoing progress in relation to the approved OAMP. |
| | The Offset Provider will be responsible for the development and completion of compliance reporting. This reporting will clearly outline how reporting requirements defined in the OAMP have been met. It will be the Offset Provider's responsibility to ensure that reporting is sent to the Proponent. It is the Proponent's responsibility to ensure that reporting is sent to DCCEEW, published on the Proponent's Project website and maintained in a safe, secure file for auditing purposes. The Proponent will ultimately remain responsible for the approval, regardless of the proposed delivery mechanism. |





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Source: D:\Dropbox\(d) Projects\2014\2014-040(c) (Warner South)\(d) Data\(d) GIS

Data Sources: Qld Globe (SIPS 2016); Digital Cadastre Database (Dept. Natural Resources, 2021); Roads (Dept. Natural Resources, 2020); Watercourses (Dept. Natural Resources, 2020); Contours (Dept. Natural Resources 2016).



Major Road

Road

- ⊢++ Rail Network
- Watercourse _ _

Statewide Biodiversity Corridor (Regional Significant Corridor) Statewide Biodiversity Corridor (State Significant Corridor)

- **Forest Reserve** • • National Park National Park (scientific)
- **.** . **Resources Reserve**

. . . State Forest

Timber Reserve

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5 Offset Receiving Site design

The ORS consists of 84.9 ha of non-remnant vegetation, 7.1 ha of remnant vegetation and 92.3 ha of regrowth. The offset management area has been further categorised into three distinct Management Units (MUs) for the purposes of management and improvement monitoring. This categorisation is based on existing habitat condition and desired environmental offset principles. The three MUs are broadly aligned with vegetation assessment units within the ORS, as identified in **Table 4** and shown in **Figure 3**.

The MUs are as follows:

- MU1 = 28.18 ha, representative of AU1a and AU1b
- MU2 = 71.21 ha, representative of AU2
- **MU3** = 84.93 ha, representative of **AU3**.

Section 4.0 of this OAMP provides a brief description of the MUs and outlines core objectives sought within each MU as part of the overall offset outcome.

The designation of the offset management area into MUs is specifically linked to Action Tables in **Section 6** of this OAMP allowing itemised tasks to reference specific geographical areas within the ORS.

Refer to **Figure 3** for the designation and spatial extent of the MUs.

5.1 Management Unit 1

5.1.1 Existing condition

Management Unit 1 covers 28.2 ha and encompasses areas of remnant and high-value regrowth RE 12.9-10.2, as well as remnant RE 12.3.7. This MU is characterised by a mature canopy cover which predominantly consists of *Corymbia citriodora, Ecalyptus crebra* (RE 12.9-10.2) and *E. tereticornis* and *C. cunninghamiana* (RE 12.3.7).

This MU currently provides the foundations for functional habitat for koala, grey-headed flying fox and greater glider, with opportunity for improvement.

5.1.2 Management approach

Improvement of MU1 will occur through assisted natural regeneration, which will take advantage of the emerging natural resilience and functionality of the existing communities, while promoting the continued regeneration of native vegetation through:

• The removal of exotic woody weed species



• Selective supplementary and infill planting, as required to ensure the species mosaic and strata of the target vegetation communities are being achieved.

The focus within MU1 will be to undertake targeted pest plant treatment and removal to encourage the natural recruitment of native species from the natural seed bank.

Supplementary and infill planting will occur within MU1 if monitoring of natural regeneration of endemic canopy and shrub species demonstrates that it is falling short of adopted performance criteria (see **Attachment 1**).

5.1.3 Offset objectives

The primary offset objective for MU1 is to enable establishment over the offset period of sustainable vegetation communities that are consistent with the pre-clear communities for AU1a and AU1b (**Table** 4), to be achieved through assisted natural regeneration.

Details on specific management actions for MU1 are located in Section 6 of this OAMP, as well as **Attachment 1 (Offset Revegetation Plan)**.

5.2 Management Unit 2

5.2.1 Existing condition

Management Unit 2 covers an area of 71.2 ha and encompasses areas of young regrowth representative of RE 12.9-10.2. These areas of early regrowth demonstrate substantially greater weed incursion than the more mature vegetation communities represented by MU1, with weeds accounting for up to 70% of ground cover in some locations. Additionally, MU2 exhibits depressed graminoid and forb diversity and an absence of a canopy and shrub layer when compared to MU1.

This MU currently provides the early foundations for functional habitat for koala, grey-headed flying-fox and greater glider, with substantial opportunity for improvement.

5.2.2 Management approach

The management approach for MU2 will be to use the existing natural landform and water features to assist the natural regeneration of native vegetation. The natural regeneration will be supported through the exclusion of stock, in line with the approved Livestock Management Plan

Natural regeneration will also be coupled with broadscale revegetation, using species that are analogous with the pre-clear and desired vegetation community (RE 12.9-10.2).

Revegetation will use tube stock of locally sourced and grown species, planted at the rates and densities outlined in **Attachment 1**. The Offset Provider will work with local native nurseries to establish a supply of tube stock to sufficiently meet the in-fill planting requirement for MU2.



5.2.3 Offset objectives

The primary offset objective for MU2 is to enable establishment over the offset period of a sustainable vegetation community that is consistent with the pre-clear community for AU2, to be achieved through a combination of revegetation and natural regeneration.

Further details on specific management actions for MU2 are located in **Section 6** of this OAMP, as well as **Attachment 1 (Offset Revegetation Plan)**.

5.3 Management Unit 3

5.3.1 Existing condition

Management Unit 3 covers an area of 84.9 ha and encompasses areas of non-remnant pastural grassland. This MU will be the main focus of active restoration efforts. Existing habitat values for the protected matters range from marginal (paddock trees) to non-existing (grass plains). There are disconnected locations throughout MU3 where native vegetation values occur in a cluster or strand of healthy specimens, however these have limited functionality as habitat available for koala, grey-headed flying-fox and greater glider outside of periodical foraging resource.

5.3.2 Management approach

The management approach for MU3 will centre on the following principles:

- 1. Removing weed sources and dense matted pasture grasses from the soil profile in preparation for mass planting of native trees and other species known to support the koala, grey-headed flying-fox and greater glider.
- 2. Mass replanting with native tube stock and seedlings endemically collected from site and propagated in the Offset Provider's nursery of choice.
- 3. Plant maintenance, weed and pest management through the varying stages of revegetation to mature self-sustaining regrowth ecosystems.

5.3.3 Offset objectives

The primary offset objective for MU3 is to enable establishment over the offset period of a sustainable vegetation community that is consistent with RE 12.9-10.2 (**Table** 4), to be achieved through mass planting.

Details on specific management actions for MU3 are located in Section 6 of this OAMP, as well as **Attachment 1 (Offset Revegetation Plan)**.



6 Offset land management actions

There are six categories of management actions that are considered as necessary and appropriate for achieving the stated offset objectives. The primary purpose of these management actions is to either reduce or remove an existing threat or improve or create new habitat opportunities. In some instances, there is an overlap in the measurable outcomes of different management actions.

Some actions apply specifically to koala and others are designed to improve habitat and outcomes for koala, grey-headed flying-fox and greater glider. Some actions are limited to acute or specific locations, others apply to the entire ORS.

Performance indicators that are referenced in this section are those that were established and documented in **Section 6** of the Preliminary Documentation Report (28 South Environmental, 2023). This includes the use of the MHQA method for koala, grey-headed flying-fox and greater glider habitat to set benchmarks and targeted improvements within the ORS.

Actions to be completed in accordance with this OAMP are covered by plans, as follows:

- Action 1: Integrated vertebrate pest management plan
- Action 2: Biosecurity management plan
- Action 3: Fencing, access and signage plan
- Action 4: Fire management plan
- Action 5: Native seed collection and propagation plan
- Action 6: Development of artificial greater glider habitat.
- Action 7: Distributing coarse woody debris.
- Action 8: Koala dispersal poles
- Action 9: Revegetation and habitat creation plan.



6.1 Action 1: Integrated vertebrate pest management plan

As acknowledged in **Section 4.1.4**, various pest invertebrate species have been confirmed as utilising the ORS. The management plan presented in **Table 8** provides actions and measures to limit the detrimental effects of these confirmed invertebrate pest species.

| Action Description: What are the tasks proposed? | Reduce the occurrence of vertebrate pest species through implementation of targeted, species-specific management and an audit program. |
|--|--|
| | Achieve zero koala injury or mortality within the ORS within 5 years from the commencement of the offset. |
| | Maintain reduced occurrence and koala injury and mortality rates for the life of the offset (20 years – reduction achieved in 5 years, with maintained reduced rates for 15 years). |
| Action Location(s): Where on site is the action proposed? | Vertebrate pest management is to occur across all MUs. |
| Action Timing: | Prior to commencement of the action - |
| When and how will the action / task be implemented, started, | Data collected from the baseline vertebrate pest survey will be used to develop and finalise an Integrated Vertebrate Pest Management Plan , which will specify: |
| | Target species (i.e. those confirmed or suspected of occurring on site based on baseline survey data) |
| | Survey data, including mapping, generated from the baseline survey. |
| | Management techniques that will be implemented to exclude or otherwise control vertebrate pest species, agreed in consultation with adjoining landowners, Regional Pest Management Group representative and SRC. Management techniques to be tailored for: |
| | Years 1-5 (intensive management effort); and |
| | Years 6-20 (moderate management effort, subject to performance criteria being met) |
| | Monitoring methods that will be implemented across future years of offset delivery. |
| | An on-site recording protocol for incidental observations of pest management species by the Offset Provider and neighbouring landholders. |
| | Performance criteria for the management of each pest species. |
| | Corrective action procedure to be followed in the event that monitoring indicates that the adopted management techniques are not achieving the established performance criteria. |
| | Year 1 |

 Table 8. Management plan for Action 1



| | Establishment of wildlife-friendly safe movement fencing² around the full perimeter of the ORS (Action 4, Section 6.3). |
|--|--|
| | 2) Installation of Koala escape poles ³ at intervals throughout open paddock areas as a retreat from predators. |
| | Years 1 – 5 – Implement intensive pest management techniques, supplementary to fencing. Techniques may include shooting, baiting, trapping, fumigation of dens/warrens. |
| | Years 6 – 20 - Implement moderate effort pest management techniques, subject to performance criteria being met. |
| | Years 1 – 20 – Undertake annual monitoring as part of the Integrated Vertebrate Pest Management Plan. Data and mapping to be included in the relevant Annual Compliance Report. |
| | Include a data comparison between each year's pest census data and the baseline (Year 1) dataset. Data to be reported in the relevant year's Annual Compliance Report with tracking assessed against the performance criteria. Each year's Annual Compliance Report is to include proposed adaptive amendments to the Integrated Vertebrate Pest Management Plan for future years. |
| Responsibility: Who will complete the action and who will provide the funding? | The Offset Provider will establish, resource and fund the pest management components of the Annual Compliance Report. The following tasks will require specific expertise or appointed contractors to complete: |
| | Repeat surveys to be completed by a senior tertiary trained ecologist, zoologists or environmental scientist with a minimum of 5 years industry field experience. |
| | Use of 1080 or sodium fluoroacetate poisons is regulated under the Health (Drugs and Poisons) Regulations 1996. Deployment and use of this control method, if adopted, is to be via a registered contractor holding relevant permits and demonstrated experience. |
| | Hunting / shooting, if adopted as a control technique, are to occur in accordance with all relevant Queensland Government permits and regulations. |
| | All participants in the pest species recording program (Offset Provider staff, neighbouring landholders etc.) are to be educated in the data collection and recording procedures. |
| | The Offset Provider is responsible for preparing and issuing Annual Compliance Reports to the Proponent within contracted timeframes. |
| Measured & Monitored By: | The effectiveness of pest management measures that are implemented will be measured and monitored as follows: |
| How will the action be measured, how will the outcome of the action be measured, by what method and timing? | • Years 1 – 20 – annual pest surveys to measure progress towards completion criteria. |
| | The findings from each of these pest surveys will be documented in that year's Annual Compliance Report. |

² Post and four strand wire fence; top and bottom wires straight gauge, middle two strands are barbed wire.

³ timber posts securely erected to remain in a vertical position at least until this approval expires, each at least 4 metres in height and 125 mm diameter and each with at least one fork large enough to enable an adult Koala to sit and rest at least 3 m above the ground surface as described in the Koala Sensitive Design Guideline: Department of Environment and Science. DES 2022.



| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being | The Integrated Vertebrate Pest Management Plan will include intensive implementation methods and annual data collection survey events for monitoring successful reduction of pest management impacts. |
|--|---|
| | The repeat survey points are designed to deliver data on outcomes being achieved. If the surveys do not demonstrate the targeted effectiveness the implementation strategy will be adjusted to: |
| achieveu? | Adopt new management techniques. |
| | Increase successful techniques and reduce less successful management methods. |
| | Increase intensity of implementation program. |
| | Change the timing or locality of proposed target treatment locations or events. |
| | Allow the Management Plan to assimilate into any new broader threat abatement programs. |
| | The Integrated Vertebrate Pest Management Plan will use the baseline data to build a calendar of annual activities based around varying control methods, seasons and species. The threat abatement actions and outcomes within any calendar year will be reported on within the Annual Compliance Report and will provide a number of lead indicators towards a reduction in occurrence and impacts. Major survey and review periods are set to ensure the program achieves long term reduction and does not respond to specific stochastic events such as a fluctuation in pest populations. |

6.2 Action 2: Biosecurity management plan

The management plan presented in **Table 8** provides actions and measures to limit the detrimental effects of potential confirmed pest plant species. Management techniques are contained in **Table 10**.

Table 9. Management plan for Action 2

| Action Description: What are the tasks proposed? | Removal and control of all major weed infestations (WoNS and restricted weeds) from within the ORS using a variety of mechanical and herbicide methods. |
|---|--|
| | Ongoing maintenance rotations to retain extents of weed infestations within the ORS at or below the reduced extent achieved through weed management actions. |
| | Prevent the further spread or establishing of new weed outbreaks within the ORS. |
| | Prevent the introduction of diseases from personnel, or use of plant and equipment. |
| Action Location(s): Where on site is the action proposed? | Management of non-native weeds is to occur across all MUs. |
| Action Timing: When and how will the action / task | <u>Year 1</u> – |



| be implemented, started, completed? | Complete a <u>detailed</u> mapped, density-based baseline weed extent survey, building upon the surveys and data presented in the Preliminary Documentation Report and Appendix S.2 (28 South Environmental, 2023). Use differential GPS system to map the full extent (as description polygons) of all weed infestations within the ORS (achieve a total area extent of weed infestations / occurrences within the ORS). The baseline weed survey is to also include the location of the vehicle washdown station. |
|---|---|
| | Using data from the Year 1 baseline survey, finalise a site-specific Biosecurity Management Plan to include management techniques to be applied throughout the offset period (refer Table 10). |
| | Include baseline weed monitoring data and the Biosecurity Management Plan with the Year 1 Annual Compliance Report, to be provided to the Department prior to implementation in Year 2. |
| | <u>Years 2 – 20</u> – |
| | Undertake annual weed surveys and weed management control activities within the ORS, in accordance with the endorsed Biosecurity Management Plan. Activities conducted in the reporting period to be included in the relevant Annual Compliance Report. |
| | • Include a data comparison between each year's weed survey data and the baseline (Year 1) dataset. Data to be reported in the relevant year's Annual Compliance Report with performance assessed against the completion criteria. Each year's Annual Compliance Report is to include (as required) proposed adaptive amendments to the Biosecurity Management Plan for future years. |
| Responsibility: Who will complete the action and | The Offset Provider will establish, resource and fund all weed management components of the OAMP. The following tasks will require specific expertise or appointed contractors to complete: |
| who will provide the funding? | Baseline and repeat surveys to be completed by a senior tertiary trained ecologist, or environmental scientist with a minimum of 5 years industry field experience. |
| | • Use of any herbicides to be undertaken by a licensed contractor or strictly in accordance with the <i>Agricultural Chemicals Distribution Control Act 1996</i> and or in accordance with manufactures recommendations or label instructions. |
| | Preparing and issuing Annual Compliance Reports to the Proponent and DCCEEW within contracted timeframes. |
| Measured & Monitored By: | The effectiveness of weed management measures that are implemented will be measured and monitored as follows: |
| How will the action be measured, | • Year 1 – baseline weed survey |
| be measured, by what method and | • Years 2 to 19 – detailed weed surveys (monitoring) to measure progress towards completion criteria |
| timing? | • Year 20 – final weed survey to measure final achievement with completion criteria at the end of the offset period. |
| | The findings from each of these weed surveys will be documented in that year's Annual Compliance Report. |
| Risks & Adaptive Management: What's the procedure for correcting | If surveys demonstrate that the ORS is not trending towards achieving the completion criteria, the following corrective actions will be implemented: |
| or amending the action if the | Adopt new management techniques |



| proposed outcomes are not being achieved? | ٠ | Increase successful techniques and reduce less successful management methods |
|---|---|---|
| | ٠ | Increase intensity of implementation program |
| | • | Change the timing or locality of proposed target treatment locations or events. |

Table 10. Preliminary management techniques for inclusion in the Biosecurity Management Plan

| Weeds compete with native vegetation and can deter or be toxic to native fauna | Complete a detailed mapped, density-based baseline weed extent survey in Year 1, building upon the surveys and data presented in the Preliminary Documentation Report. |
|--|--|
| | Undertake annual weed surveys for Years 2-20. |
| | • Implement weed species-specific control methods based on extent of infestation, existing native values, topography, waterways and other sensitive receiving environments, e.g. |
| | Stick rake, grubbing, ploughing or slashing major accessible areas of weeds where not on a slope greater than 15% or where no existing native values occur; |
| | Apply broadscale herbicide and spot spray during high germination periods (Nov-March). |
| | Utilise organic based herbicides which minimise impacts on native vegetation regenerating within and surrounding weed infestations. |
| | Ensure chemicals are used according to label instructions and are the best chemicals for that use |
| | Keep records of chemicals used |
| | Coordinate with neighbours and other local community members and groups to maximise the effectiveness of weed eradication programs |
| Visitors to a property may unintentionally introduce diseases, pests and weeds via their clothing and equipment. | Where practical, use entry points to the ORS that prevent visitors entering higher risk weed areas |
| | Have an entry and exit procedure for the ORS which can be given to people that need to access the ORS |
| | • Indicate the process for entry to the ORS by visitors in a way which is practical (e.g. signage - Figure 6) |
| | Maintain a register of all visitors who enter the ORS, e.g. using the QR code check-in option available on the sign template presented as Figure 6 |
| Emergency services include fire, ambulance and police but they can also include other service providers required to assist during an emergency | Due to the critical nature of an emergency it is not always practical for these services to meet biosecurity requirements therefore the best course of action will be to assess the risk after the event by: |
| | Checking fences, gates and making repairs |
| | Monitoring the property for new diseases, pests and weeds |
| Fertilisers, soil, organic material, animal bedding and environmental waste (fill) can also spread | Ask for quality certificates or vendor declarations when purchasing products |
| | Inspect products on arrival to ensure they are pest (e.g. fire ant), pathogen and disease free. This requirement extends to all products and materials that may act as carriers. |



| diseases, pests and weeds when brought onto a property | | | | |
|--|--|--|--|--|
| Vehicles can spread pathogens and weeds onto a property due to their large surface area and ability to trap weed seeds and soil in things such as tyre treads, radiator grills, chassis, and debris in the interior or tray of vehicle | All vehicles that arrive on site are to either arrive with Weed Hygiene Declaration, certifying that the vehicle is clean, or will be required to undergo a clean down on-site. | | | |
| | Vehicles should be driven on designated roads / tracks within the ORS where possible | | | |
| | Monitor tracks for occurrence of new weed outbreaks | | | |
| | Minimise the number of vehicles driven through the ORS by establishing a designated parking area for visitor's vehicles as close as possible to the entry gate | | | |
| | Ask visitors who must use their own vehicles within the ORS to follow a 'come clean, leave clean' procedure – it is not proposed that a vehicle washdown be established on site | | | |
| | Provide visitors with a map of the ORS that includes designated tracks, known weed infestations or management areas and encourage them not to stray off existing tracks. | | | |
| | Clean down standards and procedures for vehicles and machinery are as follows: | | | |
| | 1. Safely park the vehicle free of any hazards. | | | |
| | Check the vehicle, inside and out, for where dirt, plant material including seeds are lodged. Pay attention to the underside, radiators, spare tyres, foot wells and bumper bars. | | | |
| | 3. Remove any guards, covers or plates as required. | | | |
| | 4. Knock off large clods of mud, use a crow bar if required and sweep out the cabin. | | | |
| | 5. Brush off dry material. | | | |
| | 6. Clean down with a high pressure hose and stiff brush/crowbar. | | | |
| | Start with the underside of the vehicle, wheel arches, wheels (including spare). Next do the sides, radiator, tray, bumper bars etc and finally upper body. Some vehicles may need to be moved during clean down e.g. tracked machinery. | | | |
| | If using vehicle ramps, ensure ramps load rating matches the vehicle, are placed on a hard level surface, cannot slide forward when mounting and that the handbrake is on and grounded wheels are chocked when in use. | | | |
| | 9. Clean any associated implements, e.g. buckets. | | | |
| | 10. Check there is no loose soil or plant material that could be readily dislodged or removed. | | | |
| | 11. Wash effluent away from vehicle. Do not drive through wash effluent. | | | |
| Equipment (such as machinery, tools) and clothes can spread weed seeds and plant pathogens. | Inspect equipment for soil and weed contaminants as it enters the ORS and moves between management units within the ORS | | | |
| | Regularly clean down property, vehicles or earth working equipment when moving from high to low risk areas within the ORS | | | |


| | Personnel, equipment and machinery should adhere to a 'come clean, leave clean' procedure by using equipment supplied at the washdown station at the main entry point to the offset site. |
|---|--|
| | Clean down standards and procedures for small tools and personal clothing are as follows: |
| | 1. Remove all loose mud and dirt from the object to be cleaned. |
| | 2. Use the recommended safety equipment if washing with a fungicide (safety gloves and glasses). |
| | Part fill a wash bath with clean water, a depth of about 4 cms is adequate for boot washing. Mix a solution of detergent or fungicide as required (see below). |
| | 4. Clean boots, gaiters and equipment with the scrubbing brush. |
| | 5. Effluent containing registered products such as fungicides must be disposed of in accordance with label recommendations. Otherwise wherever possible contain the effluent for appropriate off-site disposal. Small quantities of effluent not containing registered chemical products may be spread away from watercourses at the site of soiling. |
| | 6. A final rinse or wipe with fungicide or methylated spirits can be used for sterilisation of scientific equipment. |
| People movement records | Maintain: |
| (including staff, contractors, animal | Visitor log |
| handlers and family) must be kept for traceability purposes in the event of a biosecurity outbreak. | Vehicle washdown register |
| | Vendor sheets/records |
| | Staff/contractor time sheets |
| Training records can be used to | Maintain: |
| support legislation and industry programs, demonstrate due diliconce in your biosocurity and | Staff training records |
| | Training records |
| WHS requirements, or as proof of ongoing training, upskilling and skill maintenance | Staff/contractor induction packages |
| maintenance. | |



6.3 Action 3: Fencing, access and signage plan

The management plan presented in **Table 8** provides actions and measures to manage access, signage and fencing.

| Action Description: What are the tasks proposed? | Prevention / control of unauthorised access and trespass through the ORS. |
|--|--|
| Action Location(s): Where on site is the action proposed? | The full perimeter of the ORS will be fenced, utilising a wildlife-friendly fence design, consistent with the Koala- Sensitive Design Guidelines (DES, 2022). The location of fencing, access points and tracks are shown in Figure 5. |
| Action Timing: When and how will the action / task be implemented, started, completed? | Year 1: Removal of barbed wire from the top and bottom strands, and replaced with straight gauge (plain wire). Establish wildlife-friendly fencing along the perimeter of the ORS. This will involve establishing new fencing along the eastern boundary of the ORS. New fencing will be established with the Top and Bottom strands being plain wire. Access gates, padlocks and signage to be installed where ORS fencing crosses tracks and entry points to the site (Figure 5 and Figure 7) Provide notification to all adjoining landholders of the purpose, management principles and offset objectives outcomes for the ORS. Remaining Actions: No new access tracks through the ORS unless to support offset outcomes. |
| Responsibility: Who will complete the action and who will provide the funding? | The Offset Provider is responsible for funding and undertaking all actions relating to access and trespass prevention. The Offset Provider is responsible for preparing and issuing Annual Compliance Reports to the Proponent and DCCEEW within contracted timeframes. |
| Measured & Monitored By: How will the action be measured, how will the outcome of the action be measured, by what method and timing? | A copy of the notification letter provided to adjoining landholders to be provided with the Year 1 Annual Compliance Report. Evidence (photos) of signage on gates and fencing to be provided with the Year 1 Annual Compliance Report. The integrity, effectiveness and suitability of wildlife-friendly fencing around the perimeter of the ORS will be monitored: As a component of annual surveys conducted for pests (Action 1); and Following natural hazard events (e.g. large storms, bushfire etc.). |

Table 11.Management plan for Action 3



| | 4. The security and signage of gates will be monitored opportunistically through the course of day-to-day management of the ORS and following natural hazard events. As a minimum, each access point into the ORS will be inspected every three months. |
|--|--|
| | Similarly, the condition of access tracks will be monitored opportunistically through the course of day-to- day management of the ORS and following natural hazard events. As a minimum, each access track will be inspected every three months. |
| Risks & Adaptive Management: What is the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | If pest surveys identify an increased presence of pest species in the ORS, the merits of additional or alternative fencing arrangements will be assessed to provide improved deterrence. |
| | • Similarly, if evidence of recurring trespass is identified during regular ORS management activities and surveys, the merits of additional trespass deterrents (e.g. additional signage, security cameras etc.) will be assessed. |
| | Defective or ineffective fencing will be rectified/modified as necessary, within 30 business days of issues being identified. |
| | Signage will be replaced if found to be missing, faded or otherwise illegible within 30 business days of issues being identified. |
| | Defective access tracks will be rectified as necessary, within 30 business days of issues being identified. |



VISITORS

A BIOSECURITY MANAGEMENT PLAN APPLIES TO THIS PLACE

This is a management area for the Biosecurity Management Plan that applies to this place. It is an offence for a person entering, present at, or leaving a management area to fail to comply with the measures stated in the Biosecurity Management Plan for the area unless the person has a reasonable excuse.

FARM CHECK-IN



Scanning and completing the Farm Check-In is a condition of the Biosecurity Management Plan.

All visitors must scan the QR code and complete the form prior to entering this property. You must contact us or visit our office before entering the property to obtain information about the Biosecurity Management Plan and your biosecurity obligations under the *Biosecurity Act 2014*.

Vehicles, people and equipment can carry diseases, weed seeds and pests.

Phone / UHF channel:

Use the email address on this sign to send a copy to the property owner.

Email:

Figure 6. Example signage – 'Biosecurity Management Plan'



Biodiversity Offset Area

Protected by Voluntary Declaration under the Vegetation Management Act 1999

No Unauthorised Entry

Trespassers will be prosecuted In case of emergency, contact + 61 XXX XXX XXX

Figure 7. Example signage – 'No Unauthorised Entry'



6.4 Action 4: Fire management plan

The management plan presented in **Table 8** provides actions and measures to limit the detrimental effects of wildfire, and the use of low intensity mosaic burning as the primary means of managing accumulated pasture grass biomass and promote germination and ecosystem health within the Offset Site.

| Table 12. | Management plan for Action 4 |
|-----------|------------------------------|
|-----------|------------------------------|

| Action Description: What are the tasks proposed? | Manage created bushland habitat within the ORS to prevent and / or minimise the impact of high intensity wildfires. This will be achieved through: |
|---|--|
| | • Establishing a firebreak on the inside of the ORS perimeter fence line (Figure 5). Nominally, this firebreak will be 2 m wide and will also be used as a perimeter access track. The actual width of this break will be determined by the needs of the Offset Provider to safely travel the full fence line, without compromising the adjoining MUs. |
| | Establishing 2 x 20,000 L supplementary water storages on high points within the ORS (two per lot) for combined use for firefighting and revegetation watering. |
| | Periodical and controlled cultural burns or low intensity burns occurring in a mosaic configuration every 8-10 years through the ORS. |
| | Creation and alteration of existing fire breaks in support of habitat improvement, expansion and revegetation areas (consider new tracks and breaks in replanting programs). |
| | Establishment of safety and emergency response protocols for wildfire events. If any damage is sustained, an inventory is to be included in the reporting information. |
| Action Location(s): Where on site is the action proposed? | At present, the risk of wildfire is of main relevance to MU1 and MU2. The risk of wildfire in MU3 is limited in its current condition. However, as the MUs become better established, vegetation across the whole ORS will be able to support the establishment and spread of wildfire. |
| Action Timing: | Year 1: |
| When and how will the action / task be implemented, started, completed? | Conduct baseline fuel load survey across the ORS |
| | Finalise a Wildfire Management Plan, as a minimum the Plan is to include: |
| | Results of baseline fuel load survey |
| | Methods for maintaining fuel loads and decreased risk levels |
| | Finalised plan of fire tracks, trails and breaks |



| | Program for mosaic low intensity control burns, noting that planned burns will not be conducted until new tubestock plantings have matured sufficiently to withstand fire. This will be at the discretion of the Offset Provider but is unlikely to occur before Year 8 of offset delivery. |
|--|---|
| | <u>Years 2-20</u> |
| | Implement the ORS Wildfire Management Plan. The Key Performance Indicators of management success are: |
| | Biomass management activities are implemented in accordance with the Fire Management Plan. |
| | • Vehicle tracks are well-maintained (i.e., no scouring, free of fallen timber, slashed on a 6-month cycle, and 'boggy' areas are filled with road base) to ensure they are trafficable at all times. |
| | Management is to be reported annually. |
| Responsibility: | The Offset Provider is responsible for the preparation of a Wildfire Management Plan. |
| Who will complete the action and who will provide the funding? | The Plan (for fuel load monitoring and preparation of the ORS Wildfire Management Plan) is to be prepared by an appropriately qualified bushfire consultants. is to be endorsed by the Queensland Rural Fire Service. |
| | Implementation of the Plan, specifically back burns, is to occur under relevant permits and instruction from the Rural Fire Service. |
| | The Offset Provider is responsible for preparing and issuing Annual Compliance Reports to the Proponent and DCCEEW within contracted timeframes. |
| Measured & Monitored By: | Measures: |
| How will the action be measured, | Fuel load assessments to be conducted in Years 1, 5, 10 and 20 |
| be measured, by what method | Revegetation plantings or wildlife infrastructure (such as koala retreat poles) are not burnt. |
| and timing? | No reported deaths of koalas from wildfire within the ORS. |
| | No reduction (temporary or permanent) in the available foraging and food trees for koalas during the offset period as a result of wildfire. |
| | All Wildfire Management Plan activities that are conducted (tracks, burns, fuel load reduction, etc) are to be documented within the relevant Annual Compliance Report. |
| | No established trees, including trees containing greater glider hollows are to be burnt. |
| | Mosaic burning techniques to be implemented under the approval and supervision of the local fire service. |
| | No reduction (temporary or permanent) in the available foraging and food trees for koalas during the offset period as a result of wildfire. Biomass and grass height to be maintained low around fauna infrastructure, particularly when fire index is considered to be at moderate to high levels/seasonally |



| | All Wildfire Management Plan activities that are conducted (tracks, burns, fuel load reduction, etc) are to be documented within the relevant ORS reporting. |
|---|---|
| | Monitoring: |
| | 1. The integrity and effectiveness of firebreaks will be monitored: |
| | a. Opportunistically, through the course of traversing the site for day-to-day management; |
| | b. As a component of annual surveys conducted for pests (Action 1); and |
| | c. Following natural hazard events (e.g. large storms, bushfire etc.). |
| | Fuel loads will be monitored prior to commencement of the action (baseline) and annually thereafter, outside of peak bushfire season (March – June). Where possible, this fuel load assessment will coincide with annual vegetation community monitoring (refer Table 18). |
| | 3. The stored volume of supplementary water storages is to be checked opportunistically, but at least every three months. |
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | Fire is a natural occurrence within open Eucalypt woodland and within time bushland will recover from even major events. Regardless, if a major wildfire event occurs within the ORS during the offset period the following adaptive management actions will occur: |
| | A post wildfire audit of the damage and cause of the wildfire (where it commenced, direction and area it moved through, which MUs sustained the greatest damage and why, recommendations on actions which could be incorporated to avoid or minimise any future events). |
| | An ORS Recovery Plan would be prepared scheduling actions to expedite the recovery and reinstatement of values destroyed by fire. |
| | The ORS Wildfire Management Plan would be revised to adopt recommendations and strategies from the post wildfire event audit. |
| | Additional maintenance and adaptive management measures are as follows: |
| | Firebreaks are to be maintained unobstructed for a minimum width of 2 m. Vegetation encroachment or other obstructions to firebreaks are to be cleared within one week of the issue being identified. |
| | Supplementary water storages are to be refilled within a fortnight of stored volumes dropping below 75% of capacity. |
| | If the engaged qualified bushfire consultant determines that fuel loading (as determined from annual monitoring) warrants a hazard reduction burn, a burn will be conducted in accordance with the endorsed ORS Wildfire Management Plan. |



6.5 Action 5: Native seed collection and propagation plan

The management plan presented in **Table 8** provides actions and measures to guide seed collection from the site and propagation.

| Action Description: What are the tasks proposed? | Sourcing, collecting and storing of local seed provenance from vegetated portions of the site for use in the offset replanting works. |
|---|--|
| | • The planting palettes for each MU are specified in the Offset Revegetation Plan in Attachment 1. |
| | Of the canopy and sub-canopy species that are proposed to be used, the following are considered 'locally important koala trees' (Youngentob, 2021): |
| | Corymbia citriodora |
| | Eucalyptus crebra |
| | • E. tereticornis. |
| Action Location(s): Where on site is the action | Seed collection programs will be conducted to align with various tree species flowering / fruiting seasons from areas of remnant vegetation and advanced regrowth within the ORS. |
| proposed? | Harvested native seedlings are to be germinated into tube stock in the Offset Provider's nursery of choice for use in revegetation planting across the ORS (all MUs). |
| Action Timing: | Year 1 |
| When and how will the action / task be implemented, started, | Commence a seed collection program based on the flowering / fruiting seasons across areas of remnant vegetation and advanced regrowth within the ORS (collection commences when offset commences). |
| completed? | Consult immediately adjoining landholders for permission to harvest seed from adjoining vegetated areas to maximise Year 1 collection volumes. |
| | Year 2 |
| | Planting to commence of suitably mature stock grown from seed collected in Year 1 |
| | Continue seed collection program in Year 2 until sufficient stock to complete the full replanting of the ORS has been germinated and propagated. |
| Responsibility: | The Offset Provider is responsible for: |
| Who will complete the action and who will provide the funding? | Completing the seed collection program using appropriate qualified experts to determined seed collection timeframes relative to targeted species. |
| | Employing experienced and trained staff to operate and maintain the offsite nursey or engage a Nursery of their choosing to manage plant stock. |

Table 13.Management plan for Action 5



| | Preparing and issuing Annual Compliance Reports to the Proponent and DCCEEW within contracted timeframes. |
|---|---|
| Measured & Monitored By: How will the action be measured, how will the outcome of the action be measured, by what method and timing? | Minimum 50% of all replanted stock being sourced from the ORS (target is 100%) measured through annual nursery stocktake providing data on: Volume of seed collected within the annual period % of collected seed successfully germinated and propagated into tube stock Number of plants distributed from the nursery to revegetation areas (provided as a total number and as a % proportion of total plants replanted). |
| | Nursery stocktake statistics to be included as an appendix to the Annual Compliance Report. |
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | Failure to achieve seed propagation from the seed collection program will result in the shortfall needing to be purchased from local native plant nurseries. The consequence of this would be additional costs associated with outsourcing this activity and the potential increase in stock mortality and need for rectification plantings. Additional minor risks, which can be managed through warranties and certifications, derive from the potential introduction of pathogens through external nursery stock and soil. |
| | Failure to achieve the minimum 50% sourcing of replanted stock from the ORS will be documented in the relevant Annual Compliance Report, including details on: |
| | Percentage of plants achieved from site |
| | Reasons for failure to achieve site seed source targets |
| | Changes to collection program or nursery operations to rectify shortfall in subsequent annual period. |

6.6 Action 6: Development of Artificial Greater Glider Habitat

The management plan presented in **Table 8** provides actions and measures for the deployment and installation of Greater Glider habitat at the ORS. The proponent will submit to the Department, post approval, a greater glider Hollow Monitoring and Maintenance Plan prepared by a Suitably Qualified Ecologist to the department for the Minister's approval.



The Greater Glider Hollow Monitoring and Maintenance Plan will include details of methods for periodic monitoring the condition of the Greater Glider artificial hollows to ensure they remain usable for the Greater Glider. Any Greater Glider artificial hollows which were shown to have become damaged or unusable to the greater glider species would be replaced.

| Action Description: What are the tasks proposed? | Protection of 94 existing suitable branch hollows and provision of ecological context through ecological restoration of the ORS (refer Attachment 2 for location of hollows). |
|---|--|
| | Creation of artificial denning habitat for greater glider through: |
| | Amending 38 trunk unsuitable trunk hollows (chainsaw cut, 'hollow hog') in AUs1-3 (refer Attachment 3 for location of hollows) |
| | Installation of 73 constructed branch and 'high' trunk hollows, either new or amendments to unsuitable hollows (chainsaw cut, 'hollow hog') in AUs1-3 (refer Attachment 4 for location of hollows) |
| | • The methodology for the construction of hollows is contained in Attachment 5 . |
| Action Location(s): Where on site is the action proposed? | • Deployed artificial hollows will occur within the areas identified in Attachments 3 and 4 . of the offset site within an area of existing ecological context denoted by AUs1-4. A total of 111 hollows are to be artificially created. |
| Action Timing: | Year 1 |
| When and how will the action / task be implemented, started, completed? | Greater glider expert to provide formal description of hollow attributes and orientation of entrances and development of hollow utilisation monitoring program report. |
| | Consulting arborist to conduct pre-works investigations to verify continued adequacy of trees previously selected by the arborist. |
| | Climbing arborist will construct chainsaw cut hollows. |
| | 'Hollow Hog' arborist will inspect and excavate hollows. |
| | A suitably qualified ecologist is to prepare a baseline report and monitoring and maintenance plan of constructed hollows. The report must include: |
| | Photos of each hollow at the time of creation, and subsequent annual reporting |
| | Hollow structural features relevant to the host tree (location on site and tree, facing, height from ground etc.) be mapped; and |
| | Hollows have an ID that can be reported against for the life of the offset |

Table 14.Management plan for Action 6



| Responsibility: Who will complete the action and who will | The Offset Provider is responsible for: |
|--|--|
| | Overseeing implementation of the denning habitat creation offset. |
| | Commissioning experienced and suitably qualified Greater glider expert. |
| | Commissioning suitably qualified ecologist to prepare reporting. |
| | Commissioning experienced and suitably qualified consulting arborist to inspect and oversee installation works. |
| | Commissioning experienced and suitably qualified climbing arborist and 'hollow hog' operators and oversight of hollow construction. |
| | Preparing and issuing ORAARs to the Proponent within contracted timeframes for inclusion in the Annual Compliance Reports. |
| Measured & Monitored By: | Completion of Greater glider denning habitat oversight report by the Greater glider expert. |
| How will the action be measured, how will the outcome of the action be measured, by what method and timing? | Completion of the consulting arborist verification report for trees into which artificial hollows will be deployed. |
| | 100 artificial / modified natural Greater glider to be deployed and locations of hollows recorded with GPS for future monitoring. |
| | Installation report detailing timing and deployment and GPS locations provided in the Year 1 ORSAR (and incorporated into the Year 1 Annual Compliance Report). |
| | Annual monitoring of artificial hollow utilisation; through thermal imaging, camera traps, spotlighting and other indirect signs (e.g. predation by Powerful owl (<i>Ninox strenua</i>)). Alternative technologies such as in-box infrared cameras / snake eye cameras may be considered. Damage and condition of artificial hollows to be reported. Reporting to also be provided on any maintenance and/or replacement undertaken in the reporting year to artificial hollows. |
| | Interim results provided in the Year 2-20 ORSAR (and incorporated into the relevant Annual Compliance Report). Reporting of species utilisation of habitat hollows. |
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | Utilisation and uptake of hollows by competitor and pest species will be monitored annually and managed. Pest species to be removed or destroyed by suitably qualified personnel. Occupation by European honey bee will be a primary focus for management. |
| | Results of the monitoring showing pest utilisation will result in measures to eradicate or relocate (in the case of European honey bees) pests. |
| | • Observation of actual or potential displacement of Greater glider by native arboreal mammals to be investigated with opportunities for artificial hollow habitats (nest box deployment) to be investigated. |



6.7 Action 7: Distributing Coarse Woody Debris

The management plan presented in **Table 8** provides actions and measures to guide the deployment of CWD on the ORS.

| Action Description: What are the tasks proposed? | • Distributing coarse woody debris (CWD) through AU1 will to provide stepping stone habitat for cover- dependent fauna, increase soil nutrient inputs, and to make use of trees (as habitat) that would otherwise be tub-ground. Focal areas are denoted by AU3 as shown by the Assessment Unit plan reproduced in Attachment 7 . |
|--|--|
| Action Location(s): Where on site is the action proposed? | By road, the Ripley Valey Site is >70 km from the ORS. It is cost-prohibitive to transport salvaged logs over this distance. Instead, the Proponent will salvage logs from nearby development, farm forestry, forestry activities. |
| Action Timing: When and how will the action / task be implemented, started, completed? | • There is 85 hectares of coarse woody debris establishment area (Attachment 7). CWD must be in place in Year 1 (and prior to commencement of plant out (Year 2). |
| Responsibility: Who will complete the action and who will provide the funding? | • Environmental consultant to coordinate tree selection. Offset provider and Applicant will provide the funding. |
| Measured & Monitored By: How will the action be measured, how will the outcome of the action be measured, by what method and timing? | The ecologist and offset provider will agree on suitable locations for the coarse woody debris piles, and the ecologist will oversee (and certify) the emplacement. Successful implementation of this measure will be reported upon in the Year 1 monitoring compliance report. No further monitoring is required except in the event of bushfire (refer risks and adaptive management). |
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed | The salvaged logs piles are expected to harbor vertebrate pest fauna (e.g., rabbits, foxes and cats) subject to other management requirements under this plan (refer Management Action 1). The salvaged log piles will be a particular management focus for the vertebrate pest fauna management program. |
| outcomes are not being achieved? | The flood prone nature of the offset site presents a risk that logs may float and move under extreme flooding events. The risk of damage primarily arises in the early years of the offset (when seedlings are young). The risk of log movement under flood should be assessed, and if necessary, the piles secured to the ground or weighted down. |
| | Log piles may burn during a bushfire event. After a fire has passed through the site, efforts must first be made to extinguish residual fires burning in log piles. |
| | Pest animals (and particularly fire ants) are transported with the logs. All movements are to be subject fire ant biosecurity protocols. |

Table 15.Management plan for Action 7



6.8 Action 8: Koala Dispersal Poles

The management plan presented in **Table 8** provides actions and measures to guide the deployment of koala climbing poles on the ORS.

| Action Description: What are the tasks proposed? | • Establishing koala dispersal poles^ in gaps in the western portion of the ORS to facilitate safer dispersal through this area until regeneration provides the same movement opportunities. |
|--|---|
| | • Consideration has been given to providing similar management in the east, but this has been discounted due to the marginal additional benefit that would arise (noting that a significant number of poles would need to be established to access only a small number of trees). |
| Action Location(s): Where on site is the action proposed? | • Poles will be installed as identified by Attachment 6 . |
| Action Timing: When and how will the action / task be implemented, started, completed? | Poles will be installed in the first year of management. |
| Responsibility: Who will complete the action and who will provide the funding? | • A suitably experienced ecologist will be engaged to coordinate the precise location of poles. Offset Provider and Applicant will provide the funding. |
| Measured & Monitored By: How will the action be measured, how will the outcome of the action be measured, by what method and timing? | The suitably experienced ecologist and Offset Provider will agree on the final positioning of the poles. The poles will be monitored for signs of use (distinctive scratches), and if some use is detected, confirmation of use will be established by camera trap. Results will be reported on until Year 5, after which time adjoining vegetation will be sufficiently mature to provide movement habitat. |
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | • Bushfire presents a threat to the poles. If the poles are burnt out (and fail) before Year 5, they are to be replaced. After Year 5, when adjoining vegetation will provide movement habitat, there is no need to replace damaged poles. |
| Note: | |

Table 16.Management plan for Action 8

[^] timber posts securely erected to remain in a vertical position at least until this approval expires, each at least 4 metres in height and 125 mm diameter and each with at least one fork large enough to enable an adult Koala to sit and rest at least 3 m above the ground surface as described in the Koala Sensitive Design Guideline: Department of Environment and Science. DES 2022.



6.9 Action 9: Revegetation and habitat creation plan

The management actions presented in **Table 17** should be read in conjunction with the Offset Revegetation Plan which is included at **Attachment 1**.

| Action Description: What are the tasks proposed? | Selective planting of MU1 and MU2 and broadscale revegetation of MU3. The planting palettes for MU1, MU2 and MU3 are specified in the Offset Revegetation Plan in Attachment 1. | | | | |
|--|---|--|--|--|--|
| Action Location(s): Where on site is the action proposed? | Revegetation will occur across all MUs. | | | | |
| Action Timing: When and how will the action / task be implemented, started, completed? | Refer to the Offset Revegetation Plan in Attachment 1 . | | | | |
| Responsibility: | The Offset Provider is responsible for: | | | | |
| Who will complete the action and who will provide the funding? | Employing experienced and trained staff to undertake planting, watering and other revegetation and habitat management activities. | | | | |
| | Preparing and issuing Annual Compliance Reports to the Proponent and DCCEEW within contracted timeframes. | | | | |
| Measured & Monitored By: How will the action be measured, how will | • A schedule for monitoring the success of revegetation efforts over the offset period is presented as Table 6 in Attachment 1 : Offset Revegetation Plan. | | | | |
| the outcome of the action be measured, by what method and timing? | • The extent of each vegetation community within the ORS will be surveyed annually to enable a calculation of the theoretical koala carrying capacity of the ORS. The objective of this annual calculation will be to demonstrate an increase in vegetation maturity within the ORS, and therefore an upward trend in theoretical koala carrying capacity. | | | | |
| | The method for this carrying capacity calculation will be consistent with that previously accepted by the Department for application to the offset site for the Pine Valley Residential Development (EPBC Ref. 2018/8359). This method was developed in consultation with Dr William (Bill) Ellis, PhD of the University of Queensland. | | | | |
| | • A census survey of koala, grey-headed flying-fox and greater glider will be conducted within the ORS every two years (years 1, 3, 5, 7, 9, 11, 13, 15, 17 and 19). If koala, grey-headed flying-fox or greater glider are detected on site, monitoring will be conducted at annual intervals from that point onwards for the balance of the offset period. Surveys will include Spot Assessment Technique (SAT), spotlighting and other emerging techniques appropriate for identifying the relevant protected matters. | | | | |



| | Annual carrying capacity calculations and five-yearly koala census survey data will be reported in the relevant year's Annual Compliance Report. |
|--|---|
| Risks & Adaptive Management: What's the procedure for correcting or amending the action if the proposed outcomes are not being achieved? | • Corrective actions that will be applied to revegetation, including triggers and timing, are presented in Table 10 of Attachment 1 : Offset Revegetation Plan. |
| | • If koala, grey-headed flying-fox or greater glider are observed utilising the ORS, census data will be analysed for year-on-year trends using a statistical method that is suitable for the size of data set at hand. The need for causation analysis will be triggered if the number of individuals occurring within the ORS is assessed as a) declining by a statistically significant margin over the course of one year; or b) declining consistently over three consecutive years, regardless of statistical significance. |
| | If causation analysis identifies that the reduction in specimen records is attributable to factors that are controllable within the ORS, appropriate corrective actions will be implemented to rectify the issues (refer adaptive management actions for Actions 1-5). |

6.10 Summary monitoring schedule

 Table 18 presents the 20 year monitoring schedule for the delivery of the offset at the ORS.

| Year | Monitoring / Survey | | | | | Report | Responsibility |
|------|---------------------|-------------------------|--------------|----------------------|----------------------------------|---|--|
| | Pest | Groundcover composition | Weed | Vegetation community | Offset Species Population^ | | |
| 1 | √В | √B | √В | √ B, P, T | √B | Annual Compliance Report | Offset Provider |
| 2 | ~ | √ | ~ | √ P, T | X | Annual Compliance Report | Offset Provider |
| 3 | √ | √ | √ | √ P, T | √ | Annual Compliance Report | Offset Provider |
| 4 | \checkmark | √ | \checkmark | √ P, T | X | Annual Compliance Report | Offset Provider |
| 5 | 1 | 1 | 1 | √ P, T | 1 | Annual Compliance Report Independent audit of the Annual | Offset Provider and Auditor (suitably qualified ecological professional) |

Table 18. Summary of monitoring schedule over the 20 year offset monitoring period



| Year | Monitoring / Survey | | | | | Report | Responsibility |
|------|---------------------|----------------------------|--------------|-------------------------|----------------------------------|--|--|
| | Pest | Groundcover composition | Weed | Vegetation community | Offset Species Population^ | | |
| | | | | | | Compliance Report, documented in a Year 5 Offset Audit Report | |
| 6 | √ | √ | √ | √T | X | Annual Compliance Report | Offset Provider |
| 7 | √ | ✓ | √ | √ P, T | √ | Annual Compliance Report | Offset Provider |
| 8 | √ | ✓ | √ | √T | X | Annual Compliance Report | Offset Provider |
| 9 | √ | √ | √ | √ P, T | ~ | Annual Compliance Report | Offset Provider |
| 10 | ✓ | 1 | ~ | √T | X | Annual Compliance Report Independent audit of the Annual Compliance Report, documented in a Year 10 Offset Audit Report | Offset Provider and Auditor (suitably qualified ecological professional) |
| 11 | \checkmark | √ | \checkmark | √ P, T | ~ | Annual Compliance Report | Offset Provider |
| 12 | √ | √ | √ | √T | X | Annual Compliance Report | Offset Provider |
| 13 | √ | √ | √ | √T | √ | Annual Compliance Report | Offset Provider |
| 14 | ~ | √ | √ | √ P, T | X | Annual Compliance Report | Offset Provider |
| 15 | ~ | 1 | ~ | √T | 1 | Annual Compliance Report Independent audit of the Annual Compliance Report, documented in a Year 15 Offset Audit Report | Offset Provider and Auditor (suitably qualified ecological professional) |
| 16 | ~ | √ | √ | √T | X | Annual Compliance Report | Offset Provider |
| 17 | √ | √ | √ | √ P, T | ~ | Annual Compliance Report | Offset Provider |
| 18 | √ | √ | √ | √T | X | Annual Compliance Report | Offset Provider |
| 19 | √ | √ | \checkmark | √T | ~ | Annual Compliance Report | Offset Provider |



| Year | Monitoring / Survey | | | | Report | Responsibility | |
|------|---------------------|-------------------------|------|-------------------------|----------------------------------|--|--|
| | Pest | Groundcover composition | Weed | Vegetation community | Offset Species Population^ | | |
| 20 | ~ | 1 | ~ | √ P, T | X | Annual Compliance Report Independent audit of the Annual Compliance Report, documented in a Year 20 Offset Audit Report | Offset Provider and Auditor (suitably qualified ecological professional) |

Notes:

B = Baseline, P = Primary sites, T = Tertiary sites ^ = If offset species are detected on site, monitoring will be conducted at annual intervals from that point onwards for the balance of the offset period.



7 Corrective actions

Table 19 outlines a number of triggers and corrective actions which are to be implemented in instances of non-compliance or the lack of success toward the gradual achievement of the completion criteria identified during annual monitoring, as reported in the Annual Compliance Reports, and major milestone monitoring events (every 5 years).

| Triggers | Corrective Actions | Timeframes |
|---|--|---|
| Trees and plantings showing signs of ill boatth, docting | • The Offset Provider will engage a suitably qualified professional to identify the likely cause of health decline. | Engage the suitably qualified professional within three months of detection. |
| or death. | Apply recommended mitigation measure/s to improve growing conditions (as recommended by the suitably qualified professional). | Implement recommended mitigation measures within six months of detection. |
| | Remove ill or dead plantings, undertake any remediation works and re- establishment planting. | Remove ill or dead plantings and undertake remediation works within six months of detection. |
| Weed re- establishment | • Immediately treat all WoNs with delicate methods to avoid impacts to restoration works (mechanically or chemically dependent on circumstances). | • Within three months of detection, noting that treatment during non-growth periods may be ineffective and are best targeted during growth periods for greater effectiveness. |
| | Undertake an investigation of the potential source point of seeding. | • Within three months of detection. |
| | • Additional treatment and removal works are to be followed up during the next potential growth period to avoid any regeneration and potential seeding events. | Within six months of initial detection. |
| Plant failure (>10% of stock) during the | Supplementary planting will be undertaken. | • Within six months or the next appropriate planting period (whichever comes first) of detection. |
| establishment period | Should the planting fail again, the Offset Provider is to engage a suitably qualified professional to identify the likely cause of plant failure. | Within month of detection. |
| | Apply recommended mitigation measure/s to improve growing conditions (as recommended by the suitably qualified professional). | Apply in alignment with the recommendations made by the suitably qualified professional. |
| Coarse woody debris is failing to become | The selective removal of limbs, shrubs, or trees (particularly from the shrub layer where forming dense thickets). | • At the 5, 10, 15 and 20 year monitoring events. |
| present naturally | Install coarse woody debris and other habitat features, prioritising open areas, to accelerate habitat creation. This may include importation of felled native timber from known impact areas where it would ordinarily be mulched and sent to landfill. | • At the 5, 10, 15 and 20 year monitoring events. |
| | • Engage a suitably qualified professional to review the plantings and advise on | • Within three months of detection. |



| Triggers | Corrective Actions | Timeframes |
|--|---|--|
| Growth rates not as expected | methods to increase growth rates through other interventions. | |
| | • Undertake soil testing to determine what rate of soil ameliorants or fertilizers may be required to improve the chemical balance of the soils for improved plant growth. | Within three months of detection. |
| | Revise management actions for offset. | • Within 12 months of detection. |
| | Revise OAMP and submit to Minister for the Environment for approval. | • Within 24 months of detection if the corrective actions have not amended the slowing growth rates. |
| Stochastic or nuisance events | • While such events (e.g. fire, flood, drought, vandalism etc) are rare and can be managed by the Offset Provider, where events take place, restoration works are to replace losses and reporting to the DCCEEW is required. | Notification and evidence provided to DCCEEW within one month. |
| | Evidence of impacts and rectification measures are to be issued to the DCCEEW within three months. | Within six months of rectification. |
| Ongoing presence of pest fauna (e.g. wild dogs) | • Where recurrent pest animal species are detected, reengagement with the surrounding landholders and Somerset Regional Council to re-deploy management measures. | Within one month of continued presence identification. |
| | • Should recurrent pest fauna be observed going forward, revised management measures to include more site-specific measures including targeted baiting and/or trapping. | • As required. Targeted management techniques to be implemented within one month of pest animal recurrence being detected. |
| Monitoring and reporting illustrates that KPIs are unlikely | • Engage a suitably qualified professional to review the plantings and advise on methods to increase growth rates through other interventions. | Within three months of detection. |
| the end of the 20 year management timeframe and other corrective | • Undertake soil testing to determine what rate of soil ameliorants or fertilizers may be required to improve the chemical balance of the soils for improved plant growth. | • Within 12 months, or two complete growth seasons of detection (whichever is sooner) if corrective actions have not amended the slowing growth rates. |
| actions are failing to progress the achievement of the KPI | Revise the management actions for the offset. | • Within 12 months, or two complete growth seasons of detection (whichever is sooner) if corrective actions have not amended the slowing growth rates. |



8 Risk assessment and management measures

A limited number of risks associated with climate change, pest control and large-scale rehabilitation are evaluated for the ORS. Risks are generally described and assessed against the likelihood and consequence model outlined in the Commonwealth Government's Environmental Management Plan Guidelines (Department of Environment, 2014). The following risk factors are considered in more detail in this OAMP:

- Wildfire
- Flooding
- Drought
- Climate-induced shifting habitat range
- Planting stock failure
- Pest management (wild dog)
- Weed invasion / expansion.

8.1 Likelihood, consequence and risk ratings

Each environmental risk is given a rating in terms of likelihood and consequence using the criteria in **Table 20** and **Table 21**, respectively. These ratings are then combined to derive risk scores, as shown in **Table 22**.

| Likelihood rating | Likelihood definition |
|-------------------|--|
| 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 |

Table 20. Description of likelihood definitions

Table 21. Description of consequence definitions

| Consequence rating | Consequence definition |
|--------------------|--|
| Minor | Minor incident of environmental damage that can be reversed |
| Moderate | Isolated but substantial instances of environmental damage that could be reversed with intensive efforts |
| High | Substantial instances of environmental damage that could be reversed with intensive efforts |



| Consequence rating | Consequence definition |
|--------------------|--|
| Major | Major loss of environmental amenity and real danger of continuing |
| Critical | Severe widespread loss of environmental amenity and irrecoverable environmental damage |

Table 22. Risk ratings matrix

| Likelihood | Consequence | | | | |
|---------------|-------------|----------|--------|--------|----------|
| | 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 |

8.2 Wildfire

Woody vegetation within the ORS is recognised by SRC's Bushfire Hazard Overlay for its bushfire potential, regardless of its regulated status (**Inset 1**) (SRC, 2018). Woody vegetation across Lot 271 is mapped as being of 'High' to 'Very High' potential bushfire intensity, whilst vegetation across Lot 127 is predominantly mapped as 'High' potential bushfire intensity, with 'Medium' potential attributed to riparian vegetation of the Gallanani Creek North Branch.

Areas of the ORS that are largely clear of canopy trees (i.e. AU3) are either mapped as being within potential impact buffer or as having no potential wildfire hazard. As the MUs become better established through the offset period, vegetation across the whole ORS will be able to support the establishment and spread of wildfire.



Inset 1. Wildfire risk mapping Source: Somerset Regional Council Planning Scheme Bushfire Risk Overlay Mapping (SRC, 2018)



Risk Rating

Medium

I ow

The overall assessment of wildfire risks is that their occurrence is **likely** within the offset period and consequences of such an event would be moderate. Without intervention and management wildfire is evaluated as a **medium** risk to this offset (**Table 23**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 12**. With the implementation of all relevant management actions, the consequence of wildfire risk is expected to be reduced to minor, reducing the risk rating to low (Table 23).

Moderate

Minor

| i able 23. | wiidiire | e lisk assessment | |
|-------------------|----------|-------------------|-------------|
| Mitigation status | s | Likelihood | Consequence |

Likely

Possible

| 83 | Flooding | |
|-----|-------------|--|
| 0.0 | 1 IOO MILIN | |

Pre-mitigation

Post-mitigation

SRC's Flood Hazard Overlay mapping an extreme flood hazard associated with Kipper Creek, which flows in a south to north direction immediately west of Lot 271. However, no flood hazard is mapped across the ORS (Inset 2) (SRC, 2018).



Inset 2. Flood risk mapping

Source: Somerset Regional Council Planning Scheme Flood Risk Overlay Mapping (SRC, 2018)

Whilst no flood hazard is mapped across the ORS, it is likely that rainfall events that result in flooding of Kipper Creek would also result in local flooding of Little Kipper Creek on Lot 271 and Gallanani Creek North Branch on Lot 127.

The objective for the ORS is to restore habitat with vegetation communities resembling pre-clear condition. By doing so, vegetation communities will be established and/ or enhanced that are locally adapted and resilient to naturally-occurring flood events. Rather than be an impediment to offset



Medium

success, natural flood events will provide simulation of hydrological regimes that the target vegetation communities are adapted to tolerating.

The overall assessment of flooding risks is that their occurrence is **highly likely** within the offset period and consequences of such an event would be **minor**. Without intervention and management flooding is evaluated as a **medium** risk to this offset (**Table 24**). Due to the likely beneficial nature to offset success of occasional natural flooding across, targeted management actions for minimise the impacts of flooding are limited to:

- Include stabilisation matting, tree stakes, etc for plantings within higher risk zones of erosion from rising flood waters, i.e. within riparian areas of MU1 and MU2.
- Undertake damage assessments after flood events that effect the ORS. Include findings of the damage assessment in the Annual Compliance Report.
- Consider taking out insurance for planting stock located within flood risk area to cover the cost of replacement works should a damaging rain / flood event occur.

Minor

With the implementation of all relevant management actions, the risk rating remains **medium** as the consequence is unable to be reduced further, even with mitigation (**Table 24**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | Minor | Medium |
| | | | |

Table 24. Flooding risk assessment

Highly likely

8.4 Drought

Post-mitigation

The Queensland Government's Drought Duration Report (Queensland Government, 2023) identifies the Somerset Region local government area as being drought free for 13-24 months and as being in a declared drought status for 20-30% of time since 1964.

The Bureau of Meteorology's climate statistics for the Cressbrook Dam meteorology station (closest to the ORS) report mean annual rainfall as 770.1 mm (Bureau of Meteorology, 2023). The Climate Change Adaptation Strategies for the koala prepared by Christine Adams-Hosking concluded that the highest probability of koala presence occurred at a mean annual rainfall of 700 mm (Adams-Hosking, 2011). Therefore, even with the potential for increased drought occurrence in future years, the ORS experiences a baseline average rainfall that, if reduced, would shift closer to the optimal range to support koala.

It is understood that a number of productive and reliable ground water bores are present within the KFF site and these would be relied upon to irrigate plant stock. Analysis of productivity and ground water quality will be undertaken by the Offset Provider to identify the suitability of the quantity and quality of groundwater.

Periods of prolonged drought, if they were to occur, would place stress on revegetation, particularly juvenile plantings. On this basis, the overall assessment of drought risks is that their occurrence is **likely** within the offset period and consequences of such an event would be **high**. Without intervention and



management drought is evaluated as a **high** risk to this offset (**Table 25**). The management actions that are proposed to be implemented to reduce this initial risk rating are as follows:

- Ensure offset design includes replanting and connection to higher moisture content soils associated with alluvial and riparian areas of the ORS.
- Maintain dams and waterbodies within the ORS for use in offset rehabilitation works and as water sources for native animals.
- Implement temporary, supplementary watering programs whilst plantings are juvenile if prolonged drought conditions occur.

With the implementation of all relevant management actions, the consequence of drought risk is expected to be reduced to **moderate**, but the risk rating remains **medium** (**Table 25**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|------------|-------------|-------------|
| Pre-mitigation | Likely | High | High |
| Post-mitigation | Likely | Moderate | Medium |

Table 25. Drought risk assessment

8.5 Climate-induced shifting habitat range

A number of contemporary case studies and research papers have investigated the combined weather characteristics of climate change on the current and future distribution of suitable koala habitat into the future. Koalas are considered to be at risk of these factors because of their low tolerance to adapt to environmental changes combined with the number of existing non-climate related threats already well documented.

Grey-headed flying-fox are also considered to be affected by climate change, however most studies relate to the increased temperatures at the camp and roosting sites, with less material available on their foraging range. The proposed offset provides foraging habitat and therefore the effects of climate change on roosting sites are not directly relevant to the ORS.

The Climate Change Adaptation Strategies for the Koala (Adams-Hosking, 2011) applied climate change distribution models for the koala and five of its essential eucalypt food trees to a conservation prioritisation framework ('Zonation'), to determine which Queensland local government areas were the highest priority for koala conservation and adaptation. The study included 2011 population distribution and future predicted koala habitat distribution in 2070 showing a substantial migration eastward. The study further concludes that:

"The highest probability of koala presence occurred at a mean maximum summer temperature of approximately 27°C and a mean annual rainfall of approximately 700 mm"

The study's conclusions on the probability of koala occurrence across temperature ranges are shown in Inset 3.





Inset 3. Koala probability of occurrence across temperature and rainfall ranges (Adams-Hosking, 2011)

As previously stated, the average annual rainfall for the area is 770.1 mm (Cressbrook Dam meteorology station). Additionally, the mean maximum temperature for the region (Toowoomba Airport meteorology station) is 23.2 degrees Celsius (Bureau of Meteorology, 2023). Therefore, climatic conditions remain within an acceptable range for the species. The land is also located within the current and 2070 koala habitat distribution maps based on the A1F1 climate change scenario as presented in Climate Change Adaptation Strategies for the Koala (Adams-Hosking, 2011).

At the site scale the offset design will connect existing range and foothill habitat with open plains, creek flats and riparian vegetation communities.

The overall assessment of climate-induced habitat shift risks is that the likelihood of occurrence is **unlikely** within the offset period but the consequences of such an event would be **moderate**. Without intervention and management this risk is evaluated as **low** risk to this offset (**Table 26**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Attachment 1** (Offset Revegetation Plan). With the implementation of all relevant management actions, the consequence of climate-induced habitat shift risk is expected to be reduced to **minor**, though the risk rating remains **low** (**Table 26**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|------------|-------------|-------------|
| Pre-mitigation | Unlikely | Moderate | Low |
| Post-mitigation | Unlikely | Minor | Low |

Table 26. Climate-induced habitat shift risk assessment

8.6 Planting stock failure

Significant broadscale replanting is intended for MU3, with infill planting to occur in MU1 and MU2, as required. In projects which include large areas of broadscale planting the risk exists for planting stock to fail in large volumes due to:

- Poor soil quality or incompatible match of soils to replanted vegetation types
- Weather related impacts frost / prolonged dry periods, excessive heat or cool periods
- Poor quality planting stock or the sourcing of planting stock from a different geographic region.



Lack of appropriate planting area preparation – weed removal / pasture seed removal / cultivation, etc.

The majority of these challenges are expected to be managed through the use of experienced bushland regeneration experts and contractors. Failure of planting stock will principally be a financial impact as the ORS will not achieve committed condition improvement and habitat expansion targets without rectification of planting works.

An important component of the offset proposal is the collection of native seeds from within the ORS and immediate surrounds, followed by propagation and use in revegetation.

The overall assessment of planting failure risks is that the occurrence is **possible** within the offset period and consequences of such an event would be **moderate**. Without intervention and management planting failure is evaluated as a **medium** risk to this offset (**Table 27**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 13**. With the implementation of all relevant management actions, the likelihood of planting failure risk is expected to be reduced to **unlikely**, reducing the risk rating to **low** (**Table 27**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|------------|-------------|-------------|
| Pre-mitigation | Possible | Moderate | Medium |
| Post-mitigation | Unlikely | Minor | Low |

Table 27. Planting failure risk assessment

8.7 Pest management

The following vertebrate pest species are known to utilise the ORS, based on in-person survey observations or camera trapping, a pose a risk to offset species or rehabilitation success (**Table 5**):

- Wild dogs
- Feral cat
- European foxes
- Rabbits and hares
- Deer (Red and Rusa)
- Wild pig.

8.7.1 Wild dog

Wild dog predation is a significant cause of koala mortality. A study by Hawthorne L. Beyer *et al.* over the 2013-2017 period in Moreton Bay Regional Council involved the capture of 503 koalas, which were fitted with telemetry devices (Beyer, 2018). Of the 144 koala deaths confirmed as predation, wild dogs accounted for 81.3 per cent and domestic dogs 4.2 per cent plus a further 38 deaths were suspected but unconfirmed predation events due to wild dogs.



Researchers concluded the koala population could have approached local extinction within a decade without the control of wild dogs and disease. They stated a single male dog eluding capture until the end of the study was thought to be responsible for 75 koala deaths.

SRC's declared pest programs include the following of relevance to wild dogs:

- 1080 baiting program
- 1080 bait meat subsidy program: subsidised bait meat (\$1 per bait) for landholders who participate in SRC's 1080 baiting program
- Dingo/Wild dog bounty program: a bounty of \$25 per scalp.

The overall assessment of wild dog risks is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **high**. Without intervention and management wild dogs are evaluated as a **high** risk to this offset (**Table 28**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of wild dog risk is expected to be reduced to **possible**, reducing the risk rating to **medium (Table 28**).

| Table 28. Wild dog risk assessm |
|---------------------------------|
|---------------------------------|

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | High | High |
| Post-mitigation | Possible | High | Medium |

8.7.2 Feral cats

Feral cats are carnivorous and require little free water, being able to obtain moisture from their prey. They require large amounts of fresh protein, and prey upon small mammals, birds, reptiles, amphibians, insects and fish, though rabbits are their main food source (Mitchell B. &., Monitoring Techniques for Vertebrate Pests: Feral Cats, 2007). Feral cats impact on other animal populations through direct predation and competition for prey. Importantly, they may also spread the disease toxoplasmosis. The toxoplasma protozoan reproduces only in the intestines of the cat.

Toxoplasmosis is particularly harmful to marsupials, causing abortion and birth defects, along with blindness and paralysis. Feral cats need to consume large amounts of protein, and rabbits are not always in sufficient abundance to satisfy their appetite; therefore, native fauna is often on the menu (Mitchell B. &., Monitoring Techniques for Vertebrate Pests: Feral Cats, 2007). However, neither koala or grey-headed flying fox were identified as being native vertebrates susceptible to predation from feral cats in *Overview of the Impacts of Feral Cats on Australian Native Fauna* (Dickman, C, 1996).

The overall assessment of feral cat risks is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **minor**. Without intervention and management feral cats are evaluated as a **Medium** risk to this offset (**Table 29**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of feral cat is expected to be reduced to **possible**, which keeps the risk rating at **Low** (**Table 29**).



| Table 29. Feral cat risk assess |
|---------------------------------|
|---------------------------------|

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | Minor | Medium |
| Post-mitigation | Possible | Minor | Low |

8.7.3 European foxes

The fox is an opportunistic predator and scavenger, being primarily carnivorous. In grazing areas, the primary diet of foxes consists of sheep (either as carrion or young lambs), rabbits and house mice. However, foxes will readily take small and medium-sized native animals, particularly mammals in the 'critical weight range' of 0.35-5.50 kg (Mitchell B. &., Monitoring Techniques for Vertebrate Pests: Foxes, 2007).

There have been relatively few studies with adequate replication undertaken to demonstrate the impact of fox predation on the populations of native mammals. However, preliminary research and anecdotal data indicates that native species most susceptible to predation by foxes are those species that are ground-dwelling, e.g. bettongs, wallabies, bandicoots etc (Gentle, M., 2006).

The overall assessment of fox risks is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **moderate**. Without intervention and management foxes are evaluated as a **High** risk to this offset (**Table 30**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of foxes is expected to be reduced to **unlikely**, which reduces the risk rating to **Low** (**Table 30**).

| Table 30. | European fox risk assessment |
|-----------|------------------------------|
|-----------|------------------------------|

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | Moderate | High |
| Post-mitigation | Unlikely | Moderate | Low |

8.7.4 Rabbits and hares

The rabbits and hares are considered to be some of Australia's most damaging vertebrate pests and have adverse effects on pastoral and crop industries, as well as native fauna and flora. Additional impacts include land and vegetation degradation where the loss of vegetation exposes the soil to the erosive forces of wind and rain (Mitchell B. &., Monitoring Techniques for Vertebrate Pests: Rabbits, 2007).

Grazing, browsing and ringbarking of native flora have caused declines in native species and facilitated the invasion of exotic species. Rabbits are commonly believed to cause damage only when they occur in higher numbers, but in areas of low productivity, densities as low as 1 rabbit per hectare can prevent native plant regeneration (Mitchell B. &., Monitoring Techniques for Vertebrate Pests: Rabbits, 2007).

Whilst the occurrence of rabbits and hares would not be a direct threat to koala or grey-headed flying fox, their tendency to graze on and ringbark native vegetation could have a detrimental effect on the ability to achieve successful landform stabilisation, propagation and revegetation within the ORS.



The overall assessment of rabbits and hares is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **moderate**. Without intervention and management, rabbits and hares are evaluated as a **High** risk to this offset (**Table 31**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of rabbits and hares is expected to be reduced to **possible** and the consequence reduced to **minor**, which reduces the risk rating to **Low** (**Table 31**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | Moderate | High |
| Post-mitigation | Possible | Minor | Low |

| Table 31. Ra | bbit risk asse | essment |
|--------------|----------------|---------|
|--------------|----------------|---------|

8.7.5 Feral deer

Feral deer are opportunistic and highly adaptable feeders that both graze and browse. Feral deer have been reported to cause damage to a wide variety of agricultural crops, pastures and forestry plantations through competition with cattle and other livestock for pasture. Other impacts on rural enterprises include damage to fences, spreading of weeds, fouling of water holes and overgrazing causing erosion (and the subsequent degradation of water quality in creek and river systems) (DAF, 2022).

The Queensland Department of Environment and Sciences' Parks and Wildlife unit undertake management of deer numbers in Deongwar National Park, which is proximal to the ORS, under an approved Level 2 Pest Management Strategy.

Whilst the occurrence of deer would not be a direct threat to koala or grey-headed flying fox, their tendency to graze on and ringbark native vegetation could have a detrimental effect on the ability to achieve successful landform stabilisation, propagation and revegetation within the ORS.

The overall assessment of feral deer is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **moderate**. Without intervention and management feral deer are evaluated as a **High** risk to this offset (**Table 32**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of deer is expected to be reduced to **likely** and consequences of occurrence reduced to **minor**, which reduces the risk rating to **Low** (**Table 32**).

| Mitigation status | Likelihood | Consequence | Risk Rating | |
|-------------------|---------------|-------------|-------------|--|
| Pre-mitigation | Highly likely | Moderate | High | |
| Post-mitigation | Likely | Minor | Low | |

| Table 32. | Feral deer risk assessmer | ۱t |
|-----------|---------------------------|----|
| | | |

8.7.6 Feral pigs

Feral pigs disturb natural environments through rooting up soils, grasslands and forest litter and by consuming a range of native plants (Pavlov, 1991). Fences and water sources can be damaged, and dams and waterholes fouled through wallowing and defecation (Mitchell B. &., 2007).

Whilst the occurrence of feral pigs would not be a direct threat to koala or grey-headed flying fox, their tendency to uproot soils and consume native vegetation could have a detrimental effect on the ability to achieve successful landform stabilisation, propagation and revegetation within the ORS.

The overall assessment of feral pigs is that the occurrence is **possible** within the offset period and consequences of such an event would be **high**. Without intervention and management pigs are evaluated as a **Medium** risk to this offset (**Table 33**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 8**. With the implementation of all relevant management actions, the likelihood of pigs is expected to be reduced to **unlikely** and the consequence reduced to **moderate**, which reduces the risk rating to **Low** (**Table 33**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|------------|-------------|-------------|
| Pre-mitigation | Possible | High | High |
| Post-mitigation | Unlikely | Moderate | Low |

Table 33.Feral pig risk assessment

8.8 Weed invasion / expansion

Weed infestations suppress and inhibit the natural regeneration of regrowth vegetation on-site, which in-turn directly limits the growth rates and regeneration of primary and secondary koala tree species and foraging species for grey-headed flying-fox and greater glider. Although baseline data is limited to the survey events undertaken for the Preliminary Documentation Report, it is known that highly invasive and spreading nature of some non-native weed species, coupled with the in-active management in areas, would be resulting in a progressive increase as local climatic events align with optimal germination and seeding periods.

In extreme instances, dense weed infestations can form a barrier to terrestrial species, which would include limiting the koala's ability to access areas containing an over-canopy of food trees.

The overall assessment of weed infestation risks is that the occurrence is **highly likely** within the offset period and consequences of such an event would be **moderate**. Without intervention and management weeds are evaluated as a **High** risk to this offset (**Table 34**). The management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 9**. With the implementation of all relevant management actions, the likelihood of weed infestation risk is expected to be reduced to **unlikely**, reducing the risk rating to **Low** (**Table 34**).

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|---------------|-------------|-------------|
| Pre-mitigation | Highly likely | Moderate | High |
| Post-mitigation | Unlikely | Moderate | Low |

 Table 34.
 Weed infestation risk assessment

8.9 Establishment of compensatory den habitat for Greater glider

Artificial hollows must closely mimic the characteristics (height, orientation, dimensions, internal features) of natural tree hollows to be effective. If the design is not suitable or does not meet the gliders' needs, they may not use the artificial hollows.



Artificial hollows may attract species other than the greater glider, leading to increased competition for resources. This could potentially alter local ecological dynamics and impact the glider population.

Increased visibility in artificial hollows may make gliders more vulnerable to predation by owls, snakes, or other predators, as compared to natural tree hollows.

To maximize the effectiveness of artificial hollows for the greater glider, it's important to consider various factors, as follows:

1) Mimic Natural Characteristics

Ensure that the artificial hollows closely mimic the characteristics of natural tree hollows. This includes size, shape, entrance dimensions, and internal features. The goal is to make them as appealing and suitable for the greater glider as possible.

2) Use suitable materials

If other materials are to be used, choose materials that are durable, weather-resistant, and safe for wildlife. The artificial hollows should withstand environmental conditions and provide a secure and stable habitat.

3) Install in suitable locations

Identify and select appropriate locations for artificial hollow installation. Consider factors such as tree species, height, and proximity to preferred foraging areas. Place the hollows where gliders are likely to find and use them.

4) Consider tree species

Mimic the tree species that greater gliders prefer for nesting. Some gliders may show a preference for specific tree species, so using similar wood for the artificial hollows can enhance their attractiveness.

5) Provide multiple options

Install a variety of artificial hollows in different locations and tree types to provide the greater gliders with options. This increases the chances of them finding a suitable nesting site.

6) Monitor and adapt

Implement a monitoring program to assess the effectiveness of the artificial hollows. Regularly check for occupancy, observe glider behaviour, and make adjustments based on observations and feedback from the monitoring program.

7) Implement maintenance protocols

Establish a maintenance schedule to ensure the ongoing suitability and safety of the artificial hollows. Regular inspections can identify and address issues such as degradation, wear, or damage.

The overall assessment of den habitat establishment risks is that the occurrence is likely within the offset period and consequences of such an event would be high. Without intervention and management the risk of artificial hollows going unutilised is evaluated as a high risk to this offset (**Table 35**). The



management actions that are proposed to be implemented to reduce this initial risk rating are presented in **Table 14**. With the implementation of all relevant management actions, the consequence of artificial hollows going unutilised is expected to be reduced to moderate, reducing the risk rating to moderate (**Table 36**).

Table 35. Compensatory den habitat risk assessment

| Mitigation status | Likelihood | Consequence | Risk Rating |
|-------------------|------------|-------------|-------------|
| Pre-mitigation | Likely | High | High |
| Post-mitigation | Likely | Moderate | Moderate |



9 Adaptive management

This OAMP adopts a number of 'adaptive management' procedures both as a governing principle and within specific management actions (**Section 6**).

Most management actions incorporate detailed baseline survey and data collection to be periodically repeated through the offset period and utilised for iterative changes to management implementation, particularly for stochastic habitat risks and threats. The primary purpose of adaptive management procedures is to allow on-ground monitoring and experiences on the most effective measures to feed into amendments to the OAMP which focus on best return in habitat outcomes for grey-headed flying-fox and koala. The structured decision-making process that is a by-product of adaptive management is shown in **Inset 4**.



Inset 4. Adaptive management process



10 Reporting

All surveys, results, management activities statuses, alterations or amendments will be recorded within an Annual Compliance Report. Each Annual Compliance Report will be completed by the Offset Provider and issued to the Proponent DCCEEW within 30 days of each 12 month anniversary of the documented commencement of the action. The Proponent will issue a copy to DCCEEW within contracted timeframes.

11 References

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Attachment 1

Offset Revegetation Plan

OFFSET REVEGETATION PLAN

Introduction

28 South Environmental Pty Ltd (28 South) has prepared this Offset Revegetation Plan (ORP) as part of the broader Offset Area Management Plan (OAMP) submitted for the Flinders View Residential Development (the Proposed Action) that is being assessed as a Controlled Action and which is progressing through the Preliminary Documentation phase subject to conditions of the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (DCCEEW Ref: 2020/8615). For clarity, this ORP has been prepared to guide on-ground restoration works with regard to the on-ground ecological restoration works, their goals and completion criteria. The overarching OAMP provides guidance on how the Offset Site achieves the goals of the DCCEEW Environmental Offsets Policy.

Significant residual impact associated with the Proposed Action will require the Proponent to provide an offset for the significant residual impact to listed threatened species under the EPBC Act, specifically the koala and grey-headed flying-fox. The Proponent has entered into an agreement with Koala Farmland Trust who own the land upon which the rehabilitation will occur and will legally secure the offset area (the Offset Receiving Site (ORS)) via Voluntary Declaration under the Vegetation Management Act 1996 and being assigned a Category A area of Regulated Vegetation under the Planning Act 2017. Arxhe Ripley View Investment Trust (Arxhe) will commission an approved rehabilitation contractor to undertake the offset works generally in accordance with this ORP and its Environmental Objectives to manage and protect the offset in perpetuity as defined within the OAMP.

As detailed within the overarching OAMP, the ORS will result in a direct conservation outcome for the koala and greyheaded flying-fox in accordance with the EPBC Acts Environment Offset Policy and Environmental Objectives of the OAMP through the restoration of existing habitat, re-establishment/creation of diverse and functional ecosystems providing greater additionality to adjoining large intact remnants. Further, the ORS will build upon the extent of a state significant biodiverse corridor immediately to the west at Deongwar State Forest, the regional biodiversity corridor to the south of Esk State Forest and Esk National Park and the additional offset lands owned by Koala Farmland Trust to the south. Through this, a consolidated regionally significantly area of important foraging habitat will be established, with the site strategically positioned as a staging point for rehabilitation of broad areas of spotted gum/narrow-leaved ironbark open forest on deeper loamy soils and sedimentary rocks with lower slope expression (ie, dominance) of *Eucalyptus tereticornis* (Queensland blue gum).

Offset Receiving Site

The ORS is situated on a dual property at 2157 & 2158 Road, Biarra (Lot 271 on CA311037 and Lot 127 on CA31414) held in freehold title Koala Farmland Trust. The ORS is situated in the southwest of the Somerset Regional Council (SRC) Local Government Area (LGA). The property totals 440.07 ha and the ORS comprises the 184.3 ha of the site. This area encompasses approximately 7.11 ha (3.9%) of remnant, 92.28 ha (50.1%) of high value and young regrowth and 84.93 ha (46.1%) of non-remnant pastural grassland with scattered trees of varying age.

Purpose of this ORP

The intent of this ORP is to outline the Environmental Objectives of the OAMP and how the ORS will be managed including:

a) The proposed treatments across the ORS such as;

- the ORS currently support regrowth native vegetation communities.
- ground layer (noting high levels of native woody recruitment); and

b) How the on-ground progress will be managed, monitored and reported upon.

This ORP has also been prepared in accordance with the requirements of the OAMP prepared for the Action and the South East Queensland Ecological Restoration Framework.

Restoration Area Management Strategies

The ORS and the areas proposed to be restored and managed as part of the Proposed Action's Offset have been illustrated on ORP001. A number of Management Units (MU) has been identified within the ORS and are derived from existing on-ground condition within these areas. Management measures for each MU have been derived from in-field detailed inspection and prepared in line with the SMART principals (Specific, Measurable, Achievable, Realistic & Timed) to achieve the Environmental Objectives of the OAMP. These management measures have also been prepared in concert with the Offset Land Management Actions and Corrective Actions outlined within the OAMP.

Management measures have also been prepared to ensure that temporal conditions can be reacted to and place greater accountability on the offset provider to utilise the most appropriate measures based on the proposed Environmental Objectives and on-ground temporal conditions (i.e. if good native recruitment is occurring at the time of works, tube stock plantings may not be required or can be significantly reduced, conversely, increasing weed incursion during works may require further weeding and increased tube stock plantings, drought conditions may require increased watering events through irrigation set ups). Specifications encourage the active natural regeneration from the seed bank where possible as this is the best means of establishing a robust, resilient and self-sufficient native ecosystem that is genetically suited to its endemic conditions.

Timing for Commencement of Works

The works outlined within this ORP must commence in concert with the Proposed Action (i.e. clearing and construction works on the Impact Site for the Proposed Action. Following initial establishment of the works, the ORS will be subject to ongoing management for the 20-year maintenance period and monitoring for the life of the Action's Approval (until 2053).

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Flinders View Residential Development – Offset Revegetation Plan

i. The components of the ORS which will be subject to assisted natural regeneration methods where parts of

ii. The component of the ORS which will be subject to active restoration and infill planting where parts of the ORS currently support some native vegetation, principally native shrubs and canopy elements in the

Management Unit 1 – Management Strategy

Management Unit 1 (MU 1) consists of 7.11 ha of Remnant (MU 1a) and 21.07 ha of High Value Regrowth (MU 1b) RE 12.9-10.2 (refer Plate 1 and Plate 2) totalling 28.18 ha or 13.5% of the proposed offset area - refer to ORP001. It occurs on a variety of topographic positions and aspects from ridge crests, upper slopes, lower slopes and along incised order 1 eroding stream channels on sedimentary geology (Land Zone 9-10). Canopy species include Corymbia citriodora subsp. variegata (spotted gum) and Eucalyptus crebra (narrow-leaved ironbark). Other species may include Eucalyptus tereticornis (Queensland blue gum), Corymbia intermedia (pink bloodwood), Corymbia tessellaris (Moreton Bay ash), Angophora subvelutina (broad-leaved apple) with Lophostemon suaveolens (swamp box) present along waterways. Canopy species on crests and upper slopes tends to be dominated by spotted gum and narrow-leaved ironbark, with Queensland blue gum and broad-leaved apple more prevalent on lower slopes and along waterways. Canopy species recruitment within MU1 is in the order of 1300-1400 stems/ha.

The subcanopy species includes regenerating canopy species and Allocasuarina torulosa (rose oak) and the groundlayer is significantly comprised on native graminoides and forbs (RE12.9-10.2). The canopy and sub-canopy layer is well established, though cover is patchy on account of past thinning / clearing. Large (eucalypt) trees range 28-38 trees/ha in the east and 14-22 trees/ha in the west. Tree canopy species, shrub, graminoid and forb richness are high, as is native grass and shrub cover. Non-native plant coverage ranges 25-70%, with higher levels reflective patchiness in canopy coverage and associated with exotic pasture grasses and woody weeds.

Lantana camara* (lantana) a Weed of National Significance (WoNS) can be common and thicket forming. The exotic pasture grass is abundant. Opuntia stricta* (prickly pear) and Senecio madagascariensis* (fireweed) both WoNS and Lantana modividensis* (creeping lantana) which is a State restricted pest are occasionally present.

Assisted Natural Regeneration Requirements

The Assisted Natural Regeneration (ANR) management approach to this MU will take advantage of the emerging natural resilience and functionality of the existing communities, while promoting the regeneration of native vegetation through the removal of stock and exotic weed species. The main focus within this MU is to undertake targeted pest plant treatment and removal to encourage the natural recruitment of endemic native species from the seed bank. Seed of local provenance is key to successfully creating resilient and ultimately self-sufficient ecosystems as the seed is derived from parent plants lineage evolved in a site's microclimates. The commencement of the restoration works will also coincide with de-stocking of the ORS to remove any cattle and commencement of pest fauna management. Limited in-fill planting and seeding is proposed for most REs of this MU unless regeneration of various other canopy and shrub species are shown to be lacking from the ANR suite of species or weed eradication target areas do not show signs of native recruitment after a short period of time. Planting the area encompassing the Regrowth RE 12.9-10.2 is recommended due to its lower density but this should occur after the weed treatment and observed lack of native recruitment. Revegetation should be undertaken utilising native tube stock, derived from locally sourced and grown species. Koala Farmland Fund will work closely with local native nurseries to establish a supply of tube stock to sufficiently support these areas. Seed collection from the ORS should also be considered over the course of management. All plantings are to be derived from the planting palette analogous with the pre-clear RE found in Table 1.

Presently, there are no extensive areas of weed development within the MU and so only chemical methods for weed removal are prescribed herein (to avoid machinery impacting any native recruitment); however, it is at the discretion of the restoration contractor to use the most suitable, sensitive and adaptive methods. The engaged contractor will undertake an initial intensive weed management program to identify the pest plants occurring at the time of restoration works. All weed treatment and removal methods should be in accordance with the methods specified in the South East Queensland Ecological Restoration Framework Manual.

Assisted Natural Regeneration Management Actions

The primary objectives and performance criteria of ANR efforts proposed for MU 1 include:

- Remove stock and any fencing causing impediment to native fauna movement (i.e. barbed wire fencing)
- Cull feral animals and secure the planting areas
- Retain and enhance all existing native fauna habitat
- Increase the extent of native vegetation cover over time
- cover of non-woody flora species will be recorded.
- Maintenance trails to be georeferenced mapped and established for safety, grass fire breaks and site work access
- recruitment
- Where needed plant out the ORS utilising tubestock from Table 1
- growth success goal attainment
- Water to be sourced by 4000L poly tanks located on points of high terrain. Water cartage to be minimized wherever possible due to cost and terrain
- Existing dams will be rehabilitated
- Creek crossings to have gabions or similar installed
- Reintroduce large woody debris (including logs, particularly in open areas between defined patches of regrowth) ordinarily go into green waste facilities)
- be present within MU 1
- Evidence of significant reductions in the presence of other exotic species. It is considered appropriate that the following performance criteria be adopted:
 - sprout/re-seed)
 - retention functions; however, no WoNS or BA weeds are to be present
 - creek banks or soil
- Undertake baseline monitoring for feral predator/herbivore usage and management with ICC
- Bushfire management in accordance with the OAMP
- Bushfire monitoring and management in conjunction with the QFES and ICC
- Routine monitoring of the restoration area must also identify and rectify the following impacts: o litter and/or rubbish dumping
 - o plant theft
 - o fauna impacts
 - o soil compaction
 - o erosion.

Timing assigned to these goals is variable and will be benefited by works being afforded a 20-year life span.

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• Prior to planting out of the ORS the engaged contractors are to establish 3 primary bio-condition plots and 3 tertiary site plots for on-going monitoring consistency, demarcated by steal posts or wooden bollards sufficient to last the 20 year monitoring period. In addition to tertiary level assessments, projected foliage

• Where practicable improve habitat connectivity and reduce fragmentation through encouragement of native

• Water in plantings and closely maintain these for an establishment period of 3 months or longer based on

and other habitat features (fabrication of habitat qualities from left over timber elsewhere which would

• Weeds of National Significance (WoNS) and weed species listed under the Biodiversity Act 2014 (BA) are not to

o all large weed trees and woody weeds are to be removed or treated in-situ (to ensure they will not re-

o scattered groundcover weed species may occur in very low densities where they perform important soil o all weed treatment must be performed in a manner which does not promote erosion or instability of



Inset 1: Current condition of Management Unit 1 (MU 1a Above, MU 1b Below)

Management Unit 2 – Management Strategy

Management Unit 2 (MU 2) consists of young RE 12.9-10.2 regrowth occurring on a variety of topographic positions and aspects from ridge crests, upper slopes, lower slopes and along incised order 1 eroding stream channels on sedimentary geology (Land Zone 9-10). The canopy consists of Corymbia citriodora subsp. variegata (spotted gum) and Eucalyptus crebra (narrow-leaved ironbark). Other species may include Eucalyptus tereticornis (Queensland blue gum), Corymbia intermedia (pink bloodwood), Corymbia tessellaris (Moreton Bay ash) and very occasionally Angophora subvelutina (broad-leaved apple) and Allocasuarina torulosa (rose oak) open forest 4-8 m height. Subcanopy and shrublayer species include regenerating canopy species and the groundlayer is variable ranging from areas dominated by native graminoides and forbs to exotic pasture grasses (analogous with RE12.9-10.2). MU2 comprises 71.21 ha and 38.6% of the proposed offset site area. Canopy species recruitment within MU2 is in the order of 585-625 stems/ha.

The canopy and sub-canopy layer is very sparse with canopy cover very patchy on account of past thinning / clearing. Large (eucalypt) trees range 10-16 trees/ha in the east and 0-4 trees/ha in the west. The number of tree canopy and shrub species present, and native grass and shrub cover is suppressed on account of past clearing, however conversely, graminoid and forb species richness is high. Non-native plant coverage ranges 10-60%, with higher levels reflective of a sparse canopy coverage (low levels of ground strata shading) resulting in high levels of exotic pasture grasses, particularly thickets of *Lantana camara** (lantana).

Lantana camara* (lantana) a WoNS, can be common and thicket forming. The exotic pasture grass is abundant. Opuntia stricta* (prickly pear), Opuntia tomentosa (velvety tree pear) and Senecio madagascariensis* (fireweed) all WoNS and Lantana modividensis* (creeping lantana) and Sporobolus natalensis* (giant rat's tail grass) both State restricted pests are occasionally present.

Assisted Natural Regeneration Requirements

This MU will be subject to an ANR management approach where areas of regrowth will be promoted through the regeneration of native vegetation through the removal of stock and exotic weed species with in-fill planting supplemented where necessary. The main focus within this MU is to consolidate and link existing vegetation patches to accelerate natural recruitment progression processes. Targeted pest plant treatment and removal to encourage the natural recruitment of endemic native species from the seed bank should be undertaken in areas of established shrub and canopy layers. In areas of grasslands, weed eradication to be focused on woody weeds with exotic pasture grasses to be utilized for planted sapling protection (ie frost/wind etc.). Established trees will shade out most of these exotic grass over time with widespread evidence of this already occurring onsite. Seed of local provenance is key to successfully creating resilient and ultimately self-sufficient ecosystems as the seed is derived from parent plants lineage evolved in a site's microclimates. The commencement of the restoration works will also coincide with destocking of the ORS to remove any cattle and commencement of pest fauna management. Limited planting is proposed for most of this MU unless regeneration of various other canopy and shrub species are shown to be lacking from the ANR suite of species or weed eradication target areas do not show signs of native recruitment after a short period of time. Hill crests within the MU are areas exhibiting low natural recruitment and should be an initial focus for supplementary planting. Planting the area encompassing the Regrowth RE 12.9-10.2 is recommended due to its lower density but this should occur after the weed treatment and observed lack of native recruitment. Revegetation should be undertaken utilising native tube stock, derived from locally sourced and grown species. Koala Farmland Fund will work closely with local native nurseries to establish a supply of tube stock to sufficiently support these areas. Seed collection from the ORS should also be considered over the course of management. All plantings are to be derived from the planting palette analogous with the pre-clear RE in **Table 1**.

The extensive areas of lantana weed development within the MU indicate some chemical methods for weed removal are prescribed herein. However, it is at the discretion of the restoration contractor to use the most suitable, sensitive and adaptive methods. The engaged contractor will undertake an initial intensive weed management program to identify the pest plants occurring at the time of restoration works. All weed treatment and removal methods should be in accordance with the methods specified in the South East Queensland Ecological Restoration Framework Manual.

Assisted Natural Regeneration Management Actions

The primary objectives and performance criteria of ANR efforts proposed for MU 2 include: Remove stock and any fencing causing impediment to native fauna movement (i.e. barbed wire fencing)

- Cull feral animals and secure the planting areas
- Retain and enhance all existing native fauna habitat
- Increase the extent of native vegetation cover over time
- cover of non-woody flora species will be recorded.
- Maintenance trails to be georeferenced mapped and established for safety, grass fire breaks and site work access
- Where practicable improve habitat connectivity and reduce fragmentation through encouragement of native recruitment
- Where needed plant out the ORS utilising tubestock from **Table 1**
- which will shade out most of the exotics grass over time evidence of this occurring onsite is widespread
- Water in plantings and closely maintain these for an establishment period of 3 months or longer based on growth success goal attainment

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• Prior to planting out of the ORS the engaged contractors are to establish 3 primary bio-condition plots and 3 tertiary site plots for on-going monitoring consistency, demarcated by steal posts or wooden bollards sufficient to last the 20 year monitoring period. In addition to tertiary level assessments, projected foliage

• Where grassland, weed eradication to be focused on woody weeds. Exotic pasture grasses to be utilized for plant protection (ie frost/wind etc.). Use exotic grasses to assist with protecting the plantings. Establish trees

- Water to be sourced by 4000L poly tanks located on points of high terrain. Water cartage to be minimized wherever possible due to cost and terrain and water may be supplemented by pumping water from existing dams.
- Creek crossings to have gabions or similar installed
- Reintroduce large woody debris (including logs, particularly in open areas between defined patches of regrowth) and other habitat features (fabrication of habitat qualities from left over timber elsewhere which would ordinarily go into green waste facilities)
- Weeds of National Significance (WoNS) and weed species listed under the *Biodiversity Act 2014* (**BA**) are not to be present within MU 2
- Evidence of significant reductions in the presence of other exotic species. It is considered appropriate that the following performance criteria be adopted:
 - o all large weed trees and woody weeds are to be removed or treated in-situ (to ensure they will not resprout/re-seed)
 - scattered groundcover weed species may occur in very low densities where they perform important soil retention functions or shielding of native saplings; however, no WoNS or BA weeds are to be present
 - o all weed treatment must be performed in a manner which does not promote erosion or instability of creek banks or soil
- Undertake baseline monitoring for feral predator/herbivore usage and management with ICC
- Bushfire management in accordance with the OAMP
- Bushfire monitoring and management in conjunction with the QFES and ICC
- Routine monitoring of the restoration area must also identify and rectify the following impacts:
 - \circ litter and/or rubbish dumping
 - o plant theft
 - o fauna impacts
 - \circ soil compaction
 - \circ erosion.

Timing assigned to these goals is variable and will be benefited by works being afforded a 20-year life span.



Inset 2: Current condition of Management Unit 2

Management Unit 3 – Management Strategy

Management Unit 3 (**MU 3**) consists of derived pastural grassland of exotic and native species occurring on a variety of topographic positions across the site on sedimentary geology (Land Zone 9-10). The pre-clear regional ecosystem is **RE 12.9-10.2** and relict paddock trees, canopy recruitment and groundcover species are reflective of this. MU 3 comprises 84.93 ha and 46.1% of the proposed offset site area.

The canopy and sub-canopy layer is mostly absent on account of past thinning / clearing. Large (eucalypt) trees are absent. The number of canopy and shrub species present, and native grass and shrub cover is suppressed on account of past clearing. There is high variability in native grass species richness and native species richness is consistently high. Non-native plant coverage ranges 55-65%, with high levels of exotic pasture grasses. Canopy species recruitment within MU3 is in the order of 89-309 stems/ha.

Lantana camara* (lantana) a WoNS can be common and thicket forming. The exotic pasture grass is abundant. *Opuntia stricta** (prickly pear), *Opuntia tomentosa* (velvety tree pear) and *Senecio madagascariensis** (fireweed) all WoNS and Lantana modividensis* (creeping lantana) and Sporobolus natalensis* (giant rat's tail grass) both State restricted pests are occasionally present.

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Reconstruction Requirements

The Reconstruction management approach to this MU will take advantage of the unchanged site topography (no earthworks required to undertaken reconstruction methods) to promote the regeneration of native vegetation through the removal of stock and exotic weed species and critically, the in-fill planting of species analogous with the ground-truthed **RE 12.9-10.2**. The first focus within this MU is to undertake targeted woody pest plant treatment and removal to enable the planted recruitment of native species from the planting palette. The exotic pasture grasses are to be utilized for planted sapling protection until such a time when established trees will shade them out. The commencement of the reconstruction works will also coincide with de-stocking of the ORS to remove any cattle commencement of pest fauna management. The reconstruction strategy for this MU is to focus on establishing new planting corridors which bisect the open areas to ultimately establish 'concentric circles' across the eastern and western sites. If successfully implemented, natural recruitment across the entire ORS will be accelerated in the latter half of the offset period. Revegetation should be undertaken utilising native tube stock, derived from locally sourced and grown species at the rates and densities outlined in Table 1. Over the grassland, there is potential for rapid rehabilitation to supplement tubestock plantings, which if successful, could be more widely expanded across the Site. The open grassland also presents an opportunity to utilise ripping to facilitate direct seeding and direct planting. Koala Farmland Fund will work closely with local native nurseries to establish a supply of tube stock to sufficiently support these areas. Seed collection from the ORS should also be considered over the course of management. It is noted that not all species may be available at the time of works. Subsequent species listed under the Regional Ecosystem Definition Data (REDD) prepared by the Queensland Herbarium must be consulted to identify other appropriate species for planting.

Regular maintenance must be undertaken to ensure plant establishment is successful and any failed plantings can be appropriately replaced to ensure the achievement of the respective stratum's density. Further, regular monitoring must coincide with weed management to remove woody pest plants that may continue to persist within the MU. Mechanical and chemical methods for weed removal are prescribed and it is at the discretion of the Restoration Contractor to use the most suitable method. All weed treatment and removal methods must be undertaken in accordance with the methods specified in the South East Queensland Ecological Restoration Framework Manual.

Ecological Reconstruction Management Actions for MU 3

The primary objectives and performance criteria of the Reconstructive efforts proposed for MU 3 include:

- Remove stock and any fencing causing impediment to native fauna movement (i.e. barbed wire fencing)
- Cull feral animals and secure the planting areas
- Retain and enhance all existing native fauna habitat and existing veteran trees
- Prior to planting out of the ORS the engaged contractors are to establish 3 primary bio-condition plots and 3 tertiary site plots for on-going monitoring consistency, demarcated by steal posts or wooden bollards sufficient to last the 20 year monitoring period. In addition to tertiary level assessments, projected foliage cover of non-woody flora species will be recorded.
- Maintenance trails to be georeferenced mapped and established for safety, grass fire breaks and site work access
- Plant out the ORS utilising tubestock from Table 1
- Water in plantings and closely maintain these for an establishment period of 3 months or longer based on growth success goal attainment.
- Water to be sourced by 4000L poly tanks located on points of high terrain. Water cartage to be minimized wherever possible due to cost and terrain
- Existing dams will be rehabilitated
- Creek crossings to have gabions or similar installed
- Increase the extent of native vegetation cover over time

most of the exotics grass over time – evidence of this occurring onsite is widespread

- Where practicable improve habitat connectivity and reduce fragmentation through encouragement of native recruitment and where possible the installation of nesting boxes in veteran trees.
- Reintroduce large woody debris (including logs, particularly in open areas between defined patches of regrowth) and other habitat features
- WONS and weed species listed under BA are not to be present within MU 3 • Evidence of significant reductions in the presence of other exotic species. It is considered appropriate that the
- following performance criteria be adopted:
 - o all large weed trees and woody weeds are to be removed or treated in-situ (to ensure they will not resprout/re-seed)
 - o scattered groundcover weed species may occur in very low densities where they perform important soil retention functions or shielding of native saplings; however, no WoNS or BA weeds are to be present o all weed treatment must be performed in a manner which does not promote erosion or instability of
 - creek banks or soil
- Undertake baseline monitoring for feral predator/ herbivore usage and management with SRC
- Bushfire management in accordance with the OAMP
- Bushfire monitoring and management in conjunction with the QFES and SRC
- Routine monitoring of the restoration area must also identify and rectify the following impacts: litter and/or rubbish dumping
 - o plant theft
 - o fauna impacts
 - o soil compaction
 - o erosion.

Timing assigned to these goals is variable and will be benefited by works being afforded a 20-year life span.



Inset 3: Current condition of Management Unit 3

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• Weed eradication to be focused on woody weeds. Exotic pasture grasses to be utilized for plant protection (ie frost/wind etc.). Use exotic grasses to assist with protecting the plantings. Establish trees which will shade out

Planting Palette

The species list and target density for planting in Table 1 has been derivedfromRegionalEcosystemTechnicalDescriptions(https://www.publications.qld.gov.au/dataset/re-technical-descriptions).

Table 1: Planting palette RE 12.9-10.2

| Botanical Name | Common Name | Dominance (%) | Density* |
|-----------------------------|------------------------|---------------|--|
| | Canopy and Sul | ocanopy | <u></u> |
| Corymbia citriodora | Spotted gum | 50% | |
| Eucalyptus crebra | Narrow-leaved ironbark | 30% | - |
| Angophora leiocarpa | Smooth-barked apple | 10% | |
| Angophora subvelutina* | Broad-leaved apple | 10% | Canopy plantings should be established at |
| Eucalyptus tereticornis* | Queensland blue gum | 10% | 1/40m ² (~6.3m spacing) |
| Lophostemon suaveolons* | Swamp box | 5% | |
| Corymbia intermedia | Pink bloodwood | 10% | |
| Corymbia tessellaris | Moreton Bay ash | 10% | - |
| _ | Shrub/Subca | nopy | <u> </u> |
| Acacia leiocalyx | Black wattle | 30% | |
| Jacksonia scoparia | Native broom | 5% | - |
| Alphitonia excelsa | Red ash | 5% | - |
| Acacia disparrima | Southern salwood | 30% | Shrub plantings |
| Allocasurina toruloso | Rose-oak | 20% | should be |
| Allocasurina littoralis | Forest-oak | 20% | 1/16m ² (~4 m |
| Acacia implexa | Hickory wattle | 5% | spacing)± |
| Wikstroemia indica | Tie bush | 5% | • |
| Psydrax odorata | Shiny-leaved Canthium | 1% | - |
| Breynia oblongifolia | Coffee bush | 1% | • |
| | Graminoi | ds | I |
| Themeda triandra | Kangaroos grass | 25% | |
| Cymbopogon refractus | Barbed wire grass | 15% | Groundcover |
| Entolasia stricta | Wiry panic | 5% | plantings |
| Eremochloa bimaculata | Poverty grass | 5% | 1/1m ² (~1 m spacing) ¹ |
| Aristida calycina | a wire grass | 5% | |
| Alloteropsis semialata | Cockatoo grass | 10% | |

| Botanical Name | Common Name | Dominance (%) | Density* |
|------------------------------|--------------------------|---------------|----------|
| Heteropogon contortus | Black spear grass | 5% | |
| Microlaena stipoides | Weeping grass | 5% | |
| Sporobolus elongatus | Slender rat's tail grass | 5% | |
| Capillipedium spicigerum | Scented top | 5% | |
| Hyparrhenia filipendula | Tambookie grass | 5% | |
| Aristida ramosa | a wire grass | 5% | |
| Digitaria divaricatissima | Umbrella grass | 5% | |

1. Subject to micro-site conditions and prevailing climatic factors, the contractor may elect to

supplement plantings with seeding of prepped areas to maximise likelihood of early revegetation success.

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Landscape Specifications

Maintenance

The minimum following maintenance measures are required to be undertaken by the contractor:

- Planting areas are to be regularly watered for a period of 12 weeks or as deemed necessary by the contractor to ensure establishment is successful or until sufficient rainfall is received: and
- Recurrent listed WoNS or BA weeds within regeneration areas are to be removed (weed management 0 measures are outlined within Table 6);

Planting Requirements

Table 1 identifies the appropriate species to be selected for planting as well as the density criteria to be achieved. It is noted that not all species proposed may be available at the time of works. Subsequent species listed under the Regional Ecosystem Definition Data (REDD) prepared by the Queensland Herbarium should be consulted to identify other appropriate species for planting. If all species required for planting are not available, a staged planting may be required. This must be supported in writing from the Assessment Manager/Team.

Site Clean-up & Waste Management

Hazards and wastes are removed from the development site; this includes:

- any wastes as defined in the Environmental Protection Act 1994;
- machinery, fencing or equipment left over from past uses and practices; and
- items of rubbish and litter.

It is noted that site surveys did not identify any significant waste material. Contractors should be made aware of any contaminates or waste material prior to undertaking works.

Sediment and Erosion Control

The engaged contractor must install silt control fencing as required on site, to prevent soil material from entering restoration areas or leaving restoration areas. If soil stabilisation measures are required within the MUs to assist in the avoidance, minimisation and mitigation of soil loss, they should be sympathetic to the specific situation and only utilise appropriate measures such as sediment fencing, coir logs or native mulch.

Fire Ant Movement Controls

To prevent the spread of fire ants, the Queensland Government has implemented controls that apply to individuals and commercial operators, to restrict the movement of materials that could carry fire ants including soil, turf, potted plants, mulch, baled hay or straw, animal manures mining or quarry products. Penalties apply for non-compliance with the movement controls. If the engaged contractors are unsure of their obligations under the Biosecurity Act 2014 they should contact the relevant Queensland State Government Department.

Contractor Requirements

All weed treatment must be safely undertaken by a suitably qualified contractor and utilise appropriate chemicals and all contractors must have Conservation and Land Management Certification 4 or equivalent experience and an ACDC licence. This RMP has been based on best practices from the SEQ Ecological Restoration Framework and significant practical experience in restoration implementation projects.

Services

The contractor shall make themselves aware of all underground and overhead services prior to the commencement of works. The contractor shall also be responsible for determining the locations of as-built and to be constructed services during the course of the works. No services have been identified on these drawings.

Controlling Domestic Pets and Wildlife

It is important to exclude domestic pets and wildlife from restoration areas during the formative periods of the restoration efforts. This will help avoid the loss of tube stock or regenerating vegetation from being impacted and or loss through foraging.

Landscape Specification Notes for Planting

- 1. Ensure all water crystals are thoroughly wetted before application and fertiliser applied at the nominated rate.
- 2. Compensatory Planting Treatments: remove all weeds and install planting as noted. Provide a bamboo marker at each tube stock location that extends 300mm above the ground and has the top 100mm painted white or pink.
- 3. Planting is to be undertaken in accordance with the below diagram - Tubestock Planting 1.
- should take into account the position of any existing vegetation retained within the Site and the necessary maintenance of the MU.





Each specimen will be watered-in with at least 5 litres of water; fertiliser and water crystals; and surrounding with a 0.5m ring of clean native mulch to a depth of 50mm. Landscape specifications for plants are outlined below and within Tube Stock Planting Note 1.

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4. It is the responsibility of the engaged contractor to determine the final location of each planting. This location

Table 6: Control techniques and herbicide application rates

| Common Name | Scientific Name | Application Method | Chemical | Application Rate |
|-----------------------------------|-----------------------------|---|--|---------------------------------------|
| Trees | | | | - |
| | | Stem inject | Glyphosate | - |
| Camphor laurel | Cinnamomum camphora | Cut, scrape and paint | Glyphosate | - |
| | | Basal bark (saplings) | Fluroxypyr | - |
| | | Spot spray | Glyphosate, Glyphosate + Metsulfron methyl | - |
| | | Cut stump and paint, stem injection | Triclopyr 200g /L plus picloram 100 g/L | - |
| Chinese celtis | Celtis sinensis | Stem injection, cut stump and paint | Glyphosate 360 g/L | - |
| | | Spot spray | Fluroxypyr 200 g/L | - |
| | | Spot Spray | Glyphosate | - |
| Cadaghi | Corymbia torelliana | Cut, scrape and paint | Glyphosate | - |
| - | | Stem inject | Glyphosate | - |
| | | Basal bark (saplings) | Fluroxypyr | - |
| | | Spot Spray | Glyphosate + Metsulfron methyl | _ |
| Umbrella tree | Schefflera actinophylla | Cut, scrape and paint | Glyphosate | _ |
| | | Stem inject | Glyphosate | _ |
| | | Spot spray | Glyphosate, Fluroxypyr | _ |
| Giant devils fig and wild tobacco | Solanum chrysotrichum | Cut, scrape and paint | Glyphosate | _ |
| | and S. mauritianum | Basal bark (juvenile / mature) | Fluroxypyr | _ |
| | | Stem inject | Glyphosate | _ |
| African tulip tree | Spathodea campanulata | Spot spray | Glyphosate | Herbicides must be applied by appr |
| | | Cut, scrape and paint | Glyphosate | accordance with the Agricultural Ch |
| | | Stem inject | Glyphosate | rates as identified on registered pro |
| Cocos palm | Sugarus romanzofffiana | Stem inject | Glyphosate + Metsulfron methyl | Veterinary Medicines Authority (AF |
| | Syugius iomanzojjjiuna | Spot spray | Glyphosate + Metsulfron methyl | the South East Queensland Ecologic |
| Shrubs | | | | guidance. |
| | | Spot Spray | Glyphosate | |
| Easter Cassia | Senna pendula var. glabrata | Cut Scrape Paint | Glyphosate | |
| | | Stem Inject | Glyphosate | |
| | | Cut, Scrape and Paint | Glyphosate | |
| Lantana | Lantana camara | Spot-spray | Fluroxypyr | |
| | | Spray (spot spray and | Glyphosate | |
| | | Spot spray | Glyphosate | |
| Brazilian peppertree | Schinus terebinthifolius | Cut scrape paint | Glyphosate + Metsulfuron Methyl | |
| | | Basal barking | Fluroxypyr | |
| | | Spot Spray, Stem Inject, Cut Scrape Paint | Glyphosate | |
| Groundsel | Baccharis halimifolia | Spot Spray | 2,4-D | _ |
| | | Cut stump method | Triclopyr 200g /L plus picloram 100 g/L | _ |
| | | Spot spray | Glyphosate | - |
| Yellow bells | Tecoma stans | Basal barking | Fluroxypyr | - |
| | | Stem injection | Glyphosate | - |
| Groundcovers and grasses | | · | | - |
| | | | Glyphosate + Metsulfuron Methyl | |
| Singapore Daisy | Sphagneticola trilobata | Spot-spray | Metsulfuron Methyl | |
| Pink Lady | Callisia repens | Culture burn | Glyphosate | |
| ·, | · | | | |

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ropriately qualified / supervised persons in hemicals and Distribution Control Act 1966 at oduct labels, or on an Australian Pesticides and PVMA) issued permit where applicable. Refer to cal Restoration Framework for addition

| Common Name | Scientific Name | Application Method | Chemical | Application Rate |
|--|---|--------------------|---------------------------------|------------------|
| | | Spot Spray | | |
| Plue hilly geats wood | Ageratum houstonianum | Spot Spray | Glyphosate | |
| Blue billy goats weed | | | Metsulfuron Methyl | |
| Singanara Daiau | Cabaanaticala trilabata | Spot sprov | Glyphosate + Metsulfuron Methyl | _ |
| Singapore Daisy | spriagneticola trilobata | Spot-spray | Metsulfuron Methyl | _ |
| Basket asparagus | According anthiopique | Spot Sprov | Glyphosate + Metsulfuron Methyl | |
| | Asparagus detmopicus | spot spray | Metsulfuron Methyl | |
| Red Natal, South African Pigeon Grass, Molasses Grass, Para Grass, Rhodes Grass, Guinea Grass, Elephant Grass, Signal Grass | Melinis repens, Setaria sphacelata, Melinis multiflora, Urochloa mutica, Chloris gayana, Megathyrsus maximus, Pennisetum purpureum, Urochloa decumbens | Spot Spray | Glyphosate | |



Monitoring

Monitoring is important to understand the gradual improvement and eventual achievement of the offset obligation, which will ultimately result in the net-benefit for the two listed threatened species (koala and grey-headed flying-fox). Detailed monitoring will be undertaken throughout the ORS with a minimum of 3 Primary monitoring sites established for each MU (i.e. minimum of 6 primary monitoring sites across the ORS). A further 3, tertiary monitoring sites are also to be established within each MU where tertiary monitoring is to be undertaken as a means of ensuring adequate coverage capturing growth, cover and species richness and assisting in the insurance of goals being met. Monitoring should include the collection of Key Performance Indicators¹ as indicated in **Table 7** below as well as any opportunistic observations of species koala and grey-headed flying-fox. During each monitoring event, photos should be collected in the centre of each monitoring site and taken in cardinal directions. Any other additional photographic evidence of the parameters being monitored should also be collected and recorded where appropriate. Monitoring is to be undertaken once per annum for the first 3 years, biennially until year 10 and then every five years until the expiry of the approval (2052) with audit reporting submitted to DCCEEW following each 5 year milestone. Refer to Table 9. Table 7: Monitoring of Key Performance Indicators (KPIs) for Primary Monitoring Sites

| Key Performance Indicators | Description | 20+ year Goal |
|---|---|--|
| Bio-condition Parameters | | • |
| Large trees | Number of large trees above the DBH size threshold defined by the target Regional Ecosystem bio- condition benchmark. | The ultimate goal of all KPIs is to achieve, |
| Tree canopy height | Record the average height of each strata layer present (i.e. emergent, canopy, sub-canopy, shrub and groundcover layers) | proposed upswing in Condition Scoring |
| Recruitment of woody perennial species in EDL | Record the number of tree species that are being naturally recruited within the monitoring site (i.e. occurring as saplings <5cm DBH). | for each individual MU (based on a weighted scoring of |
| Tree canopy cover | Percentage of 100m transect within the monitoring site that is covered by canopy and sub-canopy. | Assessment Units |
| Shrub Cover | Percentage of 100m transect within the monitoring site that is covered by shrub. | described in Attachment 11 of |
| Coarse woody debris | Amount of coarse woody debris occurring within the monitoring site (in metres per site) (collected the length of wood debris that is >10cm in width and >0.5m in length). | OAMP). |
| Native Species Richness – Trees | Record the number of native tree species occurring in the monitoring site. | |
| Native Species Richness – Shrubs | Record the number of native shrub species occurring in the monitoring site. | |
| Native Species Richness – Grasses | Record the number of native grass species occurring in the monitoring site. | |
| Native Species Richness – Forbes | Record the number of native forbs species occurring in the monitoring site. | |
| Extent of non-native/weed coverage | Note the extent/occurrence of weeds listed under the <i>Biosecurity Act 2014</i> or as a WoNS (percentage coverage within the monitoring site) | |
| Organic litter | Note the extent/occurrence of organic litter (percentage coverage within the monitoring site) | |
| Additional Restoration Parameter | S | |
| Dominant Species | Qualitative description of the floristic structure of the monitoring site for the tree, shrub and ground layers | N/A |
| Assessment of plant health | Notation of plant health within the monitoring site. Notation of survival rate of plants where they have been established. | |
| Plant Failure | Notation and number of natural death or illegal removal of established plantings | |

Key Performance Indicators Description Flowering Trees the relative density for flowering within the MU (and ORS generally)

Tertiary monitoring sites should be established to provide greater coverage over the ORS to ensure rehabilitation works as a whole are trending towards the ultimate goals and Environment Objectives of the OAMP. Tertiary monitoring aims to track the major KPIs. Failure of the KPIs will trigger a review of management measures and potentially corrective actions (Refer to OAMP). KPIs for the Tertiary monitoring sites are outlined in Table 7. Tertiary monitoring sites are based on the Regional Ecosystem Vegetation Structure Assessment (CORVEG)². Tertiary monitoring sites are to be monitored yearly to ensure trends in growth and/or management issues are detected and corrective actions can be immediately actioned where required. Table 8 includes an auditing report proforma for the monitoring of KPIs. Each KPI for the ORS condition scoring has a significantly different ability to be achieved, particularly noting many are simply a result of the initial planting works or ANR (e.g. species richness, weediness etc.). As such, some KPIs will be achieved and maintained early; while others will require much of the +20 years to achieve.
 Table 8: Monitoring of KPIs for tertiary monitoring sites

| Key Performance Indicators | Description |
|---|---|
| Bio-condition Parameters | |
| Tree canopy height | Record the average height of each strata layers) |
| Recruitment of woody perennial species in EDL | Record the number of tree species that a <5cm DBH). |
| Tree canopy cover | Percentage of 100m transect within the r |
| Shrub Cover | Percentage of 100m transect within the r |
| Native Species Richness – Trees | Record the number of native tree species |
| Native Species Richness – Shrubs | Record the number of native shrub specie |
| Extent of non-native/weed coverage | Note the extent/occurrence of weeds list the monitoring site) |
| Additional Restoration Parameters | |
| Dominant Species | Qualitative description of the floristic stru |
| Assessment of plant health | Notation of plant health within the monit |
| Plant Failure | Notation and number of natural death or |
| Flowering Trees | Monitoring should be focused on periods for flowering within the MU (and ORS get |

On-ground fauna surveys for koala and grey-headed flying-fox are to be undertaken as part of each major monitoring event (5, 10, 15 and 20 years³) and are to be in accordance with the relevant Terrestrial Vertebrate Fauna Survey Guidelines for Queensland as well as Spot Assessment Technical (SAT) Surveys for Koala, spot lighting, diurnal bird surveys, incidental records during management activities.

² Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F, Addicott, E.P. and Appelman, C.N. (2020) Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland. Version 5.1. Updated March 2020. Queensland Herbarium, Queensland Department of Environment and Science, Brisbane.

¹ The auditor should develop a performer for the collection of information in Table 6/7 and in accordance with the Queensland Government Guide to Determining Terrestrial Habitat Quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (Version 1.3 2020).

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laver present (i.e. emergent, canopy, sub-canopy, shrub and groundcover

are being naturally recruited within the monitoring site (i.e. occurring as saplings

monitoring site that is covered by canopy and sub-canopy.

monitoring site that is covered by shrub.

s occurring in the monitoring site.

es occurring in the monitoring site.

ted under the Biosecurity Act 2014 or as a WoNS (percentage coverage within

ucture of the monitoring site for the tree, shrub and ground layers

toring site. Notation of survival rate of plants where they have been established.

illegal removal of established plantings

during late winter to detect the presence of flowering and the relative density nerallv)

³ It is recommended monitoring be undertaken more regularly while rehab staff are on Site to improve the volume of study undertaken.

Table 9: Monitoring Schedule

| Monitoring activity | Management needs/questions addressed | Parameter/s measured | Survey/monitoring guidelines | Where | When | Reporting Requirements |
|--|---|--|--|--|--|---|
| Baseline Surveys - Primary Monitoring Site Establishment | Establish an understanding of baseline values/condition of each of the monitoring sites across the ORS for comparison during the 20 year management timeframe and the ongoing auditing until 2050. | Refer to the KPI's in Table 7/8 and specific completion criteria in Table 10 and 11 . | KPI's have been adopted from the Queensland Government Guide to Determining Terrestrial Habitat Quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (Version 1.3 2020). | At each of the 9 Monitoring Sites to be established across the ORS (a minimum of 3 per Management Unit) | Year 0 - Prior to the commencement of offset works and establishment (2022). | Annual Compliance Reporting |
| Monitoring of KPIs (9 Primary Monitoring | Undertake monitoring and auditing reporting for the primary monitoring | Refer to the KPI's in Table 7/8 and specific | KPI's have been adopted from the <i>Queensland Government</i> <i>Guide to Determining Terrestrial Habitat Quality: A toolkit</i> | At each of the 9 Primary Monitoring Sites to be established across the ORS (a minimum of 3 per | Year 1 (2023) | |
| Sites) | sites. Report to DAWE on the ORS achievement of the KPIs and | completion criteria in Table 10 and 11. | for assessing land based offsets under the Queensland Environmental Offsets Policy (Version 1.3 2020). | Management Unit) | Year 2 (2024) | |
| | completion cinteria. | | | | Year 3 (2025) | |
| | | | | | Year 5 (2027) | Annual Compliance Reporting Reporting on Website Audit Report to DAWE |
| | | | | | Year 8 (2030) | Annual Compliance Reporting |
| | | | | | Year 10 (2032) | Annual Compliance Reporting |
| | | | | | Year 15 (2037) | Reporting on Website |
| | | | | | Year 20 (2042) | Audit Report to DAWE |
| | | | | | Year 25 (2047) | Annual Compliance Reporting |
| | | | | | Year 28 (2050) | |
| Monitoring of Secondary Sites (9 | Undertake monitoring at the secondary sites. | General floristic structure and composition including | Simplified assessment sheet that is based on the CORVEG Proforma and methodology from the <i>Methodology for</i> | At each of the 9 Secondary Monitoring Sites | Year 1 (2023) | |
| additional sites) | | the tree canopy heights (growth rates), assessment | surveying and mapping regional ecosystems and vegetation communities in Queensland (Version 5.1 2020) | | Year 2 (2024) | |
| | | of plant health and failure, and extent of weed | | | Year 3 (2025) | |
| | | coverage. | | | Year 5 (2027) | Annual Compliance Reporting |
| | | | | | | Reporting on Website Audit Report to DAWE |
| | | | | | Year 8 (2030) | Annual Compliance Reporting |
| | | | | | Year 10 (2032) | Annual Compliance Reporting |
| | | | | | Year 15 (2037) | Reporting on Website |
| | | | | | Year 20 (2042) | Audit Report to DAWE |
| | | | | | Year 25 (2047) | Annual Compliance Reporting |
| | | | | | Year 28 (2050) | |
| Targeted Fauna | Understanding of MNES Fauna | MNES Fauna Species | Surveys are to be in accordance with the relevant Terrestrial | At ORS in accordance with the Terrestrial Vertebrate | Year 5 (2027) | |
| Surveys | Species Presence/Usage of the ORS | Presence/Usage | Presence/Usage Vertebrate Fauna Survey Guidelines for Queensland as well as Spot Assessment Technical (SAT) Surveys for Koala, spot | Fauna Survey Guidelines. | Year 10 (2032) | |
| | lighting, diurnal bird surveys, incidental records during management activities. | | | Year 15 (2037) | | |
| | | | | | Year 20 (2042) | |
| | | | | | | |

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Table 10: Completion Criteria Scoring Table Proforma

| Key Performance Indicators | Description | MUXX Benchmark Score | MUXX Baseline Score | MUXX Monitoring Year 5 Score | Increase in Score | MUXX 20+ year Goal | Required Increase to achieve Goal | Trending / Not Trending Towards and Recor |
|---|---|----------------------------|---------------------------|------------------------------------|----------------------|-----------------------|---|---|
| Bio-condition Parameters | | | | | | | | |
| Large trees | Number of large trees above the DBH size threshold defined by the target Regional Ecosystem bio-condition benchmark. | | | | | | | |
| Tree canopy height | Record the average height of each strata layer present (i.e. emergent, canopy, sub-canopy, shrub and groundcover layers) | | | | | | | |
| Recruitment of woody perennial species in EDL | Record the number of tree species that are being naturally recruited within the monitoring site (i.e. occurring as saplings <5cm DBH). | | | | | | | |
| Tree canopy cover | Percentage of 100m transect within the monitoring site that is covered by canopy, sub-canopy and shrub. | | | | | | | |
| Coarse woody debris | Amount of coarse woody debris occurring within the monitoring site (in metres per site) (collected the length of wood debris that is >10cm in width and >0.5m in length). | | | | | | | |
| Native Species Richness – Trees | Record the number of native tree species occurring in the monitoring site. | | | | | | | |
| Native Species Richness – Shrubs | Record the number of native shrub species occurring in the monitoring site. | | | | | | | |
| Native Species Richness – Grasses | Record the number of native grass species occurring in the monitoring site. | | | | | | | |
| Native Species Richness – Forbes | Record the number of native forbes species occurring in the monitoring site. | | | | | | | |
| Extent of non-native/weed coverage | Note the extent/occurrence of weeds listed under the <i>Biosecurity Act 2014</i> or as a WoNS (percentage coverage within the monitoring site) | | | | | | | |
| Organic litter | Note the extent/occurrence of organic litter (percentage coverage within the monitoring site) | | | | | | | |
| Additional Restoration Paramet | ers | | | | | | | · |
| Dominant Species* | Qualitative description of the floristic structure of the monitoring site for the tree, shrub and ground layers | N/A | N/A | | N/A | | | |
| Assessment of plant health | Notation of plant health within the monitoring site. Notation of survival rate of plants where they have been established. | N/A | N/A | | N/A | | | |
| Plant Failure | Notation and number of natural death or illegal removal of established plantings | N/A | N/A | | N/A | | | |

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| ommendations |
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Completion Criteria

Completion criteria is directly linked to the KPI's listed in Tables 7 and 8 as well as increases in Context and Species Stocking Rates Scores (which are also derived from the KPIs), with the gradual achievement contributing to the eventual satisfaction and completion of the offset works at the end of the 20-year maintenance period for the ORS. Completion criteria include:

- Achievement of Habitat Quality Scores at year 20.
 - All Habitat Quality Scores, are to be populated by detailed monitoring assessments (i.e. Bio-condition (MHQA) and fauna surveys) for the Offsets Condition scoring (at both East and West areas).
 - o Context Scoring is directly linked to the achievement of regrowth and remnant status of the rehabilitation works. As such, achieving 50% (cover) and 70% (height) will attain Remnant Status, as such achieving the proposed increases in Context scoring- a GIS metric.
 - Species Stocking Rates will be assessed and accounted for during bio-condition survey efforts.
 - Achievement of remnant status under the Vegetation Management Act 1999, whereby vegetation meets the 70% of the height and greater than 50% cover relative to the bio-condition benchmarks for targeted RE's. This is demonstrated through the following KPIs; Tree Canopy Height, Tree Canopy Cover, Native Species Richness – Trees and Dominant Species.
 - Revegetation works must establish at least 1 koala habitat tree per 40m2 in accordance with the • Queensland Environmental Offsets Policy 2014;
 - No WoNS present and less than 10% coverage of other weeds listed under the BA are present within the ORS; and
 - At least 90% survival rate of established plantings

Each audit report should state the progression towards achieving the Completion Criteria and when they have been met. The audit reporting should include the data in tabulated format as illustrated in Table 9/10 & ultimately final results in Table 11. This information should be assessed at an ORS scale (i.e. all scores should be compiled to calculate the weighted total score for ORS MU 1 (MU1a & MU1b), MU 2 and MU 3. Tables 12a-c illustrate the expected upswing in scores for each koala and grey-headed flying-fox over 5, 10, 15 and 20 years over the Site as an averaged whole.

Table 11: Completion Criteria – Habitat Quality Score Increases for MNES species

| Monitoring Consulation | Deceline Coore | Neer E Ceere | V | Veen 1E Ceene | Veen 20 Ceers |
|--------------------------|--|--|---|---|---|
| Monitoring Completion | Baseline Score | Year 5 Score | Year 10 Score | Year 15 Score | Year 20 Score |
| Criteria | | | | | |
| Total Condition Score /3 | Derived from results of Monitoring (Table 9) | Derived from results of Monitoring (Table 9) | Derived from results of Monitoring (Table 9) | Derived from results of Monitoring (Table 9) | Derived from results of Monitoring (Table 9) |
| | | | | | (18516-5) |
| Cite Contout Coore /2 | Derived from GIS | Derived from GIS | Derived from GIS | Derived from GIS | Derived from GIS |
| Site Context Score / 3 | Analysis (IVIHQA | Analysis (IVIHQA | Analysis (IVIHQA | Analysis (IVIHQA | Analysis (IVIHQA |
| | Methods) | wethous) | Methods) | Methods) | Methods) |
| Spacios Stacking Pata | Derived from Fauna | Derived from Fauna | Derived from | Derived from | Derived from |
| Species Stocking Rate | Survey Results | Survey Results | Fauna Survey | Fauna Survey | Fauna Survey |
| Score /4 | | | Results | Results | Results |
| Total Future Habitat | Sum of the above | Sum of the above | Sum of the above | Sum of the above | Sum of the above |
| Quality Score With | parameters | parameters | parameters | parameters | parameters |
| Offset /10 | | | | | |
| | | | | | |

Triggers and Corrective Actions

The following Triggers, Corrective Actions and Timing outlined in Table 12 are to be implemented in instances of noncompliance or a lack of success towards the gradual achievement of the Key Performance Criteria in Table 6 and 7 and the Completion Criteria Scores at Years 5, 10, 15 and 20 in Table 9.

 Table 12a: Completion Criteria for Koala- Example outlining how ORS performance will achieve OAMP goals and reach proposed ecological benefit in line with EPBC Offsets Policy.

| Key Performance Indicators | Description | Baseline | Year 5 Score | Year 10 Score | Year 15 Score | Year 20 Score |
|--|--|-----------------------|-----------------------|-----------------------|-----------------------|----------------------------|
| | Site Condition (Bio-condition Parameters and KPIs) | | | | | |
| Deemitmeent of woods | Depend the number of two experies that are being not well, non-sited within the respitevise site (i.e. converses or continue of two | 2.0/5 | 2.0/5 | 2.0/5 | 2.0/5 | r /r |
| perennial species in EDL | DBH). | 3.9/5 | 3.9/5 | 3.9/5 | 3.9/5 | 5/5 |
| | | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >75% of Benchmark |
| Native Species Richness | Record the number of native tree species occurring in the monitoring site. | 2.5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| - 11265 | This is controlled by the planting palettes within the OMP. | ≥25-90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native shrub species occurring in the monitoring site. | 2.3/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| - 511005 | | ≥25-90% of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native grass species occurring in the monitoring site. | 3.9/5 | 4.4/5 | 4.6/5 | 5/5 | 5/5 |
| | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native forbes species occurring in the monitoring site. | 4.7/5 | 4.7/5 | 4.7/5 | 5/5 | 5/5 |
| | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Tree canopy height | Record the average height of each strata layer present (i.e. emergent, canopy, sub-canopy, shrub and groundcover layers) | 3.4/5 | 3.6/5 | 4.3/5 | 4.7/5 | 5/5 |
| | | ≥25-70% of Benchmark | ≥25-70% of Benchmark | >70% of Benchmark | >70% of Benchmark | >70% of Benchmark |
| Tree canopy cover | Percentage of 100m transect within the monitoring site that is covered by canopy and sub-canopy. | 2.8/5 | 2.8/5 | 2.9/5 | 3.5/5 | 4.7/5 |
| | | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >50%-<200% of Benchmark |
| Shrub Canopy Cover | Percentage of 100m transect within the monitoring site that is covered by shrub. | 2.5/5 | 3.6/5 | 4.7/5 | 4.9/5 | 5/5 |
| | | ≥10%-<50% or >200% of | ≥10%-<50% or >200% of | >50%-<200% of | >50%-<200% of | >50%-<200% of |
| | | Benchmark | Benchmark | Benchmark | Benchmark | Benchmark |
| Native grass cover | Record the number of native grass species occurring in the monitoring site. | 3.6/5 | 4.3/5 | 4.5/5 | 4.8/5 | 4.9/5 |
| | | >50-90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark |
| Organic litter | Note the extent/occurrence of organic litter (percentage coverage within the monitoring site) | 3.6/5 | 4/5 | 4.4/5 | 5/5 | 5/5 |
| | | ≥10%-<50% or >200% of | ≥10%-<50% or >200% of | >50%-200% of | >50%-200% of | >50%-200% of Benchmark |
| | | Benchmark | Benchmark | Benchmark | Benchmark | |
| Large trees | Number of large trees above the DBH size threshold defined by the target Regional Ecosystem bio-condition benchmark. | 4.2/15 | 4.2/15 | 4.8/15 | 6.4/15 | 8.2/15 |
| | | 0-50% of Benchmark | 0-50% of Benchmark | >50-110% of Benchmark | >50-110% of Benchmark | >50-100% of Benchmark |
| Course woody debris | Amount of coarse woody debris occurring within the monitoring site (in metres per site) (collected the length of wood debris that is >10cm in width and >0.5m in length) | 2.1/5 | 2.4/5 | 3.2/5 | 3.5/5 | 5/5 |
| | | <50% or >200% of | >50% or <200% of |
| | | Benchmark | Benchmark | Benchmark | Benchmark | Benchmark |
| Extent of non- native/weed coverage | Note the extent/occurrence of weeds listed under the Biosecurity Act 2014 or as a WoNS (percentage coverage within the monitoring site) | 2.7/10 | 3.2/10 | 4.3/10 | 4.9/10 | 6.1/10 |
| | | >25-50% of Benchmark | >25-50% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark |
| Quality and availability of f | ood and habitat required for foraging | 4.7/10 | 4.7/10 | 4.7/10 | 4.7/10 | 10/10 |
| Quality and availability of I | nabitat required for shelter and breeding | 4.4/10 | 4.4/10 | 4.4/10 | 4.4/10 | 10/10 |

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| | 1 | 1 | 1 | | |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Site Condition Score (out of 100) | 51.3 (baseline) | 60.2 | 65.5 | 70.7 | 88.8 |
| Site Condition Score (converted out of 3) | 1.54 (baseline) | 1.81 | 1.96 | 2.12 | 2.67 |
| Site Context | 1 | 1 | | 1 | <u>.</u> |
| Size of Patch | 6.2/10 | 6.2/10 | 6.2/10 | 6.2/10 | 10/10 |
| Connectedness | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Context | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Ecological Corridors | 0/6 | 0/6 | 0/6 | 0/6 | 0/6 |
| Role of site location to species overall population in the state | 4/30 | 4/30 | 4/30 | 4/30 | 4/30 |
| Threats to Species | 6/30 | 7/30 | 7/30 | 7/30 | 7/30 |
| Species mobility capability | 7/10 | 7/10 | 8/10 | 8/10 | 10/10 |
| Site Context Score (out of 56) | 27 (baseline) | 28 | 29 | 29 | 39 |
| Site Context Score (converted out of 3) | 1.46 (baseline) | 1.51 | 1.56 | 1.56 | 2.09 |
| Species Stocking Rate | | | | | |
| Presence detected on or adjoining site (neighbouring property with connecting habitat) | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 |
| Species Usage (Habitat type & evidence of usage) | 15/15 | 15/15 | 15/15 | 15/15 | 15/15 |
| Approximate Density (per ha) | 10/30 | 10/30 | 10/30 | 20/30 | 20/30 |
| Role/Importance of Species Population on Site | 5/15 | 5/15 | 5/15 | 5/15 | 5/15 |
| Species Stocking Rate (out of 70) | 40 | 40 | 40 | 40 | 50 |
| Species Stocking Rate (converted out of 4) | 2.3 | 2.3 | 2.3 | 2.3 | 2.9 |
| Total Habitat Quality Score (out of 10) | 4.74 (baseline) | 5.12 | 5.38 | 5.57 | 7.32 |
| | Averaged Scores for AUs |
| | Round to 5 | Round to 5 | Round to 5 | Round to 6 | Round to 7 |

Table 12b: Completion Criteria for Greater Glider – Example outlining how ORS performance will achieve OAMP goals and reach proposed ecological benefit in line with EPBC Offsets Policy.

| Key Performance Indicators | Description | Baseline | Year 5 Score | Year 10 Score | Year 15 Score | Year 20 Score |
|-------------------------------------|---|------------------------------------|------------------------------------|---------------------------|---------------------------|----------------------------|
| | Site Condition (Bio-condition Parameters and KPIs) | | | | | |
| Recruitment of woody | Record the number of tree species that are being naturally recruited within the monitoring site (i.e. occurring as saplings <5cm | 3.9/5 | 3.9/5 | 3.9/5 | 3.9/5 | 5/5 |
| perennial species in EDL | DBH). | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >75% of Benchmark |
| Native Species Richness | Record the number of native tree species occurring in the monitoring site. | 2.5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| - Trees | This is controlled by the planting palettes within the OMP. | ≥25-90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness – Shrubs | Record the number of native shrub species occurring in the monitoring site. | 2.3/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| | | ≥25-90% of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native grass species occurring in the monitoring site. | 3.9/5 | 4.4/5 | 4.6/5 | 5/5 | 5/5 |
| | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native forbes species occurring in the monitoring site. | 4.7/5 | 4.7/5 | 4.7/5 | 5/5 | 5/5 |
| - 101063 | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Tree canopy height | Record the average height of each strata layer present (i.e. emergent, canopy, sub-canopy, shrub and groundcover layers) | 3.4/5 | 3.6/5 | 4.3/5 | 4.7/5 | 5/5 |
| | | ≥25-70% of Benchmark | ≥25-70% of Benchmark | >70% of Benchmark | >70% of Benchmark | >70% of Benchmark |
| Tree canopy cover | Percentage of 100m transect within the monitoring site that is covered by canopy and sub-canopy. | 2.8/5 | 2.8/5 | 2.9/5 | 3.5/5 | 4.7/5 |
| | | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >50%-<200% of Benchmark |
| Shrub Canopy Cover | Percentage of 100m transect within the monitoring site that is covered by shrub. | 2.5/5 | 3.6/5 | 4.7/5 | 4.9/5 | 5/5 |
| | | ≥10%-<50% or >200% of | ≥10%-<50% or >200% of | >50%-<200% of | >50%-<200% of | >50%-<200% of |
| | | Вепсптагк | Вепсптагк | Benchmark | вепсптагк | Benchmark |
| Native grass cover | Record the number of native grass species occurring in the monitoring site. | 3.6/5 | 4.3/5 | 4.5/5 | 4.8/5 | 4.9/5 |
| | | >50-90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark |
| Organic litter | Note the extent/occurrence of organic litter (percentage coverage within the monitoring site) | 3.6/5 | 4/5 | 4.4/5 | 5/5 | 5/5 |
| | | ≥10%-<50% or >200% of Benchmark | ≥10%-<50% or >200% of Benchmark | >50%-200% of Benchmark | >50%-200% of Benchmark | >50%-200% of Benchmark |
| Large trees | Number of large trees above the DBH size threshold defined by the target Regional Ecosystem bio-condition benchmark. | 4.2/15 | 4.2/15 | 4.8/15 | 6.4/15 | 8.2/15 |
| | | 0-50% of Benchmark | 0-50% of Benchmark | >50-110% of Benchmark | >50-110% of Benchmark | >50-100% of Benchmark |
| Course woody debris | Amount of coarse woody debris occurring within the monitoring site (in metres per site) (collected the length of wood debris that | 2.1/5 | 2.4/5 | 3.2/5 | 3.5/5 | 5/5 |
| | is >10cm in width and >0.5m in length). | <50% or >200% of | <50% or >200% of | <50% or >200% of | <50% or >200% of | >50% or <200% of |
| | | Benchmark | Benchmark | Benchmark | Benchmark | Benchmark |
| Extent of non- | Note the extent/occurrence of weeds listed under the Biosecurity Act 2014 or as a WoNS (percentage coverage within the monitoring site) | 2.7/10 | 3.2/10 | 4.3/10 | 4.9/10 | 6.1/10 |
| | | >25-50% of Benchmark | >25-50% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark |
| Quality and availability of f | ood and habitat required for foraging | 4.7/10 | 4.7/10 | 4.7/10 | 4.7/10 | /10 |
| Quality and availability of I | nabitat required for shelter and breeding | 4.4/10 | 4.4/10 | 4.4/10 | 4.4/10 | /10 |

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| | 1 | 1 | 1 | T | |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Site Condition Score (out of 100) | 51.3 (baseline) | 60.2 | 65.5 | 70.7 | 88.8 |
| Site Condition Score (converted out of 3) | 1.54 (baseline) | 1.81 | 1.96 | 2.12 | 2.67 |
| Site Context | 1 | 1 | | I | L |
| Size of Patch | 6.2/10 | 6.2/10 | 6.2/10 | 6.2/10 | 10/10 |
| Connectedness | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Context | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Ecological Corridors | 0/6 | 0/6 | 0/6 | 0/6 | 0/6 |
| Role of site location to species overall population in the state | 4/30 | 4/30 | 4/30 | 4/30 | 4/30 |
| Threats to Species | 6/30 | 7/30 | 7/30 | 15/30 | 15/30 |
| Species mobility capability | 2/10 | 2/10 | 4/10 | 9/10 | 10/10 |
| Site Context Score (out of 56) | 22 (baseline) | 23 | 25 | 38 | 47 |
| Site Context Score (converted out of 3) | 1.19 (baseline) | 1.24 | 1.35 | 2.05 | 2.52 |
| Species Stocking Rate | | · | | · | |
| Presence detected on or adjoining site (neighbouring property with connecting habitat) | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 |
| Species Usage (Habitat type & evidence of usage) | 15/15 | 15/15 | 15/15 | 15/15 | 15/15 |
| Approximate Density (per ha) | 10/30 | 10/30 | 10/30 | 20/30 | 20/30 |
| Role/Importance of Species Population on Site | 5/15 | 5/15 | 5/15 | 5/15 | 5/15 |
| Species Stocking Rate (out of 70) | 40 | 40 | 40 | 50 | 50 |
| Species Stocking Rate (converted out of 4) | 2.3 | 2.3 | 2.3 | 2.9 | 2.9 |
| Total Habitat Quality Score (out of 10) | 4.5 (baseline) | 4.87 | 5.14 | 6.64 | 7.75 |
| | Averaged Scores for AUs |
| | Round to 5 | Round to 5 | Round to 5 | Round to 7 | Round to 8 |

Table 12c: Completion Criteria for Grey Headed Flying Fox – Example outlining how ORS performance will achieve OAMP goals and reach proposed ecological benefit in line with EPBC Offsets Policy.

| Key Performance Indicators | Description | Baseline | Year 5 Score | Year 10 Score | Year 15 Score | Year 20 Score |
|--|--|------------------------------------|------------------------------------|----------------------------|----------------------------|----------------------------|
| | Site Condition (Bio-condition Parameters and KPIs) | | | | | |
| Recruitment of woody | Record the number of tree species that are being naturally recruited within the monitoring site (i.e. occurring as saplings <5cm | 3.9/5 | 3.9/5 | 3.9/5 | 3.9/5 | 5/5 |
| perennial species in EDL | DBH). | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >20-75% of Benchmark | >75% of Benchmark |
| Native Species Richness | Record the number of native tree species occurring in the monitoring site. | 2.5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| – Trees | This is controlled by the planting palettes within the OMP. | ≥25-90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native shrub species occurring in the monitoring site. | 2.3/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| | | ≥25-90% of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native grass species occurring in the monitoring site. | 3.9/5 | 4.4/5 | 4.6/5 | 5/5 | 5/5 |
| - Grasses | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Native Species Richness | Record the number of native forbes species occurring in the monitoring site. | 4.7/5 | 4.7/5 | 4.7/5 | 5/5 | 5/5 |
| 101003 | | ≥90 of Benchmark | ≥90 of Benchmark | ≥90 of Benchmark | ≥90% of Benchmark | ≥90% of Benchmark |
| Tree canopy height | Record the average height of each strata layer present (i.e. emergent, canopy, sub-canopy, shrub and groundcover layers) | 3.4/5 | 3.6/5 | 4.3/5 | 4.7/5 | 5/5 |
| | | ≥25-70% of Benchmark | ≥25-70% of Benchmark | >70% of Benchmark | >70% of Benchmark | >70% of Benchmark |
| Tree canopy cover | Percentage of 100m transect within the monitoring site that is covered by canopy and sub-canopy. | 2.8/5 | 2.8/5 | 2.9/5 | 3.5/5 | 4.7/5 |
| | | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >200% of Benchmark | >50%-<200% of Benchmark |
| Shrub Canopy Cover | Percentage of 100m transect within the monitoring site that is covered by shrub. | 2.5/5 | 3.6/5 | 4.7/5 | 4.9/5 | 5/5 |
| | | ≥10%-<50% or >200% of Benchmark | ≥10%-<50% or >200% of Benchmark | >50%-<200% of Benchmark | >50%-<200% of Benchmark | >50%-<200% of Benchmark |
| Native grass cover | Record the number of native grass species occurring in the monitoring site. | 3.6/5 | 4.3/5 | 4.5/5 | 4.8/5 | 4.9/5 |
| | | >50-90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark | >90% of Benchmark |
| Organic litter | Note the extent/occurrence of organic litter (percentage coverage within the monitoring site) | 3.6/5 | 4/5 | 4.4/5 | 5/5 | 5/5 |
| | | ≥10%-<50% or >200% of Benchmark | ≥10%-<50% or >200% of Benchmark | >50%-200% of Benchmark | >50%-200% of Benchmark | >50%-200% of Benchmark |
| Large trees | Number of large trees above the DBH size threshold defined by the target Regional Ecosystem bio-condition benchmark. | 4.2/15 | 4.2/15 | 4.8/15 | 6.4/15 | 8.2/15 |
| | | 0-50% of Benchmark | 0-50% of Benchmark | >50-110% of Benchmark | >50-110% of Benchmark | >50-100% of Benchmark |
| Course woody debris | Amount of coarse woody debris occurring within the monitoring site (in metres per site) (collected the length of wood debris that is >10cm in width and >0.5m in length) | 2.1/5 | 2.4/5 | 3.2/5 | 3.5/5 | 5/5 |
| | | <50% or >200% of | <50% or >200% of | <50% or >200% of | <50% or >200% of | >50% or <200% of |
| | | Benchmark | Benchmark | Benchmark | велсптагк | Benchmark |
| Extent of non- native/weed coverage | Note the extent/occurrence of weeds listed under the Biosecurity Act 2014 or as a WoNS (percentage coverage within the monitoring site) | 2.7/10 | 3.2/10 | 4.3/10 | 4.9/10 | 6.1/10 |
| | | >25-50% of Benchmark | >25-50% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark | >5-25% of Benchmark |
| Quality and availability of f | ood and habitat required for foraging (Alternative Scoring Method Supplementary Data) | 28.1/80 | 30/80 | 39.5/80 | 49.1/80 | 54.9/80 |
| Quality and availability of h | nabitat required for shelter (Alternative Scoring Method Supplementary Data) | 0/20 | 0/20 | 0/20 | 0/20 | 0/20 |

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| | | | | 1 | 1 |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Site Condition Score (out of 180) | 70.4 (baseline) | 72.3 | 95.9 | 110.8 | 123.7 |
| Site Condition Score (converted out of 4) | 1.57 (baseline) | 1.61 | 2.13 | 2.46 | 2.75 |
| Site Context | | 1 | L | L | |
| Size of Patch | 6.2/10 | 6.2/10 | 6.2/10 | 6.2/10 | 10/10 |
| Connectedness | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Context | 2/5 | 2/5 | 2/5 | 2/5 | 4/5 |
| Ecological Corridors | 0/6 | 0/6 | 0/6 | 0/6 | 0/6 |
| Role of site location to species overall population in the state (Alternative Scoring Method Supplementary Data) | 4/30 | 4/30 | 9/30 | 9/30 | 14/30 |
| Threats to Species (Alternative Scoring Method Supplementary Data) | 10/30 | 10/30 | 10/30 | 10/30 | 10/30 |
| Species mobility capability | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 |
| Site Context Score (out of 96) | 34 | 34 | 39 | 39 | 52 |
| Site Context Score (converted out of 3) | 1.07 | 1.07 | 1.22 | 1.22 | 1.63 |
| Species Stocking Rate | | | | | |
| Presence detected on or adjoining site (neighbouring property with connecting habitat) | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 |
| Species Usage (Habitat type & evidence of usage) | 15/15 | 15/15 | 15/15 | 15/15 | 15/15 |
| Approximate Density (per ha) (Alternative Scoring Method Supplementary Data) | 10/30 | 10/30 | 10/30 | 10/30 | 10/30 |
| Role/Importance of Species Population on Site | 5/15 | 5/15 | 5/15 | 5/15 | 5/15 |
| Species Stocking Rate (out of 70) | 40 | 40 | 40 | 40 | 40 |
| Species Stocking Rate (converted out of 3) | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Total Habitat Quality Score (out of 10) | 3.98 | 4.04 | 4.83 | 5.22 | 5.89 |
| | Averaged Scores for AUs |
| | Round to 4 | Round to 4 | Round to 5 | Round to 5 | Round to 6 |

 Table 13: Overarching Triggers, Corrective Actions and Timing to Achieve KPIs

| Triggers | Corrective Actions | Timeframes |
|--|--|--|
| | | |
| Trees and plantings showing signs of ill health, decline or | The restoration contractor will engage a suitably qualified professional to identify the likely cause of health decline | Engage the suitably qualified professional within three months of detection |
| death. | Apply recommended mitigation measure/s to improve growing conditions (as recommended by the suitably qualified | Implement recommended mitigation measures within six months of detection |
| | Remove ill or dead plantings, undertake any remediation works and re-establishment planting | Remove ill or dead plantings and undertake remediation works within six months of detection |
| Weed re-establishment | Immediately treat all WoNs & BA weeds with delicate methods to avoid impacts to restoration works (mechanically or chemically dependent on circumstances) | Within three months of detection, noting that treatment during non-growth periods may be ineffective and are best targeted during growth periods for greater |
| | Undertake an investigation of the potential source point of seeding | |
| | Additional treatment and removal works are to be followed up during the next potential growth period to avoid any regeneration and potential seeding events | Within six months of initial detection |
| Plant failure (>10% of stock) during the establishment | Supplementary planting will be undertaken | Within six months or the next appropriate planting period (whichever comes first) of |
| period | Should the planting fail again, the contractor is to engage a suitably qualified professional to identify the likely cause of plant failure | detection Within month of detection |
| | Apply recommended mitigation measure/s to improve growing conditions (as recommended by the suitably qualified professional) | Apply in alignment with the recommendations made by the suitably qualified professional |
| Coarse woody debris is failing to become present naturally | The selective removal of limbs, shrubs, or trees (particularly from the shrub layer were forming dense thickets) | At the 5, 10, 15 and 20 year monitoring events |
| | Importation of felled native timber from known impact areas where it would ordinarily be mulched and sent to land fill | At the 5, 10, 15 and 20 year monitoring events |
| Growth rates not as expected | Engage a suitably qualified professional to review the plantings and advise on methods to increase growth rates through | Within three months of detection |
| | ouner interventions | Within three months of detection |
| | balance of the soils for improved plant growth | Within 12 months of detection |
| | Revise management actions for offset | Within 24 months of detection if the corrective actions have not amended the slowing growth rates |
| | Discuss with the Department to negotiate changes to timeframes to meet the completion criteria | Within 24 months of detection if the corrective actions have not amended the |
| | Revise OAMP and submit to Minister for the Environment for approval | slowing growth rates |
| Stochastic or nuisance events | While such events (eg. fire, flood, drought, vandalism etc) are rare and can be managed by the contractor, where | Within six months of the event |
| | Evidence of impacts and restification measures are to be issued to the DCCEEW is required | Within six months of rectification |
| | Evidence of impacts and rectilication measures are to be issued to the DCCEEW within three months | Within three months of continued processor identification |
| Ongoing presence of pest fauna (eg. wild dogs/pigs) | where recurrent pest animal species are detected, reengagement with the surrounding landholders and ICC to re- deploy management measures. | Within three months of continued presence identification |
| | Should recurrent pest fauna be observed going forward, revised management measures to include more site-specific measures including targeted baiting and/or trapping | |
| Monitoring and reporting illustrates that KPIs are unlikely to | Engage a suitably qualified professional to review the plantings and advise on methods to increase growth rates through | Within three months of detection |
| be achieved at the end of the 20 year management | Undertake soil testing to determine what rate of soil emplications or fartilizare may be required to improve the chemical | Within three months of detection |
| timeframe and other corrective actions are failing to | balance of the soils for improved plant growth | Within 24 months of detection if corrective actions have not amended the slowing growth rates |
| progress the achievement of the KP | The proponent / approval holder will request an extension to the 20 year management timeframe from the Minister | Within 24 months of detection if corrective actions have not amended the slowing |
| | Revise the management actions for the offset | growth rates |
| | Extend timeframes to meet completion criteria | Within 24 months of detection if corrective actions have not amended the slowing growth rates |

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Attachment 2

Location of existing suitable hollows





Figure 8 - Suitable Hollows

28 South Project Ref: 2018-079C

Data Sources: Qld Globe (SIPS 2016); Digital Cadastre Database (Dept. Natural Resources and Mines, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contours (DNRME 2016).



Note: While ID numbers fall

outside the site boundary, all tree

points are within the boundary.

-

ENVIRONMENTAL

Waterway

Tree with 2 hollows [10] Tree with 3 hollows [5]

Tree with 4 hollows [2]

Tree with 5 hollows [3]

Tree with 1 hollow [12]

Tree with 6 hollows [2]

Tree with 7 hollows [1]

0

| Issue Da | te D | wg No. | A | luthor |
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| 17-11-202 | 3 | | N | 10 |
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| | | | P | age 22 |



Attachment 3

Location of amendably suitable hollows





| Ripley View Residential Subdivision | Legend | | |
|---|--|------------|----------------------|
| Figure 9 - Amendably Suitable | Offset Receiving Site Boundary Regulated Vegetation | Issue Date | Dwg No. Author |
| Hollows | Property Boundaries Regrowth Vegetation | 17-11-2023 | мо |
| 28 South Project Ref: 2018-079C | Trees with amendably suitable Greater glider hollows | Approved | Revision Note |
| | Tree with 1 hollow [14] | WM | |
| Data Sources: Qld Globe (SIPS | Tree with 2 hollows [6] | (A3) GDA 2 | 2020 MGA 56 |
| 2016); Digital Cadastre Database 28 28 5 | Tree with 3 hollows [4] | 1:5 | ,500 |
| Mines, 2021); Roads (DNRME, | 0 | 100 20 | 00 300 m / 🔨 |
| 2020); Watercourse (DNRME, 2020); Contours (DNRME 2016). | Note: While ID numbers fall outside the site boundary, all tree points are within the boundary. | | N |



Attachment 4

Location of constructed hollows





Ripley View Residential Subdivision

Figure 10 - Arbor Australis **Constructed Hollows**

28 South Project Ref: 2018-079C

Data Sources: Qld Globe (SIPS 2016); Digital Cadastre Database (Dept. Natural Resources and Mines, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contours (DNRME 2016).



- Offset Receiving Site Boundary
- **Property Boundaries**
- Waterway

Legend

Arbor Australis Constructed Hollows [74]

- 0 Chainsaw Cut Hollow [44]
- Hollowhog Cut Hollow [30] 0



Regrowth Vegetation

Remnant Vegetation

0





Attachment 5

Artificial hollow creation technical advice

Arboricultural Technical Advice

Artificial Hollow Creation

November 2023



15th November 2023

Attention: Wayne Moffitt Director – 28 South Environmental

28 South Environmental 11/43 Martin Street Fortitude Valley QLD 4006

Dear Wayne,

Re: Artificial Hollow Creation, Esk, Arboricultural Technical Advice.

I am pleased to submit our assessment and advice on the potential of Chainsaw Cut and Hollowhog carved hollows as artificial habitat design locations for *Petauroides spp*, (Greater Gliders) within the offset site.

I trust that you find this assessment both satisfactory and helpful. Should you wish to discuss any of its recommendations or arrange for them to be implemented, please contact me on 07 3379 7793.

Yours sincerely,

Jeremy Young Managing Director Cert Arb (UK) | Adv Dip Hort (Arb) | Dip Arb Certified Arborist AU-0011A Industry License AL1204 QTRA 2061 | TRAQ | VALID



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| Contact: | Contact Name: | Wayne Moffitt |
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1. Scope:

Assessment of existing trees was undertaken to identify opportunities to artificially develop or introduce hollows, by creating chainsaw cut hollows (CCH) and/or Hollowhog carved hollows (HHH); these are relatively novel practices that have been found to be effective in re-creating habitat. The target fauna species for which the hollows are to be developed is the *Petauroides spp*, Greater Glider.

The Greater Glider requires larger hollows with good thermal qualities. No documentation sets out a CCH or HHH methodology specifically for this species, and limited research has been conducted on the success of CCH or HHH for Greater Gliders. However, recent research provided in the technical advice provided by 28 South Environmental (Insert 1) has indicated positive results.

Due to the limited information available, this advice aims to propose selection criteria and considerations required to determine trees that may be suitable candidates for CCH or HHH.



2. Offset Site:

Image 1: Offset site indicated approximately by the red polygons.

The offset site may be defined as a wood-pasture where cattle currently graze. This grazing has impeded tree regrowth. The trees on site are predominantly of semi-mature age, with a few mature and over-mature trees. There is a notable difference between trees in the western portion, with trees being smaller and slower growing due to the western sun exposure when compared to the trees on the eastern portion of the site. The tree life stage is an essential indicator of the likelihood of hollow development, with hollows typically not present until trees reach the late to over-mature stages of life.

3. Methodology:

Following the initial request for an assessment and advice concerning chainsaw cut hollows to achieve denning opportunities for Greater Glider species, a tree assessment and survey was conducted. This assessment sought opportunities to achieve new artificial habitat locations without compromising existing tree habitat features.

All measurements have been estimated, and the assessment for hollow opportunities has been conducted from the ground. Tree location and numbering have been plotted using the GPS coordinates provided by 28 South Environmental, and all tree numbering has been retained to ensure continuity between reports.

The requirements for the Greater Glider hollows have been based on the technical note provided by Dr David Sharp.

4. Natural Hollow Development:

An understanding of hollow development and the tree's natural response to wounding and decay is required to determine the opportunities to impose artificial hollows on trees.

Crown hollow development is primarily a result of decay in over-mature trees that have experienced branch, branch union or stem failures. These failures expose dysfunctional heartwood to the air. This exposure to the air reduces the moisture content in the cells and stimulates the decay pathogens that are latent in the timber. Decay can enter the tree through spores colonising the wound site; however, recent research indicates this is less likely and that often pathogens, predominantly wood decay fungi are already dormant in the wood structure (endophytes).

Decay progresses relatively slowly as fugal hyphae exude enzymes that break down cellulose and lignin. At the same time, the trees actively try to compartmentalise (resist) the decay pathogen through chemical alteration of cells to create barrier zones. Compartmentalisation occurs in the living tissue of the tree (sapwood), not the heartwood. The basic principle of compartmentalisation is the forming of internal chemical walls or barriers, increasing in effectivity from 1-4:

- Barrier Zone 1 is the longitudinal zone parallel to the direction of tree growth, on a trunk this is above and below the wounding site. At the time of wounding, the border pits are altered through a process called tylosis. Barrier zone 1 is the weakest of the barrier zones due to the large sap vessels that allow fungal hyphae movement.
- **Barrier Zone 2** is the marginal axial parenchyma (growth rings). At the time of wounding, the tree will chemically alter the cells and create a barrier at the current growth ring. The barrier resists the spread of decay inwards from the wounding site.
- **Barrier Zone 3** is the medullary or parenchyma rays which radiate like spokes of a bike wheel from trunk centre. This chemical barrier resists and limits the lateral spread of decay.

• **Barrier Zone 4** is laid down at the time of wounding by the area of the cambium that is still functioning at the edge of the wound site. This barrier resists the spread of decay into the new wound wood that develops around the wound site and is the strongest defence against decay.

The rate of decay and speed of hollow development is highly variable. Tree species, vigour, and vitality, play a significant role in the rate of decay that results in hollow development.

Some examples of variations:

Growing Location, Trunk Size Variation:

- A Queensland Blue Gum (*Eucalyptus tereticornis*) growing in an alluvial loam, close to a water supply is unlikely to reach over maturity until the age of 250 years. It may be 2m+ in trunk diameter before hollows start to develop. Trees in this growing environment typically have a higher vitality and energy reserves that can be utilised in defence against decay.
- Whereas a Queensland Blue Gum (*Eucalyptus tereticornis*) growing in poor soil with limited water supply will age quicker and put on less annual increment growth, so over-maturity may be reached in 100 - 150 years. Trees in this growing environment have reduced vitality and, as a result, have less energy reserves that can be utilised for active defence against decay.

Species, Decay Rate Variation:

- A Narrow-leaved Red-Ironbark (*Eucalyptus crebra*) has a dense wood structure with high lignin content. This provides a physical barrier to fungal hyphae movement through the timber and impedes decay, slowing the development of hollows.
- Whereas a Scribbly Gum *(Eucalyptus racemosa)* has a low timber durability rating with low lignin content in its heartwood. This species will typically begin to develop hollows within 30 years.

The examples above are only a snapshot of the variability of hollow development. The tree's trunk diameter/DBH (diameter at breast height) or tree's height has little to no bearing on the likelihood of hollows being present. The tree's life stage because of its growing environment, is by far a better indicator.

5. Hollow Opportunities:

The development of artificial hollows through CCH or HHH methodology needs to consider the fauna requirements it is intended for, the tree structure, the presence of other habitat features and the biological function of the tree. The following is a summary of conditions that collectively need to be satisfied to meet the potential for creating hollows.

Existing Hollows: Some trees previously mapped by 28 South Environmental that have existing hollows have been included as opportunities for HHH. The selection criteria also identify the trees with existing hollows as having the potential for hollow improvement to meet the needs of the Greater Glider. This will need to be weighed against the benefit they currently provide to other species.

Thermal Qualities: Dead trees (stags) have been excluded from the assessment due to their limited thermal qualities not being suitable or preferred by the Greater Gliders.
Hollow Location: Greater Gliders prefer branch-end hollows over vertical trunk hollows. The assessment has focused on the opportunity for branch-end hollow development; however, opportunities have also been listed where a good opportunity exists to position a hollow in a trunk.

Structure: Hollows should not create a significant weakness or a significantly increased probability of failure at the site of the artificial hollow.

Risk: In considering Risk of Harm (RoH) artificial hollows may pose, the risk is acceptable for this site as there is a low probability of people (target) being present should a tree failure occur.

However, maintaining acceptable levels of structure at the site of hollow generation is essential to avoid failures that would compromise the habitat created. For this reason, end weight reduction or branch removal has been identified to reduce load where applicable.

6. Hollow Creation for Greater Glider:

Requirements for denning hollows for greater glider are:

- Den opening of 130mm.
- Entry height was set at a minimum of 10m
- A 200mm x 200mm hollow void in cross-section.
- A minimum of 50mm in wall thickness around the hollow void.
- The length of the hollow void to be 0.5m 2.0m

To achieve and meet these requirements and create the branch-end hollows, the branch needs to be a minimum of 375mm in diameter. This achieves 47% of retained cross-section and 66% of the outer circumference undamaged, ensuring sap flow, living branch structure, and providing opportunity for response growth. This may be possible at sites of previous branch failures or by cutting appropriately sized branches.

Where swelling on trunks and branches indicates internal decay, HHH have been selected as a preferred methodology. This methodology utilises the existing hollow and the artificial entry point has the least structural impact on the tree.

**Please note:* The Hollowhog carving method is a recently invented innovative system. In reviewing the online information regarding the method & tool, there may be limitations in achieving the required denning depths from the entry point required for the Greater Glider.



Images 2 and 3: Example of hollows created in a trunk with the Hollowhog carving tool.



Image 4: Example of a site with a swollen branch indicating possible internal decay. It is likely that a denning site can be created with a simple entry point with the Hollowhog.



Image 5: Example of a site with swollen trunks indicating possible internal decay. It is likely that a denning site can be created with a simple entry point with the Hollowhog.



Image 6: Cross section of the proposed branch Chainsaw Cut Hollow (CCH)



Image 7: Example where the branch is a sufficient size to accommodate a hollow; however, to preserve structure, weight reduction is required to prevent failure at the hollow. The Artificial Hollow data indicates foliage loss by % of the total crown where this is required.



Image 8: Following the removal of the branch, the hollow will be carved into the side of the branch stub.



Image 9: The best option for the entrance hole will be determined on a branch-by-branch basis. The sketch above shows the option for an open-ended entrance point.



Image 10: Side access entrance holes may be better in more upright hollows.

*NOTE: No two hollows will be identical, and the methodologies outlined in the report provide various options for creating the hollows. The arborist creating the hollows needs to have some scope for flexibility to ensure the hollow is created for the specific location on the tree.

7. Artificial Hollow, Selection Criteria:



8. Hollow Opportunity Data Table 1, Primary Hollow Opportunity:

| Q | Genus | Hollow Opportunity | Hollow Type | Foliage Loss % | Entry Height | Crown Position | Entry Point Notes |
|------|-------------------------|--------------------|-------------|----------------|--------------|--------------------|---|
| 1888 | Corymbia citriodora | Trunk | ССН | 0 | 12 | Lower 1/3 of Crown | between 1st and 3rd union |
| 1843 | Eucalyptus crebra | Branch End | ССН | 15 | 13 | Mid Crown | large lateral limb at 13m, cut back to long stub and bore |
| 33 | Corymbia citriodora | Branch End | ССН | 15 | 17 | Mid Crown | Lateral limb, cut to stub and bore |
| 1914 | Eucalyptus crebra | Branch End | ССН | 10 | 19 | Mid Crown | Branch end back to long stub and bore - approximately 8m above main union |
| 1787 | Corymbia citriodora | Branch End | ССН | 15 | 12 | Lower 1/3 of Crown | cut one of the larger leaders/upright branches in main union back to a long stub and bore |
| 1840 | Corymbia citriodora | Trunk | Hollowhog | 0 | 12 | Lower 1/3 of Crown | Hollow hog bore at 12m height on trunk around main union, where large leaders originate |
| 192 | Corymbia citriodora | Branch End | ССН | 15 | 16 | Mid Crown | Cut lateral branch to stub and bore |
| 201 | Eucalyptus crebra | Branch End | Hollowhog | 0 | 14 | Lower 1/3 of Crown | Cut dead branch growing towards neighbour to stub and bore |
| 122 | Eucalyptus tereticornis | Branch End | Hollowhog | 10 | 15 | Mid Crown | Cut upright central 3rd order branch/leader to union and bore |
| 211 | Eucalyptus crebra | Trunk | ССН | 0 | 12 | Lower 1/3 of Crown | Bore hollow on trunk, mid trunk |
| 97 | Corymbia citriodora | Trunk | Hollowhog | 0 | 21 | Upper 1/3 of Crown | Around top union, upright leader below large old stub |
| 76 | Corymbia intermedia | Branch End | Hollowhog | 0 | 14 | Mid Crown | Create hollow on snapped limb with Epi |
| 180 | Eucalyptus crebra | Trunk | ССН | 0 | 10 | Upper 1/3 of Crown | Above main union |
| 278 | Corymbia citriodora | Trunk | ССН | 0 | 12 | Mid Crown | Mid trunk |
| 394 | Corymbia citriodora | Trunk | Hollowhog | 0 | 12 | Mid Crown | above main union below dead stub |
| 381 | Corymbia intermedia | Trunk | Hollowhog | 0 | 12 | Lower 1/3 of Crown | Below dead branch |
| 347 | Corymbia citriodora | Trunk | ССН | 8 | 16 | Mid Crown | on trunk above 4th lateral branch |
| 408 | Corymbia citriodora | Branch End | ССН | 20 | 11 | Lower 1/3 of Crown | First lateral branch leader, cut to stub and bore |
| 294 | Corymbia citriodora | Trunk | Hollowhog | 0 | 14 | Mid Crown | Below dead branch |
| 428 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 12 | Lower 1/3 of Crown | Below dead stub at main union |
| 307 | Corymbia citriodora | Trunk | ССН | 0 | 11 | Mid Crown | Above crowded union mid trunk |
| 332 | Eucalyptus tereticornis | Branch End | Hollowhog | 10 | 16 | Lower 1/3 of Crown | Cut lateral near main union back to stub and bore |
| 357 | Corymbia citriodora | Branch End | ССН | 10 | 14 | Mid Crown | Around crowded union near possum nest |
| 448 | Corymbia citriodora | Branch End | Hollowhog | 10 | 14 | Lower 1/3 of Crown | Cut 3rd order leader back to union and bore |
| 498 | Eucalyptus crebra | Branch End | ССН | 0 | 18 | Mid Crown | Broken branch to south |
| 607 | Corymbia citriodora | Branch End | ССН | 15 | 14 | Lower 1/3 of Crown | 2nd large lateral, cut to stub and bore |

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| D | Genus | Hollow Opportunity | Hollow Type | Foliage Loss % | Entry Height | Crown Position | Entry Point Notes |
|------|-------------------------|--------------------|-------------|----------------|--------------|--------------------|---|
| 526 | Corymbia intermedia | Trunk | Hollowhog | 0 | 15 | Upper 1/3 of Crown | Dead branch on lowest branch eastern side |
| 608 | Corymbia citriodora | Trunk | ССН | 0 | 15 | Mid Crown | Below the top central main union |
| 515 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 13 | Lower 1/3 of Crown | Swelling on scaffold to the south |
| 539 | Corymbia intermedia | Branch End | Hollowhog | 0 | 16 | Upper 1/3 of Crown | Creek side |
| 707 | Corymbia citriodora | Branch End | Hollowhog | 15 | 13 | Mid Crown | 3rd order union, reduce leader to stub and bore |
| 794 | Angophora subvelutina | Branch End | Hollowhog | 10 | 14 | Mid Crown | Cut branch from main union back to a stub |
| 708 | Corymbia citriodora | Trunk | ССН | 0 | 14 | Mid Crown | Around main crowded union |
| 810 | Corymbia citriodora | Branch End | ССН | 10 | 11 | Mid Crown | 6th limb. Cut limb to stub and habitat |
| 770 | Eucalyptus crebra | Trunk | ССН | 0 | 15 | Mid Crown | Upright leader below stubs |
| 974 | Eucalyptus tereticornis | Branch End | ССН | 5 | 15 | Mid Crown | Reduce leader on western side 2m above bifurcation |
| 905 | Corymbia citriodora | Branch End | ССН | 15 | 0 | Lower 1/3 of Crown | one of the larger lateral branches originating on main union at 10m, cut back to a long stub and bore |
| 1031 | Corymbia citriodora | Trunk | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Swelling 6m above main union |
| 955 | Corymbia citriodora | Trunk | Hollowhog | 0 | 12 | Lower 1/3 of Crown | On main scaffold branch |
| 1032 | Corymbia citriodora | Branch End | ССН | 15 | 10 | Lower 1/3 of Crown | Cut back one of the larger leaders to main union |
| 839 | Corymbia citriodora | Trunk | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Between main union and first branch |
| 1029 | Corymbia citriodora | Branch End | ССН | 15 | 14 | Lower 1/3 of Crown | Union of within second lateral, 3rd order, cut to stub and bore |
| 1232 | Eucalyptus crebra | Trunk | ССН | 0 | 15 | Lower 1/3 of Crown | Trunk between dead stubs |
| 1218 | Corymbia citriodora | Trunk | ССН | 0 | 20 | Upper 1/3 of Crown | On main trunk |
| 1085 | Eucalyptus tereticornis | Trunk | ССН | 0 | 18 | Mid Crown | On main trunk |
| 1139 | Corymbia citriodora | Branch End | ССН | 5 | 15 | Lower 1/3 of Crown | Main branch to the east on bend of branch |
| 1104 | Angophora subvelutina | Branch End | ССН | 5 | 15 | Upper 1/3 of Crown | End of trunk at bifurcation |
| 1183 | Corymbia citriodora | Branch End | ССН | 5 | 12 | Lower 1/3 of Crown | lower branch |
| 1226 | Corymbia citriodora | Trunk | ССН | 0 | 12 | Lower 1/3 of Crown | On trunk around 3rd lateral branch |
| 1154 | Corymbia tessellaris | Branch End | ССН | 5 | 18 | Mid Crown | First branch to the west 10 m from union |
| 1202 | Corymbia citriodora | Branch End | ССН | 5 | 13 | Mid Crown | Cut 2nd order lateral leader to stub and bore |
| 1415 | Corymbia intermedia | Branch End | Hollowhog | 10 | 17 | Mid Crown | Cut 3rd ord branch on secondary leader and bore |
| 1421 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Below third branch |
| 1356 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 9 | Lower 1/3 of Crown | Main trunk |

| D | Genus | Hollow Opportunity | Hollow Type | Foliage Loss % | Entry Height | Crown Position | Entry Point Notes |
|------|-------------------------|--------------------|-------------|----------------|--------------|--------------------|--|
| 1344 | Corymbia citriodora | Branch End | ССН | 10 | 18 | Upper 1/3 of Crown | Cut branch end and bore. Lateral branch upper crown |
| 1271 | Corymbia citriodora | Trunk | ССН | 0 | 14 | Lower 1/3 of Crown | Below main union |
| 1323 | Corymbia citriodora | Trunk | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Leader to west on swelling 4m from union |
| 1310 | Eucalyptus crebra | Branch End | ССН | 0 | 15 | Lower 1/3 of Crown | Lower stub |
| 1324 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 0 | Lower 1/3 of Crown | Below dead branch |
| 1385 | Lophostemon suaveolens | Branch End | ССН | 5 | 12 | Lower 1/3 of Crown | Lower branch to the west |
| 1605 | Angophora subvelutina | Branch End | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Swelling on first branch to the west |
| 1448 | Corymbia intermedia | Branch End | Hollowhog | 10 | 17 | Mid Crown | Cut large diam. Lateral branch back to stub and bore |
| 1517 | Corymbia citriodora | Trunk | ССН | 0 | 18 | Mid Crown | Between second and third unions |
| 1516 | Corymbia citriodora | Branch End | ССН | 5 | 13 | Lower 1/3 of Crown | 3rd lateral branch, cut back to stub and bore |
| 1481 | Angophora subvelutina | Trunk | Hollowhog | 0 | 12 | Lower 1/3 of Crown | Swelling on main trunk 4m above first union |
| 1572 | Corymbia citriodora | Branch End | ССН | 15 | 14 | Mid Crown | 5th partially upright branch. Cut to stub and bore |
| 1576 | Corymbia citriodora | Branch End | ССН | 10 | 12 | Mid Crown | Reduce scaffold branch to the north |
| 1760 | Corymbia citriodora | Trunk | Hollowhog | 0 | 16 | Mid Crown | Bellow main union |
| 1953 | Eucalyptus crebra | Branch End | ССН | 215 | 0 | Mid Crown | Western branch |
| 1720 | Corymbia tessellaris | Trunk | ССН | 0 | 16 | Mid Crown | Below main bifurcation |
| 1948 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 0 | Lower 1/3 of Crown | Swelling on branch to the east |
| 1731 | Eucalyptus tereticornis | Trunk | Hollowhog | 0 | 16 | Upper 1/3 of Crown | Below top union old failure |
| 1713 | Eucalyptus crebra | Branch End | ССН | 10 | 15 | Mid Crown | Western upper branch 5m from union |
| 2026 | Eucalyptus crebra | Trunk | ССН | 0 | 15 | Lower 1/3 of Crown | Between first and second branch |
| 0 | Corymbia citriodora | Trunk | Hollowhog | 0 | 18 | Mid Crown | Mid trunk |

9. Hollow Opportunity Data Table 2, Second Hollow Opportunity:

| D | Genus | Hollow Opportunity 2 | Hollow Type 2 | Foliage Loss 2 | Entry Height 2 | Crown Position 2 | Entry Point Notes |
|------|---------------------|-------------------------|---------------|----------------|----------------|--------------------|--|
| 211 | Eucalyptus crebra | Branch End | Hollowhog | 10 | 16 | Mid Crown | Cut to stub 5th or 6th lateral, bore stub |
| 498 | Eucalyptus crebra | Branch End | ССН | 0 | 18 | Mid Crown | Broken branch to west |
| 608 | Corymbia citriodora | Branch End | Hollowhog | 5 | 12 | Lower 1/3 of Crown | Lateral limb (7th lateral), cut to stub and bore |
| 515 | Eucalyptus crebra | Trunk | Hollowhog | 0 | 10 | Lower 1/3 of Crown | Below dead branch to the west |
| 539 | Corymbia intermedia | Trunk | Hollowhog | 0 | 0 | Mid Crown | Below main union |
| 770 | Eucalyptus crebra | Trunk | ССН | 0 | 10 | Mid Crown | Lateral leader, between epi shoots and union with failure |
| 839 | Corymbia citriodora | Trunk | ССН | 0 | 12 | Lower 1/3 of Crown | Below dead stub |
| 1516 | Corymbia citriodora | Branch End | Hollowhog | 10 | 15 | Mid Crown | lateral upright branch union into 3 branches, cut one branch back to stub and bore |

10. Hollow Opportunity Data Table 3, Third Hollow Opportunity:

| Q | Genus | Hollow Opportunity 3 | Hollow Type 3 | Foliage Loss 3 | Entry Height 3 | Crown Position 3 | Entry Point Notes |
|-----|-------------------|-------------------------|---------------|----------------|----------------|--------------------|---|
| 211 | Eucalyptus crebra | Branch End | Hollowhog | 10 | 19 | Upper 1/3 of Crown | Cut to stub 8th or 9th lateral, bore stub |

11. Hollow Opportunity Statistics Table:

| | Trunk | Branch End | Totals |
|----------------------|-------|------------|--------|
| Total | 41 | 43 | 84 |
| Chainsaw Cut Hollows | 19 | 28 | 47 |
| Hollowhog Hollows | 22 | 15 | 37 |

12. Discussion:

Chainsaw Cut Hollows and Hollowhog Hollows are a relatively new approach to creating artificial habitat hollows. These can be sized based on the targeted fauna species by altering position, orientation, and hollow and entrance sizes. The overall success of CCH and HHH for Greater Glider is yet to be proven; however, the benefits of an artificially created hollows in living trees appear to solve the thermal limitation of hollow boxes.

The opportunity for improving denning sites for Greater Gliders through artificial hollows needs to be carefully balanced against the adverse impacts that wounding the trees will have. It is imperative that the tree recovers from the wounding and continues to grow. Living trees with hollows will continue to provide the hollow shelters and dens with good thermal qualities.

The size required for the hollow to suit the Greater Glider is the most significant factor limiting the number of opportunities. To achieve the required thermal qualities and maintain some structural integrity to support the regrowth, the branches or trunk must be a minimum of 375mm in diameter to achieve the internal void requirements.

For overall tree health to be maintained, it is recommended that foliage loss to create the branch end hollow must not exceed 30% of the total crown foliage. This is to ensure the tree has sufficient photosynthetic material remaining to generate carbohydrates (energy) for continuing cell function and a sufficient supply of energy for the active defence from decay and pests, while still sustaining secondary thickening (cell division from the cambium) and foliage regeneration around the hollow.

A number of trees that had branch structures suitable for branch end hollows were excluded from the opportunities due to smaller habitat hollows present that would have been removed in the process. The creation of artificial hollows should not be at the expense of other habitat features.

Trunk hollow opportunities can be created without the loss of foliage; however, they require greater structural integrity to sustain and support the trunk, branches, and foliage above. The opportunities onsite for this type of hollow, at the size required, were on the largest of the trees only. The use of existing features or wounds, on or close to the trunk, allows the introduction of artificial hollows with only limited loss of structure.

From the ground-based review of all trees across the site, 84 artificial hollow opportunities have been identified for Greater Gliders. Of these 84 opportunities, 43 are located at branch ends, and 41 are located in trunks. The 85 hollows are located on 75 individual trees, with six having two hollow opportunities and one tree having three hollow opportunities.

13. Further Consideration

The development of artificial hollows could be supplemented with other environmental arboricultural practices to promote a diversity of hollows and improve the overall biodiversity.

Whilst dead trees (stags) are reported to not have the thermal qualities suitable for Greater Glider, the presence of a hollow provides an opportunity for potential habitat improvement. This could be achieved by planting a Fig Tree (*Ficus spp.*) at the base and or higher on the trunk in a suitable cavity or union and utilising the root and trunk development to encapsulate the dead hollow with living wood.

The potential success of this proposed management is untested, and will take some time to develop the required structure; however, it aims to utilise the hollow assets present.

Trees identified by 28 South as having existing hollows may have hollows that are not currently of appealing size to Greater Gliders, and that may be increased in size. A review of the aerial assessment data and further arboricultural advice in relation to the current hollow benefits will help inform this option.

14. Appendix 1: Branch End Hollow with Side Entrance, Creation Methodology

(Chainsaw Cut Hollow) NB: For branches that are more upright and or do not have an existing hollow present. Hollow in trunks will follow a similar methodology.



15. Appendix 1: Branch End Hollow with End Entrance, Creation Methodology (Chainsaw Cut Hollows)



16. Appendix 3: Artificial Hollow Opportunity Map



Site: Esk Hollow Offset Site DATE: November 2023



TITLE: Artificial Hollow Plan - Cover Sheet

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07 3379 7793







Site: Esk Hollow Offset Site DATE: November 2023



TITLE: Artificial Hollow Plan - West

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Site: Esk Hollow Offset Site DATE: November 2023



TITLE: Artificial Hollow Plan - East

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07 3379 7793





Author's Statement of Experience

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With 35 years of experience in all aspects of the Arboricultural Industry, I can provide a well-rounded, experienced, and educated approach to arboricultural-related issues in most environments. A commitment to continual professional development has ensured I can provide up-to-date information that will add value and resolve tree issues for most sites.

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Attachment 6

Location of koala dispersal poles



Indicative Koala Movement Path

Koala Escape Pole (Notional arrangements)

Data Sources: Aerial Imagery (Nearmap/Qld Globe); Digital Cadastre Database (DNRME, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contour (DNRME 2016).



Source: C:\Users\Max\Dropbax\(d) Projects\2023\2023-020 (84 Bowhilll Road, Willawong)\(d) Data\(d) GIS

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| 0 | 75 | | | 150 m | N |
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Data Sources: Aerial Imagery (Nearmap/Qld Globe); Digital Cadastre Database (DNRME, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contour 28°S ENVIRONMENTAL (DNRME 2016).

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Offset Receiving Site Boundary

Focus Area

Indicative Koala Movement Path

Koala Escape Pole (Notional arrangements)

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Attachment 7

Coarse woody debris focal points



28 South Project Ref: 2018-079C

Data Sources: Qld Globe (SIPS 2016); Digital Cadastre Database (Dept. Natural Resources and Mines, 2021); Roads (DNRME, 2020); Watercourse (DNRME, 2020); Contours (DNRME 2016).

| nits of the ORS | | Offset Receiving | ORS Assessment Units |
|-----------------|--------------|---|--|
| | | Waterway Property Boundaries | AU1a - Remnant (RE12.9-1 AU1b - High Value Regrow |
| 28ºS | •••• •••• | Farm Dam MHQA Transect 50 x 50m recruitment | AU2 - Young Regrowth (pro AU3 - Pastural Grassland (j |
| ENVIRONMENTAL | | and weed assessment plot | |

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Appendix 26

Supporting Greater Glider Records for the Offset Site



Appendix 26.1

Big T Pumped Hydro Report





Big T Pumped Hydropower Energy Storage – Baseline Ecological Surveys

December 2021

Big T Pumped Hydropower Energy Storage – Baseline Ecological Surveys

December 2021

Prepared for: Complex Infrastructure Services Pty Ltd (BE Power) Level 2, Tavistock House, 383-387 Flinders Lane, Melbourne VIC 3000

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DPM Ref: DPM21009_RPT_22Dec2021.docx



DISTRIBUTION

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This document was prepared for the sole use of Complex Infrastructure Services Pty Ltd (BE Power) and their consultant Hydro-Electric Corporation (Entura), the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of BE Power, Entura or DPM Envirosciences Pty Ltd.

Ву

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EXECUTIVE SUMMARY

BE Power is proposing to build a pumped hydropower energy storage adjoining Lake Cressbrook on the border of the Toowoomba and Somerset Regional Council areas in South East Queensland (SEQ), referred to as the Big T Pumped Hydropower Energy Storage (the Project). Hydro-Electric Corporation (Entura) is assisting Complex Infrastructure Services Pty Ltd (BE Power) with planning, approvals and engineering design for the Project. BE Power engaged DPM Envirosciences Pty Ltd (DPM Envirosciences) to undertake baseline ecological assessments within the Study area to inform the feasibility stages of the Project. This baseline ecological assessment includes desktop searches, and comprehensive flora and fauna field surveys, to map vegetation and fauna habitats of the Study area, target threatened species and to identify key ecological values and constraints of the Study area.

Field surveys thus far include:

- vegetation mapping, fauna habitat assessments and a reconnaissance to inform targeted fauna surveys, conducted 24 to 26 February and 1 to 5 March 2021;
- comprehensive autumn fauna surveys and further vegetation mapping, conducted 12 to 16 April and 19 to 23 April 2021;
- comprehensive spring fauna surveys conducted 8 to 11 November and 15 to 19 November 2021;
- targeted MNES/MSES flora species surveys undertaken 2 to 4 December 2021; and
- vegetation and fauna habitat mapping of Lot 10 RP223812 on 13 December 2021.

The survey effort includes:

- 112 flora survey sites;
- 120 fauna habitat assessment sites;
- 12 fauna trap sites (utilising Elliot traps, funnel traps and pitfall traps);
- 40 baited camera trap sites (with cameras deployed for at least three weeks);
- five harp trap sites;
- 27 ultrasonic bat detector sites;
- approximately 24 km of vehicle spotlighting transects, five walking spotlighting transects, and nocturnal searches at each trap site;
- 17 call playback sessions;
- dedicated scat and signs searches, bird surveys and active searches at each trap site and in other locations of the Survey area; and
- opportunistic observations across the broader Study area.

Vegetation

The State Regional Ecosystem (RE) mapping identifies 819.7 ha of remnant vegetation and 469.4 ha of High Value Regrowth (HVR) within the Study area. Vegetation boundaries were refined using the field survey findings, aerial imagery and State-mapped vegetation boundaries. The field-verified mapping identified 1,047.5 ha of remnant vegetation (RE) and 450.3 ha of regrowth vegetation within the Study area. Of the remnant vegetation, 493.8 ha is Of Concern and 553.7 ha is Least Concern RE under the *Vegetation Management Act 1999* (VM Act). Of the regrowth vegetation, 435.7 ha is Of Concern and 14.6 ha is Least Concern.

The desktop assessment indicated potential for the Lowland Rainforest of Subtropical Australia Threatened Ecological Community (TEC), listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to occur in the far south-eastern



extent of the Study area where a small (0.1 ha) mosaic of RE 12.11.2/12.3.2/12.11.1 was mapped. RE 12.11.1, which is predicted to comprise 5% of this mosaic community, is consistent with the description of this TEC. This patch was verified in the field to be RE 12.3.7 and RE 12.11.8, which are not TECs. The field survey did not detect any TECs within the Study area. However, there remains potential for small pockets of TECs to occur in inaccessible areas of the broader Study area.

Flora species

The majority of the Study area comprises eucalypt woodlands to open forests habitat types likely to provide habitat for a number of threatened and common flora and fauna species. A total of 272 Least Concern and Special Least Concern flora species, from 69 plant families, were recorded during the surveys. No EVNT flora (listed as Endangered, Vulnerable or Near Threatened under the EPBC Act and/or *Nature Conservation Act 1992* [NC Act]) were recorded during the survey. Based on the habitat available, and species records in proximity to the Study area, the following 19 EVNT flora species have potential to occur within the broader Study area:

- hairy-joint grass (Arthraxon hispidus) Vulnerable (EPBC Act and NC Act);
- three-leaved Bosistoa (Bosistoa transversa) Vulnerable (EPBC Act);
- stream clematis (*Clematis fawcettii*) Vulnerable (EPBC Act and NC Act);
- cockspur flower (Coleus torrenticola) Endangered (EPBC Act and NC Act);
- leafless tongue-orchid (Cryptostylis hunteriana) Vulnerable (EPBC Act);
- Helidon ironbark (*Eucalyptus taurina*) Endangered (NC Act);
- Grevillea quadricauda Vulnerable (EPBC Act and NC Act);
- tall velvet sea-berry (*Haloragis exalata* subsp. *velutina*) Vulnerable (EPBC Act and NC Act);
- Leionema obtusifolium Vulnerable (EPBC Act and NC Act);
- wandering pepper-cress (Lepidium peregrinum) Endangered (EPBC Act);
- macadamia nut (Macadamia integrifolia) Vulnerable (EPBC Act and NC Act);
- Nicotiana wuttkei Endangered (NC Act);
- Paspalidium grandispiculatum Vulnerable (EPBC Act and NC Act);
- Mt Berryman Phebalium (*Phebalium distans*) Critically Endangered (EPBC Act), Endangered (NC Act);
- Picris conyzoides Vulnerable (NC Act);
- Austral cornflower (*Rhaponticum australe*) Vulnerable (EPBC Act and NC Act);
- scrub turpentine (*Rhodamnia rubescens*) Critically Endangered (EPBC Act and NC Act);
- native guava (*Rhodomyrtus psidioides*) Critically Endangered (EPBC Act and NC Act); and
- blotched sarcochilus (Sarcochilus weinthalii) Vulnerable (EPBC Act), Endangered (NC Act).

Targeted surveys for the above species were undertaken within a subset of the Study area – i.e. the Survey area. None of the above species were recorded during vegetation mapping of the Study area in February-March 2021, during fauna (and opportunistic flora) surveys of the Survey area in April and November 2021, nor during targeted flora searches of the Survey area in December 2021. Consequently, although there remains potential for these species to occur within the Survey area, the likelihood of occurrence for most species has been downgraded to unlikely. However, due to inherent difficulty of detecting blotched sarchochilus (*Sarcochilus weinthalii*), there remains a higher potential for this species to occur in the Survey area.



Fauna species

A total of 208 terrestrial fauna species were recorded from the Study area (126 birds, 61 mammals, 9 amphibians and 12 reptiles). Seven EVNT and six Special Least Concern (SLC) fauna species are known to occur in the Study area, comprising:

- koala (Phascolarctos cinereus) Vulnerable (EPBC Act and NC Act);
- greater glider (*Petauroides volans*) Vulnerable (EPBC Act) and Endangered (NC Act);
- brush-tailed rock-wallaby (*Petrogale penicillata*) Vulnerable (EPBC Act and NC Act);
- white-throated needletail (*Hirundapus caudacutus*) Vulnerable/Migratory (EPBC Act), Vulnerable (NC Act);
- powerful owl (*Ninox strenua*) Vulnerable (NC Act);
- silver perch (*Bidyanus bidyanus*) Critically Endangered (EPBC Act);
- Mary River cod (Maccullochella mariensis) Endangered (EPBC Act);
- spectacled monarch (Monarcha trivirgatus) Migratory (EPBC Act), SLC (NC Act);
- satin flycatcher (Myiagra cyanoleuca) Migratory (EPBC Act), SLC (NC Act);
- black-faced monarch (Monarcha melanopsis) Migratory (EPBC Act), SLC (NC Act);
- eastern osprey (Pandion cristatus) Migratory (EPBC Act), SLC (NC Act);
- rufous fantail (*Rhipidura rufifrons*) Migratory (EPBC Act), SLC (NC Act); and
- short-beaked echidna (*Tachyglossus aculeatus*) SLC (NC Act).

The grey-headed flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under the EPBC Act, is likely to occur within the Study area on occasion, although was not recorded during the surveys.

There remains potential for another four Migratory/SLC species to utilise the Study area (specifically the periphery of Lake Cressbrook) on occasion, including:

- sharp-tailed sandpiper (Calidris acuminata) Migratory (EPBC Act), SLC (NC Act);
- red-necked stint (Calidris ruficollis) Migratory (EPBC Act), SLC (NC Act);
- Latham's snipe (Gallinago hardwickii) Migratory (EPBC Act), SLC (NC Act); and
- marsh sandpiper (Tringa stagnatilis) Migratory (EPBC Act), SLC (NC Act).

Wetlands and waterways

There are no wetlands of International importance, National Importance nor any High Ecological Significance wetlands within the Study area. Protected Areas in proximity to the Study area (Deongwar State Forest and Crows Nest National Park) are identified as High Ecological Value (HEV) areas with scheduled water quality objectives for Lower Cressbrook Creek and Upper Cressbrook Creek. State-mapped Wetlands of General Ecological Significance occur in association with Crows Nest Creek and Cressbrook Creek and traverse these HEV areas.

Numerous waterways occur within the Study area, owing to the steep nature of the terrain, with the majority occurring as (Strahler) stream order (SO) 1 and 2 waterways draining the surrounding slopes. The most notable waterways within the Study area include Cressbrook Creek (SO5), Crows Nest Creek (SO5) and Little Oaky Creek (SO4).

Matters of National and State Environmental Significance

A number of Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES) occur within the Study area, including:

- regulated Of Concern vegetation (MSES);
- regulated vegetation that intersects watercourses (MSES);



- regulated vegetation that is mapped Essential Habitat (MSES);
- large tracts of vegetation that provide connectivity across the landscape (MSES);
- core koala habitat and locally refined koala habitat (MSES);
- wildlife habitat for Endangered or Vulnerable wildlife;
- wildlife habitat for Special Least Concern wildlife;
- habitat (known and potential) for migratory bird species (MNES);
- known habitat for threatened fauna species, including:
 - koala (Phascolarctos cinereus) (MNES and MSES);
 - greater glider (Petauroides volans) (MNES and MSES);
 - brush-tailed rock-wallaby (*Petrogale penicillata*) (MNES and MSES);
 - white-throated needletail (*Hirundapus caudacutus*) (MNES and MSES); and
 - powerful owl (Ninox strenua) (MSES);
 - silver perch (Bidyanus bidyanus) (MNES); and
 - Mary River cod (Maccullochella mariensis) (MNES);
- likely habitat for threatened fauna species, including:
 - grey-headed flying-fox (*Pteropus poliocephalus*) (MNES);
- potential habitat for 19 threatened flora species in the broader Study area and one threatened flora species in the Survey area, comprising:
 - blotched sarcochilus (Sarcochilus weinthalii) (MNES and MSES).

Most vegetated areas of the Study area are identified as koala habitat (core and locally refined) under regulatory koala habitat maps for SEQ, and the field survey confirmed that approximately 1,496 ha (99% of the vegetation within the Study area; including remnant, regrowth and other non-remnant habitat) comprises koala habitat. Koala habitat of the Study area has been scored against the Commonwealth Department of Agriculture, Water and the Environment's (DAWE's) koala habitat assessment tool (DotE 2014) and is considered to be habitat critical to the survival of the koala. Consequently, subsequent stages of the Project will likely require referral to the DAWE.

The terrestrial habitats of the Study area include known habitat for four other EVNT fauna species, namely greater glider, brush-tailed rock-wallaby, white-throated needletail and powerful owl. Whilst habitat for these species is broadly defined and covers a large area of the Study area, measures to avoid or reduce impacts to these species should be considered when determining the location and extent of the proposed Project footprint. The Project should avoid impacts to potential refuge habitat (rocky outcrops) for the brush-tailed rock-wallaby and areas where older growth habitat adjoins Deongwar State Forest to the north-east of the Study area, where suitable large hollows for the greater glider and powerful owl are more likely to occur.



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APPENDICES

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Appendix B: Species likelihood of occurrence

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Appendix D: Survey site profiles

Appendix E: Microbat Call Identification Report (Balance! Environmental 2021)



Acronyms

| Acronym | Description |
|---------------|---|
| ACA | Aquatic Conservation Assessment |
| AKF | Australian Koala Foundation |
| BD status | Biodiversity status |
| BS Act | Biosecurity Act 2014 |
| BVG | Broad Vegetation Group |
| CE | Critically Endangered (threatened fauna species status) |
| DAWE | The Commonwealth Department of Agriculture, Water and the |
| | Environment |
| DES | The Queensland Department of Environment and Science |
| DotE | The former Commonwealth Department of the Environment |
| DR | The Queensland Department of Resources |
| E | Endangered (species conservation status) |
| EA | Environmental Authority |
| EH | Essential Habitat |
| EO Act | Queensland Environmental Offsets Act 2014 |
| EO Regulation | Queensland Environmental Offsets Regulation 2014 |
| EP Act | Queensland Environmental Protection Act 1994 |
| EP Regulation | Queensland Environmental Protection Regulation 2008 |
| EPBC Act | Commonwealth Environment Protection and Biodiversity Conservation |
| | Act 1999 |
| EVNT | Endangered, Vulnerable or Near Threatened (species conservation |
| | status) |
| HES | High Ecological Significance |
| HRA | High Risk Area |
| HVR | High Value Regrowth |
| LC | Least Concern species listed under the NC Act |
| LGA | Local Government Area |
| MNES | Matters of National Environmental Significance |
| MSES | Matters of State Environmental Significance |
| NC Act | Queensland Nature Conservation Act 1992 |
| NC Regulation | Nature Conservation (Wildlife) Regulation 2006 |
| NT | Near Threatened (species conservation status) |
| RE | Regional Ecosystem |
| SLC | Special Least Concern |
| SPP | State Planning Policy |
| TEC | Threatened Ecological Communities |
| V | Vulnerable (species conservation status) |
| VM Act | Queensland Vegetation Management Act 1999 |
| VM status | Vegetation Management Act status |
| WoNS | Weeds of National Significance |
| WPA | Wetland Protection Area |



INTRODUCTION

Complex Infrastructure Services Pty Ltd (BE Power) is proposing to build the Big T Pumped Hydropower Energy Storage (the Project) at Lake Cressbrook on the border of the Toowoomba and Somerset Regional Council areas in South East Queensland (SEQ). The Project encompasses a new reservoir (dam; inundation area) northeast of Lake Cressbrook. The existing lake will serve as a lower reservoir, and there will be a penstock system between the upper and lower storages. The Project also includes construction of a new transmission line. Hydro-Electric Corporation (Entura) is assisting BE Power with planning and approvals for the Project.

BE Power has commissioned an ecological assessment of the Study area to inform the feasibility of the Project. This ecological assessment includes desktop searches, comprehensive flora and fauna field surveys to map vegetation and fauna habitats, target EVNT species and identify key ecological values and constraints of the Study area.

Figure 1-1 shows the location of the Study area within the broader region.

1.1 Purpose

This report is a baseline ecological assessment of the Study area based on the findings of a desktop assessment and comprehensive field surveys of the Study area. The purpose of this Ecological Survey Report is to identify the key ecological values and constraints of the Study area to inform subsequent stages of the Project.

1.2 Scope of work

The scope of work included the following tasks:

- conduct a desktop review of available literature and previous studies in the vicinity of the Study area, and conduct database searches for conservation significant flora and fauna species;
- undertake flora surveys within the Study area to:
 - ground truth Regional Ecosystem (RE) mapping of the Study area;
 - target potentially occurring conservation significant flora species listed under the Environment Protection and Biodiversity Act 1999 (EPBC Act) and / or the Nature Conservation Act 1994 (NC Act);
 - target potentially occurring Threatened Ecological Communities (TECs) listed under the EPBC Act; and
 - identify the presence of Weeds of National Significance (WoNS) and restricted matter species listed under the Queensland *Biosecurity Act 2014* (BS Act);
- undertake fauna habitat assessments throughout the Study area to:
 - characterise the broad fauna habitat types, and map them;
 - identify habitat resources for known and potentially occurring conservation significant species;
- complete a comprehensive fauna survey focusing on a refined 744 ha Survey extent comprising lot 2/SP200942 and a sub-parcel of lot 58/CSH2241, being the land where project infrastructure (excluding the transmission line) is planned and where ecological values and constraints have the greatest influence on the feasibility of the Project;
- prepare an ecological survey report that identifies:
 - the methods and results of the desktop assessment;



- key ecological values and constraints within the Study area;
- survey findings and their implications; and
- recommendations relevant to the next stages of the project.

1.3 Study area, Search area and Survey area

The Study area is the focus of the vegetation and fauna habitat assessments and encompasses an area of approximately 2,290 ha surrounding, and including, Lake Cressbrook. The Study area boundary was supplied by Entura on 11 December 2020 and was extended slightly in December 2021 to incorporate adjacent road reserve area as well as Lot 10 RP223812, on which a switching station is planned. Vegetation mapping was field verified within the Study area, and formed the basis of subsequent fauna habitat mapping.

The desktop Search area extends approximately 10 km beyond the Study area and has been used as the basis of desktop searches.

The Survey area is an area of approximately 744 ha comprising lot 2/SP200942 and a sub-parcel of lot 58/CSH2241, being the land where project infrastructure (excluding the transmission line and switching station) is planned and where ecological values and constraints have the greatest influence on the feasibility of the Project. Detailed fauna surveys were conducted within the Survey area, including both comprehensive/generic surveys and targeted searches (for MNES and MSES fauna species) in accordance with relevant State and Commonwealth guidelines (Sections 4.5.3, 4.5.7 and 4.5.8).

Targeted flora searches (for MNES and MSES flora species) were also undertaken across the abovementioned Survey area, and were also continued along the Sebastapool Road and Three Mile Road corridors within which the transmission line is planned, and into lot 10 RP223812 within which the switching station is planned.

Given the Project is in the feasibility stage, there is no Impact area defined for the Project. Therefore, all area calculations presented within this ecological survey report are based on the Study area boundary.

The Study area, Search area and Survey area are shown on Figure 1-1.







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> REGIONAL CONTEXT OF THE STUDY AREA Big T Pumped Hydropower Energy Storage

FIGURE 1-1

2 LEGISLATIVE CONTEXT

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Department of Agriculture, Water and the Environment (DAWE) and regulates any action that will have, or is likely to have, an impact on any Matter of National Environmental Significance (MNES). MNES include:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the Ramsar Convention);
- listed threatened species and TECs;
- migratory species protected under international agreements;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and
- a water resource, in relation to coal seam gas development and large coal mining development.

Proponents refer projects to the DAWE initially for determination on whether a project is a controlled action or not a controlled action. If the referral is deemed to be a controlled action, then it is likely to have a significant impact on MNES and must be undertaken only in accordance with prior approval from the Environment Minister.

A self-assessment undertaken in accordance with the Significant Impact Guidelines (DotE 2013) would be undertaken as part of a subsequent impact assessment to determine whether the Project is likely to be considered a controlled action in relation to ecological triggers.

2.1.2 EPBC Environmental Offsets Policy

The EPBC Act Environmental Offsets Policy (DSEWPC 2012) provides guidance on the role of offsets in environmental impact assessments, and how the DAWE considers the suitability of a proposed offset. The intention of the policy is that it will be applied to 'controlled actions' only after DAWE is satisfied that all other mitigation measures have been exhausted and where the residual impact on the relevant MNES is still likely to be significant.

Suitable offsets for MNES must comply with a set of eight offset principles, as follows:

- 1. deliver an overall conservation outcome to improve or maintain the MNES;
- 2. be 90% direct offset (at least), but may include other compensatory measures;
- 3. be in proportion to the level of protection that applies to the MNES;
- 4. be of a size and scale proportionate to the residual impact on the MNES;
- 5. effectively account for and manage the risks of the offset not succeeding;
- be additional to what is already required under other programs or legislation; however, this does not preclude the recognition of State offsets provided the MNES is specifically catered for;
- 7. be effective, timely, transparent and scientifically robust; and



8. have transparent governance arrangements (e.g. a management plan including monitoring).

2.2 State legislation and policy

2.2.1 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) is administered by the DES and in conjunction with the sub-ordinate legislation developed under the act, aims to protect the environment while allowing for ecologically sustainable development. The EP Act prescribes a general environmental duty, such that any activity that causes or is likely to cause environmental harm should not be carried out unless all reasonable and practical steps to prevent or minimise the harm are taken. There is also a duty to notify the administering authority of any environmental incident that may have caused or threaten serious or material environmental harm. Under the EP Act the following sub-ordinate legislation is regulated:

- Environmental Protection Regulation 2019 which prescribes the Environmentally Relevant Activities (ERA) regulated under the EP Act. ERAs that are prescribed activities have the potential to release emissions into the environment and cause harm. These activities are listed in Schedule 2 and include intensive animal industry operations, cropping, horticulture, energy related services, extractive activities, food production, metal production, mineral processing, other manufacturing activities, transport and maritime services, waste treatment and water treatment,
- Environmental Protection (Air) Policy 2019 which provides a framework for decisionmaking with regard to the air environment by identifying air quality objectives and indicators to protected and enhance.
- Environmental Protection (Noise) Policy 2019 which provides a framework for decisionmaking with regard to the acoustic environment by identifying air quality objectives and indicators to protected and enhance.
- Environmental Protection (Water and Wetland Biodiversity) Policy 2019 which provides a framework for decision-making with regard to the aquatic environment (waters and wetlands). Water quality objectives and Environmental Values are being progressively determined for Queensland waters which define the objectives for the physical, chemical and biological characteristics of the water and its use by aquatic ecosystems and humans.

Collectively, this legislature forms the Environmental Protection Framework under which projects are regulated.

2.2.2 Environmental authority

All prescribed ERAs and Resource Activities require an Environmental Authority (EA) and proposals are assessed against the requirements under the Environmental Protection Framework legislature. Some ERAs are also Concurrence ERAs and may be State assessable development under the *Planning Act 2016* and accompanying *Planning Regulation 2017*. State Code 22: Environmentally Relevant Activities and the Guideline is relevant if the proposed development is an ERA and is for a material change of use.



2.2.4 Vegetation Management Act 1999

The Queensland *Vegetation Management Act 1999* (VM Act) is administered by the Department of Resources (DR). The VM Act, in conjunction with the *Planning Act 2016*, regulates the clearing of native vegetation in Queensland.

The VM Act classifies remnant vegetation into Regional Ecosystems (REs) that form the basis of the description of vegetation communities. REs are defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. Remnant vegetation is referred to under the VM Act as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to height and canopy cover of the pristine (undisturbed) vegetation community. Remnant vegetation must also be dominated by species characteristic of the vegetation community in its pristine condition.

The Queensland government produces RE maps illustrating the distribution of REs throughout Queensland. REs are assigned one of the following three vegetation management classes (VM status) under the VM Act: Endangered; Of Concern; or Least Concern. REs are also assigned biodiversity status (BD status), which is based on an assessment of the condition of remnant vegetation in addition to the criteria used to determine the class under the VM Act. The BD status is used for a range of planning and management applications including the Biodiversity Planning Assessments.

2.2.5 Nature Conservation Act 1992

The Queensland *Nature Conservation Act 1992* (NC Act) is administered by the DES. The NC Act addresses the legal status and management of certain flora and fauna species listed under the *Nature Conservation (Wildlife) Regulation 2006* (NC Regulation) and the *Nature Conservation (Wildlife Management) Regulation 2006*. The NC Act provides for the protection and management of native wildlife and habitat that supports native species, with particular regard to:

- the clearing of plants projected under the NC Act;
- clearing permits or exemptions under the NC Act;
- activities that may cause disturbance to (tamper, damage, destroy, mark, move or excavate) animal breeding places; and
- the taking of fauna.

Under the NC Act (and the subordinate NC Regulation), native species are assigned a conservation status of either Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened (collectively referred to as EVNT), Special Least Concern (SLC) or Least Concern (LC).

2.2.6 South East Queensland Koala Conservation Strategy 2020-2025

In February 2020, the Queensland Government released regulatory koala habitat maps for South East Queensland (SEQ) to support the implementation of the SEQ Koala Conservation Strategy 2020-2025 and koala conservation protections within the planning framework. These maps identify:

- koala priority areas, which are large, connected areas that have the highest potential for supporting the long-term survival of the koalas and will be the focus of habitat protection, restoration and management;
- core koala habitat areas that identify the best quality koala habitat areas;



- locally refined koala habitat areas where mature vegetation occurs that is locally important for koalas but does not meet the criteria for core koala habitat; and
- koala habitat restoration areas where land could be restored and established as koala habitat areas.

Depending on the circumstances, projects that propose to clear koala habitat may be prohibited, require a development approval or be exempt from requirements.

Interfering with koala habitat in an area that is a koala habitat area but outside of a koala priority area is assessable development, and is assessed by the Chief Executive, Department of State Development, Manufacturing, Infrastructure and Planning (either as the assessment manager or as a referral agency) against a new code in the State Development Assessment Provisions (SDAP): State Code 25: Development in South East Queensland koala habitat areas. However, a number of exemptions are in place, including those for a coordinated project.

2.2.7 Water Act 2000

The Queensland *Water Act 2000* (Water Act) is administered by the DR. The Water Act provides for the sustainable management of water and other resources and the establishment and operation of water authorities. The Water Act requires that a riverine protection permit (RPP) be attained prior to the excavation, placing of fill or destroying vegetation in a watercourse, lake or spring.

A watercourse is defined by the Water Act as a river, creek or stream in which water flows permanently or intermittently, and includes the bed and banks and any other element of a river, creek or stream confining or containing water. The DR has published a watercourse identification map of the state (DoR 2021) that shows: watercourses (other than their lateral limits); the downstream limit of watercourses; drainage features; lakes; and springs.

2.2.8 Biosecurity Act 2014

The Queensland *Biosecurity Act 2014* (Biosecurity Act) provides measures to safeguard Queensland's economy, agricultural and tourism industries, environment and way of life, from pests, disease and contaminants.

All persons have a 'general biosecurity obligation' under the Biosecurity Act. This means that everyone is responsible for managing biosecurity risks that are under their control and that they know about or should reasonably be expected to know about. Under the 'general biosecurity obligation', individuals and organisations whose activities pose a biosecurity risk must:

- take all reasonable and practical steps to prevent or minimise each biosecurity risk;
- minimise the likelihood of causing a biosecurity event, and limit the consequences if such an event is caused; and
- prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse.

Prohibited matter

Prohibited matter is listed in Schedule 1 of the Biosecurity Act and refers to biosecurity matter that is not currently found in Queensland but that would have a significant adverse impact on our health, way of life, the economy, and the environment if it entered the state.



Restricted matter

Restricted matter is listed in Schedule 2 of the Biosecurity Act and refers to biosecurity matter (including invasive plants) that are currently found in Queensland and that are known to have a significant impact on human health, social amenity, the economy or the environment. Specific actions are required to limit the spread and impact of this matter by reducing, controlling or containing it.

There are seven categories of restricted matter (Table 2-1).

| Table 2-1 | Categories of | restricted matter | under the | Queensland | Biosecurity | Act 2014 |
|-----------|---------------|-------------------|-----------|------------|--------------------|----------|
|-----------|---------------|-------------------|-----------|------------|--------------------|----------|

| Restricted matter | Description and obligation |
|--------------------------|--|
| Category 1 | Includes red imported fire ants, electric ants, Asian honey bees, and certain |
| | animal diseases, aquatic diseases and pathogens. |
| | All people must take action to minimise the biosecurity risk posed. Must be |
| | reported to a Biosecurity Queensland inspector (by phoning 13 25 23) within 24 |
| | hours of becoming aware of its presence. |
| Category 2 | Includes certain noxious fish, weeds and pest animals such as spotted gar and red-eared slider turtle. |
| | Must be reported to a Biosecurity Queensland inspector or authorised person |
| | (by phoning 13 25 23) within 24 hours of becoming aware of its presence. |
| Category 3 | Includes weeds, pest animals and noxious fish (e.g. gambusia, dingoes, yellow crazy ants). |
| | Distribution of this restricted matter is illegal. This means it must not be given as |
| | a gift, sold, traded or released into the environment unless the distribution or |
| | disposal is authorised in a regulation or under a permit. |
| Category 4 | Includes specific weeds, pest animals and noxious fish such as the bitou bush, |
| | feral pig or giant cichlid. |
| | This restricted matter must not be moved to ensure that it does not spread into |
| | other areas of the state. |
| Category 5 | Includes weeds, pest animals and noxious fish such as Mexican feather grass, |
| | rabbits and carp. |
| | It is illegal to possess or keep this restricted matter, unless under a permit of the |
| | Biosecurity Act 2014 or another Act. |
| Category 6 | Includes invasive animals such as feral deer, foxes, rabbits and wild dogs and |
| | noxious fish such as carp, gambusia and tilapia. |
| | It is illegal to feed this category of restricted matter, unless feeding for the |
| | purpose of preparing for or undertaking a control program. |
| Category 7 | Includes noxious fish such as carp, weatherloach, climbing perch, gambusia |
| | and tilapia. |
| | It is illegal to possess these noxious fish. The restricted matter must be killed |
| | and disposed of by burying the whole carcass in the ground above the high tide |
| | water mark or placing it in a waste disposal receptacle. |

2.2.9 Fisheries Act 1994

The *Fisheries Act 1994* (Fisheries Act) addresses the use, conservation and improvement of Queensland's fisheries resources and fish habitats. The main purpose of the Fisheries Act is to provide for the use, conservation, and enhancement of the community's fisheries resources and fish habitats by applying the principles of ecologically sustainable development.



The Fisheries Act incorporates fish passage and provides legislation to manage developments that may impact on fish passage through activities such as construction of a waterway barrier. The Fisheries Act defines waterway barrier works as a dam, weir, or other barrier across a waterway, if the barrier limits fish stock access and movement along a waterway.

The *Queensland waterways for waterway barrier works* mapping (DAF 2020) assists in the determination of whether a site of proposed waterway barrier works requires assessment and approval under the Fisheries Act. It maps waterways from a low to major risk of impact on fish movement. Major risk is generally associated with larger waterways, higher quality habitat and bigger populations of fish (DAFF 2013).

2.2.10 Environmental Offsets Act 2014 and Environmental Offsets Policy

The environmental offsets framework in Queensland includes the *Environmental Offsets Act 2014* (EO Act), the *Environmental Offsets Regulation 2014* (EO Regulation) and the *Queensland Environmental Offsets Policy* (EO Policy).

MSES are defined in the EO Regulation and are a component of the biodiversity state interest identified in the Queensland State Planning Policy (DILGP 2017). Interference with MSES is subject to approval under State legislation.

MSES regulated by the act include:

- Regulated Vegetation, including:
 - Endangered REs (VM Act status);
 - Of Concern REs (VM Act status);
 - an RE that intersects with an area shown as a wetland on the Vegetation Management Wetlands Map;
 - an area of essential habitat on the Essential Habitat Map for Endangered or Vulnerable flora or fauna; and
 - located within a defined distance (identified in the Offsets Policy) from the defining banks of a relevant watercourse.
- Connectivity Areas.
- Protected wildlife habitat, including:
 - High Risk Areas (HRAs) identified on the flora survey trigger map and that contain Endangered or Vulnerable flora;
 - areas not shown as an HRA on the flora survey trigger map, to the extent the area contains Endangered or Vulnerable flora; and
 - habitat for Endangered, Vulnerable or SLC fauna.

Other MSES include:

- Protected areas;
- legally secured offset areas;
- wetlands and watercourses, including:
 - a wetland in a Wetland Protection Area (WPA) or of High Ecological Significance (HES) shown on the Map of Referable Wetlands; and
 - a wetland or watercourse in High Ecological Value Waters;
- High Preservation Areas of wild river areas;
- highly protected zones of State marine parks;
- Fish Habitat Areas;



- a waterway providing for fish passage, only if the construction, installation or modification of waterway barrier works would limit the passage of fish along the waterway; and
- marine plants, if outside of an urban area.

An environmental offset may be required as a condition of approval where, following consideration of avoidance and mitigation measures, the activity is likely to result in a significant residual impact on a MSES.

The Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP 2014) is used to determine if a residual impact from a prescribed activity is significant for applications made under the EP Act, NC Act and *Marine Parks Act 2004*.

Where required, the EO Policy allows for environmental offsets to be delivered as:

- financial settlement offsets;
- proponent-driven offsets including land-based offsets and / or delivery of actions in Direct Benefit Management Plans; or
- a combination of both.



3 EXISTING ENVIRONMENT

3.1 Regional setting

The Study area encompasses land under jurisdiction of the Toowoomba Regional Council to the west and land under jurisdiction of the Somerset Regional Council to the east, and falls entirely within the SEQ Bioregion.

3.1.1 Catchment context

The main watercourse that drains from the east of the Study area is Cressbrook Creek, a stream order 5 waterway, that ultimately drains into Cressbrook dam (Figure 1-1). Minor watercourses (mostly stream order 1 and 2) drain the hills to the north and west of the Study area. Traversing the landscape west-to-east before draining into Lake Cressbrook is Crows Nest Creek, a stream order 5 waterway

The Study area falls within the Upper Brisbane catchment and flows into the SEQ region's primary water supply, Wivenhoe Dam. The Upper Brisbane catchment includes 12 sub-catchments. This includes the Upper Cressbrook Creek sub-catchment upstream of Lake Cressbrook and the Lower Cressbrook Creek sub-catchment downstream of Lake Cressbrook (Figure 1-1).

The Upper Cressbrook Creek sub-catchment encompasses Crows Nest, Old Woman's Hut, Bald Hills and Rocky Creeks. The sub-catchment is steep and creek flows can be fast in times of high flow, passing through gorges and boulder beds (DES 2020a). Cressbrook Dam is positioned at the end of the sub-catchment. Land use includes grazing on native vegetation, Crows Nest National Park area, animal husbandry, irrigated perennial horticulture, and some ex grazing and vegetation around the dam (DES 2020a).

The Lower Creek sub-catchment includes Cressbrook Creek and main tributaries Kipper and Oaky Creeks. The upper sub-catchment is steep and gorge-like, with incised and confined channels with isolated erosion, gravel and boulders (DES 2020a). The mid sub-catchment channels are deep with large bends, gorge country, flatter areas and paleo channels (DES 2020a). Land use includes grazing on native vegetation, forestry, irrigated perennial horticulture, animal husbandry, gravel extraction and rural residential areas (DES 2020a). Due to the geology and modified water flows (reduced flushing), there are isolated saline areas, usually at the edge of the alluvium, where the aquifer is drawn down; and water quality is also impacted by erosion, small scalds and saline seeps (DES 2020a).

King, Raiber and Cox (2013) identified that surface water in Cressbrook Creek was generally fresh, becoming slightly more concentrated with distance from source, due largely to the effects of water-rock interactions and evaporation.

3.2 Climate

According to data collected at Toowoomba Airport (approximately 33 km from the Study area, weather station number 41529), December through to February are typically the warmer months in the region, with mean maximum temperatures around 31 degrees Celsius (°C). The coolest months are generally May to August, with mean minimum temperatures around 16°C. Rainfall data is collected at the nearest weather station located within the Study area (Cressbrook Dam, weather station number 40808). The annual average rainfall is 731.3 millimetres (mm), with the wettest period typically occurring during the warmer months from December to February (BoM 2021) (Figure 3-1).





Figure 3-1 Mean monthly temperature statistics for Toowoomba Airport (BoM station 41529) and mean monthly rainfall statistics for Cressbrook Dam (BoM Station 40808) (BoM 2021)

3.3 Topography

Cressbrook Dam lies at an elevation of approximately 270 m ADH and rises to its highest point to the north-east at 540 m ADH. The terrain in proximity to the dam and along the Sebestapol Road corridor to the west is generally flat or gently inclined. The area to the north-east rises sharply in some locations in association with Mount Sevastopol.

3.4 Geology

The steep hills of the north-east are mapped by the State as Sugarloaf metamorphics (DCo – slate, phyllite, quartzite, schist, amphibolite) with a small intrusion of granite (PRg?) at the furthest northern boundary. The centre portion of the corridor to the west is mapped as Eskdale Granodiorite/1 (Rges/1) and the furthest west is Crows Nest Granite (Rgr – biotite, granite, adamellite). There are small areas of clay, silt and sand on floodplain alluvium mapped near the confluence of Cressbrook Creek and Lake Cressbrook in the east (DoR 2021a). The major geological units are shown on Figure 3-2.

3.5 Land Zones and soils

The following Land Zones occur within the Study area:

- Land Zone 3 which includes (for the broader State) recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave built lunettes.
- Landzone 11 metamorphosed rocks, forming ranges, hills and lowlands.



 Landzone 12 – Mesozoic to Proterozoic igneous rocks, forming ranges, hills and lowlands.

Soils mapping at the 1:2 million scale by CSIRO (and various other groups) (BRS 1991) identifies tenosols and sodosols as the primary soil groups mapped for the Study area (Figure 3-3).

Table 3-1 CSIRO soils mapping within the Study area (BRS 1991)

| Soil group and unit | Soil description |
|---------------------|--|
| Sodosol, Qd6 | Hard pedal red duplex soils. Duplex red, hard setting A horizon, A2 horizon |
| (Dr2.42) | conspic bleached, neut pedal whole col B horizon. |
| Tenosol, Fu3 | Steep hilly to mountainous terrain on metasediments and phyllites. Uniform |
| (Um2.12) | medium, conspic bleached A2 horizon, non calc, underlain by a carbonate pan. |
| Tenosol, Cd4 | Mountainous land on granite. Uniform coarse, non calc, A2 horizon conspic |
| (Uc2.12) | bleached with non calc pan below A2 horizon. Bleached sands. |



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DPM

SURFACE GEOLOGY MAPPING FOR THE STUDY AREA Big T Pumped Hydropower Energy Storage **FIGURE 3-2**





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CSIRO SOIL MAPPING FOR THE STUDY AREA Big T Pumped Hydropower Energy Storage

FIGURE 3-3



4

METHODS

4.1 Taxonomic nomenclature

Scientific names of fauna used in this report are consistent with the Queensland WildNet database (DES 2021a). Scientific names of flora used in this report follow the Australian Plant Census database (CHAH 2021).

4.2 Determination of significance level

The significance of TECs is described as per their listing in the EPBC Act as:

- Critically Endangered (CE);
- Endangered (E); or
- Vulnerable (V).

REs are classified according to their status under the VM Act as:

- Endangered (E);
- Of Concern (OC); or
- Least Concern (LC).

EVNT flora and fauna species are defined as those taxa listed in the EPBC Act or NC Act as:

- Critically Endangered (CE);
- Endangered (E);
- Vulnerable (V); or
- Near Threatened (NT).

All other native fauna species are designated as being either Special Least Concern (SLC) or Least Concern (LC) under the NC Act.

4.3 EVNT species likelihood of occurrence

EVNT species identified from the desktop assessment were assigned a likelihood of occurrence based on the criteria identified in Table 4-1, with the assigned likelihood of occurrence for fauna species reviewed and refined post-survey to reflect site knowledge and presence of suitable habitat and microhabitat.



Table 4-1 Criteria adopted for the likelihood of Endangered, Vulnerable or NearThreatened species identified from the desktop searches occurring within the Study area

| Likelihood of | Criteria |
|---------------|--|
| occurrence | |
| Unlikely | • species or species habitat may occur, is likely to occur or is known to occur from |
| | the broader search area (based on database searches); but |
| | preferred habitat has not been identified within the Study area; and |
| | there are no confirmed species records within 10 km of the Study area. |
| | • preferred habitat occurs within the Study area, but there are no confirmed species |
| | records within 50 km of the Study area for fauna and 10 km for flora. |
| Potential | species or species habitat may occur, is likely to occur or is known to occur from |
| | the broader search area (based on database searches); and |
| | preferred habitat occurs within the Study area; and |
| | • there are no confirmed species records within 10 km of the Study area; however, |
| | there are confirmed species records within 50 km of the Study area for fauna and |
| | 10 km for flora; OR |
| | • species indicated as likely during desktop assessment, but field surveys revealed |
| | no evidence of occurrence in the Study area. |
| Likely | preferred habitat occurs within the Study area; and |
| | confirmed species records within 10 km of the Study area; however |
| | species not yet confirmed as occurring within the Study area. |
| Known | • confirmed species records within the Study area (generally as a result of |
| | subsequent field survey). |

4.4 Desktop assessment

Desktop searches were undertaken in January 2021 and included a review of the following:

- EPBC Act Protected Matters Search Tool, to identify MNES relevant to the Project within a Search area extending at least 10 km and 50 km from the Study area (DAWE 2021a).
- The Queensland Wildlife Online search (DES 2021a) results for EVNT and SLC species records within a search area extending at least 10 km from the Study area.
- Atlas of Living Australia for EVNT and SLC species records, accessed January (and November) 2021 (ALA 2021).
- Matters of State Environmental Significance, to identify known MSES within the Survey area (DES 2020b).
- Vegetation management RE map (versions 11 and 12) for the Study area to identify vegetation communities and fauna habitats that are likely to occur (DNRME 2019, 2021b).
- RE (Queensland Herbarium 2019) and Broad Vegetation Group (BVG) descriptions (Nelder et al. 2019).
- Regulated Vegetation Management mapping (version 5.03) to identify areas of assessable and non-assessable vegetation (DNRME 2021c).
- NC Act Protected Plants Flora Survey Trigger Map (Version 8) to identify High Risk Areas (HRAs) where EVNT flora are present or are likely to be present (DES 2021).
- Essential habitat (EH) mapping (version 10.02, DNRME 2021a) to identify habitat for EVNT flora and fauna species within the Survey area.
- Queensland State-wide Corridors mapping (version 1.4; DES 2020f) and South East Queensland Regional Plan 2017 regional biodiversity corridor mapping (DSDMIP 2020) to identify wildlife corridors relevant to the Project.
- Protected areas of Queensland mapping series (DES 2020c).



- Queensland Wetland Data Series (Version 5) mapping (DES 2020d) to identify any lacustrine, palustrine and riverine wetland areas within the Study area.
- Aquatic Conservation Assessment series mapping (DES 2020e) to identify areas assessed as having conservation values using the Aquatic Biodiversity Assessment and Mapping Methodology (Clayton et al. 2006).
- Queensland Waterways for Waterway Barrier Works mapping (DAF 2020) to identify waterways that pose a risk to fish passage for any subsequent waterway barrier works.
- Map of Queensland Wetland Environmental Values (DES 2019c) to determine wetland environmental values applicable to Environmental Protection (Water and Wetland Biodiversity) Policy 2019 that are within the Study area.
- Other relevant projects, including:
 - Preliminary Works for Cooby and Cressbrook Dams, Environmental Assessment Report (GHD 2020);
 - New Acland Coal Mine (New Hope Group 2014); and
 - Cressbrook Dam Post Stocking Survey (DAF 2021).

4.5 Field surveys

Field surveys were undertaken on several occasions in 2021, comprising:

- 24 to 26 February and 1 to 5 March 2021, to map vegetation communities and fauna habitats of the broader Study area;
- 12 to 16 April and 19 to 23 April 2021, to complete comprehensive autumn fauna surveys and additional vegetation mapping of previously inaccessible areas within the Survey area;
- 8 to 11 November and 15 to 19 November 2021, to complete comprehensive spring fauna surveys of the Survey area;
- 2 to 4 December 2021, to undertake targeted searches of the Survey area and road corridor for MNES/MSES flora species; and
- 13 December 2021, to map vegetation and fauna habitats on Lot 10 RP223812.

4.5.1 Survey timing

Conditions at the time of the surveys were generally fine. Temperatures over the initial survey period 24 February to 5 March ranged from 14.3°C to 34.4°C (station 041529, BoM 2021). In the lead-up to these surveys, 337.6 mm of rainfall was measured at Cressbrook Dam (weather station number 40808) from October 2020 to end of February 2021, resulting in good vegetative growth and suitable conditions for flora surveys in February-April 2021.

At the time of writing, Cressbrook Dam weather station (40808) rainfall data was limited to end of September 2021. Nearby Pechey Forestry weather station (40170), approximately 17 km southwest of Cressbrook Dam, recorded 558.7 mm rainfall from March 2021 through to end October 2021 (BoM 2021, providing suitable growing conditions prior to comprehensive targeted MNES/MSES flora and fauna species surveys in November and December 2021.

Seasonal surveys are undertaken to improve the accuracy of data collected, and to cover expected peaks in vertebrate activity associated with the commencement of breeding and dispersal or migration. The Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al.* 2018) provide a guide to the optimal times of year and conditions for vertebrate fauna surveys in the SEQ bioregion (Table 4-2). The final timing is dependent on climatic conditions in the lead-up to fieldwork.



| 2010) | | |
|-----------|------------------------|--|
| Bioregion | Survey timing | Rationale |
| SEQ | Autumn | Conducted when high summer temperatures begin to drop |
| | (late Feb – April) | and before the onset of colder overnight temperatures. |
| | Spring | Conducted when temperatures begin to warm up and |
| | (mid-September to mid- | particularly after the first storms when animal activity |
| | December) | peaks. |

Table 4-2 Optimal time of year and conditions for vertebrate fauna surveys (Eyre et al.2018)

The autumn comprehensive fauna surveys were conducted 12 to 16 April and 19 to 23 April 2021, consistent with Eyre *et al.* (2018) (Table 4-2). Temperatures over the fauna survey period 12 to 23 April ranged from 6.3°C to 26.4°C, with rainfall recorded on 18 April 2021 (station 40808, BoM 2021).

The spring surveys were conducted 8 to 11 November and 15 to 19 November 2021, consistent with Eyre *et al.* (2018) (Table 4-2). The survey period in the first week was cut short by one day due to inclement weather. Temperatures over the fauna survey period 8 to 19 November ranged from 9.7°C to 27.7°C (station 041529, BoM 2021). A total of 53.2 mm of rainfall was recorded on 8 November 2021 and 36.6 mm recorded on 12 November 2021 (station 40170, BoM 2021).

4.5.2 Flora survey sites

Aerial imagery and State vegetation mapping data were used to identify representative sites for field assessment. Flora surveys aimed to verify the desktop findings, gather information to produce a field verified (ground truthed) vegetation map and to inform fauna habitat mapping.

A total of 106 flora survey sites were assessed from February to April 2021 and 12 waking meanders targeting threatened flora species were completed in December 2021, (Figure 4-1- Map 1 and Figure 4-1- Map 2). A further 6 flora survey sites were assessed in December 2021 on Lot 10 RP223812. Additional observations were made throughout the surveys, at non-designated sites, and whilst traversing the Study area on foot and by all-terrain vehicle.





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Big T Pumped Hydropower Energy Storage FIGURE 4-2: MAP 2 OF 2



4.5.3 Fauna survey sites

Both generic (comprehensive/detailed) (Section 4.5.7) and targeted survey methods (Section 4.5.8) were employed, aligning with anticipated stakeholder expectations, the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2018), and relevant Commonwealth survey guidelines for reptiles (DSEWPC 2011a), birds (DEWHA 2010a), bats (DEWHA 2010b) and mammals (DSEWPC 2011b).

The generic fauna survey effort was undertaken in sites representing primary fauna habitat types of the Survey area. Site selection has been based on consideration of likely disturbance, Broad Vegetation Group (based on ground-truthed REs), Land Zone, topography and site knowledge gained during previous surveys of the Study area (Table 4-3). Twelve sites were selected, representing the following assessment units:

- forested hillside/crest on metamorphics seven sites;
- forested hillside/crest on granite two sites;
- forested depression one site; and
- vine thicket two sites.

Table 4-3 Assessment units adopted for generic fauna survey sites

| Broad Vegetation | BVG extent in | GT REs within | Proposed site and assessment | | | | |
|----------------------------|----------------------|-----------------|---------------------------------|--|--|--|--|
| Group (BVG) | Survey area | Study area | unit (in brackets) | | | | |
| Eucalypt woodlands to | 675.0 | 12.11.3 | FA1 – 12.11.18 (forested | | | | |
| open forests | | 12.11.3a | hillside/crest on metamorphics) | | | | |
| | | 12.11.6 | FA2 – 12.11.6 (forested | | | | |
| | | 12.11.9 | hillside/crest on metamorphics) | | | | |
| | | 12.11.14 | FA3 – 12.12.12 (forested | | | | |
| | | 12.11.18 | hillside/crest on granite) | | | | |
| | | 12.12.9 | FA4 – 12.11.14 (forested | | | | |
| | | 12.12.12 | depression) | | | | |
| | | 12.12.23 | FA7 – 12.11.18 (forested | | | | |
| | | | hillside/crest on metamorphics) | | | | |
| | | | FA9 – 12.12.23 (forested | | | | |
| | | | hillside/crest on granite) | | | | |
| | | | FA11– 12.11.9 (forested | | | | |
| | | | hillside/crest on metamorphics) | | | | |
| Eucalypt dry woodlands on | 21.4 | 12.11.8 | FA5 – 12.11.8 (forested | | | | |
| sand plains and footslopes | | 12.12.8 (not in | hillside/crest on metamorphics) | | | | |
| of hills and ranges | | Survey area) | FA10 – 12.11.8 (forested | | | | |
| | | | hillside/crest on metamorphics) | | | | |
| Rainforests and scrubs | 8.0 | 12.11.11 (State | FA6 – 12.11.11 (vine thicket) | | | | |
| | | map) | FA8 – 12.11.11 (vine thicket) | | | | |
| Eucalypt open forests to | 3.8 | 12.3.7 | - | | | | |
| woodlands on inland | | | | | | | |
| depositional plains | | | | | | | |
| Wet eucalypt forests | 0 | 12.3.3a | - | | | | |
| | | (State map; not | | | | | |
| | | in Survey area) | | | | | |

Notes: BVG = Broad Vegetation Group, in this instance being the 1:5M scale categories for which there are 15 in Queensland (Neldner et al. 2019). GTRE – Ground-truthed Regional Ecosystem, based on fieldwork by DPM Envirosciences February-March 2021.



Twelve generic fauna trap sites and 120 fauna habitat assessment sites were assessed across seasonal surveys in 2021. Generic trap sites included pitfall traps, funnel traps, Elliot traps, camera traps, ultrasonic bat detectors (apart from site FA6), diurnal active searches, bird surveys, spotlighting, and scats and signs searches (Section 4.5.7). Additional targeted survey effort included 28 camera trap sites, 16 ultrasonic bat detector sites, 15 call playback sessions, 5 diurnal active searches, 11 diurnal bird survey, two scat and signs search, five spotlighting sites, and approximately 24 km of spotlighting vehicle transects. The fauna survey sites are depicted in Figure 4-2- Map 1 and Figure 4-2- Map 2 and detailed in Table 4-4.



Table 4-4 Fauna survey sites (refer to Figure 4-2, Map 2)

| Site | Latitude | Longitude | Pitfall trap | Funnel trap | Elliot trapping | Camera trap | Call playback | Bat detection | Harp trap | Diurnal search active | Diurnal bird survey | Nocturnal spotlighting | Scat and signs search | Habitat assessment |
|------|-----------|-----------|--------------|--------------|-----------------|--------------|---------------|---------------|--------------|--------------------------|------------------------|---------------------------|-----------------------|-----------------------|
| FA1 | -27.2362 | 152.2128 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA2 | -27.2422 | 152.2182 | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | |
| FA3 | -27.2499 | 152.1901 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA4 | -27.2456 | 152.2033 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA5 | -27.2546 | 152.2116 | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | |
| FA6 | -27.2366 | 152.2326 | \checkmark | \checkmark | \checkmark | \checkmark | | | | \checkmark | \checkmark | \checkmark | \checkmark | |
| FA7 | -27.23668 | 152.21472 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA8 | -27.23617 | 152.23242 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA9 | -27.23351 | 152.22088 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA10 | -27.25995 | 152.21079 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA11 | -27.24352 | 152.19729 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| FA12 | -27.23784 | 152.22839 | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark | | \checkmark | \checkmark | \checkmark | \checkmark | \checkmark |
| CP1 | -27.2383 | 152.2214 | | | | | | | | | | | | |
| CP2 | -27.2381 | 152.2285 | | | | | | | | | | | | |
| B1 | -27.2650 | 152.2119 | | | | | | \checkmark | | | | | | |
| B2 | -27.2362 | 152.2214 | | | | | | \checkmark | | | | | | |
| B3 | -27.2328 | 152.2204 | | | | | | \checkmark | | | | | | |
| B4 | -27.2384 | 152.2253 | | | | | | \checkmark | | | | | | |
| B5 | -27.2366 | 152.2115 | | | | | | \checkmark | | | | | | |
| B6 | -27.2425 | 152.1917 | | | | | | \checkmark | | | | | | |
| B7 | -27.2393 | 152.2044 | | | | | | \checkmark | | | | | | |
| B8 | -27.25829 | 152.21221 | | | | | | \checkmark | | | | | | |
| B9 | -27.25622 | 152.20393 | | | | | | ✓ | | | | | | |



| Site | Latitude | Longitude | Pitfall trap | Funnel trap | Elliot trapping | Camera trap | Call playback | Bat detection | Harp trap | Diurnal search active | Diurnal bird survey | Nocturnal spotlighting | Scat and signs search | Habitat assessment |
|------|-----------|-----------|--------------|-------------|-----------------|--------------|---------------|---------------|-----------|--------------------------|------------------------|---------------------------|-----------------------|-----------------------|
| B10 | -27.25079 | 152.1897 | | | | | | \checkmark | | | | | | |
| B11 | -27.24294 | 152.19134 | | | | | | \checkmark | | | | | | |
| B12 | -27.23832 | 152.22138 | | | | | | \checkmark | | | | | | |
| B13 | -27.23764 | 152.2232 | | | | | | \checkmark | | | | | | |
| B14 | -27.23669 | 152.21123 | | | | | | \checkmark | | | | | | |
| B15 | -27.23587 | 152.22136 | | | | | | \checkmark | | | | | | |
| B16 | -27.23359 | 152.22756 | | | | | | \checkmark | | | | | | |
| DS1 | -27.2348 | 152.2334 | | | | | | | | \checkmark | | | | |
| DS2 | -27.2349 | 152.2314 | | | | | | | | \checkmark | | | | |
| DS3 | -27.24481 | 152.20927 | | | | | | | | \checkmark | | | | |
| DS4 | -27.23612 | 152.23148 | | | | | | | | \checkmark | | | | |
| DS5 | -27.23558 | 152.2318 | | | | | | | | \checkmark | | | | |
| BS1 | -27.2425 | 152.1917 | | | | | | | | | \checkmark | | | |
| BS2 | -27.28328 | 152.19613 | | | | | | | | | \checkmark | | | |
| BS3 | -27.27433 | 152.19814 | | | | | | | | | \checkmark | | | |
| BS4 | -27.26854 | 152.19992 | | | | | | | | | \checkmark | | | |
| BS5 | -27.25704 | 152.20221 | | | | | | | | | \checkmark | | | |
| BS6 | -27.25411 | 152.18083 | | | | | | | | | \checkmark | | | |
| BS7 | -27.25328 | 152.19639 | | | | | | | | | \checkmark | | | |
| BS8 | -27.25026 | 152.17883 | | | | | | | | | \checkmark | | | |
| BS9 | -27.24399 | 152.20984 | | | | | | | | | \checkmark | | | |
| BS10 | -27.23757 | 152.22516 | | | | | | | | | \checkmark | | | |
| BS11 | -27.23498 | 152.23324 | | | | | | | | | \checkmark | | | |
| SS1 | -27.2358 | 152.2253 | | | | | | | | | | | \checkmark | |
| SS2 | -27.2389 | 152.21201 | | | | | | | | | | | \checkmark | |
| C1 | -27.2357 | 152.2328 | | | | \checkmark | | | | | | | | |



| Site | Latitude | Longitude | Pitfall trap | Funnel trap | Elliot trapping | Camera trap | Call playback | Bat detection | Harp trap | Diurnal search active | Diurnal bird survey | Nocturnal spotlighting | Scat and signs search | Habitat assessment |
|------|-----------|-----------|--------------|-------------|-----------------|--------------|---------------|---------------|-----------|--------------------------|------------------------|---------------------------|--------------------------|-----------------------|
| C2 | -27.2515 | 152.2058 | | | | \checkmark | | | | | | | | |
| C3 | -27.2657 | 152.2108 | | | | \checkmark | | | | | | | | |
| C4 | -27.2336 | 152.2277 | | | | \checkmark | | | | | | | | |
| C5 | -27.2369 | 152.2174 | | | | \checkmark | | | | | | | | |
| C6 | -27.2360 | 152.2212 | | | | \checkmark | | | | | | | | |
| C7 | -27.2368 | 152.2112 | | | | \checkmark | | | | | | | | |
| C8 | -27.2655 | 152.2117 | | | | \checkmark | | | | | | | | |
| C9 | -27.2359 | 152.2285 | | | | \checkmark | | | | | | | | |
| C10 | -27.2425 | 152.1914 | | | | \checkmark | | | | | | | | |
| C11 | -27.2313 | 152.2232 | | | | \checkmark | | | | | | | | |
| C12 | -27.2671 | 152.2119 | | | | \checkmark | | | | | | | | |
| C13 | -27.2625 | 152.2139 | | | | \checkmark | | | | | | | | |
| C14 | -27.2384 | 152.2258 | | | | \checkmark | | | | | | | | |
| C15 | -27.26006 | 152.2108 | | | | \checkmark | | | | | | | | |
| C16 | -27.25616 | 152.20381 | | | | \checkmark | | | | | | | | |
| C17 | -27.2561 | 152.21175 | | | | \checkmark | | | | | | | | |
| C18 | -27.25542 | 152.20323 | | | | \checkmark | | | | | | | | |
| C19 | -27.25396 | 152.20578 | | | | \checkmark | | | | | | | | |
| C20 | -27.25075 | 152.18997 | | | | \checkmark | | | | | | | | |
| C21 | -27.25041 | 152.21908 | | | | \checkmark | | | | | | | | |
| C22 | -27.24911 | 152.21623 | | | | \checkmark | | | | | | | | |
| C23 | -27.24236 | 152.19153 | | | | \checkmark | | | | | | | | |
| C24 | -27.23885 | 152.21116 | | | | \checkmark | | | | | | | | |
| C25 | -27.23586 | 152.22139 | | | | \checkmark | | | | | | | | |
| C26 | -27.23501 | 152.23214 | | | | \checkmark | | | | | | | | |
| C27 | -27.23497 | 152.23331 | | | | \checkmark | | | | | | | | |



| Site | Latitude | Longitude | Pitfall trap | Funnel trap | Elliot trapping | Camera trap | Call playback | Bat detection | Harp trap | Diurnal search active | Diurnal bird survey | Nocturnal spotlighting | Scat and signs search | Habitat assessment |
|------|-----------|-----------|--------------|-------------|-----------------|--------------|---------------|---------------|--------------|--------------------------|------------------------|---------------------------|-----------------------|-----------------------|
| C28 | -27.23362 | 152.2285 | | | | \checkmark | | | | | | | | |
| C29 | -27.23238 | 152.22718 | | | | \checkmark | | | | | | | | |
| CP1 | -27.2383 | 152.2214 | | | | | \checkmark | | | | | | | |
| CP2 | -27.2381 | 152.2285 | | | | | \checkmark | | | | | | | |
| CP3 | -27.2339 | 152.2142 | | | | | \checkmark | | | | | | | |
| CP4 | -27.2355 | 152.2210 | | | | | \checkmark | | | | | | | |
| CP5 | -27.2298 | 152.2208 | | | | | \checkmark | | | | | | | |
| CP6 | -27.2452 | 152.1928 | | | | | \checkmark | | | | | | | |
| CP7 | -27.2385 | 152.2303 | | | | | \checkmark | | | | | | | |
| CP8 | -27.2451 | 152.1928 | | | | | \checkmark | | | | | | | |
| CP9 | -27.25557 | 152.20307 | | | | | \checkmark | | | | | | | |
| CP10 | -27.24914 | 152.20363 | | | | | \checkmark | | | | | | | |
| CP11 | -27.24208 | 152.21777 | | | | | \checkmark | | | | | | | |
| CP12 | -27.24077 | 152.21872 | | | | | \checkmark | | | | | | | |
| CP13 | -27.23833 | 152.22515 | | | | | \checkmark | | | | | | | |
| CP14 | -27.23531 | 152.21033 | | | | | \checkmark | | | | | | | |
| CP15 | -27.23539 | 152.23218 | | | | | \checkmark | | | | \checkmark | | | |
| H1 | -27.2453 | 152.2033 | | | | | | | \checkmark | | | | | |
| H2 | -27.23758 | 152.22512 | | | | | | | \checkmark | | | | | |
| H3 | -27.23611 | 152.21041 | | | | | | | \checkmark | | | | | |
| SL1 | -27.2339 | 152.2216 | | | | | | | | | | \checkmark | | |
| SL2 | -27.2307 | 152.2206 | | | | | | | | | | \checkmark | | |
| SL3 | -27.2371 | 152.2259 | | | | | | | | | | \checkmark | | |
| SL4 | -27.25357 | 152.20504 | | | | | | | | | | \checkmark | | |
| SL5 | -27.24076 | 152.21866 | | | | | | | | | | ~ | | |



| Site | Latitude | Longitude | Pitfall trap | Funnel trap | Elliot trapping | Camera trap | Call playback | Bat detection | Harp trap | Diurnal search active | Diurnal bird survey | Nocturnal spotlighting | Scat and signs search | Habitat assessment |
|----------------------------|---------------------------------|-------------------------------|--------------|-------------|-----------------|-------------|---------------|---------------|-----------|--------------------------|------------------------|---------------------------|-----------------------|-----------------------|
| Q1-Q94 and Q96- Q104 | See site profiles in Appendix D | | | | | | | | | | | | \checkmark | \checkmark |
| FH1-FH2 | | oce site promes in Appendix D | | | | | | | | | | | \checkmark | \checkmark |
| S1-S6 | | | | | | | | | | | | | \checkmark | \checkmark |





COMPREHENSIVE FAUNA SITES AND FAUNA HABITAT ASSESSMENT SITES Big T Pumped Hydropower Energy Storage FIGURE 4-2: MAP 1 OF 2

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COMPREHENSIVE FAUNA SITES AND FAUNA HABITAT ASSESSMENT SITES Big T Pumped Hydropower Energy Storage FIGURE 4-2: MAP 2 OF 2



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4.5.4 Vegetation community surveys

The vegetation community survey methods were consistent with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 5.1 (Neldner et al. 2020). The specific method used was an enhanced version of the Quaternary method with additional data collected to assist with habitat and Threatened Ecological Community (TEC) assessments. The following information was collected at each of the 106 sites to confirm the vegetation present, assist in defining vegetation boundaries, record the floristic and structural characteristics of the vegetation, and assess its condition:

- RE and vegetation status (remnant, regrowth);
- median height and cover of the ecologically dominant layer;
- the dominant and characteristic canopy, midstorey and understorey species (relative abundance measured as dominant [D], abundant [A], frequent [F], occasional [O] or rare [R]);
- groundcover characteristics;
- vegetation condition (integrity as either pristine, excellent, very good, good, average, degraded or completely degraded);
- presence and abundance of WoNS and Restricted weeds;
- details of EVNT flora present;
- other notes of relevance, such as community characteristics (size of community), site features (gullies) or evidence of disturbance; and
- landscape characteristics.

4.5.5 Vegetation mapping

A seamless vegetation layer was produced, based preliminarily on State mapping but refined using aerial imagery from quarter 3 in 2017 (DNRME 2017) and field survey results. Vegetation polygons were mapped at a 1:10,000 scale, such that polygons greater than 0.01 ha or with a width of more than 10 m would be mapped. Any areas less than this threshold were merged into neighbouring areas. Some areas to the very north of the Study area were not assessed and in these locations the State-mapped communities have been adopted. The State mapping was used in instances where there was insufficient information to determine the vegetation and/or boundary.

All calculations presented in this report have been calculated using GDA94 UTM Zone 56 projection and are rounded to one significant figure, which may account for slight differences in the total area calculations presented.

4.5.6 EVNT flora survey

Desktop searches were undertaken to determine the EVNT flora species listed under the NC Act and/or EPBC Act that are likely or have the potential to occur within the Study area based on their habitat preferences, State-mapped vegetation and species records for the Search area (Appendix B). Species that are known, likely or with potential to occur in the Study area were targeted during the surveys (Table 4-5). Walking meanders were undertaken 2-4 December 2021, targeting habitats within the Survey area and road corridor for MNES/MSES flora species. Eleven meanders were completed, shown on Figure 4-1-Map 1 and Figure 4-1- Map 2.

The Project area intercepts locations mapped by the State as a High Risk Area (HRA) for protected plants (Figure 5-4). Detailed Protected Plant Flora Surveys will likely be undertaken in



HRAs and their associated buffers in later stages of the Project when access to relevant properties can be obtained. These surveys will be conducted by a suitably qualified person in accordance with the Flora Survey Guideline – Protected Plants (DES 2020g). The method and results of the Flora Survey will be detailed in a separate Flora Survey Report specific to the requirements of that guideline.

The survey timing was appropriate for most target flora species (Table 4-5).

Table 4-5 Endangered, Vulnerable or Near Threatened flora species considered known,likely or with potential to occur in the Study area, and detectability considerations

| | | Statu | S | |
|-----------------|--------------------|-----------------------|---------------------|---|
| Scientific name | Common name | EPBC Act ¹ | NC Act ² | Seasonality/ detectability |
| Arthraxon | Hairy-joint | V | V | Inflorescences used to differentiate from similar |
| hispidus | grass | | | species (DES 2021b). Flowers during summer- |
| | | | | autumn (Harden 1993). Expected to be obvious, if |
| | | | | good growing conditions. |
| Bosistoa | Three- | V | LC | Tree, detectable all year round (DES 2021c). |
| transversa | leaved | | | |
| Clematis | bosistoa Stream | V | V | As a perennial vine, surveys can be conducted at any |
| fawcettii | clematis | v | v | time of the year and under any weather conditions |
| | | | | (DAWE 2021b). |
| Coleus | Cockspur | Е | Е | Flowering occurs in February–April. Distinguished |
| torrenticola | flower | | | from the closely related <i>P. argentatus</i> , <i>P. graniticola</i> |
| (Plectranthus | | | | and <i>P. omissus</i> by the complete absence of sessile |
| ton enticola) | | | | (DAWE 2021b). |
| Cryptostylis | Leafless | V | LC | Only detectable when flowering, due to its leafless |
| hunteriana | tongue- | | | habit. Known to flower in August in Queensland; |
| | orchid | | | September to January in nearby Northern NSW |
| Eucalyptus | Helidon | - | E | Tree, detectable year-round (DES 2021d), but most |
| taurina | ironbark | | | distinguishable from similar looking ironbarks when |
| | | | | fruit and buds are present. |
| Grevillea | - | V | V | Flowers August-September (PlantNet 2021), although |
| quadricauda | | | | a conspicuous shrub expected to be detectable year- |
| Haloragis | Tall velvet | V | V | Flowering has been recorded in February and April |
| exalata subsp. | sea-berry | | | (DES 2021e), although a conspicuous shrub to 1.5 m |
| velutina | | | | with square-shaped stems (DES 2021e) and |
| | | \ <u>\</u> | \ <u>\</u> | expected to be detectable year-round. |
| Leionema | - | V | V | spring (DEWHA 2008) although a conspicuous shrub |
| ostaononam | | | | with unique branchlets and leaves and expected to |
| | | | | be detectable year-round. |



| | | Statu | S | |
|---------------------------------|--------------------------|-----------------------|---------------------|---|
| Scientific name | Common name | EPBC Act ¹ | NC Act ² | Seasonality/ detectability |
| Lepidium | Wandering | Е | LC | Perennial herb to sub-shrub 10–80 cm tall, |
| peregrinum | pepper cress | | | sometimes ascending to 2 m (DOE 2014). Expected to be detectable year-round. |
| Macadamia integrifolia | Macadamia nut | V | V | Tree, detectable year-round (DAWE 2021b). |
| Nicotiana wuttkei | | - | E | Inconspicuous. Annual herb less than 1 m (DEW 2021). Little information available; however, expected to flower chiefly spring-summer consistent with other Australian Nicotiana herbs. |
| Paspalidium grandispiculatum | | V | V | Surveys should be conducted during autumn when flowering is at a peak. Erect, tufted perennial grass that grows to 1.5 m tall. Can be distinguished from other Australian Paspalidium spp. by its large spikelets, 3.5–4.8 mm long and characteristic woody culms arising from robust woody rhizomes (DES 2021f). |
| Phebalium distans | Mt Berryman Phebalium | CE | E | Small tree to 8 m, detectable all year round (DAWE 2021b). |
| Picris conyzoides | | - | V | Inconspicuous herb, flowering recorded in March (ALA 2021). |
| Rhaponticum australe | Austral cornflower | V | V | Herb, flowering occurs in February, October, November, and December (DES 2021). Expected to be detectable during surveys as actively growing in other close localities in the 2021 Autumn late wet. |
| Rhodamnia | Scrub | CE | CR/ | Shrub or small tree, detectable all year round. Flower |
| rubescens | turpentine | | CE | from late winter through spring, with a peak in October (TSSC 2020a). |
| Rhodomyrtus psidioides | Native guava | CE | CE | Shrub or small tree (DAWE 2021b), detectable year- round. |
| Sarcochilus weinthalii | Blotched sarcochilus | V | E | Difficult to detect. Orchid that grows on rainforest trees projecting or hanging from the trunk or growing on rock surfaces. Flowers from June to October and fruits persist for 6–8 months after fertilisation (DES 2021g). |

Notes:

¹ Conservation status under the EPBC Act. CE = Critically Endangered, E = Endangered, V = Vulnerable.

² Conservation status under the NC Act. E = Endangered, V = Vulnerable, NT = Near Threatened, LC = Least Concern.


4.5.7 Generic fauna survey effort

Generic fauna surveys comprised several methods targeting various fauna groups, including amphibians, reptiles, small, medium and medium-large mammals, birds and bats (Table 4-6). These methods are consistent with the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre et al. 2018). Echo-location bat calls were analysed and identified by Balance! Environmental (2021).



Table 4-6 Comprehensive fauna survey effort

| Method | Target fauna group | Autumn survey effort (April 2021) | Spring survey effort (November 2021) | Quantity |
|---------------|--|--|---|-----------------------------|
| Pitfall traps | Amphibians, reptiles, small terrestrial mammals | 96 trap nights. Four buckets at 7.5 m intervals on T- design with a 45 m fence. Left open for four days and nights, checked each morning. Six sites. | 75 trap nights. Buckets at 7.5 m intervals on T-design with a 45 m fence. Due to inclement weather, traps were positioned for only three days and nights at FA7, FA8 and FA9. Only one bucket installed at FA8 due to subsurface rock. Four traps set at FA7 and FA9. Four traps left open for four days and nights at FA10, FA11 and FA12. Traps checked each morning. | 171 trap nights |
| Funnel traps | Amphibians, reptiles | 144 trap nights. Six funnels, 3 m in on distal end of T- design with a 45 m fence. Left open for four days and nights, checked each morning. | 132 trap nights. Six funnels 3 m in on distal end of T-design with a 45 m fence. Due to inclement weather, traps were positioned for only three days and nights at FA7, FA8 and FA9. Additional two funnels positioned at FA8. Traps left open for four days and nights at FA10, FA11 and FA12. | 276 trap nights |
| Elliot traps | Small terrestrial mammals | 480 trap nights. Twenty baited traps at 5-10 m intervals along on a 100 m transect at each site. Left open for four days and nights, checked each morning. | 420 trap nights. Twenty baited traps at 5-10 m intervals along on a 100 m transect at each site. Due to inclement weather, traps were left open for three days and nights at FA7, FA8 and FA9. Traps left open for four days and nights at FA10, FA11 and FA12. Traps checked each morning. | 900 trap nights |
| Camera traps | Reptiles, medium-large terrestrial mammals | At least 420 trap nights. A total of 20 camera traps deployed for at least three weeks at the six dedicated trap sites and a further 14 targeted sites. Camera traps baited with chicken or sardines and two standard bait balls. | At least 420 trap nights. A total of 20 camera traps deployed for at least three weeks at the six dedicated trap sites and a further 14 targeted sites. Camera traps baited with chicken and two standard bait balls. | At least 840 trap nights |



| Method | Target fauna group | Autumn survey effort (April 2021) | Spring survey effort (November 2021) | Quantity |
|----------------------------------|--|--|---|---------------------------------|
| Call playback | Nocturnal birds, arboreal mammals | 9 sessions. One session of call playback of relevant species (i.e. koalas, owls and nightjars) at sites FA1, FA3 and FA4. Additional sessions at six other locations. | 8 sessions. One session at site FA10 and additional sessions at seven other locations. | 17 sessions |
| Echo-location bat call detection | Microbats | 13 trap nights. One bat detector for at least one night per site (except FA6). Seven additional locations targeted for 1-2 nights using 2 Anabat units. | 25 trap nights. One bat detector for at least one night per site. Nine additional locations targeted for 1-2 nights using 3 Anabat units. | 38 trap nights |
| Harp traps | Microbats | 6 trap nights. One harp trap set at FA2 for two nights. Two harp traps set in proximity to FA4 for two nights. Suitable flyways were difficult to locate. | 8 trap nights. Two harp traps set for two nights at two locations within suitable flyways. | 14 trap nights |
| Diurnal active searches | Amphibians, reptiles, small terrestrial mammals | Approx. 450 search minutes. Two searches of 30-45 minutes at each dedicated site by 1-2 people. Two additional 45-minute searches, both near FA6. | Approx. 660 search minutes. Two searches of 15-30 minutes at each dedicated site by 1-2 people. Three additional 30-minute searches. Twelve additional searches of 15-30 minutes by 1-2 people. | Approx. 1,110 search minutes |
| Diurnal bird surveys | Diurnal birds | 510 search minutes. Four 10-minute diurnal bird surveys by two people at each of the six dedicated sites at dawn and/or dusk. One additional bird search of 15 minutes by two people. | 810 search minutes. Four 10-minute diurnal bird surveys by two people at each of the six dedicated sites at dawn and/or dusk. Ten additional bird searches of between 15- 30 minutes by 1-2 people. | 1,320 search minutes |



| Method | Target fauna group | Autumn survey effort (April 2021) | Spring survey effort (November 2021) | Quantity |
|---|--|---|---|-------------------------|
| Nocturnal spotlighting (and thermal camera) searches | Nocturnal birds, arboreal mammals, flying-foxes, medium-large terrestrial mammals | 1,636 search minutes. Two 30 person-minute spotlight searches within each dedicated site. Walking spotlighting transects at three sites (between 30 and 60 minutes each) and vehicle spotlighting transects across the survey extent, of varying lengths and periods by two people totalling approximately 11.7 km. A total of at least 27 search hours, including: 360 search minutes at trap sites; 826 additional search minutes; and 450 vehicle transect search minutes. | 1,080 search minutes. Two 30 person-minute spotlight searches within each dedicated site. Walking spotlighting transects at two sites (60 minutes each) and vehicle spotlighting transects across the survey extent, of varying lengths and periods by two people totalling approximately 12 km. A total of at least 18 search hours, including: 360 search minutes at trap sites; 240 additional search minutes; 480 vehicle transect search minutes. | 2,716 search minutes |
| Scat and signs search | Reptiles, medium-large terrestrial mammals, nocturnal birds, arboreal mammals | 390 search minutes. Scat and sign searches of 30 minutes by two people at each dedicated site. One additional search of 15 minutes by two people. | 390 search minutes. Scat and sign searches of 30 minutes by two people at each dedicated site. One additional search of 15 minutes by two people. | 780 search minutes |



4.5.8 Targeted fauna survey effort

The desktop assessment and vegetation/habitat assessment in February-March 2021 (prior to targeted fauna surveys) identified potential habitat for 22 EVNT fauna species as either known, likely or having potential to occur in the Study area (Appendix B). These comprised:

- species known to occur in the Study area:
 - koala (Phascolarctos cinereus) Vulnerable (EPBC Act and NC Act);
 - brush-tailed rock-wallaby (*Petrogale penicillata*) Vulnerable (EPBC Act and NC Act);
 - silver perch (*Bidyanus bidyanus*) Critically Endangered (EPBC Act) translocated/stocked population only; and
 - Mary River cod (*Maccullochella mariensis*) Endangered (EPBC Act) translocated/stocked population only.
- species likely to occur within the Study area:
 - greater glider (Petauroides volans) Vulnerable (EPBC Act and NC Act);
 - grey-headed flying-fox (*Pteropus poliocephalus*) Vulnerable (EPBC Act);
 - tusked frog (Adelotus brevis) Vulnerable (NC Act);
 - glossy black-cockatoo (*Calyptorhynchus lathami lathami*) Vulnerable (NC Act);
 - white-throated needletail (*Hirundapus caudacutus*) Vulnerable (EPBC Act and NC Act);
 - powerful owl (*Ninox strenua*) Vulnerable (NC Act);
 - black-breasted button-quail (*Turnix melanogaster*) Vulnerable (EPBC Act and NC Act); and
 - collared delma (Delma torquata) Vulnerable (EPBC Act and NC Act).
- other species with potential to occur within the Study area:
 - northern quoll (Dasyurus hallucatus) Endangered (EPBC Act);
 - spot-tailed quoll (*Dasyurus maculatus maculatus*) Endangered (EPBC Act), Vulnerable (NC Act);
 - long-nosed potoroo (*Potorous tridactylus tridactylus*) Vulnerable (EPBC Act and NC Act);
 - curlew sandpiper (*Calidris ferruginea*) Critically Endangered (EPBC Act), Endangered (NC Act);
 - Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*) Endangered (EPBC Act and NC Act);
 - grey falcon (Falco hypoleucos) Vulnerable (EPBC Act and NC Act);
 - squatter pigeon southern subspecies (*Geophaps scripta scripta*) Vulnerable (EPBC Act and NC Act);
 - painted honeyeater (Grantiella picta) Vulnerable (EPBC Act and NC Act);
 - swift parrot (*Lathamus discolor*) Critically endangered (EPBC Act), Endangered (NC Act); and
 - common death adder (*Acanthophis antarcticus*) Vulnerable (NC Act).

These 22 species were targeted during comprehensive seasonal fauna surveys in 2021. The survey effort undertaken for these species is identified in Table 4-7, along with the relevant guideline survey effort.



In addition to EVNT species, a number of migratory bird species have potential to utilise habitat resources of the Study area on occasion. Survey effort for these species was covered by the survey effort for EVNT target species, the comprehensive fauna survey effort, fauna habitat assessments, and opportunistic observations across the Study area.

Table 4-7 identifies threatened fauna species (other than translocated/stocked aquatic species) considered likely or with potential to occur in the Study area, as well as the recommended survey method and effort undertaken for each species. The relevant EPBC Act survey guidelines for MNES reptiles (DSEWPC 2011a), birds (DEWHA 2010a), bats (DEWHA 2010b) and mammals (DSEWPC 2011b), as well as relevant Commonwealth referral guidelines, have been considered for these species.



| | ·····,··· | Sta | tus | | | |
|---|--|-----------------------|---------------------|--|---|--|
| | Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| | Mammals | | | | | |
| - | Koala (<i>Phascolarctos</i> <i>cinereus</i>) | | V | Koala not included in the Survey guidelines for Australia's threatened mammals 2011 (DSEWPC 2011b), as it was listed as Vulnerable in 2012. The EPBC Act referral guidelines for the vulnerable koala (DotE 2014) do not prescribe survey effort standards for koala surveys, but suggest a range of direct and indirect methods to detect koalas, including: Strip transects; nocturnal spotlighting; call playback; remote sensor (IR) cameras; mark-resight / mark-recapture; detection dogs; radio or satellite collars; identification of scratching and scats. Spot Assessment Technique (SAT). | No species-specific guideline; however, call playback may be used and scats and scratches may also be used to determine presence (Eyre et al. 2018). | Koala scratch and scat searches were undertaken at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey. Call playback undertaken for the koala at three locations in April 2021. The guideline survey effort has been met and this species has been confirmed present in the Study area. |

Table 4-7 Survey methods for EVNT fauna species potentially occurring within the Study area



| | Status | | | | |
|---|-----------------------|---------------------|---|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Greater glider (<i>Petauroides</i> <i>volans</i>) | V | E | Greater glider not included in Survey guidelines for Australia's threatened mammals 2011 (DSEWPC 2011b), as it was listed as Vulnerable in 2016. | No species-specific guideline, but call playback, vehicle spotlighting and spotlighting transects may be used to detect gliders (Eyre et al. 2018). | Glider scratch and scat searches were undertaken at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey area. The guideline survey effort has been met and this species has been confirmed present in the Study area. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|---|----------------------|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Grey-headed flying-fox (<i>Pteropus</i> <i>poliocephalus</i>) | V | | Search appropriate databases and information sources for the locations of camps, and conduct vegetation surveys to identify feeding habitat (DEWHA 2010b). Daytime field surveys for camps. Surveys of vegetation communities and food plants (DEWHA 2010b). Night-time surveys, looking for feeding and flying bats. The presence of a smell, scat and bat calls can be used to identify their presence (DEWHA 2010b). | Not applicable. | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for flying-fox camps, feeding signs and scats were undertaken whilst traversing the Study area to assess 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey area. The guideline survey effort has been met and this species has not been recorded in the Study area, although is considered likely to utilise the Study area on occasion, when the majority of eucalypts are flowering. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|---|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Northern quoll (<i>Dasyurus</i> <i>hallucatus</i>) | E | | Baited cage traps or Elliot traps, deployed between May and August to minimise disturbance to reproductive period (DSEWPC 2011b). Daytime searches for potentially suitable habitat resources, latrines or tracks (DSEWPC 2011b). Baited remote cameras (DSEWPC 2011b). Hair tubes (DSEWPC 2011b). Spotlighting surveys (DSEWPC 2011b). | No species-specific guideline, but camera traps, spotlighting along walked or driven transects, hair tubes, and predator scat collection and analysis may be used to detect quolls (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for quoll latrines and tracks were undertaken across 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Baited cameras were deployed at 40 locations throughout the Survey area (April and November 2021), deployed for at least 840 trap nights. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey area. The guideline survey effort has been met and this species has not been recorded in the Study area. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|--|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Spot-tailed quoll (<i>Dasyurus</i> <i>maculatus</i> <i>maculatus</i>) | E | V | Daytime searches for potentially suitable habitat resources, latrines or tracks (DSEWPC 2011b). Remote cameras, left on site for a minimum of 3 weeks (DSEWPC 2011b). Hair tubes set for a minimum of 14 consecutive nights (DSEWPC 2011b). Cage trapping surveys are not considered necessary, provided hair funnel surveys or remote cameras are employed, as they are an appropriate and effective alternative (DSEWPC 2011b). | No species-specific guideline, but camera traps, spotlighting along walked or driven transects, hair tubes, and predator scat collection and analysis may be used to detect quolls (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for quoll latrines and tracks were undertaken across 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Baited cameras were deployed at 40 locations throughout the Survey area (April and November 2021), deployed for at least 840 trap nights. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|---|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Brush-tailed rock- wallaby (<i>Petrogale</i> <i>penicillata</i>) | > | V | Daytime searches for potentially suitable habitat resources (DSEWPC 2011b). Daytime searches for signs of activity, including tracks, scats and rock shelters worn smooth from resting (DSEWPC 2011b). Collection and analysis of predator scats (DSEWPC 2011b). Baited camera traps (DSEWPC 2011b). Observations for rock wallabies basking during the day, or becoming active at dusk (DSEWPC 2011b). | No species-specific guideline, but camera traps targeting any special landscape features that may support rock-wallabies may be used for species detection (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for signs of activity were undertaken at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Observations of suitable shelter sites (e.g. rock boulder piles) were undertaken using binoculars. Opportunistic observations were undertaken across the Survey area. Baited cameras were deployed at 40 locations throughout the Survey area (April and November 2021), deployed for at least 840 trap nights. The guideline survey effort has been met and this species has been confirmed present in the Study area. |



| Long-nosed potoroo (<i>Potorous</i> <i>tridactylus</i> <i>tridactylus</i>) | V | Daytime searches for potentially suitable habitat resources, and signs of activity (DSEWPC 2011b). Collection and analysis of predator scats (DSEWPC 2011b). Soil plot surveys (DSEWPC 2011b). Baited camera traps using universal bait (DSEWPC 2011b). An integrative approach is recommended, whereby detection surveys like spotlighting, cage trapping or hair sampling surveys should be conducted in concert with searches for traces like diggings, scats and tracks, baited camera traps and predator scat surveys (DSEWPC 2011b). | No species-specific guideline, but camera trapping has been demonstrated to be a far more successful method than many trapping techniques for cryptic or wary vertebrate species (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for signs of activity were undertaken at 108 representative fauna habitat assessment sites and at each of the 12 trap sites. Opportunistic observations were undertaken across the survey area. Baited cameras were deployed at 40 locations throughout the Survey area (April and November 2021), deployed for at least 840 trap nights. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey area. The guideline survey effort has been met and this species has not been recorded in the Study area. |
|---|---|--|--|--|



| | Sta | tus | | | |
|---|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Amphibians | | | | | |
| Tusked frog (<i>Adelotus brevis</i>) | | V | Not applicable. | Survey during warmer months (September to February), particularly in spring when males are likely to be calling (Rowland 2013a). Aural and dip-net surveys in appropriate habitat should be the highest priority, through to trapping being the lowest priority (Rowland 2013a). Two surveys of waterbody and/or stream perimeters, each spread over three or more nights (Rowland 2013a). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey area. Aural surveys and call playback was undertaken in proximity to suitable breeding habitat in November 2021. The guideline survey effort has been met and this species has not been recorded in the Study area. |



| | Sta | tus | | | |
|---|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Reptiles | | | | | |
| Collared delma (<i>Delma torquata</i>) | V | V | One-off hand searches (including raking through leaf litter) in appropriate habitats, together with pitfall trapping during late spring to summer. Pitfall trap lines comprising six 4-10 litre buckets and funnel traps spread along a 15 m fence (DSEWPC 2011a). | No species-specific guideline is provided; however, general reptile survey methods and effort at each fauna survey site includes (Eyre et al. 2018): 4 buckets at 7.5 m intervals on T-design with a 45 m fence (pitfall trapping); 6 funnels 3 m in on distal end of T-design with a 45m fence; 2 x 30 person-minute diurnal active searches; and 2 x 30 person-minute nocturnal active searches. | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches were undertaken at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Twelve trap sites were positioned in representative habitats, each including pitfall and funnel traps in accordance with Eyre et al 2018. Two active searches were undertaken at each trap site. |
| | | | | | The guideline survey effort has been met and this species has not been recorded in the Study area. |



| | Sta | tus | | | |
|---|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Common death adder (<i>Acanthophis</i> <i>antarcticus</i>) | | V | Not applicable. | Surveys should be undertaken in the breeding period (September to March), preferably at night when the species is likely to be more active (Rowland and Ferguson 2012). Nocturnal vehicle transects on all suitable roads with limited overlying debris on warm humid nights is preferable over at least two nights, undertaken twice (Rowland and Ferguson 2012). Pitfall and funnel trapping could be used in addition to nocturnal vehicle transects (Rowland and Ferguson 2012). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Twelve trap sites were positioned in representative habitats, each including pitfall and funnel traps in accordance with Eyre et al 2018. Searches were undertaken at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Two active searches were undertaken at each trap site. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey. The guideline survey effort has been met and this species has not been recorded in the Study area. |



| | Sta | tus | | | |
|---|-----------------------|---------------------|--|---|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Birds | | | | | |
| Glossy black- cockatoo (<i>Calyptorhynchus</i> <i>lathami lathami</i>) | | V | Not applicable. | Can be surveyed year-round. A combination of diurnal bird surveys and searches for foraging and nesting signs are recommended (Hourigan 2012). The minimum effort required for a diurnal survey is 5 hours over 1 day per 50 ha of project area, and the minimal effort required for foraging and nesting signs is 20 hours over 4 days, per 50 ha of project area (Hourigan 2012). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals and signs at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Opportunistic observations were undertaken across the Study area. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|--|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| White-throated needletail (<i>Hirundapus</i> <i>caudacutus</i>) | V | V | White-throated needletail not included in Survey guidelines for Australia's threatened birds (DEWHA 2010a), as it was listed as Vulnerable in 2019. | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals and signs at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. Opportunistic observations were attempted across the Study area. The guideline survey effort has been met and this species has been confirmed present in the Study area. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|---|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Curlew sandpiper (<i>Calidris</i> <i>ferruginea</i>) | CE | E | Curlew sandpiper not included in Survey guidelines for Australia's threatened birds (DEWHA 2010a), as it was listed as Critically Endangered in 2015. | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. Opportunistic observations were attempted across the Study area (February-March, April and November 2021). The proposed survey effort is thorough, meeting the intent of the guidelines. |



| | Sta | tus | | | |
|---|-----------------------|---------------------|---|---|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Coxen's fig-parrot (<i>Cyclopsitta diophthalma</i> <i>coxeni</i>) | E | E | Area searches for potential nesting and feeding (fruiting fig) trees, including searches for fruit particles and strips under trees (DEWHA 2010a). Targeted searches at dawn and dusk in areas where potential nesting and feeding trees have been located (DEWHA 2010a) The minimum effort for area searches is 20 hours over 5 days and the minimum effort for targeted searches is 15 hours over 4 days (DEWHA 2010a). | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals and signs at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. Opportunistic observations were attempted across the Study area. |



| | Sta | tus | | | |
|---|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Grey falcon (<i>Falco hypoleucos</i>) | V | V | Grey falcon not included in Survey guidelines for Australia's threatened birds (DEWHA 2010a), as it was listed as Vulnerable in 2020. | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. Opportunistic observations were attempted across the Study area. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|--|--|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Squatter pigeon – southern subspecies (<i>Geophaps scripta</i> <i>scripta</i>) | V | V | Area searches or transect surveys in suitable habitat. Flushing surveys also likely to be useful (DEWHA 2010a). The minimum effort for area searches is 15 hours over 3 days per 50 ha and the minimum effort for flushing surveys is 10 hours over 3 days per 50 ha (DEWHA 2010a). | No species-specific guideline, but the effort for general bird surveys recommends six 5- 10 minute area searches within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk. Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 16.5 person hours of dedicated bird surveys over 9 days in November 2021. Eight cameras deployed over eight nights on waterbodies/drainage lines in April 2021. Six cameras deployed over three weeks on waterbodies/drainage lines in November 2021. The proposed survey effort is thorough, meeting the intent of the guidelines. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|--|---|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Painted honeyeater (<i>Grantiella picta</i>) | | V | Painted honeyeater not included in Survey guidelines for Australia's threatened birds (DEWHA 2010a), as it was listed as Vulnerable in 2015. | Surveys should be conducted in early spring to late summer, when mistletoe fruit and flower is most abundant (Rowland 2012a). The minimum effort for area searches is 4 hours over 4 days per 50 ha of suitable habitat (Rowland 2012a). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 16.5 person hours of dedicated bird surveys over 9 days in November 2021. The proposed survey effort is thorough, meeting the intent of the guidelines. |



| | Sta | tus | | | | |
|------------------------|-----------------------|---------------------|---|---|---|--|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken | |
| Swift parrot | CE | Е | Surveys on mainland Australia should | • No species-specific guideline, but the | Comprehensive seasonal surveys completed | |
| (Lathamus discolor) | | | be conducted between March and July (DEWHA 2010a). | effort for general bird surveys recommends six 5-10 minute area | in autumn (April 2021) and spring (November 2021). | |
| | | | Area searches or transect surveys in suitable habitat, preferably early morning and afternoon when birds are most active; vehicle transects also likely to be useful (DEWHA 2010a). Targeted searches in patches of heavily flowering eucalypts (DEWHA 2010a) The minimum effort for area searches is 20 hours over 8 days per 50 ha and the minimum effort for targeted surveys is 20 hours over 8 days per 50 | searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Searches for individuals at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Four 10-minute diurnal bird survey by two people at each of the 12 trap sites at dawn and/or dusk Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 16.5 person hours of dedicated bird surveys over 9 days in November 2021. | |
| | | | ha (DEWHA 2010a). | | meeting the intent of the guidelines. | |



| | Sta | itus | | | |
|--|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Powerful owl (<i>Ninox strenua</i>) | | V | Not applicable. | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Comprehensive seasonal surveys completed in autumn (April 2021) and spring (November 2021). Searches for individuals at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. Spotlighting was conducted twice at 12 comprehensive trap sites and at five additional locations. Vehicle spotlighting transects (approx. 24 km) were conducted across the Survey. 17 call playback sessions were conducted. The guideline survey effort has been met and this species has been confirmed present in the Study area. |



| | Sta | tus | | | |
|--|-----------------------|---------------------|--|--|---|
| Species | EPBC Act ¹ | NC Act ² | Commonwealth Survey (or referral) Guidelines | Queensland Guideline | Effort and Method Undertaken |
| Black-breasted button quail (<i>Turnix</i> <i>melanogaster</i>) | | V | Area searches of suitable habitat with detection of flushing birds or hearing of foraging scratching (DEWHA 2010a). Land-based area searches of 15 hours over 3 days in areas of less than 50 ha (DEWHA 2010a). | No species-specific guideline, but the effort for general bird surveys recommends six 5-10 minute area searches (on different occasions) within 1 ha survey site. Species may also be detected incidentally while conducting other surveys or whilst moving across the overall survey site (Eyre et al. 2018). | Two comprehensive trap sites were undertaken in suitable habitat for this species (vine thicket, mapped 'Rainforests and scrubs'). Site FA6 in autumn (April 2021) and site FA8 in spring (November 2021). For each trapping event in autumn (April 2021) and spring (November 2021), at least two cameras were located in suitable habitat and a further 18 cameras located in other areas of the Study area (totalling at least 840 trap nights). Approximately 8.5 person hours of dedicated bird surveys over 10 days in April 2021. Approximately 13.5 person hours of dedicated bird surveys over 9 days in November 2021. Searches for individuals and signs (distinctive platelets left by pivoting action as they feed) at 120 representative fauna habitat assessment sites and at each of the 12 trap sites. The proposed survey effort is thorough, meeting the intent of the guidelines |



4.5.9 Fauna habitat assessments

The desktop assessment identified EVNT fauna species known, likely or with potential to occur within the Study Area based on known habitat preferences, State mapped vegetation and existing records from the broader Search area (Appendix B).

Fauna habitat assessments were undertaken at 120 sites (Figure 4-2 Map 1 and Figure 4-2 Map 2). At each site, an approximate 1 ha search area was assessed for features including:

- overall condition (pristine, very good, good, average, poor, degraded, or completely degraded);
- level of erosion (absent, scattered, frequent);
- presence and type of disturbance (grazing etc.);
- presence and accessibility of standing water;
- soil type / texture;
- presence of scats, tracks and other traces of fauna;
- abundance (absent, scattered, common, abundant) of:
 - large hollows (>20 cm);
 - medium hollows (11-20 cm);
 - small hollows (<11cm);
 - large logs (>50 cm diameter);
 - small logs (<50cm diameter);
 - burrows;
 - rock crevices;
 - basking areas;
 - cliffs and rocky outcrops;
 - stones (20-30 cm);
 - boulders (61 cm-2 m);
 - large boulders (> 2 m);
 - fine leaf litter (<2 cm diameter);
 - coarse leaf litter (2-10 cm diameter);
 - dense grass/shrub shelter;
 - decorticating bark;
 - arboreal and terrestrial termite mounds;
 - grassy tussocks;
 - seeding native grass cover;
 - fleshy fruiting plants; and
 - nectar and pollen producing plants.

Opportunistic sightings of fauna were also recorded.



Koala habitat assessment

Koala habitat assessment was undertaken at each fauna habitat assessment site. This assessment was based on consideration of both the Commonwealth and State koala habitat definitions discussed below.

Commonwealth Government definition of koala habitat

In accordance with the DAWE's SPRAT database (DAWE 2021c), koala habitat includes a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. The Commonwealth Government further defines koala habitat as (DotE 2014):

any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. This can include remnant and non-remnant vegetation in natural, agricultural, urban and peri-urban environments. Koala habitat is defined by the vegetation community present and the vegetation structure; koalas do not necessarily have to be present.

DotE (2014) identifies koala food trees as generally those trees of the genus *Angophora*, *Corymbia*, *Eucalyptus*, *Lophostemon* and *Melaleuca*, but that information specific to the local area is likely to be most accurate.

Queensland Government definitions of koala habitat

Koala habitat is defined in the Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation (2020) as:

- a) an area of vegetation in which koalas live and that includes a koala habitat tree; or
- b) an area of vegetation that consists primarily of koala habitat trees and which is reasonably suitable for sustaining koalas; or
- c) a partially or completely cleared area used by koalas to cross from an area mentioned in paragraph (a) or (b) to another area mentioned in paragraph (a) or (b).

The Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation (2020) defines a koala habitat tree as:

- (a) a tree of the Corymbia, Melaleuca, Lophostemon or Eucalyptus genera that is edible by koalas; or
- (b) a tree of a type typically used by koalas for shelter, including, for example, a tree of the Angophora genus.

Adopted definition of koala habitat

Although koalas are known to browse and shelter within a broad range of tree species, local food trees have been used as the basis of the koala habitat assessments consistent with DotE (2014). The Australian Koala Foundation (AKF) identifies primary and secondary koala feed trees in local government areas throughout much of Australia, including Queensland (AKF 2015). Species lists for the Toowoomba and Somerset Regional Council areas were used as the basis of identifying suitable feed trees, with the addition of other species based on local experience of the assessment team:

Primary feed trees:

- river red gum (Eucalyptus camaldulensis);
- Queensland blue gum (*E. tereticornis*); and
- dirty gum (*E. chloroclada*).



Secondary feed trees:

- fuzzy Box (*E. conica*);
- mountain coolibah (*E. orgadophila*);
- narrow-leaved red ironbark (*E. crebra*);
- poplar box (*E. populnea*);
- grey gum (*E. biturbinata*);
- grey gum (*E. major*);
- yellow box (*E. melliodora*);
- gum-topped box (*E. moluccana*); and
- small-fruited gum (*E. propinqua*).

The following eucalypts were also considered to be suitable secondary feed trees for the koala, based on local experience of the assessment team:

- narrow-leaved ironbark (*E. crebra*);
- silver-leaved ironbark (E. melanophloia);
- thin-leaved stringybark (*E. eugenioides*); and
- white mahogany (*E. acmenoides*).

Koala habitat relevant to the Study area has been broadly defined as patches of vegetation where:

- species recognised as food trees occur; AND
- the height of the tallest stratum is greater than 5 m and is therefore defined as a 'Woodland or Forest' as per Specht, 1970 (Attachment 1 to the EPBC Act referral guidelines for the vulnerable koala); or
- the height of the tallest stratum is less than 5 m (ie the structure of a shrubland) AND contains emergent food or shelter trees greater than 5 m in height.

Based on information provided in the SPRAT database (DAWE 2021c), and referral guidelines (DotE 2014b), there are no specific definitions for foraging, breeding and dispersal habitat for the koala. It is likely that foraging and breeding habitats share the same characteristics.

Koala habitat scoring

Koala habitat was scored at each site (for added context and future use) using the habitat assessment tool in the EPBC Act Referral Guidelines for the Vulnerable Koala (DotE 2014) (Table 4-8). The habitat assessment tool is typically applied once to an entire impact area for a proposed action (DotE 2014). Impact areas that score five or more using the habitat assessment tool for the koala contain habitat critical to the survival of the koala.



| Attribute | Description | Score | |
|--------------|--|-------|--------|
| Koala | Evidence of one or more koalas within the last 5 years. | 2 | High |
| occurrence | Evidence of one or more koalas within 2 km of the edge of the | 1 | Medium |
| | impact area within the last 10 years | | |
| | None of the above | 0 | Low |
| Vegetation | Has forest, woodland or shrubland with emerging trees with 2 or | | |
| composition | more known koala food tree species, OR 1 food tree species that | 2 | High |
| | alone accounts for >50% of the vegetation in the relevant strata | | |
| | Has forest, woodland or shrubland with emerging trees with only 1 | 1 | Modium |
| | species of known koala food tree present | I | Medium |
| | None of the above | 0 | Low |
| Habitat | Area is part of a contiguous landscape ≥ 1000 ha | 2 | High |
| connectivity | Area is part of a contiguous landscape < 1000 ha, but ≥ 500 ha | 1 | Medium |
| | None of the above | 0 | Low |
| Key | Little or no evidence of koala mortality from vehicle strike or dog | | |
| existing | attack at present in areas that score 1 or 2 for koala occurrence. | 2 | High |
| inreals | Areas which score u for koala occurrence and have no dog or | | |
| | Venicie unear present | | |
| | er dog attack at present in areas that score 1 or 2 for koala | | |
| | occurrence OR Areas which score 0 for koala occurrence and are | 1 | Medium |
| | likely to have some degree dog or vehicle threat present | | |
| | Evidence of frequent or regular koala mortality from vehicle strike or | | |
| | dog attack in the study area at present. OR Areas which score 0 for | | |
| | koala occurrence and have a significant dog or vehicle threat | 0 | Low |
| | present. | | |
| Recoverv | Habitat is likely to be important for achieving the interim recovery | | |
| value | objectives for the relevant context | 2 | High |
| | Uncertain whether the habitat is important for achieving the interim | 1 | Medium |
| | recovery objectives for the relevant context | | Mcdium |
| | Habitat is unlikely to be important for achieving the interim recovery | 0 | Low |
| | objectives for the relevant context | | l |

Table 4-8 Koala habitat assessment tool (DotE 2014)

4.5.10 Opportunistic fauna observations

Any fauna species identified during the vegetation mapping, comprehensive fauna surveys and fauna habitat assessments, or whilst moving throughout the Study area, were recorded, along with signs of fauna occupation such as scats, bones, tracks, scratches and diggings.



4.5.11 EVNT fauna habitat mapping criteria

Potential habitat for species known or considered likely to occur within the Study area (Section 5.8.2) has been mapped based on the criteria presented in Table 4-9.

Table 4-9 Adopted habitat criteria for identifying potential habitat for fauna species known or likely to occur within the Study area

| Species | Habitat criteria |
|--|--|
| white-throated needletail (<i>Hirundapus caudacutus</i>) | All remnant and regrowth vegetation and non-remnant forest or woodland within the Study area. |
| powerful owl (<i>Ninox strenua</i>) | All remnant vegetation in the Study area, including vegetation consistent with RE 12.11.3, 12.11.3a, 12.11.3, 12.11.9, 12.11.14, 12.11.18,12.12.9, 12.11.11, 12.12.12, 12.12.23, 12.11.8, 12.12.8, 12.12.9, 12.3.7 and 12.12.3a. |
| greater glider (<i>Petauroides volans</i>) | All areas of remnant eucalypt-dominated habitats, including vegetation consistent with RE 12.11.3, 12.11.3a, 12.11.3, 12.11.9, 12.11.14, 12.11.18, 12.12.9, 12.12.12, 12.12.23, 12.11.8, 12.12.8, 12.3.7 and 12.12.3a. Regrowth of REs above that are within 100 m of remnant glider habitat. |
| brush-tailed rock-wallaby (<i>Petrogale penicillata</i>) | Refuge habitat are areas where suitable rocky microhabitat was observed during the surveys. Foraging habitat and dispersal habitat are areas of remnant and regrowth vegetation consistent with RE 12.11.3, 12.11.3a, 12.11.3, 12.11.9, 12.11.14, 12.11.18, 12.12.9, 12.11.11, 12.12.12, 12.12.23, 12.11.8, 12.12.8, 12.3.7 and 12.12.3a that are within 1 km of refuge habitat. |
| koala (Phascolarctos cinereus) | All areas of remnant, regrowth and non-remnant forest or woodland containing koala food trees, or shrubland with emergent food trees, including vegetation consistent with RE 12.11.3, 12.11.3a, 12.11.3, 12.11.9, 12.11.14, 12.11.18, 12.12.9, 12.12.12, 12.12.23, 12.11.8, 12.12.8, 12.12.9, 12.3.7 and 12.12.3a. |
| grey-headed flying-fox (<i>Pteropus poliocephalus</i>) | All remnant and regrowth vegetation and non-remnant forest or woodland within the Study area. |



5 ECOLOGICAL CHARACTERISTICS

5.1 Protected Areas

Protected areas of Queensland represent those areas protected for the conservation of natural and cultural values and those areas managed for production of land for public enjoyment, water sheds and productive resources, iconic geological and landscape values, and land of significance to traditional owners.

Four Protected Areas occur in proximity to the Study area including:

- Pine Cliffs Nature Reserve, located adjacent to the north-east boundary;
- Crows Nest National Park, located 500 m to the south of the Study area;
- Deongwar State Forest, directly to the east of the Study area; and
- Pechey State Forest, 5 km to the south of the Study area.

The locations of Protected Areas in proximity to the Study area are shown Figure 1-1.

5.2 Vegetation description

The Survey area constitutes a range of vegetation communities which vary with position in the landscape and, to a lesser degree, soils, previous management, and fire. Due to broadscale clearing, fire history or heavy logging (in the more timbered country at higher elevations), all vegetation within the Study area originates from regrowth and there are few trees that could be considered old growth. Recent fires (November 2019) have caused significant damage to many areas within the Study area, with some locations having experienced a complete loss of canopy.

At lower elevations, on both granite and metamorphic derived soils, the dominant vegetation is Queensland blue-gum (*Eucalyptus tereticornis*) and narrow-leaved ironbark (*E. crebra*) dominated woodland corresponding to RE 12.12.12 and 12.11.14. These ecosystems persist to the bottoms of the gullies, with brush box (*Lophostemon confertus*) dominating some areas. The communities range from sparse regrowth open woodland to sparse remnant woodland, some of which has experienced extensive damage to canopies, especially in the valley floors, from the November 2019 fires.

A riparian community dominated by Queensland blue-gum and river oak (*Casuarina cunninghamiana*) occurs on the minor alluvial creeks that have not been submerged by Cressbrook dam. These areas are in poor condition due to weed infestation and recent fire damage with the area on Cressbrook Creek immediately below the dam wall having lost most of the remaining canopy species in the fire.

Woodland dominated by silver-leaved ironbark (*Eucalyptus melanophloia*), representing RE 12.11.8 and 12.12.8, occurs in the lower elevations as small, infrequent, and interspersed patches. Generally, these communities are in good condition with little apparent damage from fires. At higher elevations, spotted gum (*Corymbia citriodora* subsp. *variegata*) on metamorphic rises dominates. This community represents RE 12.11.6 and is in average to good condition, with a largely intact canopy, despite experiencing high fire disturbance.

A considerable portion of the higher country is dominated by gum-topped box (*Eucalyptus moluccana*) open forest, representing RE 12.11.18. This community occurs on the plateau and ridges toward the northern end of the Study area. This vegetation is in good to excellent condition with little canopy damage from the fires, likely due to the overall height of the canopy. This community contains few old growth trees and appears to have been heavily logged in past years.



Other communities observed on the higher ground in the Study area includes RE 12.11.9, 12.11.3, 12.11.11 and 12.12.23.

RE 12.11.9 is dominated by Queensland blue-gum, grey gum (*E. biturbinata*) and/or small-fruited grey gum (*E. propinqua*). This community was extensively damaged by the recent fires and is in poor condition with the canopy destroyed in some locations. There is dense regrowth in areas where fire disturbance has been at its highest ,with a shrub canopy to 3 m consisting of canopy species and lower shrubs such as inkweed (*Phytolacca octandra**), sarsaparilla (*Smilax australis*), brush-box (*Lophostemon confertus*) regrowth, native peach (*Trema tomentosa*), flannel weed (*Abutilon oxycarpum*) and a range of other natives.

RE 12.11.3 is present as a narrow band adjoining Deongwar State Forest in the east of the Study area. This community is dominated by grey ironbark (*Eucalyptus siderophloia*), grey gum (*E. biturbinata*) and gum-topped box (*E. moluccana*) with a well-developed understory and shrub layer of rainforest species. While some large trees have fallen from the recent fire, this patch is in good condition with healthy old growth hollow-bearing trees present. It is likely the rainforest elements have moderated the effect of the fire in this community.

RE 12.11.11 is a patch of remnant microphyll vine-forest to the north-east of the Study area. The canopy is dominated by hoop pine (*Araucaria cunninghamii*), ribbonwood (*Euroschinus falcatus*), gum-topped box, lignum vitae (*Vitex lignum-vitae*) and grey ironbark, with a well-developed understory and shrub layer of rainforest species. This patch is in good condition with few obvious impacts from the recent fires, apart from the development of a dense shrub layer of *Solanum* species in response to fire and recent rains.

RE 12.12.23 is the dominant community on the granite rises to the north of the Study area and is dominated by small-fruited grey gum, brown bloodwood (*Corymbia trachyphloia*), brown stringy-bark (*E. acmenoides*) and Queensland blue-gum. This community has experienced extensive fire damage resulting in varying extents of canopy loss. Some areas are dominated by brush box in the canopy and most areas affected by the fire have vigorously regrown with brush box the dominant species in the dense shrub layer. This community ranges from fire degraded to good condition.

5.3 Regional Ecosystems

Most of the Study area has been mapped by the State as containing remnant/RE or High Value Regrowth (HVR) vegetation.

The State RE mapping identifies 819.7 ha of remnant vegetation and 469.4 ha of HVR within the Study area (Table 5-1). Vegetation boundaries were refined using the field survey findings, aerial imagery and State-mapped vegetation boundaries. The field-verified mapping identified 1,047.5 ha of remnant vegetation (REs) and 450.3 ha of regrowth vegetation within the Study area. Of the remnant vegetation, 493.8 ha is Of Concern and 553.7 ha is Least Concern RE under the VM Act (Table 5-1). Of the regrowth vegetation, 435.7 ha is Of Concern and 14.6 ha is Least Concern (Table 5-1). Table 5-2 provides the details and area of each of the State-mapped and field-verified REs within the Study area.



| Table 5-1 Remnant vege | etation mapped and field-ve | erified in the Study area |
|------------------------|-----------------------------|---------------------------|
| | | |

| | State-mapp | ed area (ha) | Field-verified area (ha) | | |
|---|---------------------|---------------------|--------------------------|---------------------|--|
| Vegetation Status ¹ | VM | BD | VM | BD | |
| | Status ² | Status ³ | Status ² | Status ³ | |
| Endangered RE | 0 | 0 | 0 | 0 | |
| Of Concern RE | 229.7 | 290.2 | 493.8 | 524.0 | |
| Least Concern/ Not of Concern RE | 590.0 | 479.3 | 553.7 | 523.5 | |
| HVR Endangered / regrowth Endangered | 0.2 | 0.2 | 0 | 0 | |
| HVR Of Concern/ regrowth Of Concern | 296.3 | 301.2 | 435.7 | 437.9 | |
| HVR Least Concern/ regrowth Least Concern | 172.9 | 168.0 | 14.7 | 12.3 | |
| Total remnant | 81 | 9.7 | 1047.5 | | |
| Total regrowth | 46 | 9.4 | 450.3 | | |
| Total non-remnant | 54 | 7.2 | 315.3 | | |
| Water | 45 | 3.8 | 47 | 6.9 | |
| Total⁴ | 229 | 90.1 | 2290.1 | | |

Notes:

^{1.} RE = Regional Ecosystem, HVR = High Value Regrowth;

^{2.} VM Status = Status under the Vegetation Management Act 1994;

^{3.} BD Status = Biodiversity status.

 $^{\rm 4}$ 0.1-0.2 error from rounding to one decimal place



| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|--|--|--|-----------------------------------|------------------------------|---------------------------------|--------------------------------|
| 12.3.2 🗸 | | OC | <i>Eucalyptus grandis</i> tall open forest on alluvial plains. | RE | 0 | 0 | Not observed during the survey | |
| | OC | | | HVR/ regrowth | 0.1 | 0 | | |
| 12.3.3 | \checkmark | E | E | <i>Eucalyptus tereticornis</i> woodland on Quaternary alluvium. | HVR/ regrowth | 0.2 | 0 | Not observed during the survey |
| 12.3.7 ✓ LC | | <i>Eucalyptus tereticornis, Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> +/- <i>Melaleuca</i> spp. fringing woodland. Benchmark canopy height: 16 m. Benchmark canopy cover: 30 %. | RE | 79.8 | 30.1 | Site Q34 | | |
| | OC | | HVR/ regrowth | 4.9 | 2.2 | | | |
| 12.11.1 × LC | Sim | Simple notophyll vine forest often with abundant | RE | 0 | 0 | | | |
| | LC | NC | forest) on metamorphics +/- interbedded volcanics. | HVR/ regrowth | 0.1 | 0 | Not observed during the survey | |
| 12.11.2 ✓ | | | | <i>Eucalyptus saligna</i> subsp. <i>saligna</i> or <i>E. grandis,</i> <i>E. microcorys, Lophostemon confertus</i> tall open forest on metamorphics +/- interbedded volcanics. | RE | 0.6 | 0 | Not observed during the survey |
| | , v | | NC | | HVR/ regrowth | 1.2 | 0 | |



| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|---------------------------|---------------------------|--|-----------------------------------|------------------------------|---------------------------------|--|
| 12.11.3 | V | LC | NC | Eucalyptus siderophloia, E. propinqua +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides open forest on metamorphics +/- interbedded volcanics. | RE | 2.3 | 9.0 | Site Q98 |
| | | | | | HVR/ regrowth | 1.7 | 0.8 | |
| 12.11.3a | V | LC | NC | Lophostemon confertus +/- Eucalyptus microcorys, E. carnea, E. propinqua, E. major, E. siderophloia woodland. Occurs in gullies and exposed ridges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics | RE | 23.5 | 23.5 | Not observed during the survey (land access not available) |
| 12.11.6 | ~ | LC | NC | <i>Corymbia citriodora</i> subsp. <i>variegata, Eucalyptus crebra</i> woodland on metamorphics +/- interbedded volcanics. Benchmark canopy height: 21 m. Benchmark canopy cover: 32 %. | RE | 246.1 | 112.2 | |
| | | | | | HVR/ regrowth | 41.7 | 0 | Site Q30 |


| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|---------------------------|---------------------------|---|-----------------------------------|------------------------------|---------------------------------|---------------------------|
| 12.11.8 | V | oc | oc | <i>Eucalyptus melanophloia, E. crebra</i> woodland on metamorphics +/- interbedded volcanics. Benchmark canopy height: 20 m. Benchmark canopy cover: 40 %. | RE | 18.2 | 28.7 | |
| | | | | | HVR/ regrowth | 11.6 | 15.7 | Site Q37 |
| 12.11.9 | ~ | oc | oc oc | <i>Eucalyptus tereticornis</i> subsp. <i>tereticornis or E.</i> <i>tereticornis</i> subsp. <i>basaltica</i> open forest on metamorphics +/- interbedded volcanics. Benchmark canopy height: 23 m. Benchmark canopy cover: 50 %. | RE | 0.8 | 95.1 | |
| | | | | | HVR/ regrowth | 1.6 | 3.4 | Site Q6 |
| 12.11.11 | ~ | LC | NC | <i>Araucarian microphyll</i> vine forest on metamorphics +/- interbedded volcanics; usually southern half of bioregion. | RE | 46.0 | 8.0 | Site Q95 |



| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|---------------------------|---------------------------|--|-----------------------------------|------------------------------|---------------------------------|--|
| 12.11.14 | | | ос | <i>Eucalyptus crebra, E. tereticornis, Corymbia intermedia</i> woodland on metamorphics +/- interbedded volcanics. Benchmark canopy height: 24 m. Benchmark canopy cover: 39 %. | RE | 61.4 | 186 | |
| | ~ | 0 | | | HVR/ regrowth | 16.1 | 43.1 | Site 038 |
| 12.11.18 ✓ | ~ | LC | NC | <i>Eucalyptus moluccana</i> woodland on metamorphics +/- interbedded volcanics. Benchmark canopy height: 25 m. Benchmark canopy cover: 47 %. | RE | 93.3 | 169.3 | |
| | | | | | HVR/ regrowth | 15.7 | 0 | Site Q25 |
| 12.12.2 × | | | | Fucalvotus pilularis tall open forest on Mesozoic | RE | 0.6 | 0 | |
| | × | LC | NC | to Proterozoic igneous rocks especially granite. | HVR/ regrowth | 0.3 | 0 | Not observed during the survey |
| 12.12.3a | x | LC | NC | Open forest complex with <i>Corymbia citriodora</i> subsp. <i>variegata, Eucalyptus siderophloia</i> or <i>E.</i> <i>crebra or E. decolor, E. major</i> and/or <i>E.</i> <i>longirostrata, E. acmenoides</i> or <i>E. portuensis</i> on Mesozoic to Proterozoic igneous rocks. | RE | 4.4 | 4.4 | Not observed during the survey (land access not available) |



| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|---------------------------|---------------------------|--|-----------------------------------|------------------------------|---------------------------------|---------------------------|
| 12.12.8 | x | 00 | ос | <i>Eucalyptus melanophloia</i> woodland on Mesozoic to Proterozoic igneous rocks. | RE | 0.1 | 1.4 | |
| | | OC | | | HVR/ regrowth | 51.8 | 6.1 | Site Q79 |
| 12.12.9 | x | oc | oc | <i>Eucalyptus dura</i> woodland usually on rocky peaks on Mesozoic to Proterozoic igneous rocks. | RE | 7.4 | 11.4 | Site S4 |



| RE/ regrowth | BM ¹ | VM Status ² | BD Status ³ | Description | Vegetation status ⁴ | State mapped area (ha) | Field- verified area (ha) | Representative photograph |
|-----------------|-----------------|---------------------------|---|---|-----------------------------------|------------------------------|---------------------------------|---------------------------|
| 12.12.12 | ¥ | | | <i>Eucalyptus tereticornis, Corymbia intermedia, E. crebra +/- Lophostemon suaveolens</i> woodland on Mesozoic to Proterozoic igneous rocks. Benchmark canopy height: 21 m. Benchmark canopy cover: 31 %. | RE | 141.8 | 171.2 | |
| | | OC | ос | | HVR/ regrowth | 215.1 | 367.5 | Site 54 |
| 12.12.23 | V | ✓ LC NC | Eucalyptus tereticornis subsp. tereticornis or E. tereticornis subsp. basaltica +/- E. eugenioides woodland to open forest on crests, upper slopes and elevated valleys and plains on Mesozoic to Proterozoic igneous rocks. Benchmark canopy height: 25 m. Benchmark canopy cover: 56 %. | RE | 93.3 | 197.1 | KAM | |
| | | | | and elevated valleys and plains on Mesozoic to Proterozoic igneous rocks. Benchmark canopy height: 25 m. Benchmark canopy cover: 56 %. | HVR/ regrowth | 107.3 | 11.6 | Site Q65 |
| | <u>I</u> | 1 | 1 | 1 | TOTAL | 1,289.1 | 1,497.9 | |

Notes:

^{1.} BM = Benchmarks; \checkmark = available; × = not available

² VM Status = Status under the Vegetation Management Act 1994; E = Endangered; OC = Of Concern; LC = Least Concern.

³ BD Status = Biodiversity status; E = Endangered; OC = Of Concern; NC = No Concern at Present.

⁴ RE = Regional Ecosystem, HVR = High Value Regrowth



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NED ECOLOGICAL COMMUNITIES Big T Pumped Hydropower Energy Storage

FIGURE 5-1







FIELD-VERIFIED REGIONAL ECOSYSTEMS Big T Pumped Hydropower Energy Storage

FIGURE 5-2



5.4 Threatened Ecological Communities

The desktop assessment identified the potential occurrence of six TECs listed as Endangered under the EPBC Act (Table 5-3 and Appendix A). Based on State RE mapping, the Lowland Rainforest of Subtropical Australia TEC had the potential to occur within a community mapped in the far south-eastern extent of the Study area where a small (0.1 ha) mosaic of RE 12.11.2/12.3.2/12.11.1 occurs (Figure 5-1). RE 12.11.1, which is predicted to comprise 5% of this mosaic community, is consistent with the description of the Lowland Rainforest of Subtropical Australia TEC. This patch was verified in the field to be RE 12.3.7 and RE 12.11.8, which is not consistent with the TEC description for this community.

The field survey did not detect any TECs within the Study area. However, there remains potential for TECs to occur in areas that were unable to be accessed due to land access constraints.

| Threatened Ecological | Status | REs consistent | Likelihood of occurrence within |
|--|--------------------------|---|---|
| Community | (EPBC Act) | with TEC description | the Study area |
| Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions | Endangered | 11.3.3, 11.3.15, 11.3.16, 11.3.27, 11.3.37 | Unlikely . Limited to the Darling Riverine Plains and Brigalow Belt South bioregions. No suitable REs mapped or likely to occur within the Study area. |
| Lowland Rainforest of Subtropical Australia | Critically Endangered | 12.3.1, 12.5.13, 12.8.3, 12.8.4, 12.11.1, 12.11.10, 12.12.1 and 12.12.16 | Potential . Whilst this TEC was not detected during the survey, there is potential for small pockets of this community to occur in areas that were unable to be accessed during the surveys. |
| Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland | Critically Endangered | 11.3.21, 11.3.24 | Unlikely . No suitable REs mapped or likely to occur within the Study area. |
| Poplar Box Grassy Woodland on Alluvial Plains | Endangered | 11.3.2, 11.3.17, 11.4.7, 11.4.12, 12.3.10 | Unlikely . No suitable REs mapped or likely to occur within the Study area. |
| Weeping Myall Woodlands | Endangered | This TEC may form elements of RE 11.3.2. | Unlikely . No suitable REs mapped or likely to occur within the Study area. |
| White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | 11.8.2a, 11.8.8, 11.9.9a, 13.3.1, 13.11.8, 13.12.8, 13.12.9, 11.3.23, 12.8.16 (at far western edge of bioregion), 13.3.4, 13.11.3, 13.11.4 | Unlikely . No suitable REs mapped or likely to occur within the Study area. |

Table 5-3 Threatened Ecological Communities identified from the desktop Search area



5.5 Connectivity

The SEQ Regional Plan 2017 (DSDMIP 2020) identifies a regional biodiversity corridor traversing the landscape north-south, intercepting the eastern extent of the Study area. Terrestrial State-wide biodiversity corridors of State and Regional Significance traverses the landscape north-south. These corridors are shown on Figure 5-3. The vegetation within the Study area forms an integral component of the wildlife corridors, forming part of substantial tracts of vegetation and contributing to connectivity across the broader region. Any subsequent proposal to develop a Project within this area would need to apply the Landscape Fragmentation and Connectivity Tool to quantify the impact to connectivity. This tool provides an assessment of the significance of an impact on connectivity with regard to core habitat pre and post impact. Once an impact area is known, the tool can be used to determine the significance of the impact on connectivity.

5.6 Flora species

5.6.1 EVNT flora

The preliminary Project area intercepts locations mapped by the State as a High Risk Area (HRA) for protected plants (Figure 5-4). Protected plant surveys were not undertaken due to access restrictions and will be undertaken at a later stage once the impact footprint has been developed and permission to access these areas has been attained, if necessary.

Searches of the EPBC Act Protected Matters database (DAWE 2021a), Queensland WildNet database (DES 2021a) and Atlas of Living Australia (ALA 2021) identified the potential occurrence of 30 EVNT flora species within the Search area (Appendix B). Based on the habitat available, and species records in proximity to the Study area, the following 19 EVNT flora species have potential to occur within the broader Study area:

- hairy-joint grass (Arthraxon hispidus) Vulnerable (EPBC Act and NC Act);
- three-leaved Bosistoa (Bosistoa transversa) Vulnerable (EPBC Act);
- stream clematis (*Clematis fawcettii*) Vulnerable (EPBC Act and NC Act);
- cockspur flower (Coleus torrenticola) Endangered (EPBC Act and NC Act);
- leafless tongue-orchid (Cryptostylis hunteriana) Vulnerable (EPBC Act);
- Helidon ironbark (*Eucalyptus taurina*) Endangered (NC Act);
- Grevillea quadricauda Vulnerable (EPBC Act and NC Act);
- tall velvet sea-berry (*Haloragis exalata* subsp. *velutina*) Vulnerable (EPBC Act and NC Act);
- Leionema obtusifolium Vulnerable (EPBC Act and NC Act);
- wandering pepper-cress (Lepidium peregrinum) Endangered (EPBC Act);
- macadamia nut (Macadamia integrifolia) Vulnerable (EPBC Act and NC Act);
- Nicotiana wuttkei Endangered (NC Act);
- Paspalidium grandispiculatum Vulnerable (EPBC Act and NC Act);
- Mt Berryman Phebalium (*Phebalium distans*) Critically Endangered (EPBC Act), Endangered (NC Act);
- Picris conyzoides Vulnerable (NC Act);
- Austral cornflower (*Rhaponticum australe*) Vulnerable (EPBC Act and NC Act);
- scrub turpentine (*Rhodamnia rubescens*) Critically Endangered (EPBC Act and NC Act);



- native guava (*Rhodomyrtus psidioides*) Critically Endangered (EPBC Act and NC Act); and
- blotched sarcochilus (Sarcochilus weinthalii) Vulnerable (EPBC Act), Endangered (NC Act).

Targeted searches for the above EVNT flora species were undertaken across the Survey area. None of these species were recorded during vegetation mapping of the Study area in February-March 2021, during fauna (and opportunistic flora) surveys of the Survey area in April and November 2021, nor during the targeted flora searches in December 2021. Conditions at the time of survey were well suited to the detection of target species (Section 4.5.6; Appendix B). Although there remains potential for these species to still occur within the Survey area, their likelihood of occurrence has been downgraded to unlikely. This is based on either a lack of preferred habitat in the Survey area and/or non-detection of species in preferred habitat despite targeted searches in conditions well suited to detection (Appendix B). However, due to inherent difficulty of detecting blotched sarchochilus (*Sarcochilus weinthalii*), there still remains a higher potential for this species to occur in the Survey area.

No EVNT flora species were detected during targeted searches of the Survey area nor the road corridor 2-4 December 2021 (Section 4.5.6).

The locations of historic EVNT records from desktop database searches are shown on Figure 5-4.





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WILDLIFE CORRIDORS RELEVANT TO THE STUDY AREA Big T Pumped Hydropower Energy Storage FIGURE 5-3

BYERS ROA Study area 10 km from the Study area —— Road - - Track - Waterway (stream order >=2) High Risk Area on the flora trigger map (DES 2021) Essential habitat (DNRME 2021a) Native vegetation (DNRME 2021b) Threatened flora species (ALA 2021) • Callitris baileyi Caustis blakei ○ Eucalyptus taurina • Leionema obtusifolium • Lepidium peregrinum • Nicotiana wuttkei • Paspalidium grandispiculatum Picris conyzoides Plectranthus torrenticola Sarcochilus weinthalii • Thesium australe 4km

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 THREATENED AND NEAR THREATENED FLORA SPECIES RECORDS

 Big T Pumped Hydropower Energy Storage





FIGURE 5-4



5.6.2 Special Least Concern species

Schedule 3A of the Nature Conservation (Wildlife Management) Regulation 2006 identifies Special Least Concern (SLC) species as those plants belonging to a number of genera, including from the more commonly observed Cycadacae and Orchidaceae families. SLC plants are not considered rare or threatened but are managed under the NC Act to protect the species from harvest and commercial trade. During the surveys, the following SLC flora species were recorded:

- hard fern (*Blechnum* sp.);
- Kurrajong (Brachychiton populneus);
- grey grasstree (Xanthorrhoea glauca subsp. glauca);
- Johnson's grass tree (Xanthorrhoea johnsonii);
- Sarchochilus sp.;
- brown butterfly orchid (Sarcochilus dilatatus); and
- hyacinth orchid (*Dipodium* sp.).

5.6.3 Least Concern species

A total of 272 Least Concern and Special Least Concern flora species, from 69 plant families, were recorded during the February-March, April and December 2021 surveys combined (Appendix C).

5.6.4 Invasive species

The desktop assessment identified the potential occurrence of 29 invasive plant species that are identified as a Category 3 Restricted Matter species listed under the Queensland *Biosecurity Act 2014* and/or identified as a Weed of National Significance (WoNS).

A total of 40 introduced plant species were recorded during the field surveys in February-March 2021, April 2021 and December 2021 (Appendix C), of which two are a Restricted Matter species and four are both a Restricted Matter species and a WoNS (Table 5-4).

Category 3 restricted matter weeds must not be distributed; meaning that they must not be given as a gift, sold, traded or released into the environment unless the distribution or disposal is authorised under a regulation or permit. However, unlike category 1 and 2 prohibited matter species, there is no requirement to notify Biosecurity Queensland of their occurrence.

Table 5-4 Restricted pest plants and Weeds of National Significance identified during the desktop and/or recorded from the Study area

| Scientific name | Common name | QId Bio Act ¹ | National status ² | Identified within 10 km | ldentified during survey |
|--------------------------|------------------------------|-----------------------------|---------------------------------|-------------------------------|--------------------------------|
| Acacia nilotica | Prickly acacia | 3 | WoNS | ✓ | × |
| Anredera cordifolia | Madeira Vine | 3 | WoNS | ✓ | x |
| Asparagus africanus | Ornamental asparagus | 3 | - | ~ | × |
| Asparagus asparagoides | Bridal creeper | 5 | WoNS | ~ | × |
| Baccharis halimifolia | Groundsel bush | 3 | - | ✓ | √ |
| Bryophyllum x houghtonii | Mother of millions hybrid | 3 | - | ~ | × |
| Celtis sinensis | Chinese elm | 3 | - | ~ | × |



| Scientific name | Common name | QId Bio Act ¹ | National status ² | Identified within 10 km | Identified during survey |
|--------------------------------|---------------------------|-----------------------------|---------------------------------|-------------------------------|--------------------------------|
| Chrysanthemoides monilifera | Bitou bush | 3 | WoNS | ~ | × |
| Cinnamomum camphora | Camphor laurel | 3 | - | ✓ | × |
| Cryptostegia grandiflora | Rubber vine | 3 | WoNS | ✓ | × |
| Dolichandra unguis-cati | Cat's claw vine | 3 | WoNS | ✓ | ✓ |
| Gleditsia triacanthos | Honey locust | 3 | - | ✓ | × |
| Lantana camara | Lantana | 3 | WoNS | ✓ | ✓ |
| Lantana montevidensis | Creeping lantana | 3 | WoNS | ✓ | ✓ |
| Ligustrum lucidum | Large-leaved privet | 3 | - | ✓ | ✓ |
| Ligustrum sinense | Small-leaved privet | | - | ✓ | × |
| Opuntia stricta | Common pest pear | 3 | WoNS | ✓ | × |
| Opuntia tomentosa | Velvety tree pear | 3 | WoNS | ✓ | ✓ |
| Parthenium hysterophorus | Parthenium | 3 | WoNS | ~ | × |
| Prosopis spp. | Mesquite | 3 | WoNS | ✓ | × |
| Rubus anglocandicans | Blackberry | 3 | - | ✓ | × |
| Rubus fruticosus | Blackberry | 3 | WoNS | ✓ | × |
| Sagittaria platyphylla | Delta arrowhead | 3 | WoNS | ✓ | × |
| Salix spp. | Willows | 3 | WoNS | ✓ | × |
| Salvinia molesta | Salvinia | 3 | WoNS | ✓ | × |
| Senecio madagascariensis | Fireweed | 3 | WoNS | ~ | × |
| Solanum elaeagnifolium | Silver nightshade | 3 | WoNS | ✓ | x |
| Sporobolus fertilis | Giant Parramatta grass | 3 | - | ✓ | × |
| Sporobolus pyramidalis | Giant rat's tail grass | 3 | - | ✓ | × |

Notes:

¹ Restricted species under the *Queensland Biosecurity Act 2014* (Qld Bio Act);

² Species listed as a Weed of National Significance (Weeds Australia 2020).



5.7 Fauna habitat types

Eucalypt woodlands to open forests

The Study area is dominated by eucalypt woodlands to open forests, which account for approximately 1,402.2 ha (or 61.2%) of the Study area (Figure 5-5). REs constituting this habitat type within the Study area include:

- 12.11.3 Northern grey ironbark (*Eucalyptus siderophloia*), grey gum (*E. propinqua*) +/tallowwood (*E. microcorys*), brush box (*Lophostemon confertus*), pink bloodwood (*Corymbia intermedia*), white mahogany (*E. acmenoides*) open forest on metamorphics +/- interbedded volcanics;
- 12.11.3a Brush box (Lophostemon confertus) +/- tallowwood (Eucalyptus microcorys), broad-leaved white mahogany (E. carnea), grey gum (E. propinqua), grey gum (E. major), northern grey ironbark (E. siderophloia) woodland in gullies and exposed ridges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics;
- 12.11.6 Spotted gum (*Corymbia citriodora* subsp. *variegata*), narrow-leaved ironbark (*Eucalyptus crebra*) woodland on metamorphics +/- interbedded volcanics;
- 12.11.9 Forest red gum (*Eucalyptus tereticornis* subsp. *tereticornis* or *E. tereticornis* subsp. *basaltica*) open forest on metamorphics +/- interbedded volcanics, usually at higher altitudes;
- 12.11.14 Narrow-leaved ironbark (*Eucalyptus crebra*), forest red gum (*E. tereticornis*), pink bloodwood (*Corymbia intermedia*) woodland on metamorphics +/- interbedded volcanics;
- 12.11.18 Gum-topped box (*Eucalyptus moluccana*) woodland on metamorphics +/interbedded volcanics;
- 12.12.9 Gum-topped ironbark (*Eucalyptus dura*) woodland usually on rocky peaks on Mesozoic to Proterozoic igneous rocks;
- 12.12.12 Forest red gum (*Eucalyptus tereticornis*), pink bloodwood (*Corymbia intermedia*), narrow-leaved ironbark (*E. crebra*) +/- brush box (*Lophostemon suaveolens*) woodland on Mesozoic to Proterozoic igneous rocks; and
- 12.12.23 Forest red gum (*Eucalyptus tereticornis* subsp. *tereticornis* or *E. tereticornis* subsp. *basaltica*) +/- *E. eugenioides* woodland to open forest on crests, upper slopes and elevated valleys and plains on Mesozoic to Proterozoic igneous rocks.

These woodlands and open forests provide valuable habitat for a diversity of terrestrial fauna and include shelter/cover in the form of small, medium and occasional large hollows, small and large logs, leaf litter, ground and arboreal termite mounds, and shrub and grass shelter of varying densities. Food potential within these woodland and open forests includes seeding grass cover, nectar/pollen producing plants, fleshy fruiting plants, and koala feed tree species such as forest red gum (*Eucalyptus tereticornis*), grey gum (*E. biturbinata*), gum-topped box (*E. moluccana*), narrow-leaved ironbark (*E. crebra*), silver-leaved ironbark (*E. melanophloia*) and thin-leaved stringybark (*E. eugenioides*). Much of this habitat was affected by bushfires in November 2019. Evidence of fire indicates varying intensities across the Study area, including many areas subjected to high fire intensity. The shrub layer often contained regrowth of canopy species. Vegetative growth on hillslopes and ridges was typically sparser than in the moister depressions, where inkweed (*Phytolacca octandra**), *Desmodium* spp., regrowth brush box (*Lophostemon confertus*) and other pioneer species proliferated.





Plate 1 Eucalypt dry woodlands (RE 12.11.18) recorded at Site Q16, 25 February 2021



Eucalypt dry woodlands on footslopes of hills and ranges

Eucalypt dry woodlands on footslopes of hills and ranges occur in isolated parts of the Study area where silver-leaved ironbark dominates. These woodlands account for approximately 52 ha (or 2.3%) of the Study area (Figure 5-5). REs constituting this habitat type within the Study area include:

- 12.11.8 Silver-leaved ironbark (*Eucalyptus melanophloia*), narrow-leaved ironbark (*E. crebra*) woodland on metamorphics +/- interbedded volcanic; and
- 12.12.8 Silver-leaved ironbark (*Eucalyptus melanophloia*) woodland on Mesozoic to Proterozoic igneous rock.

These eucalypt dry woodlands typically provide good fauna habitat value, are generally less weedy than the eucalypt woodlands to open forests, and provide a variety of shelter/cover, including small hollows, leaf litter, as well as shrub and grass shelter of varying densities. Food potential within these woodlands include seeding grass cover, nectar/pollen producing plants, fleshy fruiting plants, and koala feed tree species including silver-leaved ironbark (*E. melanophloia*), narrow-leaved ironbark (*E. crebra*) and occasional forest red gum (*E. tereticornis*) and thin-leaved stringybark (*E. eugenioides*).



Plate 2 Woodland to eucalypt open forest on footslopes of hills and ranges (RE 12.11.8) recorded at Site Q41, 1 March 2021



Eucalypt open forests to woodlands on floodplains

Eucalypt open forests to woodland on floodplains are located within the riparian corridor of Cressbrook Creek, Little Oaky Creek and minor tributaries of Lake Cressbrook, and make up approximately 31.2 ha (or 1.4%) of the Study area (Figure 5-5). This habitat type is represented in the Study area by:

 12.3.7 – Forest red gum (*Eucalyptus tereticornis*), river oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) +/- tea-trees (*Melaleuca* spp.) fringing woodland.

These open forests to woodlands are typically weedy within the Study area, but provide good fauna habitat value, providing corridors for movement as well as a variety of shelter / cover, including small, medium and large hollows for a diversity of birds and arboreal mammals, logs and leaf litter providing refuge for amphibians, reptiles and ground-dwelling fauna, as well as shrub and grass shelter. Food potential within these open forests and woodlands typically includes seeding grasses, nectar/pollen producing plants, fleshy fruiting plants and koala food trees including forest red gum (*E. tereticornis*), and occasional thin-leaved stringybark (*E. eugenioides*) and silver-leaved ironbark (*E. melanophloia*).



Plate 3 Eucalypt open forests to woodlands on floodplains (RE 12.3.7) recorded at Site Q87, 5 March 2021



Rainforests and scrubs

Rainforests and scrubs are mapped by the State as occurring in the north-eastern corner of the Study area (Figure 5-5). This habitat was confirmed present within the Study area during the April 2021 survey. This habitat type constitutes approximately 8 ha (or 0.4%) of the Study area and is represented by:

12.11.11 – Araucarian microphyll vine forest on metamorphics +/- interbedded volcanics, usually in the southern half of the bioregion.

The canopy is dominated by *Araucaria cunninghamii* (hoop pine), *Euroschinus falcatus* (Ribbonwood), gum-topped box, *Vitex lignum-vitae* (lignum vitae) and grey ironbark with a welldeveloped understory and shrub layer of rainforest species. This community would provide refuge opportunities, including shelter from leaf litter and logs and cover from a denser midstorey. Food potential includes nectar/pollen producing plants and fleshy fruiting plants, with some koala feed trees present in the canopy.



Plate 4 Rainforests and scrubs (RE 12.11.11) recorded at Site FA6, 14 April 2021



Wet eucalypt forest

Wet eucalypt forests are mapped by the State as occurring in the northern section of the Study area (Figure 5-5). This habitat type constitutes approximately 4.4 ha (or 0.2 %) of the Study area and is represented by State-mapped:

 12.12.3a – Brush box (*Lophostemon confertus*) open forest in moister gullies on Mesozoic to Proterozoic igneous rocks.

It is understood that access to this habitat type is unlikely to be attained and that this area is unlikely to form part of the subsequent Project.

Lake Cressbrook

In addition to its human uses, Lake Cressbrook provides refuge and permanent habitat for aquatic and semi-aquatic fauna and constitutes an important drought and dry season water source for a diversity of terrestrial fauna species in the broader area. Whilst the water levels within the lake fluctuate seasonally, the field-verified mapping (based on 2017 imagery) identifies 476.9 ha (or 20.8 %) of water associated with the lake within the Study area.



Plate 5 Lake Cressbrook, 5 March 2021



Waterways (watercourses and drainage features)

Waterways are located throughout the Study area, within areas of remnant vegetation or areas of cleared land (Figure 5-8). Most of these waterways are smaller first, second or third order drainage features that are expected to be highly ephemeral, flowing for relatively short duration following intense or sustained rainfall in their catchments. Isolated natural pools occur in various locations where bedrock or clay-rich substrates hold water for longer periods. Several small, constructed dams also occur throughout the Study area, reminiscent of past agricultural grazing enterprises. These natural pools and dams form an important water source and habitat feature for a diversity of fauna, including birds, frogs, water rat (*Hydromys chrysogaster*) and whiptail wallaby (*Macropus parryi*) opportunistically observed.





Small dam, 26 February 2021Natural pool, 1 March 2021Plate 6 Pooled water on drainage features of the Study area, February-March 2021



Cleared Grasslands

Land cleared of native vegetation within the Study area includes agricultural grasslands and areas cleared for infrastructure, dwellings, yards, outdoor recreation, and other uses. This includes the periphery of Lake Cressbrook, where fluctuating water levels, and in some places mowing, inhibits the regeneration of native woodland, but where grasses, forbs, sedges and rushes still provide useful cover and forage for a diversity of animals.

Agricultural grasslands of the Study area include a mix of both native and introduced species, including black speargrass (*Heteropogon contortus*) and red Natal grass (*Melinis repens**), which were prevalent throughout agricultural grasslands observed from Sebastapool Road.



Plate 7 Agricultural grassland dominated by black speargrass (*Heteropogon contortus*) and red Natal grass (*Melinis repens*), 3 March 2021





FIELD-VERIFIED FAUNA HABITAT TYPES WITHIN THE STUDY AREA Big T Pumped Hydropower Energy Storage FIGURE 5-5



5.8 Fauna species

A total of 208 terrestrial fauna species (including ten introduced) were recorded from the Study area during the February-March, April, November and December 2021 surveys. This includes observations of the koala (listed as Vulnerable under the EPBC Act and NC Act), brush-tailed rock-wallaby (listed as Vulnerable under the EBPC Act and NC Act), powerful owl (listed as Vulnerable under the NC Act), and white-throated needletail (listed as Vulnerable under the EPBC Act and NC Act), and evidence (scats) of the southern greater glider (listed as Vulnerable under the EBPC Act and Endangered under the NC Act). A list of all fauna species recorded during the surveys is provided in Appendix C.

Amphibians

Eight native Least Concern amphibians and one exotic amphibian were recorded during the survey.

Birds

Two Vulnerable, five Special Least Concern and 119 Least Concern native bird species were recorded from the Survey area. White-throated needletail (listed as Vulnerable under both the EPBC Act and NC Act) and powerful owl (listed as Vulnerable under the NC Act) were recorded during comprehensive seasonal surveys. The majority of birds recorded are common species, mostly associated with eucalypt woodland habitats. Frequently recorded birds included noisy friarbird (*Philemon corniculatus*), little friarbird (*P. citreogularis*), weebill (*Smicrornis brevirostris*), willie wagtail (*Rhipidura leucophrys*), Torresian crow (*Corvus orru*), black-faced cuckoo-shrike (*Coracina novaehollandiae*), Lewin's honeyeater (*Meliphaga lewinii*), white-throated gerygone (*Gerygone olivacea*), pied butcherbird (*Cracticus nigrogularis*) and spotted pardalote (*Pardalotus punctatus*).

Mammals

A total of 61 species of mammal were recorded from the Study area, including one species listed as Vulnerable under the EBPC Act and Endangered under the NC Act (southern greater glider), two species listed as Vulnerable under the EBPC Act and NC Act (koala and brush-tailed rockwallaby), one Special Least Concern species and 48 Least Concern native species and nine introduced species.

Terrestrial reptiles

Twelve native Least Concern reptile species were recorded during the surveys, including three snakes, seven lizards and two monitors.

Aquatic fauna

GHD conducted a survey of aquatic fauna within, upstream and downstream of Lake Cressbrook presumably in 2020 (survey dates not provided in the report) (GHD 2020). Eleven species of fish, two species of turtle and three species of freshwater crayfish were identified from five sites within the lake. This comprised Agassiz's glassfish (*Ambassis agassizii*), barred grunter (*Amniataba percoides*), snubnose garfish (*Arrhamphus sclerolepis*), flyspecked hardyhead (*Craterocephalus stercusmuscarum*), eastern mosquitofish (*Gambusia holbrooki*)*, gudgeon (*Hypseleotris* sp.), golden perch (*Macquaria ambigua*), Australian bass (*Macquaria novemaculata*), bony bream (*Nematalosa erebi*), Australian smelt (*Retropinna semoni*), eel-tailed catfish (*Tandanus tandanus*), broad-shelled river turtle (*Chelodina expansa*), Brisbane short-necked turtle (*Emydura*)



macquarii signata), orange-fingered yabby (*Cherax depressus*), redclaw (*C. quadricarinatus*) and another freshwater crayfish species (*Cherax* sp.) (GHD 2020).

In addition to the species detected by GHD (2020), the Endangered (EPBC Act) Mary River cod (*Maccullochella mariensis*) and Critically Endangered (EPBC Act) silver perch (*Bidyanus*) *bidyanus*) are stocked in Lake Cressbrook by the Toowoomba and District Fish Stocking Association (DAF 2021), comprising populations outside of their natural distributions.

5.8.1 EVNT fauna

A total of 51 EVNT fauna species were identified from the desktop Search area (Section 4.3; Appendix B). Twenty-two of these species are either known, likely or have potential to occur in the Study area based on consideration of their preferred habitats (Appendix B). Eight of these 22 species are either known or considered likely to occur within the Survey area. The remaining 14 species may occur within the broader Study area but are unlikely to occur within the Survey area (including the Project area). This is based on either a lack of preferred habitat in the Survey area and/or non-detection of species in preferred habitat of the Survey area despite comprehensive and targeted searches following the guideline survey effort (Sections 4.5.7 and 4.5.8; Appendix B).

Five EVNT fauna species were recorded from the Survey area by DPM Envirosciences during seasonal fauna surveys in 2021, comprising:

- koala (*Phascolarctos cinereus*) Vulnerable (EPBC Act and NC Act);
- greater glider (*Petauroides volans*) Vulnerable (EPBC Act) and Endangered (NC Act);
- brush-tailed rock-wallaby (*Petrogale penicillata*) Vulnerable (EPBC Act and NC Act);
- powerful owl (Ninox strenua) Vulnerable (NC Act); and
- white-throated needletail (*Hirundapus caudacutus*) Vulnerable (EPBC Act and NC Act).

In addition, the grey-headed flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under the EPBC Act, is likely to utilise the Survey area on occasion (during mass flowering events), despite not being detected during the seasonal surveys.

The Endangered (EPBC Act) Mary River cod (*Maccullochella mariensis*) and Critically Endangered (EPBC Act) silver perch (*Bidyanus bidyanus*) are stocked in Lake Cressbrook by the Toowoomba and District Fish Stocking Association (DAF 2021), representing artificially sustained (completely reliant on stocking) populations outside of their natural distributions.

Koala (Phascolarctos cinereus) - Vulnerable (EPBC Act and NC Act)

A total of 42 koala records (including potential double-ups) were attained for the Study area from 36 locations during spring and autumn 2021 surveys. Most individuals were recorded in either Queensland blue gum (*E. tereticornis*) or narrow-leaved ironbark (*E. crebra*) (Figure 5-5, Plate 4). Two individuals were recorded on camera traps whilst moving along the ground. Koala scats and/or scratches were detected at 100 sites across the Study area. Scats and/or scratches were detected at the base of Queensland blue gum, grey gum (*E. biturbinata*), narrow-leaved ironbark, silver-leaved ironbark (*E. melanophloia*), gum-topped ironbark (*E. dura*), grey box (*E. moluccana*) and thin-leaved stringybark (*E. eugenioides*). Evidence of koalas was recorded from across the (accessible) Study area. Fewer records were made in the gullies/depressions; however, this more likely reflects the difficulty in detecting scratches and scats in the difficult terrain and areas of dense groundcover.





Mother and joey in E. tereticornis, 2 March 2021



Young koala in E. tereticornis, 3 March 2021



Koala in *E. tereticornis*, 5 March 2021



Koala in E. crebra, 3 March 2021



Mature female in E. tereticornis, 3 March 2021



Koala observed during spotlighting survey, April 2021

Plate 8 Koalas recorded from the Study area, February-March and April

Within the Study area it was determined that koala habitat includes all areas of remnant, regrowth and non-remnant woodland with known koala food trees and includes all eucalypt woodlands to open forests, eucalypt dry woodlands on footslopes of hills and ranges, eucalypt open forests to woodlands on floodplains, and likely also includes wet eucalypt forests (unable to be accessed). (Figure 5-5 and Figure 5-17). A total of 1,496.0 ha of potential koala habitat has been mapped within the Study area. Patches of cleared land and forest or woodland vegetation without known koala food trees were not mapped as koala habitat.

Koala habitat was scored at each site (for added context and future use) using the habitat assessment tool in the EPBC Act Referral Guidelines for the Vulnerable Koala (DotE 2014). The habitat assessment tool is applied once to an entire impact area for a proposed action (DotE 2014). Impact areas that score five or more using the habitat assessment tool for the koala are considered to contain habitat critical to the survival of the koala. All sites scored five or more, with most sites scoring the full 10. Consequently, koala habitat across the broader Study area meets the definition of critical koala habitat within the EPBC Act Referral Guidelines for the Vulnerable Koala (DotE 2014).



Brush-tailed rock-wallaby (Petrogale penicillata) – Vulnerable (EPBC Act and NC Act)

The brush-tailed rock-wallaby has been recorded previously from the Study Area by GHD for a project commissioned by Toowoomba Regional Council (GHD 2020). GHD recorded two individuals along the rocky escarpment to the south of the Study area near Cressbrook Dam spillway (Figure 4-2). Several records of this species are identified in the Atlas of Living Australia database (ALA 2021) by the Department of National Parks, Sport and Racing, mostly in habitat associated with Crows Nest National Park.

Two brush-tailed rock-wallabies were observed from the same rocky outcrop and were recorded from two camera traps (C3 and C8, Figure 4-2) during the April 2021 survey.

Brush-tailed rock-wallaby habitat includes refuge habitat, feeding habitat (foraging) and routes in between (dispersal) (Menkhorst and Hynes 2010). Refuge habitat is typically on steep rocky slopes that provide rock faces, tumbled boulders, ledges, caves, loose piles of rocks, overhangs, and rock stacks. Refuge habitat may be small (only 100 m²) or extend for hundreds of metres along cliff lines (Menkhorst and Hynes 2010). Foraging habitat includes any forest or woodland with a grassy understorey. Brush-tailed rock-wallaby habitat within the Study area has been mapped in accordance with the criteria in Table 4-9 (Section 4.5.11). Approximately 2.5 ha of potential refuge habitat has been mapped in the Study area, where rocky outcrops were observed near the spillway and further upstream along Cressbrook Creek (Figure 5-20). This habitat is likely to provide important shelter and basking opportunities for this species, given its limited occurrence in the broader Study area. Within the Study area, approximately 141.7 ha of potential foraging and dispersal habitat has been identified within 1 km of refuge habitat.





Brush-tailed rock-wallaby near Cressbrook Dam spillway, 13 April 2021



Brush-tailed rock-wallaby refuge habitat near Cressbrook Dam spillway, 24 April 2021



Brush-tailed rock-wallaby refuge habitat near Cressbrook Dam spillway, 24 April 2021

Plate 9 Brush-tailed rock-wallaby recorded from the Study area, April 2021



Southern greater glider (*Petauroides volans*) – Vulnerable (EPBC Act), Endangered (NC Act)

On five occasions, greater glider scats were observed whilst undertaking targeted scat and signs searches during the seasonal surveys. All five instances were located in the north-east of the Survey area (Figure 5-18). The Atlas of Living Australia database (ALA 2020) records this species in protected areas in proximity to the Study area (Crows Nest National Park, Rocky Creek Nature Reserve and Ravensbourne National Park).

The southern greater glider is restricted to eucalypt woodlands with relatively old trees and an abundance of hollows (TSSC 2016). The greater glider is particularly sensitive to vegetation clearing and fragmentation, and has a low dispersal ability across vegetation that is not native forest (TSSC 2016). Therefore, only remnant eucalypt forest or woodland within the Study area has been mapped as potential habitat for this species (Figure 5-18). There is approximately 1,198.6 ha of potential habitat for this species within the Study area.



Glider scats observed under an ironbark, 21 April 2021



Glider scats observed under an ironbark, 21 April 2021



Greater glider habitat, where scats were observed under an ironbark, 21 April 2021



Greater glider habitat, where scats were observed under an ironbark, 21 April 2021

Plate 10 Evidence of greater glider occurrence within the Study area, April 2021



Powerful owl (Ninox strenua) - Vulnerable (NC Act)

The powerful owl inhabits a range of habitat types but requires large deep hollows in old eucalypts for nesting (OEH 2017). The powerful owl requires habitat that provides nesting and foraging opportunities and can inhabit a large territory. Therefore, all remnant habitat within the Study area has been mapped as potential habitat for this species, totalling approximately 1,047.5 ha (Figure 5-22).

The powerful owl was recorded on the edge of the Survey area whilst conducting call-playback and spotlighting during the April 2021 fauna surveys, and within the Survey area during the November 2021 surveys (Plate 11) (Figure 5-22). On each occasion, the species was recorded within remnant eucalypt forest in the north-east of the Survey area. The Atlas of Living Australia database (ALA 2021) has recorded this species in nearby Deongwar State Forest and in proximity to Crows Nest National Park (Figure 5-22).



Powerful owl, 21 April 2021



Powerful owl, April 2021

Plate 11 Powerful owl recorded from the Study area, April 2021

White-throated needletail (Hirundapus caudacutus) - Vulnerable (EPBC Act and NC Act).

The white-throated needletail is a migratory bird that spends its non-breeding season in Australasia, mainly in Australia. They arrive in Australia September to November and leave in April (DAWE 2021c). Records of this species are widespread, across most types of habitats, in all coastal regions of Queensland and New South Wales and extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains.

The species is almost exclusively aerial but when not in flight, it roosts in trees in forests and woodlands, among dense foliage in the canopy or in hollows (DAWE 2021c). In November 2021, white-throated needletail was recorded from the rainforest habitat in the north-east of the Study area (Figure 5-7) and there are several other records for this species in proximity to the Study area (ALA 2021). All remnant, regrowth and non-remnant woodand habitats within the Study area considered suitable for this species, totalling 1,504.1 ha (Figure 5-21).

Grey-headed flying-fox (Pteropus poliocephalus) – Vulnerable (EPBC Act)

The grey-headed flying-fox is a canopy-feeding frugivore and nectarivore, utilising vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (DAWE 2021d). The primary food source is blossom from *Eucalyptus* and related genera, but in some area utilises a wide range of rainforest fruits (Eby 1998, cited in DAWE 2021d). None of the vegetation communities used by the grey-headed flying-fox produce continuous foraging resources throughout the year. Consequently, the species has adopted complex migration traits in response to ephemeral and patchy food resources (DAWE 2021c).



The National Flying-fox Monitoring Viewer (DAWE 2021e) indicates the nearest known greyheaded flying-fox camp being at Esk, approximately 18 km east of the Study area. Grey-headed flying-fox numbers in this camp were in the order of 16,000-49,999 (i.e. category 5) in 2012, and in the order of 500-2,499 (i.e. category 2) in 2020 (DAWE 2021e). The nearest known 'Nationally Important Flying-fox Camp' is at Lake Atkinson, approximately 30 km south-east of the Study area. Grey-headed flying-fox numbers in this camp were in the order of 16,000-49,999 (i.e. category 5) in 2018, then again in 2019 (DAWE 2021e).

No grey-headed flying-fox camps have been detected/recorded within the Study area, although grey-headed flying-foxes from the abovementioned camps may utilise foraging resources of the Study area on occasion. Furthermore, there may be grey-headed flying-fox camps closer to the Study area, for example within the less-accessible Deongwar State Forest, that have not yet been detected and/or that have not been incorporated into the DAWE (2021e) National Flying-fox Monitoring Viewer.

Potential foraging habitat for the grey-headed flying-fox within the Study area includes all areas of remnant, regrowth and non-remnant forest or woodland, totalling approximately 1,504.1 ha (Figure 5-19).

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DPM



THREATENED AND NEAR THREATENED FAUNA SPECIES RECORDS Big T Pumped Hydropower Energy Storage **FIGURE 5-6**



5.8.2 EVNT fauna potential habitat

Potential habitat for EVNT fauna species that are known or identified as likely to occur within the Study area was determined based on habitat criteria in Table 4-9 (Section 4.5.11).

| Table 5-5 Potential hab | oitat areas (hecta | res) of E | VNT fauna ki | nown or likely | to occur in the |
|-------------------------|--------------------|-----------|--------------|----------------|-----------------|
| Study area | | | | | |
| | 1 | 1 | 1 | 1 | |

| | EPBC Act | NC Act | | | |
|---|---------------------|---------------------|-------------------------------|------------------|--|
| Species | Status ¹ | Status ¹ | Area (ha) | Figure reference | |
| Koala (Phascolarctos cinereus) | V | V | 1,496.0 | Figure 5-17 | |
| Greater glider (<i>Petauroid</i> es _ <i>volans</i>) | V | E | 1198.6 | Figure 5-18 | |
| Grey-headed flying-fox (<i>Pteropus poliocephalus</i>) | V | - | 1,504.1 | Figure 5-19 | |
| | | | Refuge: 2.5 | | |
| (Petrogale penicillata) | V | V | Foraging and dispersal: 141.7 | Figure 5-20 | |
| White-throated needletail (<i>Hirundapus caudacutus</i>) | V | - | 1,504.1 | Figure 5-21 | |
| Powerful owl (Ninox strenua) | - | V | 1047.5 | Figure 5-22 | |

Notes:

V = Vulnerable; EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act); NC Act = Queensland *Nature Conservation Act* 1992.

5.8.3 Migratory and Special Least Concern species

Searches of the EPBC Act Protected Matters database (DAWE 2021a), Queensland WildNet database (DES 2021a) and Atlas of Living Australia (ALA 2021) identified the potential occurrence of 20 migratory species within Search areas extending 10-50 km from the Study area (Appendix A). Of these, six species were recorded from the Survey area by DPM Envirosciences during seasonal surveys in 2021, namely:

- white-throated needletail (*Hirundapus caudacutus*);
- spectacled monarch (Monarcha trivirgatus);
- satin flycatcher (*Myiagra cyanoleuca*);
- black-faced monarch (Monarcha melanopsis);
- eastern osprey (Pandion cristatus); and
- rufous fantail (*Rhipidura rufifrons*).

There is potential for a further four migratory species listed under the EPBC Act to utilise the Study area on occasion (Appendix B), comprising:

- sharp-tailed sandpiper (Calidris acuminata);
- red-necked stint (Calidris ruficollis);
- Latham's snipe (*Gallinago hardwickii*); and
- marsh sandpiper (*Tringa stagnatilis*).

Special Least Concern (SLC) species are protected under the NC Act for their cultural significance or their listing under international migratory bird agreements, and include:



- echidna (Tachyglossus aculeatus);
- platypus (Ornithorhynchus anatinus); and
- migratory bird species listed under the:
 - Japan Australia Migratory Bird Agreement (JAMBA);
 - China Australia Migratory Bird Agreement (CAMBA); and the
 - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Six migratory bird species were recorded from the Survey area during seasonal fauna surveys in 2021 (Figure 5-7). The Survey area may also support another four migratory bird species on occasion. The echidna was recorded on a camera trap approximately 100 m north of FA8 in the spring survey and scats were recorded on Lot 10 RP RP223812 near S4 (Figure 5-7). Parts of the broader Study area (but not the Survey area) may support platypus. Platypus has been recorded from within 10 km of the Study area, including within Crows Nest National Park and in the vicinity of Lake Perseverance (ALA 2021). Lake Cressbrook contains permanent water, but generally lacks the banks and other habitat features considered suitable for platypus burrow construction. Potential habitat occurs upstream and downstream of the lake on Cressbrook Creek.

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Study area

Desktop search area

melanopsis)

cyanoleuca)

tenuirostris)

acuminata)

hardwickii)

cyanoleuca)

Black-faced monarch

Spectacled monarch

Short-beaked echidna

Common greenshank

4km

(Tringa nebularia)

(Monarcha melanopsis)

Spectacled monarch





MIGRATORY AND SPECIAL LEAST CONCERN SPECIES RECORDS Big T Pumped Hydropower Energy Storage

FIGURE 5-7



5.8.4 Invasive species

Introduced species that have been identified as Restricted Matters are listed in Schedule 2 of the Queensland *Biosecurity Act 2014*. This refers to biosecurity matters that are currently found in Queensland and that are known to have a significant impact on human health, social amenity, the economy or the environment.

The desktop search identified 22 invasive pest fauna species with potential to occur in the Study area, comprising:

- common myna (Acridotheres tristis);
- mallard (Anas platyrhynchos);
- rock pigeon (Columba livia);
- nutmeg mannikin (Lonchura punctulata);
- house sparrow (Passer domesticus);
- spotted turtle-dove (Streptopelia chinensis);
- common starling (Sturnus vulgaris);
- common blackbird (*Turdus merula*);
- domestic dog (Canis lupus) Restricted Matter categories 3, 4, 5 and 6;
- goat (*Capra hircus*) Restricted Matter categories 3, 4 and 6;
- horse (Equus caballus);
- domestic cat (Felis catus) Restricted Matter categories 3, 4 and 6;
- feral deer (Dama dama, Cervus elaphus, Axis porcinus, Axis axis, Rusa timorensis, Rusa unicolor);
- house mouse (Mus musculus);
- brown rat (Rattus norvegicus);
- black rat (Rattus rattus);
- brown hare (Lepus europaeus);
- European rabbit (*Oryctolagus cuniculus*) Restricted Matter categories 3, 4, 5 and 6;
- cane toad (*Rhinella marina*);
- common starling (Sturnus vulgaris);
- feral pig (Sus scrofa) Restricted Matter categories 3, 4 and 6; and
- fox (*Vulpes vulpes*) Restricted Matter categories 3, 4, 5 and 6.

Of these, ten were recorded from the Study area in autumn and spring surveys, including the cane toad, red deer, cat, dog, red fox, European brown hare, black rat, house mouse, rabbit and feral pig.



5.9 Waterways and Wetlands

5.9.1 Waterways

The Queensland Wetlands Mapping 2015 (DES 2020d) identifies riverine systems, watercourses, waterways or drainage lines (referred to collectively as waterways) for the Study area. There are numerous waterways within the Study area owing to the steep nature of the terrain, with the majority occurring as (Strahler) stream order 1 and 2 waterways draining the surrounding slopes. The most notable waterways within the Study area include:

- five waterways of stream order 3 (unnamed waterways)
- one waterway of stream order 4 (Little Oaky Creek); and
- two waterways of stream order 5 (Cressbrook Creek and Crows Nest Creek).

These waterways are shown on Figure 5-8.

5.9.2 Watercourses (*Water Act 2000*)

Cressbrook Creek, which drains east-west into Lake Cressbrook, and Crows Nest Creek, which drains west-east into Lake Cressbrook, are identified as watercourses as defined by the *Water Act 2000*. These two watercourses intersect the Study area to the south and along the corridor in the west (Figure 5-9) There are no other State mapped watercourses or drainage features on the Watercourse Identification Map located within the Study area (DoR 2021).




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FIGURE 5-8

WATERWAYS AND WETLANDS Big T Pumped Hydropower Energy Storage





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WATERCOURSE IDENTIFICATION MAP Big T Pumped Hydropower Energy Storage



5.9.3 Environmental values and water quality objectives

The existing condition of aquatic environments are commonly described with reference to their Environmental Values (EVs) and a comparison of water quality monitoring results with relevant water quality guidelines.

EVs are the qualities of waterways to be protected from activities in the catchment. Protecting Evs aims to ensure healthy aquatic ecosystems and waterways that are safe and suitable for community use. Evs reflect the ecological, social and economic values and uses of the waterway (such as stock watering, swimming, fishing and agriculture).

EVs have been established for the Upper Brisbane River (DERM 2010), including the following subcatchments intersected by the Study area: Lake Cressbrook, Lower Cressbrook Creek, Upper Cressbrook Creek and Maronghi Creek (Figure 5-10). Table 5-6 identifies the surface water EVs nominated for protection in each of these subcatchments.

Table 5-6 Environmental values for sub-catchments intersected by the Study area (DERM2010)

| | Enviro | nmenta | al value | s | | | | | | | | |
|-------------------|-----------------------|------------|---------------------|--------------|-------------|-------------------|-----------------------|-------------------------|----------------------|----------------|----------------|-------------------------------|
| Sub- catchment | Aquatic ecosystems | Irrigation | Farm Supply/ use | Stock water | Aquaculture | Human consumer | Primary recreation | Secondary recreation | Visual recreation | Drinking water | Industrial use | Cultural and spiritual values |
| Lake | ✓ | | | | ✓ | ✓ | | \checkmark | \checkmark | \checkmark | | ✓ |
| Cressbrook | | | | | | | | | | | | |
| Upper | ~ | | \checkmark | \checkmark | ~ | ✓ | | | \checkmark | \checkmark | | \checkmark |
| Cressbrook Ck | | | | | | | | | | | | |
| Lower | ~ | ✓ | ✓ | ✓ | ~ | ✓ | ~ | ✓ | ✓ | ✓ | ✓ | ~ |
| Cressbrook Ck | | | | | | | | | | | | |
| Maronghi Ck | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ |

The ANZECC Guidelines (2000, 2018) provide water quality guidelines for some parameters, with a particular focus on biologically available (dissolved) metals, nutrients and physico-chemical parameters. The slightly to moderately disturbed classification (95% level of protection) is most relevant to waterways of the Study area, due to existing disturbances and not being identified as High Ecological Value freshwaters. However, the ANZECC Guidelines also encourage the development and application of local water quality guidelines, based on water quality data collected from the region.

The Water Quality Objectives (WQOs) most relevant to this ecological assessment relate to moderately disturbed surface water ecosystems identified in the *Environmental Protection* (*Water*) *Policy 2009: Upper Brisbane River environmental values and water quality objectives* (DERM 2010). The Evs and WQOs may soon be updated by DES to align with the new *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water and Wetland Biodiversity). The default ANZECC Guidelines (2000, 2018) for pesticides, heavy metals and other contaminants for slightly to moderately disturbed ecosystems (95% level of protection) also apply, where local guidelines are not available.

The WQOs for each of the sub-catchments are summarised in Table 5-7.



Table 5-7 Water quality objectives for moderately disturbed surface aquatic ecosystems intersected by the Study area (DERM 2010)

| Parameter | Unit | Lakes/reservoirs – Lake Cressbrook | Upland freshwater – Upper Cressbrook Ck, Lower Cressbrook Ck and Maronghi Ck |
|--------------------------------|-----------|---------------------------------------|---|
| Turbidity | NTU | <5 | <5 |
| Suspended solids | mg/L | <6 | n/d |
| Chlorophyll a | µg/L | <2 | <5 |
| Total nitrogen | µg/L | <250 | <300 |
| Oxidised nitrogen | µg/L | <40 | <10 |
| Ammonia nitrogen | µg/L | <10 | <10 |
| Organic nitrogen | µg/L | <200 | <270 |
| Total phosphorus | µg/L | <30 | <10 |
| Filterable reactive phosphorus | µg/L | <15 | <5 |
| Dissolved oxygen | 20:80%ile | ID 90-110 | OD90-110 |
| рН | pH units | 6.5-8.2 | 6.5-8.0 |
| Conductivity | μS/cm | <750 | - |
| Pesticides, heavy metals | - | ANZECC default | ANZECC default trigger |
| and other toxic | | trigger values for | values for slightly- |
| contaminants | | slightly-moderately | moderately disturbed |
| | | disturbed systems | systems |





SUB-CATCHMENTS WITH ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES Big T Pumped Hydropower Energy Storage

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5.9.4 Aquatic Conservation Values

The Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM) was developed to assess conservation values of wetlands and waterways in Queensland. It is a comprehensive method that uses available data (including data resulting from expert opinion), to identify relative non-social, non-economic conservation/ecological values within a specified Study area. The criteria in AquaBAMM are: naturalness (aquatic); naturalness (catchment); diversity and richness; threatened species and ecosystems; priority species and ecosystems; special features; connectivity and representativeness. The Aquatic Conservation Assessment (ACA) for the riverine and non-riverine wetlands is a product of applying this method (Clayton et al. 2006).

The Study area occurs within the South East Queensland Catchment and is identified largely as being of Very High or High Aquatic Conservation Significance. There are some areas identified as being of Medium Aquatic Conservation Significance, along the midsection of the east-west corridor and parts of Lake Cressbrook. The ACA mapping for the Study area is presented as Figure 5-11.

5.9.5 Waterways for fish passage

Waterways, as defined by the Fisheries Act, include rivers, creeks, streams, watercourses or inlets of the sea. The upstream limits of waterways are identified by Peterken et al. (2009) as including features relevant to fisheries resources, such as the following physical and hydrological attributes:

- defined bed and banks the bed and banks need to be continuous rather than isolated and broken sections of a depression;
- an extended, if non-permanent, period of flow flow must continue for a reasonable period after rain ceases and have some reliability commensurate with rainfall; and
- flow adequacy the flow needs to be sufficient to sustain basic ecological processes and to maintain biodiversity within the feature.

The Queensland Waterways for Waterway Barrier Works mapping (DAF 2020) indicates the level of 'risk' associated with undertaking waterway barrier works within Queensland waterways. Waterways with higher stream orders, steeper slopes, higher flow rates and greater numbers of fish present obtain a higher level of risk.

Waterway barrier works are regulated under the Fisheries Act and the *Planning Act 2016* when barriers to fish movement, including partial barriers, are installed across waterways. Barrier works include construction, raising, replacement and some maintenance works on structures such as culvert crossings, bed level and low level crossings, weirs and dams, both permanent and temporary. There are two major risk, two high risk, nine moderate risk and 14 low risk waterways mapped within the Study area (Figure 5-12).

The types of waterway barriers being proposed (e.g. culverts, bed-level crossings etc.) within these waterways determines the assessment requirements for the development.



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Aquatic conservation assessments - riverine (DES 2020e)

Very high significance

High significance

Medium significance

AD

2km



FIGURE 5-11

AQUATIC CONSERVATION ASSESSMENT Big T Pumped Hydropower Energy Storage







WATERWAYS FOR WATERWAY BARRIER WORKS - RISK OF IMPACT Big T Pumped Hydropower Energy Storage FIGURE 5-12

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5.9.6 Wetlands

Wetlands of International Importance

Five Wetlands of International Significance (Ramsar wetlands) were identified from the desktop searches (Appendix A), all of which are located a considerable distance from the Study area. These include (in order of direct distance):

- Moreton Bay, located approximately 80 km to the east;
- Narran Lake Nature Reserve, located in New South Wales approximately 530 km to the south-west;
- Banrock Station Wetland Complex, located in South Australia approximately 1,700 km to the south-west;
- Riverland, located in South Australia approximately 1300 km to the south-west; and
- The Coorong and Lake Alexandrina and Albert Wetland, located in South Australia approximately 1,500 km to the south-west.

In addition to the wetlands identified in the Protected Matters Search Tool above, there is the Great Sandy Strait Ramsar wetland, which is located approximately 160 km to the north-east of the Study area.

Other Wetlands

There are no wetlands of National Importance nor any High Ecological Significance (HES) wetlands within the Study area. Protected Areas in proximity to the Study area (Deongwar State Forest and Crows Nest National Park) are identified as High Ecological Value (HEV) areas with scheduled water quality objectives for Lower Cressbrook Creek and Upper Cressbrook Creek. State-mapped Wetlands of General Ecological Significance occur in association with Crows Nest Creek and Cressbrook Creek and traverse these HEV areas (shown on Figure 5-13).

Lake Cressbrook is the only waterbody mapped within the Study area, which is identified as a lacustrine waterbody. Riverine wetland is mapped along the major waterways of Crows Nest Creek and Cressbrook Creek (Figure 5-8).





QUEENSLAND WETLAND ENVIRONMENTAL VALUES Big T Pumped Hydropower Energy Storage

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FIGURE 5-13



NTA



5.10 Matters of National Environmental Significance

There are nine MNES protected under the EPBC Act. Any project that will have, or is likely to have, a significant impact on an MNES must refer that project to the Federal Environment Minister for a decision on whether assessment and approval under the EPBC Act is required. MNES relevant to this project are identified in Table 5-8.

| MNES | Relevance to project | | | |
|--|---|--|--|--|
| World and National Heritage properties | No World Heritage Properties or National Heritage Places are identified within the Study area (DAWE 2021, Appendix A). | | | |
| Great Barrier Reef Marine Park and Commonwealth Marine Area | Not relevant – the Project is inland and not in proximity to marine areas. | | | |
| Wetlands of International Importance | No wetlands of International Importance are identified within the Study area in the EPBC Act Protected Matters Report (DAWE 2021, Appendix A). The nearest wetland of International Importance is Moreton Bay which is located 80 km east (direct line) of the Study area. The following five other wetlands were identified in the desktop assessment: Great Sandy Strait (160 km to the north-east); Narran Lake Nature Reserve (530 km to the south-west); Banrock Station Wetland Complex (1,700 km to the south-west); Riverland (1,300 km to the south-west); and The Coorong, and Lakes Alexandrina and Albert Wetland (1,500 km to the south-west). | | | |
| Threatened Ecological Communities | The desktop searches identified the potential occurrence of six TECs listed under the EPBC Act, of which only one has potential to occur within the Study area based on the State-mapped vegetation (Section 5.4). The Lowland Rainforest of Subtropical Australia TEC has the potential to occur within the Study area in association with RE 12.11.1. Approximately 0.1 ha of RE 12.11.1 is mapped by the State within the Study area (Figure 5-1). However, this small patch of RE 12.11.1 was verified to be RE 12.3.7 and RE 12.11.8, which is not consistent with the TEC description for this community. No other TECs were observed during the survey. However, there remains potential for TECs to occur in areas that were unable to be accessed due to land access constraints (Section 5.4). | | | |
| Threatened Species | Six fauna species listed under the EPBC Act were recorded from the Study area during desktop assessments and seasonal surveys. This includes the Vulnerable koala (<i>Phascolarctos cinereus</i>), greater glider (<i>Petauroides volans</i>), brush-tailed rock-wallaby (<i>Petrogale penicillata</i>) and white-throated needletail (<i>Hirundapus caudacutus</i>) recorded during field surveys; and the Critically Endangered silver perch (<i>Bidyanus bidyanus</i>) and Endangered Mary River cod (<i>Maccullochella mariensis</i>) identified from the desktop assessment. A total of 42 koala observations and an abundance of evidence (scats and scratches) was recorded across the Study area. Details of these recordings and the potential habitat within the Study area for this species is discussed in Section 5.8.2. Approximately 1,496.0 ha of koala habitat has been mapped for the Study | | | |

Table 5-8 Matters of National Environmental Significance relevant to the Project



| MNES | Relevance to project | | | | |
|-------------------|---|--|--|--|--|
| | Area (Figure 5-17), which is habitat critical to the survival of the koala in accordance with the koala habitat assessment tool (DotE 2014). | | | | |
| | Greater glider scats were observed on five occasions under ironbarks in the north-east of the Study area. Approximately 1,198.6 ha of greater glider habitat has been mapped for the Study Area (Figure 5-18). | | | | |
| | Four observations of brush-tailed rock-wallabies were recorded (two observed, two observations captured on camera traps) in the rocky outcrop refuge habitat in the south-east of the Study area. Approximately 2.5 ha of refuge habitat and 141.7 ha of foraging and dispersal habitat has been mapped for the Study Area (Figure 5-20). | | | | |
| | White-throated needletail (<i>Hirundapus caudacutus</i>) was recorded in the rainforest to the north-east of the Study area in November 2021. There is 1,504.1 ha of potential habitat within the Study area (Figure 5-21). | | | | |
| | Lake Cressbrook provides habitat for silver perch (<i>Bidyanus bidyanus</i>) and Mary River cod (<i>Maccullochella mariensis</i>), stocked by the Toowoomba and District Fish Stocking Association (DAF 2021), representing artificially sustained (completely reliant on stocking) populations outside of their natural distributions. | | | | |
| | Whilst the grey-headed flying-fox (<i>Pteropus poliocephalus</i>), listed as Vulnerable under the EPBC Act, was not observed during the survey, the Study area is likely to provide habitat for this species There is 1,504.1 ha of potential foraging habitat for this species within the Study area (Figure 5-19). | | | | |
| | No flora species listed under the EPBC Act were detected during the survey. However, there remains potential for the Vulnerable blotched sarcochilus (<i>Sarcochilus weinthalii</i>) to occur within the Study area. | | | | |
| Migratory Species | The Study area provides known habitat for six Migratory species recorded during the field surveys (Figure 5-7): white-throated needletail (<i>Hirundapus caudacutus</i>); spectacled monarch (<i>Monarcha trivirgatus</i>); satin flycatcher (<i>Myiagra cyanoleuca</i>); black-faced monarch (<i>Monarcha melanopsis</i>); eastern osprey (<i>Pandion cristatus</i>); and rufous fantail (<i>Rhipidura rufifrons</i>). | | | | |
| | The Study area, specifically the lake periphery, also provides potential seasonal habitat for the following Migratory species: sharp-tailed sandpiper (<i>Calidris acuminata</i>); red-necked stint (<i>Calidris ruficollis</i>); Latham's snipe (<i>Gallinago hardwickii</i>); and Marsh sandpiper (<i>Tringa stagnatilis</i>). | | | | |
| | The records of these species are shown on Figure 5-7. | | | | |
| Nuclear actions | Not relevant to the Project. | | | | |
| A water resource | Not relevant to the Project. Water resources are a matter of National Environmental Significance when in relation to coal seam gas and large coal mining developments. | | | | |



5.11 Matters of State Environmental Significance

This report identifies MSES within the Study area based on desktop and field results from comprehensive flora and fauna surveys. MSES relevant to this project are identified in Table 5-9.

| Prescribed Environmental Matter | Relevance to project |
|--|--|
| Protected Areas | There are no Protected Areas within the Study area. |
| | Pine Cliffs Nature Reserve and Crows Nest National Park are MSES Protected Areas located in proximity to the Study area (Figure 1-1). |
| Regulated vegetation | Regulated vegetation under the <i>Vegetation Management Act 1999</i> , and shown on the regulated vegetation map (version 5.03), is an MSES. The MSES State mapping identifies Category B (Endangered and Of Concern RE) and Category C (Endangered and Of Concern High Value Regrowth) regulated vegetation within the Study area. |
| | Approximately 305.0 ha of Category B and 417.3 ha of Category C MSES regulated vegetation are mapped by the State within the Study area. These areas are shown on Figure 5-14. |
| | For reference, the field survey refined the boundaries of remnant vegetation and has mapped 493.8 ha of Of Concern RE and 435.7 ha of Of Concern regrowth. |
| | Watercourses intersecting regulated vegetation occur throughout the Study area (Figure 5 14). |
| Connectivity areas | The Study area forms part of State and Regional wildlife corridors that traverse north-south across the landscape. Whilst these corridors themselves are not an MSES, impacts to 'connectivity', where an RE is of sufficient size and configuration such that it maintains important ecosystem functioning, are. Impacts to connectivity are addressed in the <i>Environmental Offsets Regulation 2014</i> and quantified using the Landscape Fragmentation and Connectivity Tool. This tool provides an assessment of significance of an impact on connectivity with regard to core habitat pre and post impact. Once an impact area is known, the tool can be used to determine the significance of the impact on connectivity. |
| Wetlands and watercourses | There are no High Ecological Value (HEV) waters (watercourses) or HEV waters (wetlands) within the Study area. These values have been mapped outside the Study area in association with the MSES Protected Areas (Figure 5-16). |
| | Watercourses intersecting regulated vegetation occur throughout the Study area (Figure 5-14). |
| Protected Wildlife Habitat and Essential Habitat | Protected wildlife habitat has been mapped by the State based on a number of sources, including species records and habitat modelling. State mapping identifies the following areas of MSES State-mapped habitat within the Study area: wildlife habitat for Endangered or Vulnerable wildlife (149.02 ha); wildlife habitat for Special Least Concern wildlife (55.6 ha); and regulated vegetation that is remnant Essential Habitat (131.1 ha) and regrowth Essential Habitat (30.8 ha), totalling 161.8 ha. State-mapped MSES wildlife habitat is shown on Figure 5-15. |

Table 5-9 Matters of State Environmental Significance located in the Study area



| Prescribed Environmental Matter | Relevance to project | | | | |
|--|--|--|--|--|--|
| | No flora species listed under the NC Act were detected during the survey. However, there remains potential for the Endangered blotched sarcochilus (<i>Sarcochilus weinthalii</i>) to occur within the Study area. | | | | |
| | Refined habitat mapping, based on the field-verified vegetation, has been compiled for the following EVNT species that are known or considered likely to occur within the Study Area (Figure 5-17; Appendix B) Error! Reference source not found. : | | | | |
| | koala (<i>Phascolarctos cinereus</i>), with 1,496.0 ha of potential habitat within the Study area (Figure 5-17); | | | | |
| | greater glider (<i>Petauroides volans</i>) with 1,198.6 ha of potential habitat within the Study area (Figure 5-18); | | | | |
| | grey-headed flying-fox (<i>Pteropus poliocephalus</i>) with 1,504.1 ha of potential foraging habitat within the Study area (Figure 5-19). | | | | |
| | brush-tailed rock-wallaby (<i>Petrogale penicillata</i>) with 2.5 ha of potential refuge habitat, 141.7 ha of potential foraging and dispersal habitat within the Study area (Figure 5-20); | | | | |
| | white-throated needletail (<i>Hirundapus caudacutus</i>) with 1,504.1 ha of potential habitat within the Study area (Figure 5-21); and | | | | |
| | powerful owl (<i>Ninox strenua</i>) with 1,047.4 ha of potential habitat within the Study area (Figure 5-22). | | | | |
| Koala Habitat in South-East Queensland | The Study area is not mapped within a Koala Priority Area. However, 17.8 ha of core koala habitat has been mapped along some waterways located within the Study area. Furthermore, 729.8 ha of Locally Refined Koala Habitat occurs across much of the remnant vegetation within the Somerset Regional Council area. | | | | |
| | Locally Refined Koala Habitat is afforded the same protection as Core Koala Habitat, as a temporary protection for two years, and will be transitioned into Core Koala Habitat mapping where areas meet the Core Koala Habitat criteria. Based on observations of koalas, koala signs and koala habitat throughout the Study area in February-March, April, November and December 2021, it is likely that this Locally Refined Koala Habitat area will transition to Core Koala Habitat area in the State mapping. | | | | |
| | Core and Locally Refined Koala Habitat mapping is shown on Figure 5-15. | | | | |
| | Based on the field-verified vegetation, there is 1,496.0 ha of koala habitat (MSES) across the entire Study area (refer to Section 5.8.2, Section 5.10 and Figure 5-17 for more information on koala habitat). | | | | |
| Fish Habitat Areas and Highly Protected Zones of State Marine Parks | Not relevant, as the Study area does not intercept a marine park or a mapped fish habitat area. | | | | |
| Waterway providing for fish passage | There are two major risk, two high risk, nine moderate risk and 14 low risk level waterway occurrences within the Study area (Section 5.9.5 and Figure 5 11). A waterway providing for fish passage is a MSES only if a waterway barrier work is proposed that would limit the passage of fish along the waterway. | | | | |
| Marine Plants | Not relevant as the Study area is not located in a marine environment. | | | | |



| Prescribed Environmental Matter | Relevance to project |
|---------------------------------------|--|
| Legally secured Offset Area | There are no legally secured offset areas within the Study area. |





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DPM

MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE - WETLANDS AND PROTECTED AREAS

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DPM

POTENTIAL HABITAT FOR THE KOALA (PHASCOLARCTOS CINEREUS) WITHIN THE STUDY AREA



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POTENTIAL HABITAT FOR THE GREATER GLIDER (PETAUROIDES VOLANS) WITHIN THE STUDY AREA



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FIGURE 5-18

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POTENTIAL FORAGING HABITAT FOR THE GREY-HEADED FLYING-FOX (PTEROPUS POLIOCEPHALUS) WITHIN THE STUDY AREA

HALUS) WITHIN THE STUDY AREA Big T Pumped Hydropower Energy Storage

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POTENTIAL HABITAT FOR THE WHITE-THROATED NEEDLETAIL (HIRUNDAPUS CAUDACUTUS) WITHIN THE STUDY AREA

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POTENTIAL HABITAT FOR THE POWERFUL OWL (NINOX STRENUA) WITHIN THE STUDY AREA



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6 CONCLUSION AND RECOMMENDATIONS

This report identifies environmental values of the Study area based on desktop searches and comprehensive field surveys across several periods:

- 24 to 26 February and 1 to 5 March 2021, to map vegetation communities and fauna habitats of the Study area;
- 12 to 16 April and 19 to 23 April 2021, to undertake comprehensive autumn fauna surveys and additional vegetation mapping of previously inaccessible areas;
- 8 to 11 November and 15 to 19 November 2021, to complete comprehensive spring fauna surveys;
- 2 to 4 December 2021, to undertake targeted survey of the Survey area and road corridor for MNES/MSES flora species; and
- 13 December 2021 to map vegetation and fauna habitats on Lot 10 RP223812.

The surveys comprised:

- 112 flora survey sites;
- 12 fauna trap sites (including pitfall traps, funnel traps, Elliot traps, ultrasonic bat detector sites, camera traps, diurnal active searches, bird surveys, spotlighting, and scats and signs searches);
- 120 fauna habitat assessment sites;
- 40 camera trap sites;
- 27 additional ultrasonic bat detector sites;
- five harp trap sites;
- 17 call playback sessions;
- approximately 24 km of spotlighting vehicle transects; and
- five spotlighting walking transects.

The Study area is expansive, covering approximately 2,290.1 ha, with areas of steep inclines and difficult-to-access depressions/gullies. Land access constraints inhibited the assessment of some areas. Consequently, a precautionary approach has been applied where information is unavailable or limited. This report intends to inform subsequent stages of the Project and the probable implications of identified ecological values and constraints on the Project. It is noted that the implications of constraints depend on the nature of the impact, which has not been assessed in this report.

A summary of the key ecological values and constraints relevant to the Project are summarised in Table 6-1.

Protected Plant surveys in accordance with the Flora Survey Guidelines (DES 2020g) are yet to be undertaken for the Project.

Five terrestrial EVNT fauna species were recorded from the Study area:

- koala (Phascolarctos cinereus) Vulnerable (EPBC Act and NC Act);
- greater glider (*Petauroides volans*) Vulnerable (EPBC Act), Endangered (NC Act);
- white-throated needletail (*Hirundapus caudacutus*) Vulnerable (EPBC Act and NC Act);
- brush-tailed rock-wallaby (*Petrogale penicillata*) Vulnerable (EPBC Act and NC Act); and



powerful owl (Ninox strenua) – Vulnerable (NC Act).

Although not recorded during surveys, the grey-headed flying-fox (*Pteropus poliocephalus*) is likely to utilise the Study area on occasion, particularly during eucalypt mass flowering events.

The identification of an active koala population within the Study area is a significant constraint to the Project. The koala is listed as Vulnerable under both the EPBC Act and NC Act and is therefore both a MNES and MSES. A total of 42 koala observations were recorded during the survey and evidence of occupation (scats and scratches) were noted at 100 sites across the Study area.

The majority of vegetated areas of the Study area are identified as koala habitat (core and locally refined) under regulatory koala habitat maps for SEQ, and the field survey confirmed that approximately 1,496.0 ha (99 % of the vegetation within the Study area) comprises koala habitat. Koala habitat of the Study area has been scored against the DAWE's koala habitat assessment tool (DotE 2014) and is considered to be habitat critical to the survival of the koala. The habitat assessment tool is typically applied once to an entire impact area for a proposed action (DotE 2014). For added context, koala habitat was scored at each of the 120 habitat assessment sites, with scores ranging from 7 to the highest attainable score of 10, which was recorded for most sites. Consequently, subsequent stages of the Project will require referral to the DAWE.

The Project will need to provide careful consideration and justification for this impact having regard to measures that can avoid or reduce the impact on koala habitat. Notwithstanding any measures that may be implemented to reduce the impact, residual impacts that remain may still be considered significant and unacceptable to the koala.

The Study area provides known habitat for four other EVNT fauna species, namely greater glider, brush-tailed rock wallaby, white-throated needletail and powerful owl. The greater glider, white-throated needletail and brush-tailed rock wallaby are listed under both the EPBC Act and NC Act and are therefore both a MNES and MSES. The powerful owl is listed as Vulnerable under the NC Act and is therefore an MSES. Whilst habitat for these species is broadly defined and covers a large portion of the Study area, measures to avoid or reduce impacts to these species should be considered when determining the location and extent of the Project footprint. In particular, the Project should avoid impacts to potential refuge habitat for the brush-tailed rock-wallaby (rocky outcrops) and areas where relatively old growth habitat adjoins Deongwar State Forest to the north-east of the Study area, where suitable large hollows for the greater glider and powerful owl are more likely to occur.

Both the Critically Endangered (EPBC Act) silver perch and the Endangered (EPBC Act) Mary River cod are stocked within Lake Cressbrook, each representing a MNES. However, neither species is likely to successfully breed within Lake Cressbrook, instead being entirely dependent on artificial stocking (for the recreational fishery). Although it is likely that an impact assessment would conclude that significant impacts on these aquatic species are unlikely, the impact of the Project on the recreational fishery and associated social impacts should be addressed as part of the broader assessment.





| Environmental value | Details | Potential Project implications ¹ |
|---|--|---|
| | There is 1,047.5 ha of field-verified remnant vegetation and 450.3 ha of field-verified regrowth vegetation within the Study area. | Potential offset implications for impacts to Of Concern remnant vegetation at a 1:4 ratio. |
| REs under the VM Act | Of this, 493.8 ha (21.5% of the Study area) is Of Concern RE and 435.7 ha (19% of the Study area) is Of Concern regrowth. Of Concern vegetation (929.6 ha) accounts for over 62% of the total vegetation (1,497.9 ha) within the Study area. Most of the Of Concern vegetation would be considered a MSES. | |
| | There is 553.7 ha of Least Concern RE. | |
| Koala habitat | Field-verified mapping identifies 1,496.0 ha of habitat critical to the survival of the koala (MNES) within the Study area. This includes 1039.3 ha of RE, 450.3 ha of regrowth, and a further 6.3 ha of cleared land with emergent feed trees. There is 17.8 ha of core koala habitat and 729.8 ha of locally refined koala habitat mapped by the State within the Study area (MSES). | The development of a hydropower energy storage within the Study area has a high potential of resulting in significant impacts to the koala and should be referred to the DAWE. If the Project is approved as a controlled action, having regard to the impacts to the koala, offsets may be determined based on the condition of the impacted habitat and proposed offset habitat. At the State level, Locally Refined Koala Habitat is afforded the same protection as Core Koala Habitat, as a temporary protection for two years, and will be transitioned into Core Koala Habitat mapping where areas meet the Core Koala Habitat criteria. Based on observations of koala individuals, koala signs and koala habitat throughout the Study area, it is likely that the Locally Refined Koala Habitat will transition to Core Koala Habitat in the State mapping. Core and Locally Refined Koala Habitat may require an offset at a 1:3 ratio if offsets under the EPBC Act are not imposed. |
| Habitat for threatened flora and fauna species | There are five fauna species recorded from the Study area: koala, greater glider, brush-tailed rock wallaby, white- throated needletail and powerful owl. The grey-headed flying-fox is also likely to frequent the Study area when | Impacts to habitat for species that are known or likely to occur within the Study area would need to be assessed against the relevant Commonwealth and State guidelines to determine the significance of the impact. Significant residual impacts to |

Table 6-1 Summary of the key ecological values within the Study area



| Environmental value | Details | Potential Project implications ¹ | |
|---|--|--|--|
| | suitable foraging resources are available. Preliminary habitat mapping has been prepared for EVNT fauna species that | species habitat would likely require offsets; the nature of which would depend on the species and the protection it is afforded under the EPBC Act or NC Act. | |
| | are known or likely to occur within the Study area. | | |
| | No MNES or MSES flora species were detected during the surveys. However, there remains potential for the blotched sarcochilus (<i>Sarcochilus weinthalii</i>) (MNES and MSES) to occur within the Study area, although this species may not occur within habitats impacted by the Project (once defined). | | |
| State-mapped wildlife habitat for threatened fauna and flora | There is 161.1 ha of State-mapped Essential Habitat, 149.0 ha of Wildlife Habitat for Endangered and Vulnerable species, and 55.6 ha of Wildlife Habitat for Special Least Concern species. These habitat types are MSES. | | |
| Wetlands and watercourse | There are no HEV waters or wetlands within the Study area. Only Cressbrook Creek and Crows Nest Creek (stream order 5 waterways), are identified as watercourses as defined by the <i>Water</i> <i>Act 2000</i> . Numerous other waterways occur within Study area which are identified as watercourses intersecting regulated vegetation. | Impacts to vegetation within a defined distance (distance varies depending on stream order from 10-50 m in SEQ) of a waterway intersecting regulated vegetation may need to be offset at a ratio of 1:4. | |

The ecological values identified within this report are based on a desktop assessment, vegetation mapping, fauna habitat assessments, seasonal fauna surveys, and targeted flora surveys. The following is recommended:

- complete Protected Plant Surveys in High Risk Areas mapped by the State and in any other areas where EVNT flora are recorded, in accordance with the Flora Survey Guidelines – Protected Plants (DES 2020g), and as required by the Project (to be determined when the Project footprint has been developed);
- when developing the Project footprint and impact areas, consideration should be given to avoiding or minimising the extent and severity of the impact on habitat of species known to occur in the Study area.



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Appendix 26.2

MSES Report Deongwar State Forest



Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest Lot: 528 Plan: FTY1889

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

Disclaimer

Whilst every care is taken to ensure the accuracy of the information provided in this report, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness, or suitability, for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which the user may incur as a consequence of the information being inaccurate or incomplete in any way and for any reason.


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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI Lot: 528 Plan: FTY1889

| Size (ha) | 4,721.67 |
|---------------------|---|
| Local Government(s) | Somerset Regional |
| Bioregion(s) | Southeast Queensland |
| Subregion(s) | Moreton Basin, Brisbane - Barambah Volcanics, South Burnett |
| Catchment(s) | Brisbane |



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992*;

- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004*;

- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;

- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;

- Regulated vegetation under the Vegetation Management Act 1999 that is:

• Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;

• Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;

• Category R areas on the regulated vegetation management map;

• Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;

• Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;

- Strategic Environmental Areas under the Regional Planning Interests Act 2014;

- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Queensland Wetland Environmental Values under the Environment Protection Regulation 2019;

- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;

- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

| to Distantial Areas instates | 0.0 ha | 0.0.9/ |
|---|------------|----------------|
| Ta Protected Areas- estates | 0.0 na | 0.0 % |
| 1b Protected Areas- nature refuges | 0.0 ha | 0.0 % |
| 1c Protected Areas- special wildlife reserves | 0.0 ha | 0.0 % |
| 2 State Marine Parks- highly protected zones | 0.0 ha | 0.0 % |
| 3 Fish habitat areas (A and B areas) | 0.0 ha | 0.0 % |
| 4 Strategic Environmental Areas (SEA) | 0.0 ha | 0.0 % |
| 5 High Ecological Significance wetlands on the map of Referable Wetlands | 6.87 ha | 0.1% |
| 6a High Ecological Value (HEV) wetlands | 0.0 ha | 0.0 % |
| 6b High Ecological Value (HEV) waterways | 1.8 km | Not applicable |
| 7a Threatened (endangered or vulnerable) wildlife | 2284.75 ha | 48.4% |
| 7b Special least concern animals | 0.0 ha | 0.0 % |
| 7c i Koala habitat area - core (SEQ) | 185.52 ha | 3.9% |
| 7c ii Koala habitat area - locally refined (SEQ) | 2426.59 ha | 51.4% |
| 7d Sea turtle nesting areas | 0.0 km | Not applicable |
| 8a Regulated Vegetation - Endangered/Of concern in Category B (remnant) | 1453.47 ha | 30.8% |
| 8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth) | 0.36 ha | 0.0% |
| 8c Regulated Vegetation - Category R (GBR riverine regrowth) | 0.0 ha | 0.0 % |
| 8d Regulated Vegetation - Essential habitat | 2269.1 ha | 48.1% |
| 8e Regulated Vegetation - intersecting a watercourse | 104.6 km | Not applicable |
| 8f Regulated Vegetation - within 100m of a Vegetation Management Wetland | 0.0 ha | 0.0 % |
| 9a Legally secured offset areas- offset register areas | 0.0 ha | 0.0 % |
| 9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation | 0.0 ha | 0.0 % |

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

1c. Protected Areas - special wildlife reserves

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to Map 1 - MSES - State Conservation Areas for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Queensland Wetland Environmental Values

Natural wetlands that are 'High Ecological Significance' (HES) on the Map of Queensland Wetland Environmental Values are present.

6a. Wetlands in High Ecological Value (HEV) waters

(no results)

6b. Waterways in High Ecological Value (HEV) waters

Natural waterways that occur in HEV (maintain) freshwater and estuarine areas under the Environmental Protection (water) Policy are present.

Refer to Map 2 - MSES - Wetlands and Waterways for an overview of the relevant MSES.

MSES - Species

7a. Threatened (endangered or vulnerable) wildlife

Values are present

7b. Special least concern animals

Not applicable

7c i. Koala habitat area - core (SEQ)

Values are present

7c ii. Koala habitat area - locally refined (SEQ)

Values are present

7d. Wildlife habitat (sea turtle nesting areas)

Not applicable

Threatened (endangered or vulnerable) wildlife habitat suitability models

| Species | Common name | NCA status | Presence |
|----------------------------------|---------------------------|------------|----------|
| Boronia keysii | | V | None |
| Calyptorhynchus lathami | Glossy black cockatoo | V | Core |
| Casuarius casuarius johnsonii | Sthn population cassowary | E | None |
| Crinia tinnula | Wallum froglet | V | None |
| Denisonia maculata | Ornamental snake | V | None |
| Litoria freycineti | Wallum rocketfrog | V | None |
| Litoria olongburensis | Wallum sedgefrog | V | None |
| Macadamia integrifolia | | V | None |
| Macadamia ternifolia | | V | None |
| Macadamia tetraphylla | | V | None |
| Melaleuca irbyana | | E | None |
| Petaurus gracilis | Mahogany Glider | E | None |
| Petrogale persephone | Proserpine rock-wallaby | E | None |
| Pezoporus wallicus wallicus | Eastern ground parrot | V | None |
| Phascolarctos cinereus | Koala - outside SEQ* | E | None |
| Taudactylus pleione | Kroombit tinkerfrog | E | None |
| Xeromys myoides | Water Mouse | V | None |

*For koala model, this includes areas outside SEQ. Check 7c SEQ koala habitat for presence/absence.

Threatened (endangered or vulnerable) wildlife species records

| Scientific name | Common name | NCA status | EPBC status | Migratory status |
|------------------------|------------------------------|------------|-------------|------------------|
| Sarcochilus weinthalii | blotched sarcochilus | E | V | |
| Rhodamnia rubescens | scrub turpentine | CE | CE | |
| Petrogale penicillata | brush-tailed rock-wallaby | V | V | |

| Scientific name | Common name | NCA status | EPBC status | Migratory status | | |
|---|--------------------|------------|-------------|------------------|--|--|
| Delma torquata | collared delma | V | V | | | |
| Potorous tridactylus tridactylus | long-nosed potoroo | V | V | | | |
| Petauroides armillatus central greater glider | | E | V | | | |
| Ninox strenua | powerful owl | V | | | | |

Special least concern animal species records

(no results)

Shorebird habitat (critically endangered/endangered/vulnerable)

Not applicable

Shorebird habitat (special least concern)

Not applicable

*Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)

Migratory status (M) - China and Australia Migratory Bird Agreement (C), Japan and Australia Migratory Bird Agreement (J), Republic of Korea and Australia Migratory Bird Agreement (R), Bonn Migratory Convention (B), Eastern Flyway (E)

To request a species list for an area, or search for a species profile, access Wildlife Online at:

https://www.gld.gov.au/environment/plants-animals/species-list/

Refer to Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special least concern animals, Map 3b - MSES - Species - Koala habitat area (SEQ) and Map 3c - MSES - Wildlife habitat (sea turtle nesting areas) for an overview of the relevant MSES.

MSES - Regulated Vegetation

For further information relating to regional ecosystems in general, go to:

https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at: https://environment.ehp.gld.gov.au/regional-ecosystems/

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

| Regional ecosystem | Vegetation management polygon | Vegetation management status |
|------------------------|-------------------------------|------------------------------|
| 12.11.2/12.3.2/12.11.1 | O-subdom | rem_oc |
| 12.3.3 | E-dom | rem_end |
| 12.11.8/12.11.14 | O-dom | rem_oc |
| 12.3.21 | E-dom | rem_end |
| 12.5.6c | E-dom | rem_end |
| 12.11.14 | O-dom | rem_oc |
| 12.12.2/12.3.2 | O-subdom | rem_oc |

| Regional ecosystem | Vegetation management polygon | Vegetation management status |
|--------------------|-------------------------------|------------------------------|
| 12.5.6a | E-dom | rem_end |
| 12.11.8 | O-dom | rem_oc |
| 12.11.14/12.3.7 | O-dom | rem_oc |
| 12.12.13/12.12.1 | O-subdom | rem_oc |

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

| Regional ecosystem Vegetation management polygon | | Vegetation management status | | | |
|--|-------|------------------------------|--|--|--|
| 12.5.6a/12.5.6c | E-dom | hvr_end | | | |

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Not applicable

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Not applicable

Refer to Map 4 - MSES - Regulated Vegetation for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(no results)

Refer to Map 5 - MSES - Offset Areas for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas







least concern animals R **MSES - Species** Threatened (endangered or vulnerable) wildlife and special least concern animals Area of Interest Information presented on this product is distributed by the Queensland Government as an information source only. While every care is taken to ensure the accuracy of this data, the state of Queensland makes no statements, representations or warranties about the accuracy, reliability, completeness or suitability of any information contained in this product. Selected Lot and Plan Г LOCALITY DIAGRAM ▲ Towns - Freeways/Highways Secondary roads The state of Queensland disclaims all responsibility for information contained in this product and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason. Major rivers/creeks Wildlife habitat (special least concern) Wildlife habitat (endangered or vulnerable)

Map 3a - MSES - Species - Threatened (endangered or vulnerable) wildlife and special









Map 3c - MSES - Wildlife habitat (sea turtle nesting areas)

Map 4 - MSES - Regulated Vegetation



Map 5 - MSES - Offset Areas



Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html .

Appendix 2 - Source Data

The datasets listed below are available on request from:

http://qldspatial.information.qld.gov.au/catalogue/custom/index.page

• Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

| MSES layers | current QSpatial data (http://qspatial.information.qld.gov.au) |
|---|---|
| Protected Areas-Estates, Nature Refuges, Special Wildlife Reserves | - Protected areas of Queensland - Nature Refuges - Queensland - Special Wildlife Reserves- Queensland |
| Marine Park-Highly Protected Zones | Moreton Bay marine park zoning 2008 |
| Fish Habitat Areas | Queensland fish habitat areas |
| Strategic Environmental Areas-designated | Regional Planning Interests Act - Strategic Environmental Areas |
| HES wetlands | Map of Queensland Wetland Environmental Values |
| Wetlands in HEV waters | HEV waters: - EPP Water intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 5) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000) |
| Wildlife habitat (threatened and special least concern) | WildNet database species records habitat suitability models (various) SEQ koala habitat areas under the Koala Conservation Plan 2019 Sea Turtle Nesting Areas records |
| VMA regulated regional ecosystems | Vegetation management regional ecosystem and remnant map |
| VMA Essential Habitat | Vegetation management - essential habitat map |
| VMA Wetlands | Vegetation management wetlands map |
| Legally secured offsets | Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES |
| Regulated Vegetation Map | Vegetation management - regulated vegetation management map |

Appendix 3 - Acronyms and Abbreviations

| AOI | - Area of Interest |
|--------|---|
| DES | - Department of Environment and Science |
| EP Act | - Environmental Protection Act 1994 |
| EPP | - Environmental Protection Policy |
| GDA94 | - Geocentric Datum of Australia 1994 |
| GEM | - General Environmental Matters |
| GIS | - Geographic Information System |
| MSES | - Matters of State Environmental Significance |
| NCA | - Nature Conservation Act 1992 |
| RE | - Regional Ecosystem |
| SPP | - State Planning Policy |
| VMA | - Vegetation Management Act 1999 |
| | |



Appendix 26.3

Conservation Estate Records

WetlandInfo – Department of Environment and Science

Home > Facts & maps > Crows Nest National Park > Native mammals



Native mammals of Crows Nest National Park

Total number of species: 47

Download this information in .CSV format

| Family | Scientific Name | Common Name | Superseded | NCA | EPBC | End. | Wetland Status |
|-------------------|----------------------------------|--|------------|-----|------|--------|-------------------|
| Muridae | Hydromys chrysogaster | water rat | | С | | QAI | I |
| Muridae | Melomys cervinipes | fawn-footed melomys | | С | | QA | |
| Muridae | Pseudomys gracilicaudatus | eastern chestnut mouse | | С | | QA | |
| Muridae | Pseudomys novaehollandiae | New Holland mouse | | V | V | QA | |
| Muridae | Rattus fuscipes | bush rat | | С | | QA | |
| Muridae | <u>Rattus sp.</u> | | | С | | QAI | |
| Muridae | <u>Rattus tunneyi</u> | pale field-rat | | С | | QA | |
| Vespertilionidae | <u>Chalinolobus gouldii</u> | Gould's wattled bat | | С | | QA | |
| Vespertilionidae | Chalinolobus picatus | little pied bat | | С | | QA | |
| Vespertilionidae | <u>Myotis macropus</u> | large-footed myotis | | С | | QA | |
| Vespertilionidae | Nyctophilus geoffroyi | lesser long-eared bat | | С | | QA | |
| Vespertilionidae | Nyctophilus gouldi | Gould's long-eared bat | | С | | QA | |
| Vespertilionidae | Scotorepens greyii | little broad-nosed bat | | С | | QA | |
| Vespertilionidae | <u>Scotorepens sp. (Parnaby)</u> | central-eastern broad-nosed bat | | С | | QA | |
| Vespertilionidae | Vespadelus pumilus | eastern forest bat | | С | | QA | |
| Vespertilionidae | Vespadelus troughtoni | eastern cave bat | | С | | QA | |
| Vespertilionidae | Vespadelus vulturnus | little forest bat | | С | | QA | |
| Rhinolophidae | Rhinolophus megaphyllus | eastern horseshoe-bat | | С | | QAI | |
| Pteropodidae | Pteropus poliocephalus | grey-headed flying-fox | | С | V | QA | |
| Macropodidae | Notamacropus dorsalis | black-striped wallaby | | С | | QA | |
| Macropodidae | Notamacropus rufogriseus | red-necked wallaby | | С | | QA | |
| Macropodidae | Petrogale penicillata | brush-tailed rock-wallaby | | V | V | QA | |
| Macropodidae | Thylogale thetis | red-necked pademelon | | С | | QA | |
| Macropodidae | Wallabia bicolor | swamp wallaby | | С | | QA | |
| Potoroidae | Aepyprymnus rufescens | rufous bettong | | С | | QA | |
| Potoroidae | Potorous tridactylus tridactylus | long-nosed potoroo | | V | V | QA | |
| Phalangeridae | Trichosurus caninus | short-eared possum | | С | | QA | |
| Phalangeridae | Trichosurus vulpecula | common brushtail possum | | С | | QA | |
| Acrobatidae | Acrobates pygmaeus | feathertail glider | | С | | QA | |
| Pseudocheiridae | Petauroides armillatus | central greater glider | | E | E | QA | |
| Pseudocheiridae | Pseudocheirus perearinus | common ringtail possum | | C | _ | QA | |
| Petauridae | Petaurus australis australis | vellow-bellied glider (southern subspecies) | | V | V | QA | |
| Petauridae | Petaurus breviceps | sugar glider | | C. | | QA | |
| Petauridae | Petaurus breviceps sensu lato | sugar glider | Superseded | C | | QAI | |
| Petauridae | Petaurus sp. | 5 5 | | С | | QAI | |
| Phascolarctidae | Phascolarctos cinereus | koala | | E | E | QA | |
| Peramelidae | Isoodon macrourus | northern brown bandicoot | | С | | QAI | |
| Peramelidae | Perameles nasuta | long-nosed bandicoot | | C | | QA | |
| Dasvuridae | Antechinus flavipes flavipes | vellow-footed antechinus (south-east Queensland) | | C | | QA | |
| Dasvuridae | Dasvurus hallucatus | northern quoll | | С | F | QA | |
| Dasvuridae | Dasvurus maculatus maculatus | spotted-tailed quoll (southern subspecies) | | E | E | QA | |
| Dasvuridae | Phascogale tapoatafa tapoatafa | brush-tailed phascogale | | C | | QA | |
| Dasvuridae | Planigale maculata | common planigale | | C | | QA | |
| Dasvuridae | Sminthopsis murina | common dunnart | | C. | | QA | |
| Dasvuridae | Sminthonsis murina murina | common dunnart (SE mainland) | | C | | ∩∆ | |
| Tachyolossidae | Tachvolossus aculeatus | short-beaked echidna | | SI | | | |
| Ornithorhynchidae | Ornithorhynchus anatinus | nlatvnus | | SI | | 04 | |
| Similaromynomude | | piagpag | | UL. | | wл | • |

Note: Wildlife statistics are based on information that has been submitted to the DES WildNet database and converted to a 10km² grid. The grid information has been intersected with the mapping polygons to determine the species lists. <u>Click here to view the species grid metadata</u>.

Information from WildNet can also be accessed via <u>Wildlife Online</u> and <u>WetlandMaps</u>.

Rare or threatened includes species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under either the Nature Conservation Act or Environment Protection and Biodiversity Conservation Act

WetlandInfo – Department of Environment and Science

Home > Facts & maps > Ravensbourne Nature Refuge > Wildlife



Wildlife of Ravensbourne Nature Refuge

Total number of species: 609

Download this information in .CSV format

| Kingdom | Class | Family | Scientific Name Common Name | | Superseded | NCA | EPBC | End. | Wetland Status |
|---------|---------|------------------|--|---|------------|-----|------|------|-------------------|
| animals | mammals | Leporidae | <u>Lepus europaeus</u> | European brown hare | | | | II | |
| animals | mammals | Leporidae | Oryctolagus cuniculus | rabbit | | | | II | |
| animals | mammals | Felidae | <u>Felis catus</u> | cat | | | | II | |
| animals | mammals | Canidae | <u>Canis familiaris (dingo)</u> | dingo | | | | QA | |
| animals | mammals | Canidae | <u>Vulpes vulpes</u> | red fox | | | | Ш | |
| animals | mammals | Muridae | <u>Hydromys chrysogaster</u> | water rat | | С | | QAI | I |
| animals | mammals | Muridae | Melomys cervinipes | fawn-footed melomys | | С | | QA | |
| animals | mammals | Muridae | <u>Melomys sp.</u> | | | С | | QA | |
| animals | mammals | Muridae | Rattus fuscipes | bush rat | | С | | QA | |
| animals | mammals | Vespertilionidae | Nyctophilus bifax | northern long-eared bat | | С | | QAI | |
| animals | mammals | Vespertilionidae | <u>Nyctophilus geoffroyi</u> | lesser long-eared bat | | С | | QA | |
| animals | mammals | Vespertilionidae | <u>Nyctophilus gouldi</u> | Gould's long-eared bat | | С | | QA | |
| animals | mammals | Miniopteridae | Miniopterus australis | little bent-wing bat | | С | | QAI | |
| animals | mammals | Miniopteridae | <u>Miniopterus schreibersii</u> <u>oceanensis</u> | eastern bent-wing bat | | С | | QAI | |
| animals | mammals | Rhinolophidae | <u>Rhinolophus megaphyllus</u> | eastern horseshoe-bat | | С | | QAI | |
| animals | mammals | Macropodidae | <u>Macropus giganteus</u> | eastern grey kangaroo | | С | | QA | |
| animals | mammals | Macropodidae | Notamacropus dorsalis | black-striped wallaby | | С | | QA | |
| animals | mammals | Macropodidae | <u>Notamacropus parryi</u> | whiptail wallaby | | С | | QA | |
| animals | mammals | Macropodidae | Notamacropus rufogriseus | red-necked wallaby | | С | | QA | |
| animals | mammals | Macropodidae | Petrogale penicillata | brush-tailed rock-wallaby | | V | V | QA | |
| animals | mammals | Macropodidae | Thylogale stigmatica | red-legged pademelon | | С | | QAI | |
| animals | mammals | Macropodidae | Thylogale thetis | red-necked pademelon | | С | | QA | |
| animals | mammals | Macropodidae | Wallabia bicolor | swamp wallaby | | С | | QA | |
| animals | mammals | Potoroidae | Aepyprymnus rufescens | rufous bettong | | С | | QA | |
| animals | mammals | Potoroidae | Potorous tridactylus tridactylus | long-nosed potoroo | | V | V | QA | |
| animals | mammals | Phalangeridae | Trichosurus caninus | short-eared possum | | С | | QA | |
| animals | mammals | Phalangeridae | Trichosurus vulpecula | common brushtail possum | | С | | QA | |
| animals | mammals | Pseudocheiridae | Petauroides armillatus | central greater glider | | E | E | QA | |
| animals | mammals | Pseudocheiridae | Pseudocheirus peregrinus | common ringtail possum | | С | | QA | |
| animals | mammals | Petauridae | Petaurus breviceps sensu lato | sugar glider | Superseded | С | | QAI | |
| animals | mammals | Petauridae | Petaurus norfolcensis | squirrel glider | | С | | QA | |
| animals | mammals | Petauridae | <u>Petaurus sp.</u> | | | С | | QAI | |
| animals | mammals | Phascolarctidae | Phascolarctos cinereus | koala | | Е | E | QA | |
| animals | mammals | Peramelidae | Isoodon macrourus | northern brown bandicoot | | С | | QAI | |
| animals | mammals | Peramelidae | Perameles nasuta | long-nosed bandicoot | | С | | QA | |
| animals | mammals | Dasyuridae | Antechinus flavipes flavipes | yellow-footed antechinus (south-east Queensland) | | с | | QA | |
| animals | mammals | Dasyuridae | <u>Phascogale tapoatafa</u> <u>tapoatafa</u> | brush-tailed phascogale | | с | | QA | |
| animals | mammals | Dasyuridae | <u>Planigale maculata</u> | common planigale | | С | | QA | |
| animals | mammals | Dasyuridae | Sminthopsis murina | common dunnart | | С | | QA | |
| animals | mammals | Dasyuridae | <u>Sminthopsis sp.</u> | | | С | | QAI | |
| animals | mammals | Tachyglossidae | Tachyglossus aculeatus | short-beaked echidna | | SL | | QAI | |
| animals | birds | Motacillidae | Anthus novaeseelandiae | Australasian pipit | | С | | QAI | |
| animals | birds | Passeridae | Passer domesticus | house sparrow | | | | Ш | |
| animals | birds | Estrildidae | Lonchura castaneothorax | chestnut-breasted mannikin | | с | | QAI | |
| animals | birds | Estrildidae | Neochmia temporalis | red-browed finch | | С | | QA | |
| animals | birds | Estrildidae | Taeniopygia bichenovii | double-barred finch | | С | | QA | |
| animals | birds | Nectariniidae | Dicaeum hirundinaceum | mistletoebird | | С | | QAI | |
| animals | birds | Sturnidae | Sturnus vulgaris | common starling | | | | | |
| animals | birds | Turdidae | Zoothera heinei | russet-tailed thrush | | С | | QA | |
| | | | | | | 1 | | 1 | |

WetlandInfo – Department of Environment and Science

Home > Facts & maps > Lockyer National Park > Wildlife



Wildlife of Lockyer National Park

Total number of species: 1450

Download this information in .CSV format

| Kingdom | Class | Family | Scientific Name | Common Name | Superseded | NCA | EPBC | End. | Wetland Status |
|---------|---------|------------------|--|----------------------------------|------------|--------|------|------|-------------------|
| animals | mammals | Cervidae | <u>Cervus elaphus</u> | red deer | | | | Ш | |
| animals | mammals | Bovidae | <u>Bos taurus</u> | European cattle | | | | II | |
| animals | mammals | Bovidae | <u>Capra hircus</u> | goat | | | | II | |
| animals | mammals | Suidae | Sus scrofa | pig | | | | II | |
| animals | mammals | Equidae | <u>Equus caballus</u> | horse | | | | Ш | |
| animals | mammals | Leporidae | Lepus europaeus | European brown hare | | | | II | |
| animals | mammals | Leporidae | Oryctolagus cuniculus | rabbit | | | | Ш | |
| animals | mammals | Felidae | <u>Felis catus</u> | cat | | | | Ш | |
| animals | mammals | Canidae | <u>Canis familiaris</u> | dog | | | | Ш | |
| animals | mammals | Canidae | Canis familiaris (dingo) | dingo | | | | QA | |
| animals | mammals | Canidae | <u>Canis sp.</u> | | | | | II | |
| animals | mammals | Canidae | Vulpes vulpes | red fox | | | | Ш | |
| animals | mammals | Muridae | Hydromys chrysogaster | water rat | | С | | QAI | I |
| animals | mammals | Muridae | Melomys cervinipes | fawn-footed melomys | | С | | QA | |
| animals | mammals | Muridae | Mus musculus | house mouse | | | | | |
| animals | mammals | Muridae | Pseudomys gracilicaudatus | eastern chestnut mouse | | С | | QA | |
| animals | mammals | Muridae | Pseudomys novaehollandiae | New Holland mouse | | V | V | QA | |
| animals | mammals | Muridae | Rattus fuscipes | bush rat | | С | | QA | |
| animals | mammals | Muridae | Rattus rattus | black rat | | | | | |
| animals | mammals | Vespertilionidae | Chalinolobus gouldii | Gould's wattled bat | | С | | QA | |
| animals | mammals | Vespertilionidae | Chalinolobus nigrogriseus | hoary wattled bat | | C | | QAI | |
| animals | mammals | Vespertilionidae | Chalinolobus picatus | little pied bat | | C | | QA | |
| animals | mammals | Vespertilionidae | Mvotis macropus | large-footed myotis | | C | | QA | |
| animals | mammals | Vespertilionidae | Nyctophilus geoffrovi | lesser long-eared bat | | C | | 0A | |
| animals | mammals | Vespertilionidae | Nyctophilus gouldi | Gould's long-eared bat | | C | | QA | |
| animals | mammals | Vespertilionidae | Nyctophilus sp | | | C | | QAI | |
| animals | mammals | Vespertilionidae | Scotorepens grevii | little broad-nosed bat | | C C | | QA | |
| animals | mammals | Vespertilionidae | Scotorepens orion | south-eastern broad-nosed bat | | c | | QA | |
| animals | mammals | Vespertilionidae | Scotorepens sp. | | | С | | QA | |
| animals | mammals | Vespertilionidae | Vespadelus darlingtoni | large forest bat | | С | | QA | |
| animals | mammals | Miniopteridae | Miniopterus australis | little bent-wing bat | | С | | QAI | |
| animals | mammals | Miniopteridae | <u>Miniopterus schreibersii</u> <u>oceanensis</u> | eastern bent-wing bat | | с | | QAI | |
| animals | mammals | Molossidae | Austronomus australis | white-striped freetail bat | | С | | QA | |
| animals | mammals | Molossidae | Mormopterus lumsdenae | northern free-tailed bat | | С | | QA | |
| animals | mammals | Molossidae | Mormopterus norfolkensis | east coast freetail bat | | С | | QA | |
| animals | mammals | Molossidae | Mormopterus ridei | eastern free-tailed bat | | С | | QA | |
| animals | mammals | Molossidae | <u>Mormopterus sp.</u> | | | С | | QAI | |
| animals | mammals | Emballonuridae | Saccolaimus flaviventris | yellow-bellied sheathtail bat | | с | | QAI | |
| animals | mammals | Rhinolophidae | Rhinolophus megaphyllus | eastern horseshoe-bat | | С | | QAI | |
| animals | mammals | Pteropodidae | Pteropus alecto | black flying-fox | | С | | QAI | |
| animals | mammals | Pteropodidae | Pteropus poliocephalus | grey-headed flying-fox | | С | V | QA | |
| animals | mammals | Pteropodidae | Pteropus scapulatus | little red flying-fox | | С | | QAI | |
| animals | mammals | Macropodidae | Macropus giganteus | eastern grey kangaroo | | С | | QA | |
| animals | mammals | Macropodidae | Macropus sp. | | | С | | QA | |
| animals | mammals | Macropodidae | Notamacropus dorsalis | black-striped wallaby | | С | | QA | |
| animals | mammals | Macropodidae | Notamacropus parrvi | whiptail wallaby | | С | | QA | |
| animals | mammals | Macropodidae | Notamacropus rufogriseus | red-necked wallaby | | C | | QA | |
| animals | mammals | Macropodidae | Osphranter robustus | common wallaroo | | С | | QA | |
| animals | mammals | Macropodidae | Petrogale penicillata | brush-tailed rock-wallaby | | V | V | QA | |
| animals | mammals | Macropodidae | Wallabia bicolor | swamp wallaby | | C. | | QA | |
| animals | mammals | Potoroidae | Aepyprympus rufescens | rufous bettong | | C. | | QA | |
| | | | | | I | ~ | | ~ | |

4/5/23, 6:01 AM

Wildlife of Lockyer National Park (Department of Environment and Science)

| Kingdom | Class | Family | Scientific Name | e Common Name | | NCA | EPBC | End. | Wetland Status |
|---------|---------|-------------------|--|---------------------------------------|------------|-----|------|------|-------------------|
| animals | mammals | Potoroidae | Potorous tridactylus tridactylus | long-nosed potoroo | | V | V | QA | |
| animals | mammals | Phalangeridae | Trichosurus caninus | short-eared possum | | С | | QA | |
| animals | mammals | Phalangeridae | Trichosurus sp. | | | С | | QA | |
| animals | mammals | Phalangeridae | Trichosurus vulpecula | common brushtail possum | | С | | QA | |
| animals | mammals | Acrobatidae | Acrobates pygmaeus | feathertail glider | | С | | QA | |
| animals | mammals | Pseudocheiridae | Petauroides armillatus | central greater glider | | E | E | QA | |
| animals | mammals | Pseudocheiridae | Pseudocheirus peregrinus | common ringtail possum | | С | | QA | |
| animals | mammals | Petauridae | Petaurus australis australis | yellow-bellied glider | | v | v | QA | |
| animals | mammals | Petauridae | Petaurus breviceps | (southern subspecies) sugar glider | | С | | QA | |
| animals | mammals | Petauridae | Petaurus breviceps sensu lato | sugar glider | Superseded | C | | QAI | |
| animals | mammals | Petauridae | Petaurus norfolcensis | squirrel glider | Caporocaca | C | | QA | |
| animals | mammals | Petauridae | Petaurus notatus | Krefft's glider | | C | | QA | |
| animals | mammals | Petauridae | Petaurus sp. | | | C | | QAI | |
| animals | mammals | Phascolarctidae | Phascolarctos cinereus | koala | | E | E | QA | |
| animals | mammals | Peramelidae | Isoodon macrourus | northern brown bandicoot | | С | | QAI | |
| animals | mammals | Peramelidae | Perameles nasuta | long-nosed bandicoot | | C | | QA | |
| | | | | yellow-footed antechinus | | | | | |
| animals | mammals | Dasyuridae | Antechinus flavipes flavipes | (south-east Queensland) | | С | | QA | |
| animals | mammals | Dasyuridae | Dasyurus hallucatus | northern quoll | | С | E | QA | |
| animale | mammals | Dasyuridae | Dasvurus maculatus maculatus | spotted-tailed quoll | | F | F | 04 | |
| amilais | | Dasyunuae | | (southern subspecies) | | - E | | QA | |
| animals | mammals | Dasyuridae | <u>Dasyurus sp.</u> | | | С | | QAI | |
| animals | mammals | Dasyuridae | <u>Phascogale tapoatafa</u> tapoatafa | brush-tailed phascogale | | с | | QA | |
| animals | mammals | Dasyuridae | Planigale maculata | common planigale | | С | | QA | |
| animals | mammals | Dasyuridae | Planigale tenuirostris | narrow-nosed planigale | | С | | QA | |
| animals | mammals | Dasyuridae | Sminthopsis murina | common dunnart | | С | | QA | |
| | | | | common dunnart (SE | | | | | |
| animais | mammals | | Sminthopsis murina murina | mainland) | | C | | QA | |
| animals | mammals | lachyglossidae | lachyglossus aculeatus | short-beaked echidna | | SL | | QAI | |
| animals | mammals | Ornithorhynchidae | Ornithorhynchus anatinus | platypus | | SL | | QA | I |
| animals | birds | Motacillidae | Anthus novaeseelandiae | Australasian pipit | | С | | QAI | |
| animals | birds | Passeridae | Passer domesticus | house sparrow | | | | 11 | |
| animals | birds | Estrildidae | Lonchura castaneothorax | chestnut-breasted mannikin | | С | | QAI | |
| animals | birds | Estrildidae | Lonchura punctulata | nutmeg mannikin | | | | II | |
| animals | birds | Estrildidae | <u>Neochmia modesta</u> | plum-headed finch | | С | | QA | |
| animals | birds | Estrildidae | Neochmia temporalis | red-browed finch | | С | | QA | |
| animals | birds | Estrildidae | <u>Stagonopleura guttata</u> | diamond firetail | | V | | QA | |
| animals | birds | Estrildidae | <u>Taeniopygia bichenovii</u> | double-barred finch | | С | | QA | |
| animals | birds | Estrildidae | <u>Taeniopygia guttata</u> | zebra finch | | С | | QA | |
| animals | birds | Nectariniidae | Dicaeum hirundinaceum | mistletoebird | | С | | QAI | |
| animals | birds | Sturnidae | Acridotheres tristis | common myna | | | | II | |
| animals | birds | Sturnidae | Sturnus vulgaris | common starling | | | | II | |
| animals | birds | Turdidae | <u>Turdus merula</u> | common blackbird | | | | II | |
| animals | birds | Turdidae | Zoothera heinei | russet-tailed thrush | | С | | QA | |
| animals | birds | Turdidae | Zoothera lunulata | Bassian thrush | | С | | QA | |
| animals | birds | Turdidae | <u>Zoothera sp.</u> | | | С | | U | |
| animals | birds | Hirundinidae | Cheramoeca leucosterna | white-backed swallow | | С | | QA | |
| animals | birds | Hirundinidae | <u>Hirundo neoxena</u> | welcome swallow | | С | | QAI | |
| animals | birds | Hirundinidae | <u>Hirundo rustica</u> | barn swallow | | SL | | QAI | |
| animals | birds | Hirundinidae | <u>Hirundo sp.</u> | | | С | | U | |
| animals | birds | Hirundinidae | Petrochelidon ariel | fairy martin | | С | | QA | |
| animals | birds | Hirundinidae | Petrochelidon nigricans | tree martin | | С | | QAI | |
| animals | birds | Timaliidae | Zosterops lateralis | silvereye | | С | | QAI | |
| animals | birds | Megaluridae | Cincloramphus cruralis | brown songlark | | С | | QA | |
| animals | birds | Megaluridae | Cincloramphus mathewsi | rufous songlark | | С | | QA | |
| animals | birds | Megaluridae | Cincloramphus timoriensis | tawny grassbird | | С | | QAI | |
| animals | birds | Megaluridae | Poodytes gramineus | little grassbird | | С | | QAI | |
| animals | birds | Acrocephalidae | Acrocephalus australis | Australian reed-warbler | | С | | QAI | |
| animals | birds | Cisticolidae | Cisticola exilis | golden-headed cisticola | | C | | QAI | |
| animals | DIROS | Alaudidae | IVIIratra Javanica | Horstield's bushlark | | C | | QAI | |
| animals | birds | Petroicidae | <u>Eopsaltria australis</u> | eastern yellow robin | | C | | QA | |
| animals | Dirds | Petroicidae | Melanodryas cucullata | nooded robin | | C | | QA | |
| animals | birds | Petroicidae | Microeca fascinans | jacky winter | | C | | QAI | |
| animals | birds | Petroicidae | <u>Petroica boodang</u> | scarlet robin | | С | | QA | |

Wildlife of Lockyer National Park (Department of Environment and Science)

Rare or threatened includes species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent under either the Nature Conservation Act or Environment Protection and Biodiversity Conservation Act

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Legend

NCA - Status under the Nature Conservation Act 1992

- EX : Extinct
- PE : Extinct in the wild
- CR : Critically endangered
- E : Endangered
- V : Vulnerable
- NT : Near threatened
- C : Least concern
- SL : Special least concern
- I : International
- P : Prohibited

EPBC - Status under the Environment Protection and Biodiversity Conservation Act 1999

- EX : Extinct
- XW : Extinct in the wild
- CE : Critically endangered
- E : Endangered
- V : Vulnerable
- CD : Conservation dependent

End. - Endemicity

- Q : Queensland endemic naturally occurs in Queensland
- QA : Intranational naturally occurs in Queensland and interstate
- QAI : Not endemic to Australia naturally occurs in Queensland, interstate and overseas
- $\ensuremath{\mathsf{QI}}$: Regional endemic naturally occurs in Queensland and overseas
- VA : Vagrant (Intranational) normally occurs interstate
- VI : Vagrant (International) normally occurs overseas
- VU : Vagrant (Unknown)
- $\mathsf{IA}\,$: Introduced (Intranational) naturalised from interstate
- II : Introduced (International) naturalised from overseas
- IU : Introduced unknown origin

U : Unknown endemicity - native

Wetland Status

I: Wetland indicator species

This page should be cited as:

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Appendix 27

BioCondation Data Sheets for the Offset Site

HABITAT QUALITY ASSESSMENT

| Date: | 27 April 2023 | Collector: | J Armstrong, L Harri | ngton, M Girroli | OPS All1h - Site 1 | | | |
|---------------|---------------------------|------------|----------------------|--|--|--|--|--|
| Time: | | Job No. | 2019-079C | | ORS AUTO - Sile 1 | | | |
| Mapped RE: | 12.9-10.2 Regro | owth | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra | | | | |
| Field RE: | 12.9-10.2 Regro | owth | Description: | Corymbia citriodora subsp. var to 23m with canopy species re | dora subsp. variegata, Eucalyptus crebra open forest nopy species regrowth to 10m | | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. var usually with Eucalyptus crebra tereticornis, E. moluccana, E. a be present in scattered patches be grassy or shrubby. | ariegata open forest or woodland a. Other species such as <i>Eucalyptus</i> acmenoides and <i>E. siderophloia</i> may es or in low densities. Understorey can | | | |
| Slope: | Aspect: Landform (local): | | l): | Landform (broad): | | | | |
| | | | | F | | | | |
| Slope Shape: | | | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m w | (NB: *Ecologically Dominant Lay | /er. Tree defined as single | | |
|---------------|--|--|--|--|--------------------------------|
| | boundary | | | stemmed over 2m. All tree spec | ies in the 100 x 50m (not just |
| Coarse Woody | Site Total: | | Total Native | Dominant / Codominant: | Associated / Suppressed: |
| Debris | Per ha Total: | 46 m per Site | Tree Spp. | | |
| | | 460 m per ha | Richness | Corymbia citriodora subsp | Corymbia intermedia |
| | | 400 m por na | | Eucalyptus crebra | |
| | | | | Dramartian of EDL anapian | Comunatio oituis douto outore |
| | | | | with evidence of recruitment | variegata |
| | | | | (Specify recruiting species) | |
| | | | | | Eucalyptus crebra |
| | | | | | Corymbia intermedia |
| | | | | Recruitment is assessed as | 100% |
| | | | | the proportion of dominant | |
| | | | | are regenerating: | |
| 50x10m area | Native plant species rich | ness | (NB: List species i | Total | |
| JUX TUIL area | Native plant species fici | Total | | | |
| | | | multi-stemmed fro | m base or below 20cm) | |
| Shrub | Melichrus urceolatus, Al Allocasuarina littoralis | phitonia excelsa, Cory Fucalvotus crebra | mbia citriodora subs | sp. variegata, Vittadinia sp., | 6 |
| | | | | | |
| Grass | Heteropogon contortus, | Alloteropsis semialata | , Aristida calycina, E | Bothriochloa sp., Eragrostis sp., | 10 |
| | Imperata cylindrica, Cyri | ibopogon renacius, S | porobolus sp., Parilo | um sp., Digitana sp., | |
| Forb | Hybanthus stellarioides, | Chrysocephalum apic | ulatum, Glycine tab | acina, Dianella | 18 |
| | brevipedunculata, Scieri | a mackaviensis, Glyci Ivpericum gramineum | ne tomentella, Good Wahlenbergia grac | lenia sp., Zornia dyctiocarpa, ilis Lomandra sp. Sauropus | |
| | hirtellus, Eustrephus lati | folius, Galactia tenuiflo | ora, Cheilanthes siel | beri, Cyanthillium cinereum, | |
| | Rostellularia adscenden | s | | | |
| Non-native | | | | | 25% |
| plant cover | | | | | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | | |
|---|--|----|----|----|----|------|--|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. | |
| Native perennial ('decreaser') grass cover* | 15 | 15 | 20 | 25 | 20 | 19 | |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 | |
| Native forbs and other species (non-grass) | 8 | 5 | 8 | 5 | 18 | 8.8 | |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 | |
| Non-native grass | 10 | 25 | 5 | 0 | 8 | 9.6 | |
| Non-native forbs and shrubs | 0 | 0 | 0 | 0 | 0 | 0 | |
| Litter | 52 | 37 | 67 | 70 | 54 | 56 | |
| Rock | 5 | 0 | 0 | 0 | 0 | 1 | |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other (e.g. timber, inorganic refuse) | 10 | 18 | 0 | 0 | 0 | 5.6 | |

| | TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |
|--|-------|------|------|------|------|------|------|
|--|-------|------|------|------|------|------|------|

| 100x50m Area: | from benchm | ark doc | | | |
|------------------------------|-------------|--|-----|-------------------------|----|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 14 | Total Large Trees (ha): | 28 |
| | | | | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |
| | | | | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot |
|---------------------------|---|
| Species | notes |
| Lantana camara | common |
| Melinis repens | very common |
| Chamaecrista rotundifolia | occasional |
| Emilia sonchifolia | rare |
| | |

| Plot based tree data | Record all trees over 300mm dbh within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|---|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 450, 660, 590, 660, 420, 810, 620, 640, 430, 610, 540, |
| Eucalyptus crebra | 330, 320, 440 , 560 |
| Dead | 910 |

| 10x10m plots – canopy species reger | Dx10m plots – canopy species regeneration <50mm and 50-299mm DBH (present as no less than 50mm, no. 50-299) 500m ² tot. area: | | | | | | | |
|--------------------------------------|--|--------|------------------|--------|---------|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | |
| Corymbia citriodora subsp. variegata | 15, 4 | 13, 7 | 9, 6 | 2, 5 | 7, 13 | | | |
| Eucalyptus crebra | 4, 1 | 1, 1 | 1, 0 | 0, 0 | 0, 0 | | | |
| Corymbia intermedia | 0, 0 | 0, 0 | 0, 2 | 1, 1 | 0, 0 | | | |
| Eucalyptus tereticornis | 0, 0 | 0, 1 | 0, 0 | 0, 0 | 0, 0 | | | |
| Recruitment (<50 mm DBH) | | | 1,040 stems / ha | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (I are present. *If trees are i layer includes T1 and T2 | E) or Subcanopy in the same layer layers, but not T3 | (S) layers if the and continuous | benchmark doo along the trans | cument stipulate sect group them | s that layers). Canopy |
|--|--|--|-------------------------------------|----------------------------------|-------------------------------------|----------------------------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | | | start: | end: | | Cover (III) |
| Corymbia citriodora subsp. variegata | C (T1) | 21 | 1.2 | 2 | 0.8 | 0.8 |
| Corymbia citriodora subsp. variegata | C (T1) | 23 | 4.6 | 25 | 20.4 | 20.4 |
| Eucalyptus crebra | C (T1) | 18 | 4.6 | 7.8 | 3.2 | |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 39.4 | 51.2 | 11.8 | 11.8 |
| Corymbia citriodora subsp. variegata | C (T1) | 16 | 73.6 | 78.6 | 5 | 5 |
| | | | | | | |
| Corymbia citriodora subsp. variegata | S (T2) | 6 | 31.5 | 32.9 | 1.4 | 1.4 |
| Corymbia intermedia | S (T2) | 8 | 35.8 | 38.1 | 2.3 | 2.3 |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 44.2 | 46.1 | 1.9 | 3.6 |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 46.0 | 47.8 | 1.8 | |
| Corymbia citriodora subsp. variegata | S (T2) | 9 | 48.2 | 50.3 | 2.1 | 5.3 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 50.0 | 53.5 | 3.5 | |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 54.3 | 56.8 | 2.5 | 2.5 |
| Corymbia citriodora subsp. variegata | S (T2) | 11 | 57.4 | 60.5 | 3.1 | 3.1 |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 61.4 | 64.2 | 2.8 | 2.8 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 64.4 | 66.5 | 2.1 | |
| Corymbia citriodora subsp. variegata | S (T2) | 11 | 66.4 | 67.9 | 1.5 | |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 67.6 | 69.7 | 2.1 | |
| Corymbia citriodora subsp. variegata | S (T2) | 11 | 69.7 | 71.7 | 2 | |
| Corymbia citriodora subsp. variegata | S (T2) | 11 | 84.2 | 86.5 | 2.3 | 2.3 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 91.7 | 92.6 | 0.9 | 0.9 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 98.3 | 100 | 1.7 | 1.7 |

| Corymbia intermedia | S (T3) | 3 | 0 | 0.9 | 0.9 | 0.9 |
|--------------------------------------|---|--|---|--|----------------------------------|----------------|
| Corymbia citriodora subsp. variegata | S (T3) | 2.5 | 20.8 | 22.2 | 1.4 | 1.4 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 27.6 | 29.3 | 1.7 | 1.7 |
| Corymbia citriodora subsp. variegata | S (T3) | 3 | 45.3 | 46.6 | 1.3 | 1.3 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 84.6 | 85.9 | 1.3 | 1.3 |
| Total Canopy (T1) | | | | | 38 m (38% Med ht: 2 |) ?1 m |
| Total Sub-canopy (T2) | | | | | 25.9n (25.9% Med ht: 1 | າ 6) 0 m |
| Total Sub-canopy (T2) | | | | | 7.6 m (7.6%) Med ht: 3.0 m | |
| Species | Shrub - Woody level) or if single Strata: | plant that is mult stemmed, <mark>less</mark> Height (m) | i-stemmed from than 2 m tall Intercep | stemmed from the base (or with an 2 m tall Intercept Range (m) | | n ground |
| | Shrub | | start: | end: | | Cover (m |
| Corymbia citriodora subsp. variegata | | 2 | 0.9 | 1.8 | 0.9 | 0.9 |
| Allocasuarina littoralis | | 2 | 4.9 | 5.7 | 0.8 | 0.8 |
| Corymbia citriodora subsp. variegata | | 1 | 8.0 | 8.3 | 0.3 | 0.3 |
| Eucalyptus crebra | | 1.5 | 19.2 | 20.4 | 1.2 | 1.2 |
| Eucalyptus crebra | | 2 | 21.0 | 21.5 | 0.5 | 0.5 |
| Eucalyptus crebra | | 1 | 24.6 | 24.8 | 0.2 | 0.2 |
| Lantana camara* | | 1 | 30.5 | 30.8 | 0.3 | 0.3 |
| Allocasuarina littoralis | | 2 | 37.2 | 37.7 | 0.5 | 0.5 |
| Corymbia citriodora subsp. variegata | | 1.5 | 38.5 | 38.9 | 0.4 | 0.4 |
| Corymbia citriodora subsp. variegata | | 2 | 48.8 | 49.2 | 0.4 | 0.4 |
| Corymbia citriodora subsp. variegata | | 2 | 66.6 | 67.3 | 0.7 | 0.7 |
| Eucalyptus crebra | | 2 | 94.4 | 95.5 | 1.1 | 1.1 |

0.3 m (0.3%) 7 m (7%) Med ht: 2.0 m

| Total F | Exotic | Shruh | |
|---------|--------|-------|--|

Total Native Shrub Layer



Southern View from Centre of Transect

Western View from Centre of Transect

HABITAT QUALITY ASSESSMENT

| Date: | 27 April 2023 | Collector: | J Armstrong, L Harrington, M Girroli | | J Armstrong, L Harrington, M Girroli | | OPS Allah Site 2 |
|---------------|------------------------------------|----------------|--------------------------------------|---|--------------------------------------|--|------------------|
| Time: | | Job No. | 2019-079C | | OK3 A0 10 - Sile 2 | | |
| Mapped RE: | 12.9-10.2 Regrowth | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra | | | |
| Field RE: | 12.9-10.2 Regrowth | | Description: | Corymbia citriodora subsp. variegata, Eucalyptus crebra open fo to 25m. Open shrub layer of regenerating canopy species. | | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia ma be present in scattered patches or in low densities. Understorey c be grassy or shrubby. | | | |
| Slope: | Aspect: | Landform (loca | I): | Landform (broad): | | | |
| 4° | North; Transect bearing 360° | gentle slope | | | | | |
| Slope Shape: | | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as s stemmed over 2m. All tree species in the 100 x 50m EDL species) – Specify species | | |
|--------------|--|---------------------------|-----------------------|--|----------------------------|--|
| Coarse Woody | Site Total: | | Total Native | Dominant / Codominant: | Associated / Suppressed: | |
| Debris | Per ha Total: | 43m per Site | Tree Spp. | | | |
| | | | Richness | Corymbia citriodora subsp. | Eucalyptus tereticornis, | |
| | | 430m per ha | | variegata, | | |
| | | | | - | | |
| | | | | Eucalyptus crebra, | | |
| | | | | Proportion of EDL species | Corymbia citriodora subsp. | |
| | | | | with evidence of recruitment | Vanegala | |
| | | | | (Specify recruiting species) | Eucalyptus crebra | |
| | | | | Booruitmont is appaged as | 100% | |
| | | | | the properties of dominant | 100 % | |
| | | | | species present at a site that | | |
| | | | | are regenerating. | | |
| | | | | are regenerating. | | |
| 50x10m area | Native plant species rich | iness | (NB: List species i | f known or count if unknown. | Total | |
| | | | Shrub is defined a | s single stemmed below 2m or | | |
| | | | multi-stemmed fro | m base or below 20cm) | | |
| Shrub | Corymbia citriodora sub | sp. variegata, Alphiton | ia excelsa, Dodonae | ea viscosa, | 3 | |
| | | | | | | |
| Grass | Heteronogon contartus | Allateransis semialata | Aristida calveina E | Rothriachlas sp. Erzarastis sp. | 10 | |
| Glass | Imperate cylindrice Cyn | Allolei opsis serrilaiala | norobolus sp. Panic | um sp. Digitaria sp. | 10 | |
| | imperata cymunca, Cyn | | porobolus sp., raille | un sp., Digitaria sp. | | |
| Forb | Hvbanthus stellarioides | Chrvsocephalum anic | ulatum. Glvcine taba | acina. Dianella | 19 | |
| | brevipedunculata. Scleri | a mackaviensis. Glvci | ne tomentella. Good | enia sp., Zornia dvctiocarpa. | | |
| | Lobelia purpurascens. H | lypericum gramineum. | Wahlenbergia graci | ilis, Lomandra sp., Sauropus | | |
| | hirtellus, Eustrephus lati | folius, Galactia tenuiflo | ora, Cheilanthes siel | peri, Cyanthillium cinereum, | | |
| | Rostellularia adscenden | s, Vittadinia sp., | | · • | | |
| | | - | | | | |
| Non-native | | | | | 70% | |
| plant cover | | | | | | |
| | | | | | | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes | | | | | | |
|---|--|----|----|----|----|------|--|
| Ground Cover type | 1 2 3 4 5 | | | | | | |
| Native perennial ('decreaser') grass cover* | 10 | 25 | 45 | 30 | 5 | 23 | |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 | |
| Native forbs and other species (non-grass) | 8 | 10 | 8 | 5 | 10 | 8.2 | |
| Native shrubs (<1m in height) | 0 | 6 | 0 | 0 | 0 | 1.2 | |
| Non-native grass | 60 | 6 | 15 | 6 | 16 | 20.6 | |
| Non-native forbs and shrubs | 0 | 3 | 0 | 0 | 1 | 0.8 | |
| Litter | 22 | 50 | 32 | 44 | 53 | 40.2 | |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 | |
| Bare ground | 0 | 0 | 0 | 5 | 15 | 4 | |

| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 10 | 0 | 2 |
|---------------------------------------|------|------|------|------|------|------|
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | *from benchmark doc | | | | | | | |
|------------------------------|--------------|--|-----|-------------------------|----|--|--|--|--|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 19 | Total Large Trees (ha): | 38 | | | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | | | | | |

| Plot based weed data | Record all weed species within the 10 x 50 m sub-plot |
|---------------------------|--|
| Species | notes |
| Melinis repens | abundant |
| Lantana camara | common |
| Richardia brasiliensis | occasional |
| Chamaecrista rotundifolia | occasional |
| Heliotropium amplexicaule | occasional |
| Cynodon dactylon | common |
| | |
| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |

| Species | DBH |
|--------------------------------------|---|
| Corymbia citriodora subsp. variegata | 440, 460, 460, 470, 420, 360, 510, 660, 510, (470, 390), 530, 540, 460, 530, 510, 420 |
| Eucalyptus tereticornis | 450 |
| Eucalyptus crebra | 1030, 550 |
| Dead | 440 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m ²): | | | | | | | | |
|--|--------|--------|-------------|--------|---------|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | |
| Corymbia citriodora | 22, 2 | 13, 3 | 14, 7 | 18, 3 | 0, 2 | | | |
| Eucalyptus tereticornis | | 0, 1 | | 9, 1 | 0, 1 | | | |
| Eucalyptus crebra | | 3, 1 | 1, 1 | 0, 1 | | | | |
| Corymbia tessellaris | | | | | 0, 1 | | | |
| Recruitment (<50 mm DBH) | | | 800 stem/ha | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-----------|-----------|----------------------|-----------------------|--|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Corymbia citriodora subsp. variegata | C (T1) | 25 | 0 | 11.0 | 11.0 | 11.0 | |
| Corymbia citriodora subsp. variegata | C (T1) | 20 | 6.5 | 18.3 | 11.8 | | |
| Corymbia citriodora subsp. variegata | C (T1) | 24 | 15.0 | 24.0 | 9 | 28.1 | |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 22.6 | 34.6 | 12 | | |
| Corymbia citriodora subsp. variegata | C (T1) | 19 | 40 | 49.3 | 9.3 | 9.3 | |
| | | | | | | | |
| Corymbia citriodora subsp. variegata | S(T2) | 13 | 63 | 66.4 | 3.4 | 3.4 | |
| Corymbia citriodora subsp. variegata | S(T2) | 15 | 73 | 77 | 4 | 5.0 | |
| Corymbia citriodora subsp. variegata | S(T2) | 16 | 75 | 78.3 | 3.3 | 5.3 | |
| | | | | | | | |
| Corymbia citriodora subsp. variegata | S(T3) | 8 | 29.7 | 30.5 | 0.8 | 0.8 | |
| Corymbia citriodora subsp. variegata | S(T3) | 6 | 38.1 | 39.6 | 1.5 | 1.5 | |
| Corymbia citriodora subsp. variegata | S(T3) | 5 | 48.5 | 50 | 1.5 | 0.4 | |
| Corymbia citriodora subsp. variegata | S(T3) | 7 | 50 | 51.6 | 1.6 | 3.1 | |
| Corymbia citriodora subsp. variegata | S(T3) | 6 | 58.3 | 59.4 | 1.1 | 1.1 | |
| Corymbia citriodora subsp. variegata | S(T3) | 5 | 64.0 | 65.3 | 1.3 | 1.3 | |
| Total Canopy (T1) | | | | | 48. (48. Med h | 4 m 4%) t: 22 m | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|---|--|---|-------------------------------|----------------------------------|--|
| Species | Strata | Height (m) | Intercept R | ange (m) | Cover (m) | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Total Sub-canopy (T2) | | | | | | 8.7 m (8.7%) Med ht: 15.0m | |
| Total Sub-canopy (T3) | | | | | 7.8m (7.8%) Med ht: 6 m | | |
| 100m Transect Shrub canopy cover | * denote as nat Shrub - Woody level) or if singl | ive or exotic. Only / plant that is mult e stemmed. less | v native shrub cov i-stemmed from t than 2 m tall | ver is used in the he base (or withi | e scoring. in 200 mm fror | n ground | |
| Species | Strata: | Height (m) | Intercept | Range (m) | Cover (m) | Corrected | |
| | Shrub | | start: | end: | 1 | Cover (m) | |
| Lantana camara* | shrub | 1.5 | 0.0 | 0.9 | 0.9 | - | |
| Corymbia citriodora subsp. variegata | shrub | 1.2 | 1.7 | 2.3 | 0.6 | 0.6 | |

2.0

2.0

0.4

1.0

1.5

1.0

2.0

9.4

24.0

25.7

40.6

61.1

79.0

93.0

10.3

25.0

26.1

41.0

62.2

80.0

94.5

0.9

1.0

0.4

0.4

1.1

1.0

1.5

6.9m (6.9%) Med ht: 1.2 m

0.9

1.0

0.4

0.4

1.1

1.0

1.5

shrub

shrub

shrub

shrub

shrub

shrub

shrub

Corymbia citriodora subsp. variegata

Corymbia citriodora subsp. variegata

Corymbia citriodora subsp. variegata

Corymbia citriodora subsp. variegata

Alphitonia excelsa

Eucalyptus tereticornis

Total Native Shrub Layer

Corymbia tessellaris

Site Photos



Southern View from Centre of Transect

Western View from Centre of Transect

HABITAT QUALITY ASSESSMENT

| Date: | 27 April 2023 | Collector: | J Armstrong, L. Har | rington | | | | |
|---------------|----------------------------------|----------------|---------------------|---|---------------------------------------|--|--|--|
| Time: | | Job No. | 2018-079(C) | | ORS AU1a - Site 3 | | | |
| Mapped RE: | 12.9-10.2 Remr | nant | Description: | Corymbia citriodora subsp. var usually with Eucalyptus crebra | <i>iegata</i> open forest or woodland | | | |
| Field RE: | 12.9-10.2 Remnant Descripti | | Description: | Corymbia citriodora subsp. variegata, Eucalyptus tereticornis, Eucalyptus crebra and Angophora subvelutina open forest to 25m. Subcanopy species include regenerating canopy species and Allocasuarina torulosa. | | | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptu tereticornis, E. moluccana, E. acmenoides and E. siderophloia n be present in scattered patches or in low densities. Understorey be grassy or shrubby. | | | | |
| Slope: | Aspect: | Landform (loca | l): | Landform (broad): | | | | |
| 10 degrees | South; Bearing 103 degrees | Southern slope | on low hill | low sandy rise | | | | |
| Slope Shape: | Convex | | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m w boundary | rith 50 x 20m plot | 100x50m Area | (NB: *Ecologically Dominant Lay stemmed over 2m. All tree speci EDL species) – Specify species | ver. Tree defined as single ies in the 100 x 50m (not just |
|---------------------------|---|--------------------|--|---|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 16m per Site | Total Native Tree Spp. | Dominant / Codominant: | Associated / Suppressed: |
| | | 160m per ha | Richness | Corymbia citriodora subsp. variegata | Angophora subvelutina, , Allocasuarina torulosa, Corymbia intermedia, Eucalyptus crebra, Eucalyptus tereticornis Acacia concurrens , Banksia integrifolia |
| | | | | Proportion of EDL species with evidence of recruitment | Corymbia citriodora subsp. variegata, |
| | | | | (Specify recruiting species) | Eucalyptus tereticornis |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 100% |
| 50x10m area | Native plant species rich | ness | (NB: List species i Shrub is defined a multi-stemmed fro | Total | |
| Shrub | Jacksonia scoparia, Corymbia citriodora subsp. variegata, Eucalyptus crebra, Acacia maidenii, Melichrus urceolatus, Breynia oblongifolia, | | | tus crebra, Acacia maidenii, | 6 |
| Grass | Cymbopogon refractus, Aristida calycina, Imperata cylindrica, Eragrostis sp., Heteropogon contortus, Panicum sp., | | | | 6 |
| Forb | Lomandra sp., Chrysocephalum apiculatum, Cyanthillium cinereum, Glycine tabacina, Dianella brevipedunculata, Desmodium rhytidophyllum, Lobelia purpurascens, Cheilanthes sieberi, Hardenbergia violaceae, Mentha satureioides, Crotalaria montana, Hybanthus stellarioides, Galactia tenuiflora, Hydrocotyle laxiflora | | | 14 | |
| Non-native plant cover | | | | | 70% |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | | | |
|---|---|----|----|----|----|------|--|--|
| Ground Cover type | 1 2 3 4 5 Ave. | | | | | | | |
| Native perennial ('decreaser') grass cover* | 15 | 30 | 50 | 10 | 5 | 22 | | |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Native forbs and other species (non-grass) | 8 | 5 | 4 | 5 | 15 | 7.4 | | |
| Native shrubs (<1m in height) | 0 | 10 | 0 | 0 | 0 | 2 | | |
| Non-native grass | 25 | 24 | 15 | 35 | 25 | 24.8 | | |
| Non-native forbs and shrubs | 2 | 0 | 0 | 10 | 0 | 2.4 | | |
| Litter | 50 | 31 | 31 | 40 | 50 | 40.4 | | |

| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
|---------------------------------------|------|------|------|------|------|------|
| Bare ground | 0 | 0 | 0 | 0 | 5 | 1 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | from benchmark doc; Living trees only | | | | | | |
|------------------------------|--------------|--|-----|-------------------------|----|--|--|--|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 16 | Total Large Trees (ha): | 30 | | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | | | | |

| Plot based weed data Record all weed species within the 10x 50 plot | | | | |
|---|------------|--|--|--|
| Species | notes | | | |
| Lantana camara | common | | | |
| Melinis repens | abundant | | | |
| Cynodon dactylon | common | | | |
| Emilia sonchifolia | occasional | | | |
| Gamochaeta coarctata | occasional | | | |

| Plot based tree data | Record all trees within the 100 x 50 ${ m m}$ plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|---|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 440 , 360, 520 , 480 , 480 , 470 , 430 , 410 , 410 , 440 , 530 , 630 |
| Angophora subvelutina | 440 |
| Eucalyptus tereticornis | 520 |
| Eucalyptus crebra | 580 |
| Corymbia intermedia | 320, 500 |
| Dead | 360, 480, 300 |

| 10x10m plots – canopy species rege | neration <50mm;>50 | 0mm-100mm DBH (500 |)m²): | | | | | |
|------------------------------------|--------------------|--------------------|----------------|--------|---------|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | |
| Corymbia citriodora | | 2, 0 | 6, 4 | 7, 4 | 21, 2 | | | |
| Corymbia intermedia | 1, 0 | 3, 0 | 1, 3 | 1, 2 | | | | |
| Angophora subvelutina | 1, 0 | 0, 1 | | 1, 0 | | | | |
| Corymbia tessellaris | 1, 0 | | 1, 2 | 2, 1 | | | | |
| Eucalyptus crebra | 0, 1 | 3, 0 | 2, 1 | 3, 3 | 3, 4 | | | |
| Recruitment <50 mm DBH / ha | | | 780 stems / ha | | | | | |
| 50-300mm DBH / ha | 560 stems / ha | | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-------------|-----------|-----------|------------------------|--|
| Species | Strata | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected Cover (m) | |
| | | | start: | end: | | | |
| Corymbia citriodora subsp. variegata | C (T1) | 18 | 0.0 | 4.4 | 4.4 | 11.0 | |
| Corymbia citriodora subsp. variegata | C (T1) | 21 | 3.0 | 11.0 | 8.0 | | |
| Eucalyptus tereticornis | C (T1) | 19 | 21.0 | 30.3 | 9.3 | 9.3 | |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 44.0 | 56.0 | 12.0 | 12.0 | |
| Corymbia citriodora subsp. variegata | C (T1) | 20 | 64.4 | 82.0 | 17.6 | 17.6 | |
| Corymbia citriodora subsp. variegata | C (T1) | 25 | 87.0 | 100.0 | 13.0 | 13.0 | |
| | | | | | | | |
| Angophora subvelutina | S (T2) | 15 | 15.0 | 22.0 | 7.0 | 7.0 | |
| Corymbia intermedia | S (T2) | 14 | 32.4 | 43.3 | 10.9 | 10.9 | |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 51.0 | 53.0 | 2.0 | 2.0 | |
| Corymbia tessellaris | S (T2) | 12 | 57.5 | 59.3 | 1.8 | 1.8 | |
| Acacia concurrens | S (T2) | 12 | 64.5 | 71.0 | 6.5 | 6.5 | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|---|--------------------------------|-------------------|--------------------------|----------------------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| | | | | | | |
| Corymbia intermedia | S (T3) | 3.0 | 0.0 | 1.0 | 1.0 | 1.0 |
| Allocasuarina torulosa | S (T3) | 6.0 | 4.5 | 7.3 | 2.8 | 2.8 |
| Corymbia citriodora subsp. variegata | S (T3) | 3.0 | 44.3 | 46.0 | 1.7 | 2.5 |
| Eucalyptus crebra | S (T3) | 3.0 | 45.5 | 46.8 | 1.3 | |
| Jacksonia scoparia | S (T3) | 3.0 | 47.0 | 49.0 | 2.0 | 2.0 |
| Corymbia citriodora subsp. variegata | S (T3) | 9.0 | 50.3 | 52.6 | 2.3 | 2.3 |
| Corymbia intermedia | S (T3) | 8.0 | 53.0 | 54.3 | 1.3 | 1.3 |
| Corymbia citriodora subsp. variegata | S (T3) | 7.0 | 56.3 | 57.2 | 0.9 | 0.9 |
| Corymbia tessellaris | S (T3) | 3.5 | 57.0 | 58.3 | 1.3 | 1.3 |
| Eucalyptus crebra | S (T3) | 3.0 | 59.6 | 61.0 | 1.4 | 1.4 |
| Corymbia tessellaris | S (T3) | 7.0 | 62.5 | 65.2 | 2.7 | 3.8 |
| Jacksonia scoparia | S (T3) | 3.2 | 65.2 | 66.3 | 1.1 | |
| Corymbia citriodora subsp. variegata | S (T3) | 3.0 | 72.0 | 73.0 | 1.0 | 1.0 |
| Corymbia citriodora subsp. variegata | S (T3) | 8.0 | 76.7 | 78.4 | 1.7 | 1.7 |
| Eucalyptus crebra | S (T3) | 4.0 | 83.0 | 84.6 | 1.6 | 1.6 |
| | | | | | | |
| Total Canopy (T1) | | | | | 62.9 (62.9 Med ht: | 9 m 9%) 20.5 m |
| Total Sub-canopy (T2) | | | | | 28. (28.) Med ht: | 2m 2%) 12.0 m |
| Total Sub-canopy (T3) | | | | | 23. (23. Med ht | 6m 6%) : 3.5 m |
| 100m Transect Shrub capopy cover | * denote as na | ative or exotic. Only | native shrub c | over is used in t | he scoring. | |
| | Shrub - Wood level) or if sing | ly plant that is multi le stemmed, less t | -stemmed from than 2 m tall | the base (or wi | thin 200 mm from | m ground |
| Species | Strata: | Height (m) | Intercep | ot Range (m) | Cover (m) | Cover (m) |
| | Sindb | | start: | end: | | |
| Alphitonia excelsa | Shrub | 1.2 | 11.3 | 12.2 | 0.9 | 0.9 |
| Alphitonia excelsa | Shrub | 2.0 | 14.0 | 15.2 | 1.2 | 1.2 |
| Eucalyptus tereticornis | Shrub | 0.3 | 17.6 | 19.0 | 1.4 | 1.4 |
| Alphitonia excelsa | Shrub | 1.5 | 35.7 | 37.0 | 1.3 | 1.3 |
| Eucalyptus crebra | Shrub | 1.0 | 37.2 | 38.1 | 0.9 | 0.9 |
| Eucalyptus crebra | Shrub | 1.0 | 52.1 | 53.0 | 0.9 | 1.1 |
| Eucalyptus crebra | Shrub | 1.2 | 52.0 | 53.2 | 1.2 | |
| Eucalyptus crebra | Shrub | 1.0 | 55.7 | 56.5 | 0.8 | 0.8 |
| Lantana camara* | Shrub | 1.4 | 64.0 | 65.0 | 1.0 | - |
| Alphitonia excelsa | Shrub | 1.2 | 67.1 | 67.6 | 0.5 | 0.5 |
| Eucalyptus crebra | Shrub | 2.0 | 71.0 | 72.0 | 1.0 | 1.0 |

Shrub

Shrub

Shrub

0.5

2.3

2.0

84.4

85.3

88.0

84.8

86.7

89.0

0.4

1.4

1.0

11.9 m (11.9%) Med ht: 1.2 m

0.4

1.4

1.0

Jacksonia scoparia

Eucalyptus crebra

Native shrub layer

Corymbia citriodora subsp. variegata


Southern View from Centre of Transect

| Date: | 8 May 2023 | Collector: | J. Armstrong, L. Har | rington | OPS ALL2 Site 5 (Mast) | |
|---------------|--|------------|----------------------|--|------------------------|--|
| Time: | | Job No. | 2019-079C | | ORS AUZ Sile 5 (West) | |
| Mapped RE: | Category X Description: | | Description: | Non-remnant | | |
| Field RE: | Category X | | Description: | Young regrowth with Corymbia citriodora subsp. variegata open forest /regrowth to 20m. Also Corymbia intermedia, Eucalyptus tereticornis, Corymbia tessellaris to 10 m, Angophora subvelutina to 4 m. | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia ma be present in scattered patches or in low densities. Understorey c be grassy or shrubby | | |
| Slope: | Aspect: Landform (local): | | l): | Landform (broad): | | |
| 8° | South; Low hills bearing 280 degrees | | | Sedimentary soils with sandsto | ne outcrops | |
| Slope Shape: | Convex | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot | | 100x50m Area | (NB: *Ecologically Dominant Lay | ver. Tree defined as single |
|---------------------------|---|------------------------------|--|---|--|
| | boundary | | | EDL species) – Specify species | les in the 100 x 50m (not just |
| Coarse Woody Debris | Site Total: Per ha Total: | 28 m per Site 280m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: Eucalyptus tereticornis, Corymbia citriodora subsp. variegata Angophora subvelutina Corymbia intermedia | Associated / Suppressed: Corymbia tessellaris, Eucalyptus crebra Allocasuarina torulosa |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | Eucalyptus tereticornis Corymbia intermedia Angophora subvelutina Corymbia citriodora subsp. variegata |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 100% |
| 50x10m area | Native plant species rich | ness | (NB: List species i Shrub is defined a multi-stemmed fro | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total |
| Shrub | Wikstroemia indica, Dod | lonaea viscosa, Alloca | suarina torulosa | | 3 |
| Grass | Microlaena stipoides, Sp gracillima, Eragrostis sp. Cymbopogon refractus, contortus | 14 | | | |
| Forb | Lobelia purpurascens, D Oxalis sp., Hypericum gu sieberi, Calotis dentex, I Lomandra sp., Glycine to | 19 | | | |
| Non-native plant cover | | | | | 40 |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|--|-----|----|----|----|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 41 | 0 | 50 | 20 | 5 | 23.2 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 2 | 0 | 10 | 5 | 45 | 12.4 |
| Native shrubs (<1m in height) | 10 | 0 | 20 | 25 | 15 | 14 |
| Non-native grass | 20 | 0 | 0 | 0 | 0 | 4 |
| Non-native forbs and shrubs | 4 | 100 | 4 | 0 | 3 | 22.2 |

| Litter | 20 | 0 | 10 | 50 | 32 | 22.4 |
|---------------------------------------|------|------|------|------|------|------|
| Rock | 0 | 0 | 6 | 0 | 0 | 1.2 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 3 | 0 | 0 | 0 | 0 | 0.6 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchma | ark doc | | | |
|------------------------------|---------------|--|-----|-------------------------|---|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 2 | Total Large Trees (ha): | 4 |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot |
|----------------------|---|
| Species | notes |
| Lantana camara | common |
| Melinis repens | abundant |
| Verbena rigida | common |
| Bidens pilosa | occasional |

| Plot based tree data | Record all trees within the 100 x 50 plot – record multiple stems in parentheses tis way (230, 250, 190) |
|---------------------------------------|--|
| Species | DBH |
| Corymbia citriodora subsp. citriodora | 120, 55, 60, 60, 60, 850, 60, 100, 80, 70, 75, 55, 60, 80, 100, 60, 55, 55, 80, 150, 55, 55, 55, 65, 55, 60, 60, 65, 65, 65, 70, 55, 60, 70, 65, 55, 65, 55, 60, 60, 70, 55, 65, 70, 75, 90, 80, 70, 70, 70, 65, 280, 150, 120, 60 |
| Angophora subvelutina | 70, 55, 55, 70, 60, 60, 55, 55, 60, 65, 60, 60, 60, 60, 60, 65, 65, 60, 60, 55, 55, 65, 55, 60, 55, 55, 55, 55, 55, 55, 55, 55, 55, 5 |
| Corymbia tessellaris | 55, 55, 80, 55, 55, 55, 65, 55, 60, 70, 70, 60, 70, 60, 70, 55 |
| Corymbia intermedia | 120, 55, 60, 55, 70, 400 , 55, 60, 55, 90, 65, 65, 65 |
| Eucalyptus tereticornis | 55, 60, 300, 60, 70, 60, 60, 55, 60, 65, 450 , 90, 300, 55, 55, 55, 70, 60, 65, 70, 90 |
| Eucalyptus crebra | 65, 55, 75, 55, 60, 70 |

10x10m plots – canopy species regeneration <50mm DBH (500m²):

| · · · · · · · · · · · · · · · · · · · | | (****) | | | | | |
|---------------------------------------|------------------|---------|--------|--------|---------|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | |
| Corymbia citriodora subsp. variegata | 5 | 0 | 2 | 1 | 2 | | |
| Corymbia tessellaris | 0 | 0 | 1 | 0 | 0 | | |
| Corymbia intermedia | 1 | 0 | 1 | 2 | 0 | | |
| Eucalyptus tereticornis | 0 | 0 | 0 | 0 | 2 | | |
| Angophora subvelutina | 1 | 17 | 12 | 0 | 2 | | |
| Lophostemon suaveolens | 0 | 0 | 0 | 0 | 2 | | |
| Stems / ha | 1,020 stems / ha | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|-------------|---------------------|------|-----------|
| Species | Strata | Height (m) | Intercept R | Range (m) Cover (m) | | Corrected |
| | | | start: | end: | | |
| Eucalyptus tereticornis | C (T1) | 17.0 | 13.6 | 18.7 | 5.1 | 14.4 |
| Corymbia citriodora subsp. variegata | C (T1) | 19.0 | 16.4 | 28.0 | 11.6 | |
| Eucalyptus tereticornis | C (T1) | 19.0 | 49.2 | 63.3 | 14.1 | 14.1 |
| Angophora subvelutina | C (T1) | 19.0 | 64.0 | 72.0 | 8.0 | 8.0 |
| | | | | | | |
| Corymbia citriodora subsp. variegata | S (T2) | 14.0 | 9.2 | 12.8 | 3.6 | 3.6 |
| Angophora subvelutina | S (T2) | 13.0 | 44.5 | 46.1 | 1.6 | 1.6 |
| Allocasuarina torulosa | S (T2) | 12.0 | 57.6 | 58.4 | 0.8 | 0.8 |
| Allocasuarina torulosa | S (T2) | 10.0 | 72.8 | 74.4 | 1.6 | 2.8 |
| Corymbia intermedia | S (T2) | 10.0 | 73.2 | 75.6 | 2.4 | |
| Corymbia intermedia | S (T2) | 10.0 | 75.8 | 79.0 | 3.2 | 3.2 |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-------------|---------------------|-----|------------------------------------|--|
| Species | Strata | Height (m) | Intercept F | Intercept Range (m) | | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Corymbia intermedia | S (T2) | 12.0 | 80.2 | 84.7 | 4.5 | 4.5 | |
| Corymbia citriodora subsp. variegata | S (T2) | 14.0 | 94.5 | 97.6 | 3.1 | 3.1 | |
| Eucalyptus tereticornis | S (T2) | 14.0 | 98.2 | 98.8 | 0.6 | 0.6 | |
| | | | | | | | |
| Angophora subvelutina | S (T3) | 7.0 | 13.6 | 15.2 | 1.6 | 1.6 | |
| Angophora subvelutina | S (T3) | 4.0 | 19.0 | 21.6 | 2.6 | 2.6 | |
| Angophora subvelutina | S (T3) | 6.0 | 22.9 | 23.9 | 1.0 | 1.0 | |
| Angophora subvelutina | S (T3) | 5.0 | 27.4 | 28.5 | 1.1 | 3.8 | |
| Angophora subvelutina | S (T3) | 3.0 | 28.2 | 29.2 | 1.0 | | |
| Dodonaea viscosa | S (T3) | 3.0 | 29 | 30.7 | 1.7 | | |
| Angophora subvelutina | S (T3) | 6.0 | 28.8 | 29.7 | 0.9 | | |
| Angophora subvelutina | S (T3) | 5.0 | 30.1 | 31.2 | 1.1 | | |
| Angophora subvelutina | S (T3) | 9.0 | 30.4 | 32.4 | 2.0 | 2.0 | |
| Angophora subvelutina | S (T3) | 6.0 | 34.3 | 34.9 | 0.6 | 0.6 | |
| Lantana camara* | S (T3) | 3.0 | 38.0 | 47.7 | 9.7 | 10.2 | |
| Angophora subvelutina | S (T3) | 8.0 | 46.4 | 48.2 | 1.8 | | |
| Allocasuarina torulosa | S (T3) | 4.0 | 64.6 | 66.1 | 1.5 | 1.5 | |
| Allocasuarina torulosa | S (T3) | 6.0 | 66.3 | 68.3 | 2.0 | 4.6 | |
| Allocasuarina torulosa | S (T3) | 9.0 | 67.5 | 70.9 | 3.4 | | |
| Allocasuarina torulosa | S (T3) | 8.0 | 74.6 | 76.5 | 1.9 | 1.9 | |
| Allocasuarina torulosa | S (T3) | 6.0 | 78.3 | 79.2 | 0.9 | 1.9 | |
| Allocasuarina torulosa | S (T3) | 7.0 | 79.2 | 80.4 | 1.2 | | |
| Corymbia citriodora subsp. variegata | S (T3) | 7.0 | 78.8 | 80.9 | 2.1 | 2.1 | |
| Allocasuarina torulosa | S (T3) | 5.0 | 85.6 | 87.7 | 2.1 | 2.1 | |
| Allocasuarina torulosa | S (T3) | 7.0 | 94.2 | 95.7 | 1.5 | 1.5 | |
| | | | | | | | |
| Total Canopy (T1) | 36.5 m (36.5%) Med ht: 19.0 m | | | | | | |
| Total Sub-canopy (T2) | 20.2 m (20.2%) Med ht: 12.0 m | | | | | | |
| Total Sub-canopy (T3) | | | | | | 37.4 m (37.4%) Med ht: 6.0 m | |
| 100m Transect * denote as native or exotic. Only native shrub cover is used in | | | | | | | |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. | | | | | |
|-------------------------------------|---|------------|-------------|-----------|------------|----------------------|
| | Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | ground |
| Species | Strata: | Height (m) | Intercept I | Range (m) | Cover (m) | Corrected |
| | Shirub | Γ | start: end: | | | Cover (m) |
| Lantana camara* | Shrub | 1.0 | 0.0 | 0.5 | 0.5 | - |
| Angophora subvelutina | Shrub | 2.0 | 17.2 | 17.8 | 0.6 | 0.6 |
| Lantana camara* | Shrub | 2.0 | 21.8 | 27.8 | 6.0 | - |
| Allocasuarina torulosa | Shrub | 2.0 | 63.0 | 64.2 | 1.2 | 1.2 |
| Lantana camara* | Shrub | 2.0 | 64.3 | 64.8 | 0.5 | - |
| Allocasuarina torulosa | Shrub | 1.5 | 66.3 | 66.9 | 0.6 | 0.6 |
| Lantana camara* | Shrub | 1.0 | 69.3 | 70.9 | 1.6 | - |
| Lantana camara* | Shrub | 2.0 | 78.7 | 80.3 | 1.6 | - |
| Cassina quinquefaria | Shrub | 1.5 | 85.2 | 85.8 | 0.6 | 0.6 |
| | | | | | | |
| Total native shrub layer | | · | | | 3.0 (3' |) m %) t: 2 0m |



Southern View from Centre of Transect

Western View from Centre of Transect

| Date: | 8 May 2023 | Collector: | J. Armstrong L. Harrington | | OPS ALL2 Site 6 (west) | |
|--------------------|--|--------------------------|----------------------------|---|------------------------------|--|
| Time: | | Job No. | 2018-079C | | | |
| Mapped RE: | Category X | | Description: | Non-remnant | | |
| Field RE: | Category X | | Description: | Modified pastural grassland – derived native and exotic grassland 0.6 m | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia may be present in scattered patches or in low densities. Understorey can be grassy or shrubby | | |
| Slope: | Aspect: | spect: Landform (local): | | Landform (broad): | | |
| 3° Slope Shape: | West; Bearing Gentle west facil 83° | | ng slope | Outwash area, surrounding se | dimentary hills and outcrops | |
| cicpe chapor | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m w boundary | /ith 50 x 20m plot | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as single stemmed over 2m. All tree species in the 100 x 50m (not ju EDL species) – Specify species | | |
|---------------------------|--|------------------------|--|---|--------------------------|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 0 per Site 0 per ha | Total Native Tree Spp. Richness | Dominant / Codominant: N/A | Associated / Suppressed: | |
| | | | | Proportion of EDL species with evidence of recruitment | None | |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 0 | |
| 50x10m area | Native plant species rich | iness | (NB: List species i Shrub is defined a multi-stemmed fro | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total | |
| Shrub | None | | | | 0 | |
| Grass | Heteropogon contortus, | 4 | | | | |
| Forb | Chrysocephalum apiculatum, Galactia tenuiflora, Glycine tomentella, Hydrocotyle laxiflora, Rostellularia adscendens, Dichondra repens, Wahlenbergia sp., Crotalaria montana, Crotalaria mitchellii, Rhynchosia minima, Lomandra longifolia, Sida hackettiana, Oxalis sp., Desmodium varians, Flemingia sp. Evolvulus alsinoides, Cheilanthes sieberi, Convolvulus sp., Sauropus hirtellus, Mentha satureioides | | | | 20 | |
| Non-native plant cover | | | | | 65% | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|---|------|------|------|------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 4 | 55 | 18 | 12 | 5 | 18.8 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 2 | 1 | 6 | 0 | 40 | 9.8 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 91 | 39 | 55 | 48 | 30 | 52.6 |
| Non-native forbs and shrubs | 0 | 0 | 16 | 7 | 10 | 6.6 |
| Litter | 3 | 5 | 5 | 33 | 15 | 12.2 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchmark doc | | | | | | | |
|------------------------------|---------------------|--|-----|-------------------------|-----|--|--|--|
| Eucalypt large tree DBH: | N/A | No. of large eucalypt trees in plot: | N/A | Total Large Trees (ha): | N/A | | | |
| Non-eucalypt large tree DBH: | NA | No. of large non-eucalypt trees in plot: | N/A | | | | | |

| Plot based weed data | Record all weed species within the 10x 50 sub-plot |
|----------------------------|--|
| Species | notes |
| Chamaecrista rotundifolia | common |
| Melinis repens | abundant |
| Lantana camara | occasional |
| Verbena rigida | common |
| Sida cordifolia | common |
| Erigeron bonariensis | common |
| Heliotropium amplexicaule | occasional |
| Gomphocarpus physocarpus | occasional |
| Macroptilium atropurpureum | occasional |
| Lantana montevidensis | occasional |

| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|--|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 70 |
| Eucalyptus tereticornis | 80, 50, 60 |
| Corymbia tessellaris | 60 |
| Corymbia intermedia | 80 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m ²): | | | | | | | |
|--|--------|--------|---------------|--------|---------|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | |
| Corymbia tessellaris | | | | | 1 | | |
| Eucalyptus tereticornis | | | | 1 | | | |
| Recruitment | | | 40 stems / ha | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-----------|-----------|------------------|----------------------------|--|
| Species | (CorSorE) | Height (m) | Intercept | Range (m) | Cover (III) | Corrected | |
| | | | start: | end: | | Cover (m) | |
| nil | | | | | | | |
| | | | | | | | |
| Total Canopy (T1) | | | | | | 0 m (0%) Med ht: 0 m | |
| Total Sub-canopy (T2) | | | | | | 0 m (0%) Med ht: 0 m | |
| Total Sub-canopy (T3) | | | | | 0 (0 Med I | m %) nt: 0 m | |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|-------------------------------------|--|------------|---------------------|------|------------------|--------------------|
| Species | Strata: | Height (m) | Intercept Range (m) | | Cover (m) | Corrected |
| | Shiub | | start: | end: | | |
| nil | | | | | | |
| | | | | | | |
| Total Native Shrub Layer | | | | | 0 (0 Med h | m %) nt: 0 m |

Site Photos





Eastern View from Centre of Transect



Southern View from Centre of Transect

| Date: | 8 May 2023 | Collector: | J Armstrong, L Harrington | | OPS All? Site 7 (west) | |
|---------------|----------------------|--------------------------------|---------------------------|---|------------------------|--|
| Time: | | Job No. | 2019-079C | | ORS AUZ Sile 7 (west) | |
| Mapped RE: | Category X | | Description: | Non-remnant | | |
| Field RE: | Category X | | Description: | Sparse young regrowth dominated by <i>Eucalyptus tereticornis</i> . Derived native and exotic grassland understorey dominated by <i>Heteropogon contortus</i> and <i>Melinis repens</i> *. | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia ma be present in scattered patches or in low densities. Understorey ca be grassy or shrubby | | |
| Slope: | Aspect: | Landform (loca | I): | Landform (broad): | | |
| 3° | west; Bearing 83° | west; Bearing Outwash area 83° | | Gentle slope formed from outwash eroding from higher sandstone hills and outcrops | | |
| Slope Shape: | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m w boundary | ith 50 x 20m plot | 100x50m Area | (NB: *Ecologically Dominant Lay stemmed over 2m. All tree speci EDL species) – Specify species | ver. Tree defined as single les in the 100 x 50m (not just |
|---------------------------|--|--------------------------|--|---|---|
| Coarse Woody Debris | Site Total: Per ha Total: | 2m per Site 4m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: Eucalyptus tereticornis, Corymbia tessellaris | Associated / Suppressed: Corymbia intermedia |
| | | | Proportion of EDL species with evidence of recruitmen (Specify recruiting species) | | Eucalyptus tereticornis, Corymbia tessellaris Corymbia intermedia |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 100% |
| 50x10m area | Native plant species richness (NB: List Shrub is o multi-ster | | | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total |
| Shrub | Alphitonia excelsa, Cory | 2 | | | |
| Grass | Digitaria divaricatissima, Hyparrhenia filipendula | 6 | | | |
| Forb | Chrysocephalum apicula Rhynchosia minima, Vitt Galactia tenuiflora, Rost sp., Cyperus sp. | 15 | | | |
| Non-native plant cover | | | | | 60 |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | | |
|---|--|------|------|------|------|------|--|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. | |
| Native perennial ('decreaser') grass cover* | 7 | 7 | 25 | 25 | 15 | 15.8 | |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 | |
| Native forbs and other species (non-grass) | 40 | 44 | 0 | 0 | 0 | 16.8 | |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 | |
| Non-native grass | 0 | 0 | 45 | 10 | 30 | 17 | |
| Non-native forbs and shrubs | 53 | 34 | 20 | 20 | 15 | 28.4 | |
| Litter | 0 | 15 | 10 | 45 | 40 | 22 | |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 | |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 | |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% | |

100x50m Area:

| Eucalypt large tree DBH: | N/A | No. of large eucalypt trees in plot: | N/A | Total Large Trees (ha): | N/A |
|------------------------------|-----|--|-----|-------------------------|-----|
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10x 50 plot |
|---------------------------|--|
| Species | notes |
| Melinis repens | abundant |
| Lantana camara | common |
| Ageratum houstonianum | occasional |
| Opuntia sp. | occasional |
| Chamaecrista rotundifolia | common |
| Verbena rigida | common |
| Indigofera spicata | occasional |
| Aster subulatus | common |
| Cyperus aggregatus | common |

| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
|-------------------------|--|
| Species | DBH |
| Eucalyptus tereticornis | 51, 70,70,90,90, (75,75), 70,80, 65, 60, 70, 60, 60, 55, 55, 55, 55, 60, 100, 70, 65, 60, 65, 60, (50,60), 70, (55,65), 65, 60, 55 |
| Corymbia tessellaris | 51, 55, 60, 60, 51, 55, 55, 60, 60, 55 |
| Corymbia intermidia | 65, 65, 60 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m ²): | | | | | | | | | | |
|--|---------------|-------------------------------------|--|---|--|--|--|--|--|--|
| Species: | 10-20m | 10-20m 30-40m 50-60m 70-80m 90-100m | | | | | | | | |
| Corymbia tessellaris | | | | 1 | | | | | | |
| Recruitment | 20 stems / ha | | | | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-------------|-----------|-----------|---------------------------------|--|
| Species | Strata | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Eucalyptus tereticornis | C (T1) | 6 | 0.0 | 1.4 | 1.4 | 1.4 | |
| Corymbia tessellaris | C (T1) | 10 | 48.4 | 51.9 | 3.5 | 3.5 | |
| | | | | | | | |
| Total Canopy (T1) | | | | | | 4.9 m (4.9%) Med ht:8.0 m | |
| Total Sub-canopy (T2) | | | | | | 0 m (0%) Med ht:0 m | |
| Total Sub-canopy (T3) | | | | | | m %) nt: 0 m | |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|-------------------------------------|--|------------|--|------|-------------------|--------------------|
| Species | Strata: | Height (m) | Intercept Range (m) Cover (m) Correcte | | | |
| | Shrub | | start: | end: | | Cover (m) |
| nil | | | | | | |
| Total Native Shrub Layer | | | | | 0 (0' Med h | m %) it: 0 m |



Southern View from Centre of Transect

| Date: | 8 May 2023 | Collector: | J Armstrong, L Harrington | | OPS All? Site & (west) | |
|---------------|------------------------------------|------------|---------------------------|--|------------------------|--|
| Time: | | Job No. | 2018-079C | | | |
| Mapped RE: | Category X | | Description: | Non-remnant | | |
| Field RE: | Category X | | Description: | Sparse young regrowth Corymbia tessellaris and Eucalyptus tereticornis to 10 m. Derived grassland understorey dominated by Melinis repens* and Heteropogon contortus. | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucaly tereticornis, E. moluccana, E. acmenoides and E. siderophloid be present in scattered patches or in low densities. Understore be grassy or shrubby | | |
| Slope: | Aspect: Landform (local): | | I): | Landform (broad): | | |
| 4° | North; Outwash area Bearing 10° | | | Lower slopes of low sandstone | hills and ranges | |
| Slope Shape: | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as single stemmed over 2m. All tree species in the 100 x 50m (not | | |
|--------------|--|------------------------|---------------------------------------|--|--------------------------|--|
| | | | | EDL species) – Specify species | | |
| Coarse Woody | Site Total: | | Total Native | Dominant / Codominant: | Associated / Suppressed: | |
| Debris | Per ha Total: | 1m per Site | Tree Spp. | | | |
| | | | Richness | nil | nil | |
| | | 2m per ha | | | | |
| | | | | | | |
| | | | | Proportion of EDL species | | |
| | | | | with evidence of recruitment | - 11 | |
| | | | | | nıı | |
| | | | | (Specify recruiting species) | | |
| | | | | Recruitment is assessed as | | |
| | | | | the proportion of dominant | | |
| | | | | species present at a site that | 0% | |
| | | | | are regenerating: | | |
| | | | | | | |
| 50x10m area | Native plant species rich | ness | (NB: List species i | f known or count if unknown. | Total | |
| | | | Shrub is defined a | s single stemmed below 2m or | | |
| | | | multi-stemmed fro | m base or below 20cm) | | |
| Shrub | none | | | | 0 | |
| | | | | | | |
| Grass | Heteropogon contortus. | Aristida calvcina. Hvp | arrhenia filipendula. | Panicum sp., Eragrostis sp., | 6 | |
| - | Digitaria divaricatissima | ····· | · · · · · · · · · · · · · · · · · · · | 3 | | |
| <u> </u> | | | | | 10 | |
| Forb | Mentha satureioides, De | 19 | | | | |
| | tomentella, Hydrocotyle | | | | | |
| | Wanienbergia sp., Aesci | | | | | |
| | dvotiooorno | cum gramineum, Hyba | anunus stellarioldes, | Sauropus ninelius, Zornia | | |
| Non notivo | uycuocarpa | | | | 60% | |
| Non-native | | | | | 00% | |
| plant cover | | | | | | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|--|------|------|------|------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 20 | 50 | 5 | 20 | 40 | 27 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 70 | 1 | 0 | 0 | 15 | 17.2 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 5 | 35 | 65 | 50 | 10 | 33 |
| Non-native forbs and shrubs | 0 | 0 | 25 | 15 | 10 | 10 |
| Litter | 5 | 14 | 5 | 15 | 25 | 12.8 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | *from benchmark doc | | | | | |
|------------------------------|--------------|--|---|-------------------------|---|--|--|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 0 | Total Large Trees (ha): | 0 | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | 0 | | | | |

| Plot based weed data | Record all weed species within the 10x 50 plot |
|---------------------------|--|
| Species | notes |
| Melinis repens | abundant |
| Verbena rigida | common |
| Aster subulatus | common |
| Heliotropium amplexicaule | occasional |
| Chamaecrista rotundifolia | common |
| Erigeron bonariensis | common |
| Lantana camara | common |
| | |
| Plot based tree data | Record all trees within the 100 x 50 plot – record multiple stems in parentheses tis way (230, 250, 190) |

| Species | DBH |
|-------------------------|--|
| | |
| Eucalyptus tereticornis | (55,60), 51 |
| Corymbia tessellaris | 51, 70, 70, 65, 60, 55, 51, 60, 60, 65, 51, 51, 50, 55, 55, 50, 55, 55, 55, 50, 50, 50 |
| Corymbia intermedia | 75 |
| Eucalyptus crebra | 65, 65, 51, 60, 51, 51 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m²): | | | | | | |
|---|--------|--------|---------------|--------|---------|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | |
| Corymbia tessellaris | | | | | 1 | |
| Recruitment | | | 20 stems / ha | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|------------|-----------|-----------|--------------------|--------------------------------|--|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected | |
| | | | start: | end: | | Cover (III) | |
| Corymbia tessellaris | C (T1) | 9 | 97.9 | 99.6 | 1.7 | 1.7 | |
| | | | | | | | |
| Total Canopy (T1) | | | | | 1. (1. Med I | 1.7 m (1.7%) Med ht: 9 m | |
| Total Sub-canopy (T2) | | | | | | | |
| Total Sub-canopy (T3) | | | | | 0 (0 Med I | m %) nt: 0 m | |

| * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall. | | | | | |
|---|--|---|--|--|---|
| Strata: | Height (m) | Intercept Range (m) C | | Cover (m) | Corrected |
| Shrub | | start: | end: | 1 | Cover (m) |
| | | | | | |
| | | | | 0 (0' Med f | m %) nt:) m |
| | * denote as native Shrub - Woody pla level) or if single si Strata: Shrub | * denote as native or exotic. Only shrub - Woody plant that is multi- level) or if single stemmed, less the Strata: Height (m) Shrub | * denote as native or exotic. Only native shrub cover Shrub - Woody plant that is multi-stemmed from the level) or if single stemmed, less than 2 m tall Strata: Height (m) Intercept F Shrub start: | * denote as native or exotic. Only native shrub cover is used in the Shrub - Woody plant that is multi-stemmed from the base (or within level) or if single stemmed, less than 2 m tall Strata: Height (m) Shrub Intercept Range (m) start: end: | * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from level) or if single stemmed, less than 2 m tall Strata: Height (m) Intercept Range (m) Cover (m) Shrub Cover (m) start: end: 0 0 (0' Med h |

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Site Photos
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Northern View from Centre of Transect

Eastern View from Centre of Transect



Southern View from Centre of Transect

Western View from Centre of Transect

| Date: | 9 May 2023 | Collector: | J. Armstrong, L. Harrington | | OPS ALL2 Site 9 (west) | | |
|----------------------------|--------------------------------|----------------|------------------------------|---|------------------------|--|--|
| Time: | | Job No. | 2018-079C | | | | |
| Mapped RE: | Category X | | Description: | Non-remnant | | | |
| Field RE: | Category X Description: | | | <i>Eucalyptus carnea</i> regrowth to 12m, with a derived native grassland understorey | | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | <i>Corymbia citriodora subsp. variegata</i> open forest or woodland usually with <i>Eucalyptus crebra</i> . Other species such as <i>Eucalyptus</i> <i>tereticornis, E. moluccana, E. acmenoides</i> and <i>E. siderophloia</i> may be present in scattered patches or in low densities. Understorey can | | | |
| Slope: | Aspect: | Landform (loca | l): | Landform (broad): | | | |
| 6° south west Slope Shape: | North; Ridgeline Bearing 6° | | Low sedimentary/sandstone hi | lls | | | |

| 50x20m Area | All logs >10cm, >0.5m w | ith 50 x 20m plot | 100x50m Area | (NB: *Ecologically Dominant Lay | ver. Tree defined as single |
|--------------|----------------------------|---|---|--|-----------------------------|
| | boundary | | | EDL species) – Specify species | |
| Coarse Woody | Site Total: | =0 | Total Native | Dominant / Codominant: | Associated / Suppressed: |
| Debris | Per ha Total: | 76m per Site | T ree Spp. Richness | Eucalyntus carnea | Allocasuarina littoralis |
| | | 760m per ha | T torness | Eucalyptus tereticornis | Lophostemon suaveolens |
| | | Note that logs are | | | |
| | | present from | | Proportion of EDL species | Eucalyptus carnea, |
| | | historical clearing. | | with evidence of recruitment | Eucalyptus tereticornis |
| | | | | (Specify recruiting species) | |
| | | | | Recruitment is assessed as | 100% |
| | | | | the proportion of dominant species present at a site that | |
| | | | | are regenerating: | |
| 50x10m eree | Notivo plant aposico rich | 2000 | (ND: List species i | | Total |
| 50X10m area | Native plant species fich | mess | Shrub is defined a | is single stemmed below 2m or | TOLAT |
| | | | multi-stemmed fro | m base or below 20cm) | |
| Shrub | Breynia oblongifolia, Allo | ocasuarina littoralis, Lo | phostemon suaveol | lens, | 3 |
| | | | | | |
| Grass | Heteropogon contortus, | Eragrostis sp., Capillip istida ramosa, Sporob | oedium spicigerum, l olus elongatus, Pan | Hyparrhenia filipendula, Aristida icum sp. Bothriochloa sp. | 12 |
| | Digitaria divaricatissima, | unknown Poaceae sp |). | icum sp., Doumocnioa sp., | |
| F and | | | Ohan an an had | and a state of the | 07 |
| Forb | tomentella. Lobelia purp | andra sp., Fimbristylis urascens. Cheilanthes | sp., Cnrysocepnalu sieberi. Glvcine tab | im apiculatum, Glycine pacina. Wahlenbergia sp., Zornia | 27 |
| | dyctiocarpa, Crotalaria n | | | | |
| | Hybanthus stellarioides, | Lomandra longifolia, l | Rostellularia adscen | dens, Hypericum gramineum, yeum Mentha saturaioides | |
| | Haloragis heterophylla, l | Hydrocotyle laxiflora, (| Calotis dentex, Desn | nodium varians | |
| No | | | | | 000/ |
| Non-native | | | | | 30% |
| plant oo to | | | | | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|---|------|------|------|------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 40 | 23 | 60 | 20 | 10 | 30.6 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 5 | 5 | 8 | 15 | 2 | 7 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 2 | 9 | 2 | 0 | 45 | 11.6 |
| Non-native forbs and shrubs | 0 | 8 | 0 | 0 | 15 | 4.6 |
| Litter | 48 | 25 | 30 | 55 | 23 | 36.2 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 5 | 30 | 0 | 10 | 5 | 10 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | ark doc | | | |
|------------------------------|--------------|--|-----|-------------------------|-----|
| Eucalypt large tree DBH: | N/A | No. of large eucalypt trees in plot: | N/A | Total Large Trees (ha): | N/A |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot |
|---------------------------|--|
| Species | notes |
| Melinis repens | common |
| Verbena rigida | occasional |
| Chamaecrista rotundifolia | occasional |
| Lantana camara | common |
| | |
| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
| Species | DBH |
| Eucalyptus carnea | 85 x 80mm, 78 x 150mm, 1 x 480mm, 23 x 200mm, |
| Eucalyptus tereticornis | 6 x 150mm, 4 x 80mm |

| 10x10m plots – canopy species regeneration <50mm DBH (500m²): | | | | | | | | | |
|---|------------------|--------|--------|--------|---------|--|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | | |
| Eucalyptus carnea | 23 | 30 | 1 | | | | | | |
| Lophostemon suaveolens | | | | 27 | 2 | | | | |
| Recruitment | 1,660 stems / ha | | | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that are present. *If trees are in the same layer and continuous along the transect group them). Can layer includes T1 and T2 layers, but not T3. | | | | | s that layers). Canopy |
|--|--|------------|-------------|-----------|-----------|----------------------------|
| Species | Strata | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: end: | | | Cover (m) |
| Eucalyptus carnea | C (T1) | 8.0 | 16.6 | 18.9 | 2.3 | 2.3 |
| Eucalyptus carnea | C (T1) | 8.0 | 20.4 | 23.2 | 2.8 | 4.7 |
| Eucalyptus carnea | C (T1) | 9.0 | 22.5 | 25.1 | 2.6 | |
| Eucalyptus carnea | C (T1) | 8.0 | 26.4 | 28.9 | 2.5 | 3.3 |
| Eucalyptus carnea | C (T1) | 10.0 | 27.7 | 29.7 | 2.0 | |
| Eucalyptus carnea | C (T1) | 8.0 | 33.4 | 35.3 | 1.9 | 7.8 |
| Eucalyptus carnea | C (T1) | 9.0 | 35.2 | 40.0 | 4.8 | |
| Eucalyptus carnea | C (T1) | 11.0 | 54.0 | 57.0 | 3.0 | 3.3 |
| Eucalyptus tereticornis | C (T1) | 9.0 | 54.4 | 57.3 | 2.9 | |
| Eucalyptus carnea | C (T1) | 9.0 | 62.0 | 64.3 | 2.3 | 2.3 |
| Eucalyptus carnea | C (T1) | 13.0 | 65.0 | 69.5 | 4.5 | 5.6 |
| Eucalyptus carnea | C (T1) | 12.0 | 68.6 | 70.6 | 2.0 | |
| Eucalyptus carnea | C (T1) | 12.0 | 73.0 | 76.0 | 3.0 | 3.0 |
| Eucalyptus carnea | C (T1) | 12.0 | 76.1 | 79.0 | 2.9 | 2.9 |
| Eucalyptus carnea | C (T1) | 13.0 | 81.8 | 86.3 | 4.5 | 4.5 |
| Allocasuarina littoralis | C (T1) | 8.0 | 91.6 | 95.3 | 3.7 | 4.2 |
| Allocasuarina littoralis | C (T1) | 8.0 | 93.5 | 95.8 | 2.3 | |
| Eucalyptus carnea | C (T1) | 10.0 | 99.0 | 100.0 | 1.0 | 1.0 |
| | | | | | | |
| Eucalyptus carnea | S (T2) | 3.0 | 0 | 1.3 | 1.3 | 1.3 |
| Eucalyptus carnea | S (T2) | 4.0 | 2.4 | 3.8 | 1.4 | 2.1 |
| Eucalyptus carnea | S (T2) | 5.0 | 3.1 | 4.5 | 1.4 | |
| Eucalyptus carnea | S (T2) | 5.0 | 16.1 | 18.3 | 2.2 | 3.7 |
| Eucalyptus carnea | S (T2) | 3.0 | 17.8 | 19.8 | 2.0 | |
| Eucalyptus carnea | S (T2) | 4.0 | 26.8 | 28.8 | 2.0 | 2.0 |
| Eucalyptus carnea | S (T2) | 5.0 | 30.2 | 31.3 | 1.1 | 1.1 |
| Eucalyptus carnea | S (T2) | 6.0 | 31.4 | 33.3 | 1.9 | 1.9 |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|-------------------------|-----------|-----------|------------------|--------------------|--|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Eucalyptus carnea | S (T2) | 5.0 | 40.0 | 41.2 | 1.2 | 1.2 | |
| Eucalyptus tereticornis | S (T2) | 6.0 | 51.3 | 52.5 | 1.2 | 1.2 | |
| | | | | | | | |
| Total Canopy (T1) | 44. (44) Med h | 9 m .9%) t: 9.0 m | | | | | |
| Total Sub-canopy (T2) | 14.5 m (14.5%) Med ht: 5.0 m | | | | | | |
| Total Sub-canopy (T3) | | | | | 0 (0 Med I | m %) nt: 0 m | |

| 100m Transact | * denote as native or exotic. Only native shrub cover is used in the scoring | | | | | |
|--------------------------|--|-------------------------|--------------------|------------------|----------------------|-----------------------|
| | denote as harve of exerce. Only harve sinds cover is used in the scoling. | | | | | |
| Shrub canopy cover | | | | | | |
| | Shrub - Woody p | lant that is multi-s | stemmed from th | ie base (or with | in 200 mm from | ground |
| | level) or if single s | stemmed, <u>less th</u> | <u>an 2 m tall</u> | | | |
| Species | Strata: | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected |
| • | Shrub | , , , | • | U () | - `` | Cover (m) |
| | 011102 | | start: | end: | | |
| Lantana camara* | Shrub | 1.0 | 76.2 | 78.7 | 2.5 | - |
| Lantana camara* | Shrub | 2.0 | 81.3 | 85.9 | 4.6 | - |
| Lantana camara* | Shrub | 2.0 | 91.0 | 95.5 | 4.5 | - |
| Alphitonia excelsa | Shrub | 1.0 | 91.0 | 91.7 | 0.7 | 0.7 |
| Lantana camara* | Shrub | 2.0 | 99.7 | 100 | 0.3 | - |
| | | | | | | |
| Total Native Shrub Layer | | | | | 0.7 (0.7 Med h | 7 m 7%) t: 1.0m |



Southern View from Centre of Transect

| Date: | 9 May 2023 | Collector: | J Armstrong, L Harrington | | OPS All2 Site 10 (west) | | |
|---------------|-----------------------------|----------------|---------------------------|---|-------------------------|--|--|
| Time: | | Job No. | 2018-079C | | | | |
| Mapped RE: | Category X Description: | | Non-remnant | | | | |
| Field RE: | Category X | | Description: | Modified pastural grassland – derived native and exotic grassland dominated by <i>Heteropogon contortus</i> | | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia may be present in scattered patches or in low densities. Understorey can be grassy or shrubby | | | |
| Slope: | Aspect: | Landform (loca | I): | Landform (broad): | | | |
| Flat | North west; Bearing 280° | | Outwash and alluvial area | | | | |
| Slope Snape: | piairi | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as sin stemmed over 2m. All tree species in the 100 x 50m (r EDL species) – Specify species | |
|---------------------------|--|---|---|---|--------------------------|
| Coarse Woody Debris | Site Total: Per ha Total: | 0m per Site 0m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: Eucalyptus tereticornis Angophora subvelutina | Associated / Suppressed: |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | None |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 0% |
| 50x10m area | Native plant species rich | ness | (NB: List species i Shrub is defined a multi-stemmed fro | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total |
| Shrub | None | None 0 | | 0 | |
| Grass | Heteropogon contortus, Sporobolus sp., Panicun | Heteropogon contortus, Hyparrhenia filipendula, Bothriochloa sp., Capillipedium spicigerum, 8 Sporobolus sp., Panicum sp., Eragrostis sp., Aristida sp. 8 | | | 8 |
| Forb | Oxalis sp., Galactia tenu satureioides, Cyperus sp Carex inversa, Hypericu | iflora, Glycine tabacin o., Verbena sp., Wahle m gramineum, Cheilar | labacina, Dichondra repens, Centella asiatica, Mentha 15 , Wahlenbergia sp., Lomandra longifolia, Vittadinia sp., Cheilanthes sieberi, Polymeria calycina | | |
| Non-native plant cover | | | | | 50% |

| Five 1x1m plots | *attributes are es improves your at | ssential to asses bility to more acc | s as used in sco curately visualise | ring, however as proportions of | ssessment of all each of the attrib | attributes outes |
|---|--|---|--|------------------------------------|--|---------------------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 10 | 12 | 15 | 20 | 25 | 16.4 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 20 | 15 | 25 | 35 | 55 | 30 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 65 | 8 | 0 | 8 | 0 | 16.2 |
| Non-native forbs and shrubs | 0 | 50 | 45 | 37 | 20 | 30.4 |
| Litter | 0 | 15 | 15 | 0 | 0 | 6 |
| Rock | 2 | 0 | 0 | 0 | 0 | 0.4 |
| Bare ground | 3 | 0 | 0 | 0 | 0 | 0.6 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchmark doc | | | | | | |
|------------------------------|---------------------|--|-----|-------------------------|-----|--|--|
| Eucalypt large tree DBH: | N/A | No. of large eucalypt trees in plot: | N/A | Total Large Trees (ha): | N/A | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | | | |

| Plot based weed data | Record all weed species within the 10x 50 sub-plot |
|---------------------------|--|
| Species | notes |
| Cynodon dactylon | common |
| Sida cordifolia | common |
| Chamaecrista rotundifolia | common |
| Sporobolus natalensis | occasional |
| Cyperus sesquiflorus | common |
| Lantana camara | occasional |
| Gomphocarpus physocarpus | common |
| Erigeron bonariensis | common |
| Verbena rigida | occasional |
| Melinis repens | abundant |
| | |
| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
| Species | DBH |
| Eucalyptus tereticornis | (120,100) |
| Angophora subvelutina | 80, 130 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m²): | | | | | | |
|---|--------|--------|--------|--------|---------|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | |
| nil | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | es that ip them). | |
|--|--|------------|-----------|-----------|----------------------|--------------------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | | | start: | end: | | Cover (m) |
| nil | | | | | | |
| Total Canopy (T1) | | | | | 0 (0' Med h | m %) nt: 0 m |
| Total Sub-canopy (T2) | | | | | ا 0) Med h | m %) nt: 0 m |
| Total Sub-canopy (T3) | | | | | 0 (0' Med h | m %) nt: 0 m |
| | | | | | - | |

| Shrub canopy cover | Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|--------------------------|---|------------|-------------|----------|---------------------------|-----------------|
| Species | Strata: | Height (m) | Intercept R | ange (m) | Cover (m) | Corrected |
| | Sillub | | start: | end: | | (m) |
| nil | | | | | | |
| Total Native Shrub Layer | | | | | 0.0 ı (0.0% Med ht: | m %) :0 m |

Site Photos





Northern View from Centre of Transect

Eastern View from Centre of Transect



Southern View from Centre of Transect

| Date: | 9 May 2023 | Collector: | J Armstrong, L Harrington | | OPS Allth Site 12 (west) | |
|---------------|--|---------------------------|---------------------------|---|--------------------------|--|
| Time: | | Job No. | 2018-079C | | ORS AUTO SILE 12 (West) | |
| Mapped RE: | 12.9-10.2 - Regrowth | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra | | |
| Field RE: | 12.9-10.2 - Regrowth | | Description: | Corymbia citriodora subsp. variegata open forest to 25m with regeneration to 15m. | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia may be present in scattered patches or in low densities. Understorey ca be grassy or shrubby. | | |
| Slope: | Aspect: | Aspect: Landform (local): | | Landform (broad): | | |
| 12° | South-east; Transect Bearing 28º | | | | | |
| Slope Shape: | Convex | | |] | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as sin stemmed over 2m. All tree species in the 100 x 50m (n EDL species) – Specify species | |
|---------------------------|--|---|--|---|---|
| Coarse Woody Debris | Site Total: Per ha Total: | 6m per Site | Total Native Tree Spp. | Dominant / Codominant: | Associated / Suppressed: |
| | | 60m per ha | Richness | Corymbia citriodora subsp. variegata | Corymbia intermedia, Eucalyptus crebra |
| | | | | | Corymbia tessellaris Eucalyptus tereticornis |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | Corymbia citriodora subsp. variegata, |
| | | | | Recruitment is assessed as the proportion of <u>dominant</u> species present at a site that are regenerating: | 100% |
| 50x10m area | Native plant species rich | ness | (NB: List species i Shrub is defined a multi-stemmed fro | Total | |
| Shrub | Corymbia citriodora subsp. variegata, Melichrus urceolatus, Acacia implexa, Psydrax odorata, Wikstroemia indica | | | | 5 |
| Grass | Hyparrhenia filipendula, Aristida calycina, Aristida ramosa, Aristida benthamii, Heteropogon 1" contortus, Panicum sp., Eragrostis sp., Cymbopogon refractus, Imperata cylindrica, Capillipedium spicigerum, Microlaena stipoides 1" | | | | 11 |
| Forb | Glycine tomentella, Chry sp., Glycine tabacina, Eu sp., Centella asiatica, Cy purpurascens, Rostellula clandestina, Hydrocotyle | socephalum apiculatu Istrephus latifolius, Cru Iperus sp., gracilis?., (Inia adscendens, Scler Iaxiflora, Dianella bre | apiculatum, Mentha satureioides, Lobelia sp., Wahlenbergia 23 folius, Crotalaria montana, Cheilanthes sieberi, Lomandra acilis?., Galactia tenuiflora, Glycine cyrtoloba, Lobelia ns, Scleria mackaviensis, Hybanthus stellarioides, Glycine nella brevipedunculata, Dichondra repens, <u>Iphigenia indica</u> | | |
| Non-native plant cover | | | | | 20% |

| Five 1x1m plots | *attributes are es improves your al | ssential to asses oility to more acc | s as used in sco curately visualise | ring, however as proportions of | ssessment of all each of the attrik | attributes outes |
|---|--|---|--|------------------------------------|--|---------------------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 15 | 2 | 10 | 5 | 15 | 9.4 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 5 | 5 | 8 | 15 | 20 | 10.6 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 25 | 15 | 8 |
| Non-native grass | 40 | 0 | 5 | 5 | 0 | 10 |
| Non-native forbs and shrubs | 0 | 2 | 6 | 0 | 0 | 1.6 |
| Litter | 40 | 91 | 71 | 50 | 50 | 60.4 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | from benchmark doc | | | | | | |
|------------------------------|--------------|--|-----|-------------------------|----|--|--|--|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 7 | Total Large Trees (ha): | 14 | | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | | | | |

| Plot based weed data | Record all weed species within the 10 x 50 m sub-plot |
|---------------------------|---|
| Species | notes |
| Melinis repens | common |
| Chaemcrista rotundifolia | occasional |
| Heliotropium amplexicaule | occasional |
| Verbena rigida | occasional |
| Lantana camara | common |

| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|--|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 50 mm-100 mm: 124, 100 mm-200 mm: 25, 470 , 380 , (440,320), 460 , (390,360), 440 , 490 |
| Eucalyptus tereticornis | 70, 120, 100, 60, 70, |
| Corymbia tessellaris | 100 |
| Corymbia intermedia | 70, 160, 90, 90 |
| Eucalyptus crebra | 100, 90, 120, 110, 100, 90, 70 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m ²): | | | | | | |
|--|--------|--------|------------------|--------|---------|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | |
| Corymbia citriodora subsp. variegata | 8 | 16 | 13 | 33 | 30 | |
| Eucalyptus tereticornis | | 3 | | | | |
| Corymbia intermedia | 1 | 1 | | 3 | | |
| Recruitment | | | 2,160 stems / ha | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|-----------|-----------|-----------|-----------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 6.0 | 20.0 | 14.0 | 14.0 |
| Corymbia citriodora subsp. variegata | C (T1) | 21 | 47.7 | 52.0 | 4.3 | 4.3 |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 52.8 | 61.0 | 8.2 | 9.1 |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 60.2 | 71.9 | 11.7 | |
| Corymbia citriodora subsp. variegata | C (T1) | 18 | 67.0 | 85.6 | 18.6 | 33.0 |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 85.4 | 95.6 | 10.2 | |
| Corymbia citriodora subsp. variegata | C (T1) | 20 | 95.0 | 100.0 | 5.0 | |
| | | | | | | |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 0.0 | 1.3 | 1.3 | 1.3 |
| Corymbia citriodora subsp. variegata | S (T2) | 9 | 1.9 | 2.6 | 0.7 | 0.7 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 5.7 | 7.4 | 1.7 | 3.0 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 7.0 | 8.7 | 1.7 | |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 10.9 | 12.3 | 1.4 | 1.4 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 20.1 | 20.7 | 0.6 | 2.2 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 19.0 | 22.1 | 3.1 | |
| Eucalyptus tereticornis | S (T2) | 11 | 21.5 | 22.3 | 0.8 | |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 28.4 | 30.0 | 1.6 | 1.6 |
| Corymbia citriodora subsp. variegata | S (T2) | 9 | 30.7 | 31.3 | 0.6 | 0.6 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 33.9 | 36.6 | 2.7 | 2.7 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 36.8 | 37.5 | 0.7 | 0.7 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 40.0 | 40.8 | 0.8 | 0.8 |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 40.9 | 42.1 | 1.2 | 1.2 |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (I are present. *If trees are layer includes T1 and T2 | E) or Subcanopy (in the same layer layers, but not T3 | S) layers if the and continuous | benchmark doos along the trans | cument stipulate sect group them) | s that layers . Canopy |
|--|--|--|------------------------------------|--------------------------------------|--------------------------------------|----------------------------|
| Species | Strata (C or S or E) | Height (m) | Intercept | Range (m) | Cover (m) | Corrected Cover (m) |
| Corvmbia citriodora subsp. variegata | S (T2) | 10 | 43 9 | end: 46.2 | 23 | 23 |
| Corvmbia citriodora subsp. variegata | S (T2) | 9 | 51.7 | 51.9 | 0.2 | 0.2 |
| Corvmbia citriodora subsp. variegata | S (T2) | 9 | 54.0 | 55.2 | 1.2 | 1.2 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 53.9 | 55.2 | 1.3 | |
| Corymbia citriodora subsp. variegata | S (T2) | 10 | 60.7 | 61.6 | 0.9 | 0.9 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 62.3 | 64.0 | 1.7 | 1.7 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 73.0 | 73.9 | 0.9 | 0.9 |
| Corymbia citriodora subsp. variegata | S (T2) | 9 | 76.0 | 76.9 | 0.9 | 0.9 |
| Corymbia intermedia | S (T2) | 10 | 79.4 | 80.8 | 1.4 | 1.4 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 81.2 | 82.0 | 0.8 | 0.8 |
| Corymbia intermedia | S (T2) | 12 | 88.1 | 89.9 | 1.8 | 1.8 |
| Corymbia intermedia | S (T2) | 12 | 91.7 | 93.9 | 2.2 | 2.2 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 94.5 | 95.4 | 0.9 | 0.9 |
| Corymbia citriodora subsp. variegata | S (T2) | 14 | 97.0 | 100.0 | 3.0 | 3.0 |
| | | | | | | |
| Corymbia citriodora subsp. variegata | S (T3) | 5 | 14.2 | 15.3 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 5 | 15.4 | 16.3 | 0.9 | 1.3 |
| Corymbia citriodora subsp. variegata | S (T3) | 7 | 15.4 | 16.7 | 1.3 | |
| Corymbia citriodora subsp. variegata | S (T3) | 6 | 19.0 | 20.2 | 1.2 | 1.2 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 38.4 | 39.2 | 0.8 | 0.8 |
| Corymbia citriodora subsp. variegata | S (T3) | 3 | 39.4 | 40.5 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 6 | 40.9 | 42.0 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 44.0 | 45.0 | 1.0 | 1.0 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 47.3 | 48.1 | 0.8 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 5 | 47.6 | 48.4 | 0.8 | |
| Corymbia citriodora subsp. variegata | S (T3) | 7 | 56.2 | 57.4 | 1.2 | 1.2 |
| Corymbia citriodora subsp. variegata | S (T3) | 5 | 78.8 | 79.8 | 1.0 | 1.0 |
| Corymbia citriodora subsp. variegata | S (T3) | 3 | 84.5 | 85.6 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 7 | 86.0 | 87.6 | 1.6 | 1.6 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 98.3 | 99.6 | 1.3 | 1.3 |
| Corymbia citriodora subsp. variegata | S (T3) | 4 | 98.9 | 99.6 | 0.7 | |
| Total Canopy (T1) | | | | | 60. (60. Med ht: 34. | 4m 4%) 21.5 m 4 m |
| Total Sub-canopy (T2) | | | | | (34. Med ht: | 4%) 10.5 m |
| Total Sub-canopy (T3) | | | | | (14. (14. Med ht | 9%) :: 5.0 m |
| 100m Transect Shrub canopy cover | * denote as nati Shrub - Woody | ve or exotic. Only plant that is multi | native shrub c -stemmed fron | cover is used in n the base (or w | the scoring. ithin 200 mm fro | m ground |
| Species | level) or if single | e stemmed, less t | han 2 m tall | nt Dongo (m) | Course (m) | Comentat |
| opecies | Shrub | Height (m) | interce | printange (m) | | Cover (m) |
| Lantana aamara* | | 1 | start: | end: | 1.4 | . , |

| | Shrub | | • | 8 () | () | Cover (m) |
|--------------------------------------|-------|---|--------|-------|-----|-----------|
| | Shrub | | start: | end: | | Cover (m) |
| Lantana camara* | | 1 | 6.3 | 7.7 | 1.4 | - |
| Lantana camara* | | 1 | 15.2 | 15.5 | 0.3 | - |
| Alphitonia excelsa | | 2 | 17.0 | 17.8 | 0.8 | 0.8 |
| Lantana camara* | | 2 | 18.4 | 22.4 | 4.0 | - |
| Corymbia citriodora subsp. variegata | | 2 | 42.1 | 42.4 | 0.3 | 0.3 |
| Lantana camara* | | 1 | 45.7 | 47.2 | 1.5 | - |
| Lantana camara* | | 1 | 52.7 | 54.7 | 2.0 | - |
| Acacia leiocalyx | | 2 | 54.0 | 54.7 | 0.7 | 0.7 |
| Corymbia citriodora subsp. variegata | | 2 | 55.2 | 55.8 | 0.6 | 0.6 |

| 100m Transect | * denote as native or exotic. Only native shrub cover is used in the scoring. | | | | | |
|--------------------------------------|--|------------------|-------------|-----------|----------------|-------------|
| Shrub canopy cover | | | | | | |
| | Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from group | | | | | ground |
| Onesia | level) or it single s | stemmed, less th | an 2 m tall | | | Come ato d |
| Species | Strata: | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | Shiub | | start: | end: | | Cover (III) |
| Corymbia citriodora subsp. variegata | | 1 | 66.4 | 68.0 | 1.6 | 1.6 |
| Lantana camara* | | 1 | 68.2 | 71.4 | 3.2 | - |
| Corymbia citriodora subsp. variegata | | 2 | 70.3 | 71.8 | 1.5 | 1.5 |
| Corymbia citriodora subsp. variegata | | 2 | 73.4 | 73.7 | 0.3 | 0.3 |
| Corymbia citriodora subsp. variegata | | 2 | 78.6 | 79.1 | 0.5 | 0.5 |
| Corymbia citriodora subsp. variegata | | 2 | 79.7 | 81.4 | 1.7 | 1.7 |
| Corymbia citriodora subsp. variegata | | 2 | 83.3 | 84.1 | 0.8 | 0.8 |
| Corymbia citriodora subsp. variegata | | 2 | 84.2 | 84.8 | 0.6 | 0.6 |
| Corymbia citriodora subsp. variegata | | 2 | 86.8 | 87.3 | 0.5 | 0.5 |
| Corymbia citriodora subsp. variegata | | 2 | 97.0 | 97.6 | 0.6 | 0.6 |
| Lantana camara* | | 2 | 99.2 | 100.0 | 0.8 | - |
| Alphitonia excelsa | | 2 | 99.2 | 100.0 | 0.8 | 0.8 |
| | | | | | | |
| Total Native Shrub Laver | | | | | 10. | 5 m 5%) |
| | | | | | (10. Med ht | · 20 m |



Southern View from Centre of Transect

| Date: | 9 May 2023 | Collector: | J Armstrong, L Harrington | | OPS All the Site 12 (west) | |
|---------------|---|------------|---------------------------|---|----------------------------|--|
| Time: | | Job No. | 2018-079C | | ORS AUTO Sile 13 (west) | |
| Mapped RE: | 12.9-10.2 - Regrowth | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra | | |
| Field RE: | 12.9-10.2 - Regrowth | | Description: | Corymbia citriodora, Eucalyptus crebra, Corymbia intermedia, Eucalyptus tereticornis open forest to 22 m. Abundant regeneration of canopy species to 12 m | | |
| Pre-clear RE: | 12.9-10.2 | | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides and E. siderophloia ma be present in scattered patches or in low densities. Understorey ca be grassy or shrubby | | |
| Slope: | Aspect: Landform (local | | I): | Landform (broad): | | |
| 8° | South-west; Transect bearing 160° | | | | | |
| Slope Shape: | Convex | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Lay stemmed over 2m. All tree speci EDL species) – Specify species | ver. Tree defined as single les in the 100 x 50m (not just |
|---------------------------|---|---|--|--|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 6m per Site 60m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: Corymbia citriodora subsp. variegate Eucalyptus crebra | Associated / Suppressed: Corymbia intermedia Corymbia tessellaris Eucalyptus tereticornis |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | Corymbia citriodora subsp. variegata Corymbia intermedia Eucalyptus crebra Eucalyptus tereticornis |
| | | | | Recruitment is assessed as the proportion of <u>dominant</u> species present at a site that are regenerating: | 100% |
| 50x10m area | Native plant species rich | ness | (NB: List species i Shrub is defined a multi-stemmed fro | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total |
| Shrub | Brachychiton populneus, Petalostigma pubescens littoralis | 9 | | | |
| Grass | Capillipedium spicigerun sp., Panicum sp., Bothric | n, Heteropogon contor ochloa sp., Cymbopog | tus, Sporobolus sp., on refractus | Aristida calycina, Eragrostis | 8 |
| Forb | Galactia tenuiflora, Chry hackettiana, Dianella rar latifolius, Desmodium va Rostellularia adscenden. Sauropus hirtellus, Iphig | socephalum apiculatu. a, Dianella brevipedur rians, Crotalaria mont s, Cheilanthes sieberi, enia indica, Brunoniell | apiculatum, Glycine cyrtoloba, Hardenbergia violaceae, Sida 21 previpedunculata, Desmodium rhytidophyllum, Eustrephus laria montana, Lobelia purpurascens, Scleria mackaviensis, es sieberi, Hypericum gramineum, Wahlenbergia sp., Brunoniella australis, Glossocardia bidens | | |
| Non-native plant cover | | | | | 30% |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|--|----|----|----|----|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 10 | 10 | 50 | 5 | 30 | 21 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 20 | 20 | 2 | 45 | 2 | 17.8 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 35 | 30 | 0 | 0 | 0 | 13 |
| Non-native forbs and shrubs | 15 | 0 | 5 | 0 | 0 | 4 |
| Litter | 20 | 35 | 43 | 20 | 68 | 37.2 |
| Rock | 0 | 5 | 0 | 0 | 0 | 1 |

| Bare ground | 0 | 0 | 0 | 30 | 0 | 6 |
|---------------------------------------|------|------|------|------|------|------|
| Other (e.g. timber, inorganic refuse) | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | ark doc | | | |
|------------------------------|--------------|--|-----|-------------------------|----|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 7 | Total Large Trees (ha): | 14 |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10x 50 plot |
|-----------------------|--|
| Species | notes |
| Melinis repens | common |
| Praxelis clematidea | occasional |
| Verbena rigida | occasional |
| Lantana montevidensis | common |
| Lantana camara | common |

| Plot based tree data | Record all trees within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|--|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 50 mm-100 mm: 179, 100 mm-200 mm: 22, 200 mm-300 mm: 1, 390,380,380,470,410 |
| Eucalyptus tereticornis | 50 mm-100 mm: 24, 100 mm-200 mm: 11; 340, 440 , 420 |
| Corymbia tessellaris | 50 mm-100 mm: 3, 100 mm-200 mm: 12; 200 mm-300 mm: 1 |
| Corymbia intermedia | 50 mm-100 mm: 20, 100 mm-200 mm: 7; |
| Eucalyptus crebra | 50 mm-100 mm: 29, 100 mm-200 mm: 5; 200 mm-300 mm: 2 |

| 10x10m plots – canopy species regeneration <50mm DBH (500m²): | | | | | | | |
|---|--------|--------|----------------|--------|---------|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | |
| Corymbia citriodora subsp. variegata | 1 | 16 | 5 | 5 | 12 | | |
| Eucalyptus tereticornis | 1 | | | 4 | | | |
| Corymbia intermedia | 1 | | 1 | | | | |
| Eucalyptus crebra | 2 | | | | | | |
| Recruitment | | | 940 stems / ha | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|-----------|-----------|-----------|-----------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| Corymbia citriodora subsp. variegata | C (T1) | 18 | 41.3 | 51.5 | 10.2 | 10.2 |
| Corymbia citriodora subsp. variegata | C (T1) | 23 | 76.1 | 88.3 | 12.2 | 12.2 |
| Corymbia citriodora subsp. variegata | C (T1) | 22 | 88.0 | 100.0 | 12.0 | 12.0 |
| | | | | | | |
| Eucalyptus crebra | S (T2) | 12 | 6.5 | 9.0 | 2.5 | 2.5 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 11.0 | 12.1 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 17.3 | 21.1 | 3.8 | 3.8 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 23.2 | 24.1 | 0.9 | 0.9 |
| Eucalyptus tereticornis | S (T2) | 16 | 25.8 | 34.6 | 8.8 | 8.8 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 37.1 | 38.5 | 1.4 | 1.4 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 38.3 | 43.6 | 5.3 | 5.3 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 48.7 | 52.1 | 3.4 | 3.4 |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 54.2 | 58.1 | 3.9 | 3.9 |
| Corymbia tessellaris | S (T2) | 12 | 59.8 | 62.4 | 2.6 | 2.6 |
| Corymbia tessellaris | S (T2) | 10 | 64.1 | 65.2 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 80.8 | 83.4 | 2.6 | 2.6 |
| Corymbia citriodora subsp. variegata | S (T2) | 13 | 85.2 | 88.3 | 3.1 | 3.1 |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|-------------------------|-----------------|--------------------|--------------------------|------------------------|
| Species | Strata | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| Corymbia citriodora subsp. variegata | S (T2) | 12 | 86.3 | 90.0 | 3.7 | 3.7 |
| | | | | | | |
| Eucalyptus crebra | S (T3) | 9 | 2.0 | 2.9 | 0.9 | 0.9 |
| Eucalyptus crebra | S (T3) | 10 | 3.8 | 5.2 | 1.4 | 1.4 |
| Eucalyptus tereticornis | S (T3) | 8 | 10.3 | 10.9 | 0.6 | 0.6 |
| Corymbia citriodora subsp. variegata | S (T3) | 8 | 14.8 | 16.0 | 1.2 | 1.2 |
| Corymbia citriodora subsp. variegata | S (T3) | 10 | 20.9 | 22.7 | 1.8 | 1.8 |
| Corymbia citriodora subsp. variegata | S (T3) | 9 | 26.0 | 27.1 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T3) | 7 | 31.5 | 32.1 | 0.6 | 0.6 |
| Corymbia citriodora subsp. variegata | S (T3) | 9 | 33.0 | 34.2 | 1.2 | 1.2 |
| Corymbia intermedia | S (T3) | 7 | 50.0 | 52.0 | 2.0 | 2.0 |
| Corymbia citriodora subsp. variegata | S (T3) | 6 | 68.2 | 69.2 | 1.0 | 1.0 |
| Eucalyptus tereticornis | S (T3) | 6 | 73.6 | 75.2 | 1.6 | 1.6 |
| Corymbia citriodora subsp. variegata | S (T3) | 6 | 81.0 | 82.0 | 1.0 | 0.7 |
| Corymbia citriodora subsp. variegata | S (T3) | 7 | 81.9 | 82.7 | 0.8 | 2.7 |
| Eucalyptus tereticornis | S (T3) | 5 | 98.0 | 98.7 | 0.7 | 0.7 |
| | | | | | | |
| Total Canopy (T1) | 34.4 (34.4 Med ht: | ⊢m I%) 22.5 m | | | | |
| Total Sub-canopy (T2) | | | | | | 2%) 12.5m |
| Total Sub-canopy (T3) | | | | | 16.8 (16.8 Med ht: | 5 m 3%) 7.5 m |
| 100m Transect | * denote as | native or exotic. Only | native shrub co | over is used in th | ne scoring | |
| Shrub canopy cover | denote as | native of exette. Only | | | io oooning. | |
| | Shrub - Wo | ody plant that is multi | i-stemmed from | the base (or wit | hin 200 mm from | n ground |
| Species | Strata: | Height (m) | Intercep | t Range (m) | Cover (m) | Corrected |
| | Shrub | | start: | end: | | Cover (m) |
| Lantana camara* | Shrub | 1 | 3.9 | 4.2 | 0.3 | - |
| Alphitonia excelsa | Shrub | 1 | 14.7 | 15.1 | 0.4 | 0.4 |
| Lantana camara* | Shrub | 1 | 24.1 | 25.6 | 1.5 | - |
| Lantana camara* | Shrub | 2 | 28.6 | 33 | 4.4 | - |
| Eucalyptus tereticornis | Shrub | 1 | 30.5 | 31.4 | 0.9 | 0.9 |
| Lantana camara* | Shrub | 1 | 34.5 | 41.9 | 7.4 | - |
| Jacksonia scoparia | Shrub | 2 | 41.7 | 42.2 | 0.5 | 0.5 |
| Allocasuarina littoralis | Shrub | 2 | 62.3 | 63 | 0.7 | 0.7 |
| | | | | | | |
| Total Native Shrub Layer | | | | | | 5 m .5%) ht: 1 m |

Not Recorded



Start of Transect

End of Transect



Southern View from Centre of Transect

| Date: | 2 May 2023 | Collector: | A Dickinson, M Barn | ett, M Taylor, M Girroli | OPS ALL2 Site 15 | | |
|---------------|--------------------|-------------------|--|---|------------------|--|--|
| Time: | 12:00pm | Job No. | 2019-079C | | | | |
| Mapped RE: | Category X | Description: | Non-remnant | | | | |
| Field RE: | Category X | Description: | Young regrowth com | Young regrowth community within modified pastural grassland | | | |
| Pre-clear RE: | 12.9-10.2 | Description: | <i>Corymbia citriodora subsp. variegata</i> open forest or woodland usually with <i>Eucalyptus crebra</i> . Other species such as <i>Eucalyptus tereticornis, E. moluccana, E. acmenoides</i> and <i>E. siderophloia</i> may be present in scattered patches or in low densities. Understorey can be grassy or shrubby | | | | |
| Slope: | Aspect: | Landform (local): | | Landform (broad): | | | |
| 9° | Souuth easterly | Mid-slope | | Rolling | | | |
| Slope Shape: | Slight convex | | | | | | |

| 50x20m Area | All logs >10cm, >0.5m w boundary | ith 50 x 20m plot | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as sin stemmed over 2m. All tree species in the 100 x 50m (r EDL species) – Specify species | | |
|---------------------------|---|--|--|---|--|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 26.5 m per Site | Total Native | Dominant / Codominant: | Associated / Suppressed: | |
| Dobho | | 265 m per ha | Richness | Corymbia citriodora subsp variegata Eucalyptus crebra | Eucalyptus tereticornis Corymbia tessellaris Angophora subvelutina | |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | Corymbia citriodora subsp variegata Corymbia intermedia Eucalyptus tereticornis Corymbia tessellaris | |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 100% | |
| 50x10m area | Native plant species richness (NB: List species if known or count if unknown. Shrub is defined as single stemmed below 2m or multi-stemmed from base or below 20cm) | | | | Total | |
| Shrub | Corymbia intermedia, Eu variegata, Alphitonia exc | icalyptus tereticornis, elsa, Breynia oblongif | Corymbia tessellaris olia, Angophora sub | , Corymbia citriodora subsp. velutina | 7 | |
| Grass | Heteropogon contortus, Capillipedium spicigerun | Imperata cylindrica, Al n, Aristida sp. Eragrosi | lloteropsis semialata tis sp 1., Eragrostis : | , Cymbopogon refractus, sp 2., Panicum sp. | 9 | |
| Forb | Flemingia sp, Hypericun Mentha satureioides, De Cheilanthes sieberi, Wal purperescens, Glycine ta Hypericum gramineum, | , Vittadinia sp., Dianella sp., ta, Crotolaria montanus, otyle laxiflora, Lobelia cinereum, Pterocaulon redolens, | 21 | | | |
| Non-native plant cover | | | | | 10% | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|--|------|------|------|------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 30 | 5 | 25 | 10 | 20 | 18 |
| Native other grass (if relevant)* | 5 | 0 | 0 | 0 | 5 | 2 |
| Native forbs and other species (non-grass) | 10 | 0 | 5 | 5 | 15 | 7 |
| Native shrubs (<1m in height) | 5 | 0 | 0 | 0 | 0 | 1 |
| Non-native grass | 10 | 5 | 25 | 45 | 25 | 22 |
| Non-native forbs and shrubs | 0 | 0 | 0 | 0 | 0 | 0 |
| Litter | 25 | 85 | 45 | 35 | 0 | 38 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 15 | 0 | 0 | 5 | 30 | 10 |
| Other (e.g. timber, inorganic refuse) | 0 | 5 | 0 | 0 | 5 | 2 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | from benchmark doc | | | | | | |
|------------------------------|--------------|--|-----|-------------------------|----|--|--|--|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 8 | Total Large Trees (ha): | 16 | | | |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | | | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot | | | | |
|--------------------------|---|--|--|--|--|
| Species | notes | | | | |
| Lantana camara | common | | | | |
| Melinis repens | very common | | | | |
| Cynodon dactylon | common | | | | |
| Gomphocarpus physocarpus | scattered | | | | |
| <i>Opuntia</i> sp. | scattered | | | | |

| Plot based tree data | Record all trees over 300mm dbh within the 100 x 50 plot – record multiple stems in parentheses tis way (230, 250, 190) |
|--------------------------------------|---|
| Species | DBH |
| Corymbia citriodora subsp. variegata | 650 |
| Eucalyptus tereticornis | 390 |
| Eucalyptus crebra | 605, 535, 610, 465, 480, 550 |

| 10x10m plots – canopy species regeneration <50mm and 50-299mm DBH (500m²): | | | | | | | | |
|--|--------|--------|--------|--------|---------|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | |
| Eucalyptus tereticornis | 4 | 5 | 17 | 6 | 8 | | | |
| Eucalyptus crebra | | 2 | 1 | | | | | |
| Corymbia intermedia | | 2 | | | | | | |
| Corymbia citriodora subsp. variegata | 1 | 5 | | 1 | 1 | | | |
| Alphitonia excelsa | | 1 | 1 | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|-----------|-----------|-----------|-----------|
| Species | Strata | Height (m) | Intercept | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| Corymbia citriodora subsp. variegata | C (T1) | 24 | 26.0 | 37.5 | 11.5 | 11.5 |
| Eucalyptus tereticornis | C (T1) | 20 | 39.0 | 44.0 | 5 | 8.0 |
| Eucalyptus crebra | C (T1) | 14 | 43.5 | 47.0 | 3.5 | |
| Eucalyptus crebra | C (T1) | 24 | 80.0 | 88.5 | 8.5 | 8.5 |
| | | | | | | |
| Corymbia citriodora subsp. variegata | S (T2) | 8 | 12.5 | 13.6 | 1.1 | 1.1 |
| Corymbia citriodora subsp. variegata | S (T2) | 7 | 24.0 | 24.5 | 0.5 | 0.5 |
| Eucalyptus tereticornis | S (T2) | 7 | 48.0 | 50.0 | 2.0 | 2.0 |
| Eucalyptus tereticornis | S (T2) | 5 | 51.5 | 53.5 | 2.0 | 2.0 |
| Eucalyptus tereticornis | S (T2) | 7 | 63.5 | 66.0 | 2.5 | 2.5 |
| Eucalyptus tereticornis | S (T2) | 5 | 68.5 | 71.0 | 2.5 | 2.5 |
| Corymbia tessellaris | S (T2) | 6 | 76.0 | 79.0 | 3.0 | 3.0 |
| Eucalyptus tereticornis | S (T2) | 6 | 80.5 | 82.5 | 2.0 | 2.0 |
| | | | | | | |
| Eucalyptus crebra | S(T3) | 3.5 | 7.5 | 10.0 | 2.5 | |
| Corymbia citriodora subsp. variegata | S(T3) | 4 | 25.0 | 26.0 | 1.0 | 1.0 |
| Eucalyptus tereticornis | S(T3) | 3 | 25.5 | 26.0 | 0.5 | |
| Eucalyptus tereticornis | S(T3) | 3 | 36.0 | 36.5 | 1.5 | 1.5 |
| Eucalyptus crebra | S(T3) | 3 | 49.0 | 49.5 | 0.5 | 0.5 |
| Eucalyptus tereticornis | S(T3) | 3 | 53.0 | 54.0 | 1.0 | 1.0 |
| Eucalyptus crebra | S(T3) | 3 | 98.0 | 100.0 | 2.0 | 2.0 |
| | | | | | | |
| Total Canopy (T1) Cover | · | | | | 28. | 0 m |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|--|--|--------------------|-------------------|----------------|----------------------------------|--------------------------|--|
| Species | Strata | Height (m) | Intercept F | Range (m) | Cover (m) | Corrected | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Corymbia citriodora subsp. variegata | C (T1) | 24 | 26.0 | 37.5 | 11.5 | 11.5 | |
| | | · · · | | | (28 Med h | 8%) it: 22 m | |
| Total Sub-canopy (T2) Cover | | | | | 15. (15 Med h | .6 m .6%) t: 6.5 m | |
| Total Sub-canopy (T1) Cover | | | | | 3.5 (3. Med h | 5 m 5%) t: 3.0 m | |
| | | | | | | | |
| 100m Transect Shrub canopy cover | * denote as nati | ve or exotic. Only | r native shrub co | the base (or w | the scoring. ithin 200 mm fro | around | |

| | Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|--------------------------|--|------------|---------------------|------|--------------------|----------------------|
| Species | Strata: | Height (m) | Intercept Range (m) | | Cover (m) | Corrected |
| | Shrub | | start: | end: | | Cover (m) |
| Corymbia tessellaris | Shrub | 2 | 27.0 | 28.0 | 1.0 | 1.0 |
| | | | | | | |
| Total Native Shrub Cover | | | | | 1 (1.0 Med h | .0 0%) nt: 2 m |

| Date: | 2 May 2023 | Collector: | A Dickinson, M Barn | Barnett, M Taylor, M Girroli | | | |
|---------------|----------------|---------------------------------------|--|--|--|--|--|
| Time: | 1.10 pm | Job No. | 2019-079C | | | | |
| Mapped RE: | Category X | Description: | Non-remnant | | | | |
| Field RE: | Category X | Description: | Modified pastural grassland | | | | |
| Pre-clear RE: | 12.9-10.2 | Description: | Corymbia citriodora s crebra. Other specie E. siderophloia may be grassy or shrubby | subsp. variegata open forest or v s such as Eucalyptus tereticornis be present in scattered patches v | voodland usually with <i>Eucalyptus</i> s, <i>E. moluccana, E. acmenoides</i> and or in low densities. Understorey can | | |
| Slope: | Aspect: | Landform (loca | l): | Landform (broad): | | | |
| 5-7° | South easterly | lower-slope; terr incised waterway | ace beside deeply y | Rolling | | | |
| Slope Shape: | Concave colluv | ial slope | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as sin stemmed over 2m. All tree species in the 100 x 50m (no EDL species) – Specify species | | |
|---------------------------|--|---|---|--|--------------------------|--|
| Coarse Woody | Site Total: Per ha Total: | 0.0 m per Site | Total Native | Dominant / Codominant: | Associated / Suppressed: | |
| Deblia | | 0.0 mper one | Richness | Eucalyptus tereticornis | Angophora subvelutina | |
| | | 0 m per ha | | | | |
| | | | | Proportion of EDL species | | |
| | | | | with evidence of recruitment | Eucalyptus tereticornis | |
| | | | | (Specify recruiting species) | | |
| | | | | Recruitment is assessed as | | |
| | | | | species present at a site that | 100% | |
| | | | | are regenerating: | | |
| 50x10m area | Native plant species rich | lative plant species richness | | f known or count if unknown. | Total | |
| | | | Shrub is defined a multi-stemmed fro | s single stemmed below 2m or m base or below 20cm) | | |
| Shrub | Eucalyptus tereticornis, | Corymbia tessellaris, A | Angophora subveluti | na | 3 | |
| | | | | | | |
| Grass | Heteropogon contortus, sp 2., Panicum sp. Ottoo | Imperata cylindrica, C hloa gracillima | ymbopogon refractu | s, Eragrostis sp 1., Eragrostis | 7 | |
| Forb | Pteridium esculentum, C gracilis, Oxalis chnoodes Glycine tomentella. Chei satureioides, Desmodiur gramineum, Galactia ter | 18 | | | | |
| Non-native plant cover | | | | | 50% | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | |
|---|---|------|------|------|------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 5 | 5 | 0 | 0 | 0 | 2 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 95 | 90 | 40 | 95 | 55 | 75 |
| Non-native forbs and shrubs | 0 | 5 | 60 | 5 | 45 | 23 |
| Litter | 0 | 0 | 0 | 0 | 0 | 0 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 0 | 5 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchm | ark doc | | | |
|------------------------------|--------------|--|-----|-------------------------|---|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 0 | Total Large Trees (ha): | 0 |
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10x 50 plot |
|---------------------------|---|
| Species | notes |
| Melinis repens | very common |
| Cynodon dactylon | common |
| Gomphocarpus physocarpus | scattered |
| Sporobolus sp. | scattered |
| Verbena rigidula | scattered |
| Heliotropium amplexicaule | scattered |
| | |
| Plot based tree data | Record all trees over 300mm dbh within the 10x 50 plot – record multiple stems in parentheses tis way (230, 250, 190) |
| Species | DBH |

| Eucalyptus teretorcornis | 80, 120, 70 |
|--------------------------|-------------|

| 10x10m plots – canopy species regeneration <50mm and 50-299mm DBH (500m ²): | | | | | | | |
|---|--------|--------|----------------|--------|---------|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | |
| Eucalyptus tereticornis | | 1 | | | 3 | | |
| Corymbia tessellaris | | | | | 5 | | |
| Recruitment | | | 180 stems / ha | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | | |
|---|--|------------|--------------------------------------|------|-----|-----------|--|
| Species | Strata | Height (m) | Intercept Range (m) Cover (m) Correc | | | | |
| | (C or S or E) | | start: | end: | | Cover (m) | |
| Eucalyptus tereticornis | C (T1) | 8 | 0.0 | 3.5 | 3.5 | 3.5 | |
| Eucalyptus tereticornis | C (T1) | 9 | 8.5 | 11.5 | 3.0 | 3.0 | |
| | | | | | | | |
| Total Canopy (T1) Cover (6.5%) Med ht: 8.5 m | | | | | | | |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|-------------------------------------|--|------------|---------------------|------|--------------------|----------------------|
| Species | Strata: | Height (m) | Intercept Range (m) | | Cover (m) | Corrected |
| | Shiub | | start: | end: | | |
| nil | | | | | | |
| | | | | | | |
| Total Native Shrub Cover | | | | | 0 (0.0 Med h | .0 0%) nt: 0 m |

| Date: | 2 May 2023 | Collector: | A Dickinson, M Barn | ett, M Taylor, M Girroli | OPS ALL2 Site 17 | | |
|---------------|-----------------|----------------|--|---|--|--|--|
| Time: | 2.15 pm | Job No. | 2019-079C | | | | |
| Mapped RE: | Category X | Description: | Non-remnant | | | | |
| Field RE: | Category X | Description: | Modified pastural grassland | | | | |
| Pre-clear RE: | 12.9-10.2 | Description: | Corymbia citriodora s crebra. Other specie E. siderophloia may be grassy or shrubby | subsp. variegata open forest or v s such as <i>Eucalyptus tereticornis</i> be present in scattered patches / | voodland usually with <i>Eucalyptus</i> s, <i>E. moluccana, E. acmenoides</i> and or in low densities. Understorey can | | |
| Slope: | Aspect: | Landform (loca | l): | Landform (broad): | | | |
| 5° | North easterly | Mid-slope | | Rolling | | | |
| Slope Shape: | Slightly convex | • | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as single stemmed over 2m. All tree species in the 100 x 50m (not just EDL species) – Specify species | | | |
|---------------------------|--|------------------------------|---|---|--------------------------|--|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 0.0 m per Site 0 m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: | Associated / Suppressed: | | |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | | | |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 0% | | |
| 50x10m area | Native plant species richness | | (NB: List species if known or count if unknown. Shrub is defined as single stemmed below 2m or multi-stemmed from base or below 20cm) | | Total | | |
| Shrub | Corymbia tessellaris | 1 | | | | | |
| Grass | Heteropogon contortus, | 4 | | | | | |
| Forb | Rostellularia adscenden apiculatum, Desmodium Whalenbergia gracilis, E | 9 | | | | | |
| Non-native plant cover | | | | | 55% | | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | | | | |
|---|---|------|------|------|------|------|--|--|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. | | |
| Native perennial ('decreaser') grass cover* | 20 | 35 | 35 | 15 | 30 | 28 | | |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Native forbs and other species (non-grass) | 40 | 0 | 5 | 5 | 20 | 14 | | |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Non-native grass | 10 | 35 | 50 | 75 | 40 | 42 | | |
| Non-native forbs and shrubs | 10 | 25 | 5 | 5 | 10 | 11 | | |
| Litter | 20 | 0 | 5 | 0 | 0 | 5 | | |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Other (e.g. timber, inorganic refuse) | 0 | 5 | 0 | 0 | 0 | 0 | | |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% | | |

100x50m Area:

*from benchmark doc
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 0 | Total Large Trees (ha): | 0 |
|------------------------------|-----|--|-----|-------------------------|---|
| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot |
|---------------------------|---|
| Species | notes |
| Melinis repens | very common |
| Cynodon dactylon | common |
| Solanum capsicoides | scattered |
| Verbena rigidula | scattered |
| Heliotropium amplexicaule | scattered |
| | |
| Plot based tree data | Record all trees over 300mm dbh within the 100 x 50 m plot – record multiple stems in parentheses tis way (230, 250, 190) |
| Species | DBH |

| Species | DBH |
|--------------------------|-----|
| Eucalyptus teretorcornis | 55 |
| Corymbia intermidia | 55 |

| 10x10m plots – canopy species regeneration <50mm and 50-299mm DBH (500m²): | | | | | |
|--|--------|--------|--------|--------|---------|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m |
| Corymbia tessellaris | | 1 | | | 5 |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|---------------------|------|-----------------------|------------------------|
| Species | Strata | Height (m) | Intercept Range (m) | | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| Eucalyptus tereticornis | C (T1) | 4 | 1.5 | 2.0 | 0.5 | 0.5 |
| | | | | | | |
| Total Canopy (T1) Cover | | | | | 0.5 (0.5 Med ht | 5 m 5%) t: 4.0 m |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. Shrub - Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall | | | | | |
|-------------------------------------|--|------------|-------------|---------------------|--------------------|----------------------|
| Species | Strata: | Height (m) | Intercept I | Intercept Range (m) | | Corrected |
| | Shiub | | start: | end: | | Cover (m) |
| nil | | | | | | |
| | | | | | | |
| Total Native Shrub Cover | | | | | 0 (0.0 Med h | .0 0%) nt: 0 m |

HABITAT QUALITY ASSESSMENT

| Date: | 2 May 2023 | Collector: | A Dickinson, M Barn | ett, M Taylor, M Girroli | OPS 4112 Site 19 | | |
|---------------|-----------------|-------------------|---|-----------------------------|------------------|--|--|
| Time: | 4.15 pm | Job No. | 2019-079C | | | | |
| Mapped RE: | Category X | Description: | Non-remnant | | | | |
| Field RE: | Category X | Description: | Modified pastural gra | Modified pastural grassland | | | |
| Pre-clear RE: | 12.9-10.2 | Description: | Corymbia citriodora subsp. variegata open forest or woodland usually with Eucalyptus crebra. Other species such as Eucalyptus tereticornis, E. moluccana, E. acmenoides E. siderophloia may be present in scattered patches or in low densities. Understorey be grassy or shrubby | | | | |
| Slope: | Aspect: | Landform (local): | | Landform (broad): | | | |
| 3° | North easterly | spur | | Rolling | | | |
| Slope Shape: | Slightly convex | • | | | | | |

| 50x20m Area | All logs >10cm, >0.5m with 50 x 20m plot boundary | | 100x50m Area | (NB: *Ecologically Dominant Layer. Tree defined as s stemmed over 2m. All tree species in the 100 x 50m EDL species) – Specify species | | |
|---------------------------|--|-------------------------------|--|--|--|--|
| Coarse Woody Debris | Site Total: Per ha Total: | 2.0 m per Site 20 m per ha | Total Native Tree Spp. Richness | Dominant / Codominant: Corymbia citriodora subsp. variegata | Associated / Suppressed: | |
| | | | | Proportion of EDL species with evidence of recruitment (Specify recruiting species) | Corymbia citrioora subsp. variegata | |
| | | | | Recruitment is assessed as the proportion of dominant species present at a site that are regenerating: | 100% | |
| 50x10m area | Native plant species rich | iness | (NB: List species i Shrub is defined a multi-stemmed fro | f known or count if unknown. s single stemmed below 2m or m base or below 20cm) | Total | |
| Shrub | nil | | | | 0 | |
| Grass | Heteropogon contortus, Eragrostis brownie, Bothriochloa sp | | | | 3 | |
| Forb | Hybanthus stellaroides, Pterocaulon redolens, Chrysocephalum apiculatum, Desmodium rhytidophyllum, Whalenbergia gracilis, Fimbrystylis sp., Sida hackettiana | | | piculatum, Desmodium ettiana | 7 | |
| Non-native plant cover | | | | | 50% | |

| Five 1x1m plots | *attributes are essential to assess as used in scoring, however assessment of all attributes improves your ability to more accurately visualise proportions of each of the attributes | | | | attributes outes | |
|---|---|------|------|------|---------------------|------|
| Ground Cover type | 1 | 2 | 3 | 4 | 5 | Ave. |
| Native perennial ('decreaser') grass cover* | 10 | 20 | 30 | 20 | 10 | 18 |
| Native other grass (if relevant)* | 0 | 0 | 0 | 0 | 0 | 0 |
| Native forbs and other species (non-grass) | 10 | 5 | 5 | 5 | 0 | 5 |
| Native shrubs (<1m in height) | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-native grass | 70 | 75 | 60 | 65 | 85 | 71 |
| Non-native forbs and shrubs | 10 | 0 | 0 | 10 | 5 | 5 |
| Litter | 0 | 0 | 5 | 0 | 0 | 1 |
| Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare ground | 0 | 0 | 0 | 0 | 0 | 0 |
| Other (e.g. timber, inorganic refuse) | 0 | 5 | 0 | 0 | 0 | 0 |
| TOTAL | 100% | 100% | 100% | 100% | 100% | 100% |

| 100x50m Area: | *from benchmark doc | | | | |
|--------------------------|---------------------|--------------------------------------|---|-------------------------|---|
| Eucalypt large tree DBH: | 380 | No. of large eucalypt trees in plot: | 0 | Total Large Trees (ha): | 0 |

| Non-eucalypt large tree DBH: | N/A | No. of large non-eucalypt trees in plot: | N/A | |
|------------------------------|-----|--|-----|--|
| | | | | |

| Plot based weed data | Record all weed species within the 10 x 50 sub-plot |
|-----------------------|---|
| Species | notes |
| Melinis repens | very common |
| Cynodon dactylon | common |
| Lantana camara | scattered |
| Lantana montividensis | scattered |
| Solanum capsicoides | scattered |
| Verbena rigidula | scattered |
| Gomphrena celosioides | scattered |
| Sida rhombifolia | scattered |
| Cyperus brevifolius | scattered |
| Opuntia tomentosa | scattered (one specimen) |
| | |
| Plot based tree data | Record all trees over 300mm dbb within the 100 x 50 plot $-$ record multiple stems in parentheses tis way |

| Plot based tree data | (230, 250, 190) |
|----------------------|-----------------|
| Species | DBH |
| nil | |

| 10x10m plots – canopy species regeneration <50mm and 50-299mm DBH (500m ²): | | | | | | | | |
|---|--------|--------|--------|--------|---------|--|--|--|
| Species: | 10-20m | 30-40m | 50-60m | 70-80m | 90-100m | | | |
| nil | | | | | | | | |

| 100m Transect Tree Canopy Cover Intercept | (Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present. *If trees are in the same layer and continuous along the transect group them). Canopy layer includes T1 and T2 layers, but not T3. | | | | | |
|--|--|------------|-------------|---------------|--------------------|----------------------|
| Species | Strata | Height (m) | Intercept I | Range (m) | Cover (m) | Corrected |
| | (C or S or E) | | start: | end: | | Cover (m) |
| nil | | | | | | |
| | | | | | | |
| Total Canopy (T1) Cover | | | | | 0 (0.) Med h | m 0%) t: 0.0 m |
| Total Sub-canopy (T2) Cover | | | | 0 m (0.0%) | | |
| <u> </u> | | | | | Ivied fi | l. U.U III |

| 100m Transect Shrub canopy cover | * denote as native or exotic. Only native shrub cover is used in the scoring. | | | | | | |
|-------------------------------------|---|------------------|---------------------|--------|-------------------|----------------------|--|
| | Shrub - Woody level) or if single | he base (or witl | nin 200 mm from | ground | | | |
| Species | Strata: | Height (m) | Intercept Range (m) | | Cover (m) | Corrected | |
| | Shrub | | start: | end: | | Cover (m) | |
| Solanum capsicoides* | shrub | 1 | 52.5 | 54.5 | 2.0 | - | |
| Lantana camara* | Shrub | 1 | 64.5 | 66.0 | 1.5 | - | |
| | | | | | | | |
| Total Native Shrub Cover | | | | | 0 (0. Med I | .0 0%) nt: 0 m | |



Appendix 28

Canopy Species Recruitment Baseline Assessment for the Offset Site

Appendix 28 – Canopy Species Recruitment

28.1 - Preamble

Recruitment data has been collated and synthesised from two data collection methodologies, specifically:

- Bio-Condition transects (500 m² sample area)
- 50m x 50m plot assessments (2,500 m² sample area).

The locations of Biocondition transects and 50 x 50m Quadrats are shown in the figures attachment.

A summary of the biocondition plot and quadrats deployed and their relationship with Assessment Units, remnant vegetation and regulated vegetation status is shown in the following two tables.

Biocondition Sites

| AU | Description | Reg Veg Status | Pre-clear RE | Biocon-Sites | |
|----|--------------------------|----------------|--------------|--------------|------------|
| | | | | East | West |
| 1a | Remnant 12.9-10.2 | Cat B | 12.9-10.2 | 3, 4 | n/a |
| 1b | Regrowth 12.9-10.2 | Cat R | 12.9-10.2 | 1, 2 | 11, 12, 13 |
| 2 | Young regrowth 12.9-10.2 | Cat X | 12.9-10.2 | 14, 15, 18 | 5, 7, 9 |
| 3 | Pastural grassland | Cat X | 12.9-10.2 | 16, 17, 19 | 6, 8, 10 |

50 x 50m Assessment Quadrats

| AU | Description | Reg Veg | Pre-clear | 50 x 50m Plots | |
|----|--------------------------|---------|-----------|--|--------------------------------------|
| | | Status | RE | East | West |
| 2 | Young regrowth 12.9-10.2 | Cat X | 12.9-10.2 | 1019, 1103, 1229, 1255, 1534 | 62, 195, 277, 603, 658, 792, 843 |
| 3 | Pastural grassland | Cat X | 12.9-10.2 | 1010, 1098, 1101, 1124, 1154, 1201, 1361, 1495, 1504, 1637 | 417, 466, 496, 501, 770, 788, 879 |

On account of the comparatively small size of patches comprising AU1 and observed variability of regrowth within AU2 and 3, quadrats were only deployed in areas of young regrowth / pastural grassland. The location and distribution of these sampling sites is represented as **Figure S.2.1** (**Appendix S.2**).

28.2 - ASSESSMENT UNIT 1a (AU1a): Remnant (RE12.9-10.2)

AU1a, contains recruitment data sourced from the following biocondition plots only.

Biocondition Plots

| Parameters | Eastern Site | | | |
|-----------------------------|--------------------|---------|--|--|
| | Site 3 | Site 4 | | |
| Total number of stems | 59 | 38 | | |
| Total stems/ha | 1,180/ Ha | 760/ Ha | | |
| Average recruiting stems/ha | 1,330 Stems per Ha | | | |

*For species diversity refer to Attachment 1

Assessment Unit 1a – Key Points

Assessment Unit 1a was found to have a healthy level of recruitment, with a primarily native groundcover. This mapping on the eastern Site will promote recruitment within the bordering pastural grassland.

28.3 - ASSESSMENT UNIT 1b (AU1b): Regrowth (RE12.9-10.2)

AU1b, contains recruitment data sourced from biocondition plots.

Biocondition Plots

| | Easterr | n Site | Western Site | | | |
|------------------------------------|------------|-----------|--------------------|-----------|---------|--|
| | Site 1 | Site 2 | Site 11 | Site 12 | Site 13 | |
| Total Stems | 53 | 53 | 50 | 108 | 48 | |
| Total Stems per Ha | 1,180/ Ha | 760/ Ha | 1,000/ Ha | 2,160/ Ha | 960/ Ha | |
| Average Recruiting Stems per Ha | 1,330 Sten | ns per Ha | 1,373 Stems per Ha | | | |

*For species diversity refer to Attachment 1

Assessment Unit 1b – Key Points

Assessment Unit 1b was also found to have healthy levels of recruitment. This regrowth mapping also promotes stronger recruitment within the disturbed pastural grasslands directly neighbouring the mapping, this is evident in Assessment Quadrats 879 & 1504 (See AU3 - Assessment Quadrat Summary).

28.4 - ASSESSMENT UNIT 2 (AU2): Young Regrowth (RE12.9-10.2)

AU2, contains data sourced from biocondition and quadrate plots.

Biocondition Plots

| | Eastern Site | | | Western Site | | |
|---------------------------------|-------------------------|-----------|---------|--------------|------------------|-----------|
| | Site 14 Site 15 Site 18 | | | Site 5 | Site 7 | Site 9 |
| Total Stems | 10 | 55 | 32 | 51 | 1 | 83 |
| Total Stems per Ha | 200/ Ha | 1,100/ Ha | 640/ Ha | 1,020/ Ha | 20/ Ha | 1,660/ Ha |
| Average Recruiting Stems per Ha | 646.7 Stems per Ha | | | | 900 Stems per Ha | a |

*For species diversity refer to Attachment 1

Assessment Quadrats

| Site | Canopy Species (E, T1, T2 and T3) Stem number | Canopy (E, T1, T2 and T3) Stems / Ha | Shrub Species Stem Number | Shrub Stems / Ha | | | | |
|--------------|--|---|------------------------------|------------------|--|--|--|--|
| Western Site | | | | | | | | |
| 62 | 57 | 228 | 3 | 12 | | | | |
| 195 | 25 | 100 | 0 | 0 | | | | |
| 277 | 55 | 220 | 0 | 0 | | | | |
| 603 | 128 | 496 | 9 | 36 | | | | |
| 658 | 30 | 120 | 0 | 0 | | | | |
| 792 | 204 | 816 | 0 | 0 | | | | |
| 843 | 115 | 460 | 0 | 0 | | | | |
| Range | 25 – 204 | 100 – 816 | 0 – 9 | 0 – 36 | | | | |
| Mean | 87.7 | 348.6 | 1.7 | 6.9 | | | | |
| | | Eastern Site | | | | | | |
| 1019 | 177 | 708 | 5 | 20 | | | | |

| Site | Canopy Species (E, T1, T2 and T3) Stem number | Canopy (E, T1, T2 and T3) Stems / Ha | Shrub Species Stem Number | Shrub Stems / Ha |
|-------|--|---|------------------------------|------------------|
| 1103 | 135 | 536 | 0 | 0 |
| 1229 | 1 | 4 | 0 | 0 |
| 1255 | 181 | 724 | 3 | 12 |
| 1534 | 161 | 644 | 0 | 0 |
| Range | 1 - 181 | 4 - 724 | 0 - 5 | 0 - 20 |
| Mean | 32.3 | 523.2 | 1.6 | 6.4 |

Assessment Unit 2 – Key Points

Recruitment ranges on average 585 stems/ha in the east to 625 stems/ha in the west.

Assessment Unit 2 has differing levels of canopy species. recruitment throughout the mapping on both Sites. The western mapping within the western ORS was found to have lower levels of recruitment compared to the other mapping. This data will dictate the level of plant-outs required for each plot.

28.5 - ASSESSMENT UNIT 3 (AU3)

AU2, contains data sourced from biocondition and quadrate plots.

Biocondition Plots

| Parameter | Eastern Site | | | Western Site | | |
|---------------------------------|-------------------|---------|---------|--------------|-----------------|---------|
| | Site 16 | Site 17 | Site 19 | Site 6 | Site 8 | Site 10 |
| Total Stems | 8 | 6 | 0 | 2 | 1 | 0 |
| Total Stems per Ha | 160/ Ha | 120/ Ha | 0/ Ha | 40/ Ha | 20/ Ha | 0/ Ha |
| Average Recruiting Stems per Ha | 93.3 Stems per Ha | | | | 20 Stems per Ha | |

*For species diversity refer to Attachment 1

Assessment Quadrats

| Site | Canopy Species (E, T1, T2 | Canopy (E, T1, T2 and | Shrub Species Stem | Shrub Stems / Ha | | | | | | | | |
|--------------|---------------------------|-----------------------|--------------------|------------------|--|--|--|--|--|--|--|--|
| | and T3) Stem number | T3) Stems / Ha | Number | | | | | | | | | |
| Western Site | | | | | | | | | | | | |
| 417 | 52 | 208 | 13 | 52 | | | | | | | | |
| 466 | 6 | 24 | 0 | 0 | | | | | | | | |
| 496 | 38 | 152 | 0 | 0 | | | | | | | | |
| 501 | 29 | 116 | 41 | 164 | | | | | | | | |
| 770 | 3 | 12 | 0 | 0 | | | | | | | | |
| 788 | 48 | 192 | 0 | 0 | | | | | | | | |
| 879 | 98 | 392 | 41 | 164 | | | | | | | | |
| Range | 3 – 98 | 12 – 392 | 0 – 41 | 0 – 164 | | | | | | | | |
| Mean | 39.1 | 156.6 | 13.6 | 54.3 | | | | | | | | |
| Eastern Site | | | | | | | | | | | | |
| 1010 | 8 | 32 | 0 | 0 | | | | | | | | |
| 1098 | 37 | 148 | 2 | 8 | | | | | | | | |
| 1101 | 18 | 72 | 1 | 4 | | | | | | | | |
| 1124 | 7 | 28 | 0 | 0 | | | | | | | | |
| 1154 | 6 | 24 | 0 | 0 | | | | | | | | |

| Site | Canopy Species (E, T1, T2 | Canopy (E, T1, T2 and | Shrub Species Stem | Shrub Stems / Ha |
|-------|---------------------------|-----------------------|--------------------|------------------|
| | and T3) Stem number | T3) Stems / Ha | Number | |
| 1201 | 32 | 128 | 0 | 0 |
| 1361 | 90 | 360 | 0 | 0 |
| 1495 | 91 | 364 | 0 | 0 |
| 1504 | 111 | 444 | 0 | 0 |
| 1637 | 117 | 468 | 0 | 0 |
| Range | 1 - 181 | 4 - 724 | 0 - 5 | 0 - 20 |
| Mean | 32.3 | 523.2 | 1.6 | 6.4 |

Assessment Unit 3 – Key Points

Averaged recruitment ranges on average 89 stems/ha in the west to 309 stems/ha in the east.

Assessment Unit 3 has markedly low levels of recruitment on average, particularly on the western Site. Assessment Quadrats 417, 466, 495 & 501 show that this low level of recruitment within the western ORS is more pronounced within the central pastural grassland. Rehabilitation should prioritise providing linkages through these areas to further encourage recruitment following woody weed treatments.

Figures



| | Issue Date | Dwg N | lo. / | Author | | | |
|-----|------------|---------------------|---------------|--------|--|--|--|
| | 28-07-2023 | | r | мо | | | |
| | Approved | F | Revision Note | | | | |
| | WM | | | | | | |
| | (A3) GD | A 2020 M 1:4,250 | GA 56) | ٨ | | | |
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Attachment 1

Bio-Condition Recruitment Data

| Species | AU | 1a | AU1b | | | | AU2 | | | | | AU3 | | | | | | | |
|-------------------------|-------------|--------|---------------------------|----------|-----------|-------------------|---------|---------|--------------|---------|----------|--------------|----------|---------|--------------|---------|--------|--------|---------|
| | Easter | n Site | Eastern Site Western Site | | e | Eastern Site | | | Western Site | | | Eastern Site | | | Western Site | | | | |
| | Site 3 | Site 4 | Site 1 | Site 2 | Site 11 | Site 12 | Site 13 | Site 14 | Site 15 | Site 18 | Site 5 | Site 7 | Site 9 | Site 16 | Site 17 | Site 19 | Site 6 | Site 8 | Site 10 |
| Corymbia citriodora | 36 | 33 | 46 | 67 | 44 | 100 | 39 | 3 | 8 | 6 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Corymbia intermedia | 6 | 1 | 1 | 0 | 0 | 5 | 2 | 3 | 2 | 25 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Angophora subvelutina | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Corymbia tesselaris | 4 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 6 | 0 | 1 | 1 | 0 |
| Lophostemon suaveolens | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 29 | 0 | 0 | 0 | 0 | 0 | 0 |
| Eucalyptus carnea | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 0 | 0 | 0 | 0 | 0 | 0 |
| Eucalyptus crebra | 11 | 0 | 6 | 4 | 2 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Eucalyptus tereticornis | 0 | 0 | 0 | 9 | 0 | 3 | 5 | 1 | 40 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 |
| Allocasuarina torulosa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alphitonia excelsa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Stems | 59 | 38 | 53 | 53 | 50 | 108 | 48 | 10 | 55 | 32 | 51 | 1 | 83 | 8 | 6 | 0 | 2 | 1 | 0 |
| Total Stems per ha | 1,180/ha | 760/ha | 1,060/ha | 1,600/ha | 1,000/ha | 2,160/ha | 960/ha | 200/ha | 1,100/ha | 640/ha | 1,020/ha | 20/ha | 1,660/ha | 160/ha | 120/ha | 0/ha | 40/ha | 20/ha | 0/ Ha |
| Average Recruiting | 1,330 1,330 | | 220 | 4.070 | | C46 7 | | 000 | | | 00.0 | | | | | | | | |
| Stems per hectare | | | 1,3 | 1,373 | | 646. <i>1</i> 900 | | | 93.3 | | | 20 | | | | | | | |
| AVE / ha | AU1 - 1,324 | | | | AU2 - 773 | | | | AU3 - 56 | | | | | | | | | | |