Offset Monitoring Program 2019 – Mount Emerald Wind Farm

RATCH Australia Corporation Limited

4 elements

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Revision History

Version	Purpose	Issued by	Date	Reviewer	Date
1	Draft	Matthew Hemmings	31/05/2019	Mellissa Brown	10/06/2019
2	Final	Matthew Hemmings	25/06/2019	Mellissa Brown	28/06/2019

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1.0 Introduction

1.1 Background

The Mount Emerald Wind Farm (MEWF) Offset Site (the site) is located within land described as Lot 22 SP210202, which comprises approximately 434.9 ha (**Figure 1**). It is located immediately to the south west of the MEWF site at Mutchilba within the Mareeba Shire Council Area at the end of Lemontree Drive. The lot tenure is freehold and the primary land use is vacant. The area fringes the Baldy Mountain Forest Reserve and the Herberton Range National Park, via the Herberton Range (Queensland Government 2016).

On 26 November 2016, approval under the provisions of the Environmental Protection and Biodiversity Conservation (EPBC) Act, was granted to RATCH Australia Corporation Limited (RACL). As a requirement of the EPBC Act approval 2011/6228, issued by the Federal Department of the Environment and Energy (DEE), a Biodiversity Offset Area was developed to compensate for the clearing of 73 ha of habitat on the MEWF Project Site.

This site has been protected as a Nature Reserve through a statutory process through consultation with the Queensland Department of Environment and Science.

The offset site lies completely within the wet tropics bioregion. The site is mountainous with narrow ridges and rocky terrain that are steeply dissected along three dominant ridge lines falling towards Lemontree Drive at the entrance to the site. The offsets site lies adjacent to the MEWF project site.

The majority of the site consists of remnant vegetation with approximately 192.89 ha consisting of 'Least Concern' vegetation and the remaining 242 ha listed as 'Of Concern' vegetation.

4 Elements Consulting was commissioned by RACL to conduct the annual ecological monitoring surveys on the MEWF Offsets Site and this report has been prepared to comply with the requirements outlined in the Mount Emerald Wind Farm Offset Area Management Plan (RPS, 2016), which details monitoring management actions. The data collected in 2016 provided baseline data for future monitoring to be compared against and enables targeted and adaptive management procedures to be implemented to ensure the biological integrity of the biodiversity area is maintained or improved and conserved into the future.

The actions required include:

- Targeted survey of threatened fauna species to determine changes to species diversity on the site over time;

- Pest species presence/absence assessments;
- Photo-monitoring points to determine variation in trends over time; and
- Targeted weed surveys.

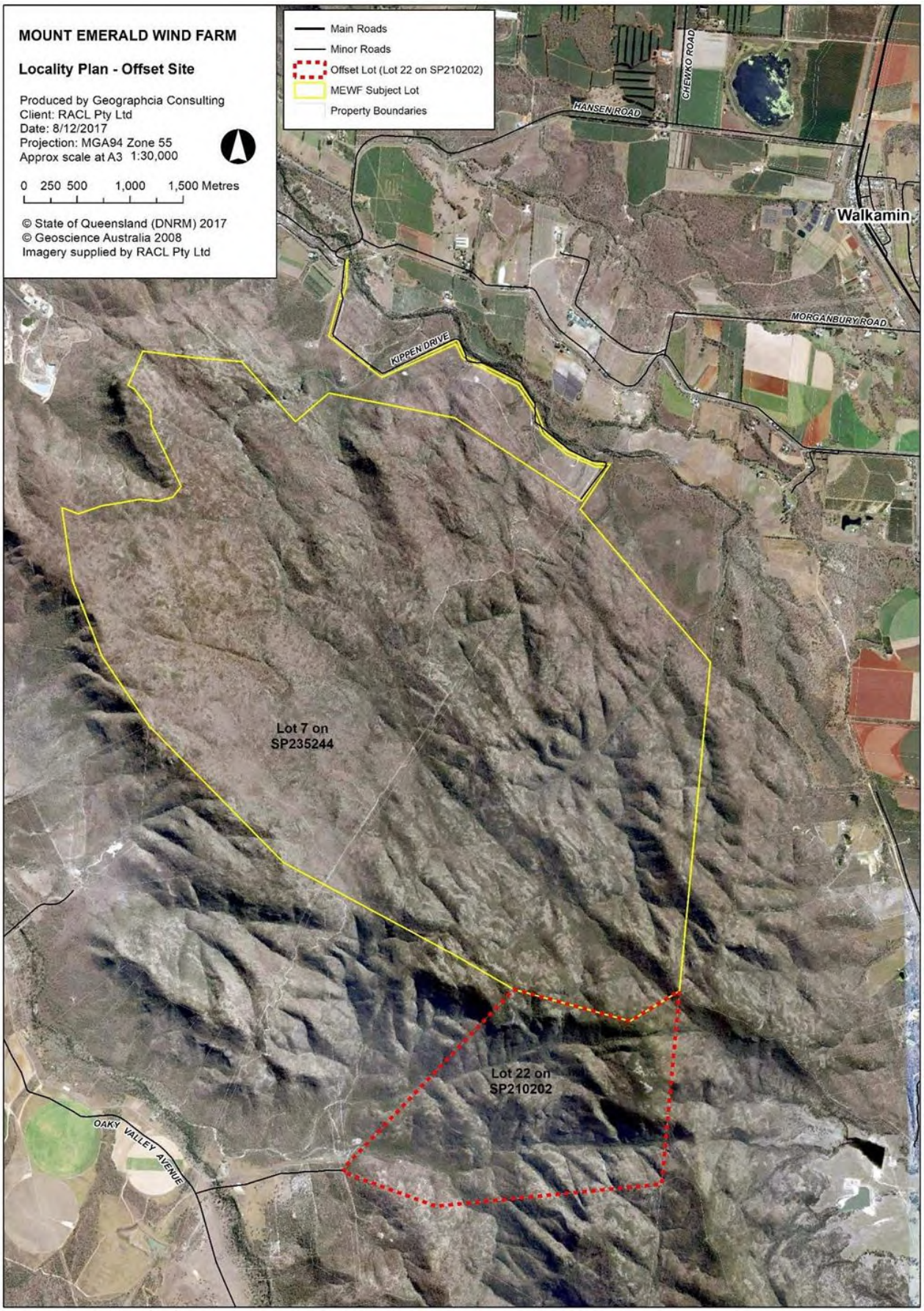

Figure 1 Project Location

1.2 Objectives and Outcomes

As identified in the Offset Area Management Plan (RPS, 2016), the offset area provides for the long-term protection of habitat for seven threatened species and through the implementation of adaptive management practices the quality of the habitat will be improved and maintained over time. The offset area is to be protected in perpetuity as a Nature Refuge. The management plan objectives and outcomes are to:

- Protect all vegetation within the offset area from future clearing;
- Protect all fauna within the offset area from introduced weeds and pests;
- Protect the site vegetation and fauna from un-prescribed burn and wildfire;
- Maintain the ecological condition of remnant of-concern and least concern vegetation within the Offset area where the BioCondition Class is of 1 for each assessment unit does not change;
- Implement of a translocation plan based on the criteria and guidelines detailed in the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al, 2004). This should be developed to identify MNES plant species appropriate for relocation as well as target and recipient sites.

This ecological monitoring report presents the methods and results of the 2018 ecological monitoring program at the MEWF Biodiversity Offset Area, including a discussion of the findings and comparisons with the results of the baseline data conducted in 2016. Management recommendations that relate to the current monitoring phase are documented in **Section 4.0**.

1.2.1 Regional Ecosystems:

The RE's mapped for the offset site are described in **Table 1** and shown on the mapping in **Figure 2**. Baseline surveys in 2016 identified that RE mapping was consistent with ground-truthed vegetation assessments.

Table 1 Regional Ecosystems Present Within the Proposed Offset Site

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
7.3.26a	*Casuarina cunninghamiana* (river oak) woodland to open forest on alluvium fringing streams. Occurs on channel benches, levees and terraces on deep loamy sands or sandy clay loams (often with loose surface gravel). (BVG1M: 16a). Vegetation communities in this regional ecosystem include: 7.3.26a: Riverine wetland or fringing riverine wetland. *Casuarina cunninghamiana*, *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Melaleuca leucadendra*, *M. fluviatilis*, *Buckinghamia celsissima*, *Mallotus philippensis* woodland and forest with an understorey of *Melaleuca viminalis* and *Bursaria tenuifolia*. Fringing forests of larger streams. (BVG1M: 16a).	OC	E	2.63
7.12.7c	Simple to complex microphyll to notophyll vine forest, often with *Agathis robusta* (kauri pine) or *A. microstachya* (bull kauri). Granites and rhyolites of foothills and uplands, of the moist rainfall zone. (BVG1M: 5c). Vegetation communities in this regional ecosystem include: 7.12.7c: Simple notophyll semi-evergreen vine forest. Uplands of the dry rainfall zone. Rhyolite. (BVG1M: 5c).	LC	NCP	1.24
7.12.9	*Acacia celsa* (brown salwood) open forest to closed forest. Foothills, uplands and highlands on granites and rhyolites, of the very wet and wet rainfall zone. (BVG1M: 5d).	OC	OC	1.16
7.12.16a	Simple to complex notophyll vine forest, including small areas of *Araucaria bidwillii* (Bunya pine). Uplands and highlands on granites and rhyolites, of the cloudy wet to moist rainfall zones. (BVG1M: 6b).	LC	NCP	9.34
7.12.26a	*Syncarpia glomulifera* (turpentine) +/- *Corymbia intermedia* (pink bloodwood) +/- *Allocasuarina* spp. (sheoaks) closed-forest to woodland, or *Lophostemon suaveolens* (swamp mahogany), *Allocasuarina littoralis* (black sheoak), *C. intermedia* shrubland, (or vine forest with these species as emergents). Exposed ridgelines or steep rocky slopes, on granite and rhyolite. 7.12.26a: *Syncarpia glomulifera*, *Allocasuarina torulosa* and/or *A. littoralis* open-forest and woodland. Uplands and highlands, often on steep slopes, of the wet rainfall zone. Granite and rhyolite. (BVG1M: 28e).	LC	NCP	4.41

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
7.12.26e	*Syncarpia glomulifera* (turpentine) +/- *Corymbia intermedia* (pink bloodwood) +/- *Allocasuarina* spp. (sheoaks) closed forest to woodland, or *Lophostemon suaveolens* (swamp mahogany), *Allocasuarina littoralis (bla*ck sheoak), *C. intermedia* shrubland, (or vine forest with these species as emergents). Exposed ridgelines or steep rocky slopes, on granite and rhyolite. (BVG1M: 9d). Vegetation communities in this regional ecosystem include: 7.12.26e: *Syncarpia glomulifera* low open forest and low woodland. Uplands on steep rocky slopes, of the moist and dry rainfall zone. Granite and rhyolite. (BVG1M: 28e).	LC	NCP	8.99
7.12.29a	*Corymbia intermedia* (pink bloodwood) and/or *Lophostemon suaveolens* (swamp mahogany) open forest to woodland +/- areas of *Allocasuarina littoralis* (black sheoak) and *A. torulosa* (forest sheoak). Uplands, on granite and rhyolite. (BVG1M: 9c). Vegetation communities in this regional ecosystem include: 7.12.29a: *Corymbia intermedia*, *Eucalyptus tereticornis*, *E. drepanophylla* open forest to low open forest and woodland with *Allocasuarina torulosa*, *A. littoralis*, *Lophostemon suaveolens*, *Acacia cincinnata*, *A. flavescens*, *Banksia aquilonia* and *Xanthorrhoea johnsonii*. Uplands, on granite and rhyolite. (BVG1M: 9c).	LC	NCP	4.60
7.12.30d	*Corymbia citriodora* (lemon-scented gum) +/- *Eucalyptus portuensis* (white mahogany) woodland to open forest. Granite and rhyolite (often coarse-grained red earths and lithosols with much surface rock). (BVG1M: 10b). Vegetation communities in this regional ecosystem include: 7.12.30d: Open woodland to open forest (10-20m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana*, *C. citriodora*, *E. portuensis*, *E. lockyeri*, *C. leichhardtii*, *E. atrata*, *E. pachycalyx*, *E. reducta*, *C. intermedia* and *E. shirleyi*. There is often a very sparse to mid-dense secondary tree layer of *C. abergiana* and/or *C. stockeri*. A very sparse to sparse tall shrub layer may be present and can include *Acacia flavescens*, *Persoonia falcata*, *Bursaria spinosa* subsp. *spinosa*, *Allocasuarina inophloia*, *Petalostigma pubescens* and *Grevillea glauca*. A sparse to dense lower shrub layer may include *Jacksonia thesioides*, *Acacia calyculata*, *Xanthorrhoea johnsonii* and *Grevillea glossadenia*. The ground layer may be dominated by species such as *Themeda triandra*, *Heteropogon triticeus*, *Mnesithea rottboellioides*, *Arundinella setosa*, *Cleistochloa subjuncea*, *Eriachne pallescens* var. *pallescens*, *Lepidosperma laterale* and *Xanthorrhoea johnsonii*. Rocky slopes on granite and rhyolite. (BVG1M: 9d).	LC	NCP	133.42

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
7.12.34	*Eucalyptus portuensis* (white mahogany) and/or *E. drepanophylla* (ironbark), +/- *C. intermedia* (pink bloodwood) +/- *C. citriodora* (lemon-scented gum), +/- *E. granitica* (granite ironbark) open woodland to open forest. Uplands on granite, of the dry rainfall zone. (BVG1M: 9d).	LC	NCP	23.76
7.12.57a	Shrubland and low woodland mosaic with *Syncarpia glomulifera* (turpentine), *Corymbia abergiana* (range bloodwood), *Eucalyptus portuensis* (white mahogany), *Allocasuarina littoralis* (black sheoak) and *Xanthorrhoea johnsonii* (grasstree). Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones. (BVG1M: 9d). Vegetation communities in this regional ecosystem include: 7.12.57a: Shrubland and low woodland mosaic with *Syncarpia glomulifera*, *Corymbia abergiana*, *Eucalyptus portuensis*, *Allocasuarina littoralis* and *Xanthorrhoea johnsonii*. Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones. (BVG1M: 9d).	OC	OC	58.60
7.12.57c	Shrubland and low woodland mosaic with *Syncarpia glomulifera* (turpentine), *Corymbia abergiana* (range bloodwood), *Eucalyptus portuensis* (white mahogany), *Allocasuarina littoralis* (black sheoak) and *Xanthorrhoea johnsonii* (grasstree). Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones. (BVG1M: 9d). Vegetation communities in this regional ecosystem include: 7.12.57c: Shrubland/low woodland (1.5-9 m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana*, *Corymbia abergiana*, *E. portuensis*, *E. reducta*, *E. lockyeri*, *C. leichhardtii*, *Callitris intratropica*, *E. atrata*, *E. pachycalyx*, *E. shirleyi*, *E. drepanophylla* and *Homoranthus porteri*, on rhyolite and granite. There is occasionally a very sparse to sparse secondary tree layer of *C. abergiana* and/or *C. stockeri*. A very sparse to sparse tall shrub layer may be present and can include *Persoonia falcata*, *Exocarpos cupressiformis* and *Melaleuca viridiflora* var. *viridiflora*. A sparse to dense lower shrub layer may include *Jacksonia thesioides*, *Acacia calyculata*, *Coelospermum reticulatum*, *Xanthorrhoea johnsonii*, *Acacia humifusa*, *Dodonaea lanceolata* var. *subsessilifolia*, *Grevillea dryandri* subsp. *dryandri*, *Grevillea glossadenia*, *Acacia umbellata* and Ericaceae spp. The ground layer may be dominated by species such as *Themeda triandra*, *Xanthorrhoea johnsonii*, *Eriachne pallescens* var. *pallescens*, *Cleistochloa subjuncea*, *Borya septentrionalis*, and *Eriachne* spp. Includes open rocky dominated by herbs and grasses. This RE includes areas of 7.12.65k (rocky areas with shrubby/herbaceous cover) which are too small to map. Rocky slopes on granite and rhyolite. (BVG1M: 9d).	OC	OC	107.32

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
7.12.58	*Eucalyptus reducta* woodland to open forest (6-18m tall). Common associated species include *E. granitica*, *Corymbia dimorpha*, *C. citriodora*, *E. cloeziana* and occasionally *C. intermedia*. There is often a sparse secondary tree layer of *C. abergiana* and/or *E. lockyeri*. There may be a very sparse tall shrub layer of species such as *Acacia flavescens*, *Persoonia falcata*, *Allocasuarina littoralis* and *Acacia simsii*, and a very sparse to dense lower shrub layer of *Acacia calyculata*, *Pultenaea millarii*, *Jacksonia thesioides*, *Grevillea glossadenia*, *Grevillea dryandri* subsp. *dryandri*, *Homoranthus porteri* and *Dodonaea lanceolata* var. *subsessilifolia*. The ground layer is often dominated by species such as *Themeda triandra*, *Eriachne* spp., *Cleistochloa subjuncea*, *Lomandra longifolia*, *Mnesithea rottboellioides*, *Xanthorrhoea johnsonii*, *Heteropogon triticeus* and *Coronidium newcastlianum*. Granite and rhyolite. (BVG1M: 9d).	OC	OC	72.45
7.12.65k	Rock pavements or areas of skeletal soil, on granite and rhyolite, mostly of dry western or southern areas, often with shrublands to closed forests of *Acacia* spp. (wattles) and/or *Lophostemon suaveolens* (swamp mahogany) and/or *Allocasuarina littoralis* (black sheoak) and/or *Eucalyptus lockyeri* subsp. *exuta*. (BVG1M: 28e). 7.12.65k: Granite and rhyolite rock outcrop, of dry western areas, associated with shrublands to closed forests of *Acacia* spp. and/or *Lophostemon* spp. and/or *Allocasuarina* spp. In the Mount Emerald area, shrubs may include *Acacia umbellata*, *Melaleuca borealis*, *Homoranthus porteri*, *Leptospermum neglectum*, *Melaleuca recurva*, *Melaleuca uxorum*, *Grevillea glossadenia*, *Corymbia abergiana*, *Eucalyptus lockyeri*, *Sannantha angusta*, *Pseudanthus ligulatus* subsp. *ligulatus*, *Acacia aulacocarpa*, *Leptospermum amboinense*, *Xanthorrhoea johnsonii* and *Jacksonia thesioides*. Ground-cover species may include *Borya septentrionalis*, *Lepidosperma laterale*, *Eriachne* spp., *Cleistochloa subjuncea*, *Boronia occidentalis*, *Cheilanthes* spp., *Coronidium newcastlianum*, *Schizachyrium* spp., *Tripogon loliiformis*, *Gonocarpus acanthocarpus* and *Eragrostis* spp. Dry western areas. Granite and rhyolite. (BVG1M: 29b).	LC	OC	7.03
9.5.8	Woodland to open-woodland of *Eucalyptus cullenii* (Cullen's ironbark) and/or *E. leptophleba* (Molloy red box) +/- *Corymbia erythrophloia* (red bloodwood) +/- *Erythrophleum chlorostachys* (Cooktown ironwood). *Eucalyptus tardecidens* (box) may also occur as a subdominant in northern extent of this regional ecosystem. A sparse shrub layer includes *Petalostigma* spp., *Melaleuca* spp., *Grevillea* spp., *Alphitonia pomaderroides* and *Maytenus cunninghamii* (yellowberry bush). The sparse to dense ground layer is dominated by *Heteropogon contortus* (black speargrass) and *Sarga plumosum* (plume sorghum). Occurs on undulating plains in valleys in ranges on Tertiary/Quaternary soils overlying granite and metamorphic geologies. (BVG1M: 13a)	LC	NCP	0.01

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
9.5.9a	Woodland to open-woodland of *Corymbia clarksoniana* (Clarkson's bloodwood) and/or *Eucalyptus leptophleba* (Molloy red box) and/or *E. platyphylla*. A sparse to mid-dense shrub layer including *Melaleuca* spp., *Grevillea* spp., and *Planchonia careya* (cocky apple) can occur. The ground layer is dominated by *Themeda triandra* (kangaroo grass) and *Heteropogon* spp. Occurs on plains, undulating plains and outwash deposits and Tertiary to Quaternary locally consolidated high-level alluvium and colluvium. Major vegetation communities include: 9.5.9a: Woodland to open-woodland of *Corymbia clarksoniana* (Clarkson's bloodwood) +/- *Eucalyptus platyphylla* (poplar gum) +/- *E. leptophleba* (Molloy red box) +/- *C. tessellaris* (Moreton Bay ash) with a distinct to sparse sub-canopy layer often including *Melaleuca viridiflora* (broad-leaved paperbark), *Grevillea glauca* (bushman's clothes peg), *Petalostigma pubescens* (quinine) and *Alphitonia pomaderroides* (soapbush). An open to sparse shrub layer includes *Melaleuca* spp., *Persoonia falcata*, *Grevillea* spp. and *Petalostigma pubescens (*quinine). The sparse to mid-dense ground layer is dominated by *Themeda triandra* (kangaroo grass), *Aristida* spp., *Heteropogon contortus* (black speargrass), *H. triticeus* (giant speargrass), and *Sarga plumosum* (plume sorghum). Occurs on undulating plains. (BVG1M: 9e).	LC	NCP	
9.12.7a	Woodland to low open-woodland of Eucalyptus cullenii (Cullen's ironbark) +/- Erythrophleum chlorostachys (Cooktown ironwood) +/- C. leichhardtii (yellowjacket) +/- Corymbia erythrophloia (red bloodwood). The mid-layer is generally absent but a subcanopy and/or shrub layer can occur. The ground layer is sparse to dense and dominated by Heteropogon contortus (black speargrass) and Themeda triandra (kangaroo grass). Occurs on predominantly felsic volcanic rocks, on rolling to steep hills. Major vegetation communities include: 9.12.7a: Woodland to open-woodland of *Eucalyptus cullenii* (Cullen's ironbark) +/- *Corymbia erythrophloia* (red bloodwood) +/- *Erythrophleum chlorostachys* (Cooktown ironwood) +/- *C. dallachiana* (Dallachy's gum). An open to mid-dense subcanopy can occur and includes a variety of species. The shrub layer is absent to open and dominated by *Maytenus cunninghamii* (yellowberry bush), *Alphitonia pomaderroides* (soapbush), *Petalostigma* spp., and *Acacia* spp. The ground layer is sparse to dense and dominated by *Heteropogon contortus* (black speargrass), *H. triticeus* (giant speargrass), *Themeda triandra* (kangaroo grass) and *Sarga plumosum* (plume sorghum) with a *Xanthorrhoea* sp. (grasstree) occurring in some areas. Occurs on rhyolite hills. (BVG1M: 13a).	LC	NCP	0.01

RE	RE Description	VMA[1]	Bio.[2]	Area[3]
9.12.40	Low open-woodland to low woodland of *Melaleuca citrolens* (scrub teatree) +/- *Terminalia platyptera* (yellow-wood) +/- *Corymbia dallachiana* (Dallachy's gum) +/- *Erythrophleum chlorostachys* (Cooktown ironwood). The sparse shrub layer consists of *Petalostigma banksii* (smooth-leaved quinine), *M. citrolens* and *Gardenia vilhelmii* (breadfruit). The ground layer is frequently bare, with patches of short grasses including *Eriachne* spp., *Aristida* spp. and *Schizachyrium* spp. (firegrass). This community also occurs as short open-tussock grassland wooded with low trees and shrubs of *Melaleuca citrolens* +/- *Terminalia* spp. Occurs on gentle slopes, footslopes, rolling hills and colluvial low slopes. (BVG1M: 21b).	LC	NCP	
Non-rem	Non-remnant: modified land, roads, clearings and tracks.			0.08

[1] Status under Vegetation Management Act 1999: OC - Of Concern; LC - Least Concern.

[2] Biodiversity management status: E - Endangered; OC - Of Concern, NCP - No Concern at Present.

[3] Area - total area in hectares of RE type within offset site.

Conservation status of EVNT species: *Acacia purpureopetala* (CE - EPBC Act, V - NCA); *Grevillea glossadenia* (V- EPBC Act, V - NCA); *Homoranthus porteri* (V - EPBC Act, V - NCA); *Melaleuca uxorum* (E - NCA); *Plectranthus amoenus* (V - NCA); *Prostanthera albohirta* (CE - EBC Act, E - NCA); *Prostanthera clotteniana* (CE - EBC Act, E - NCA).

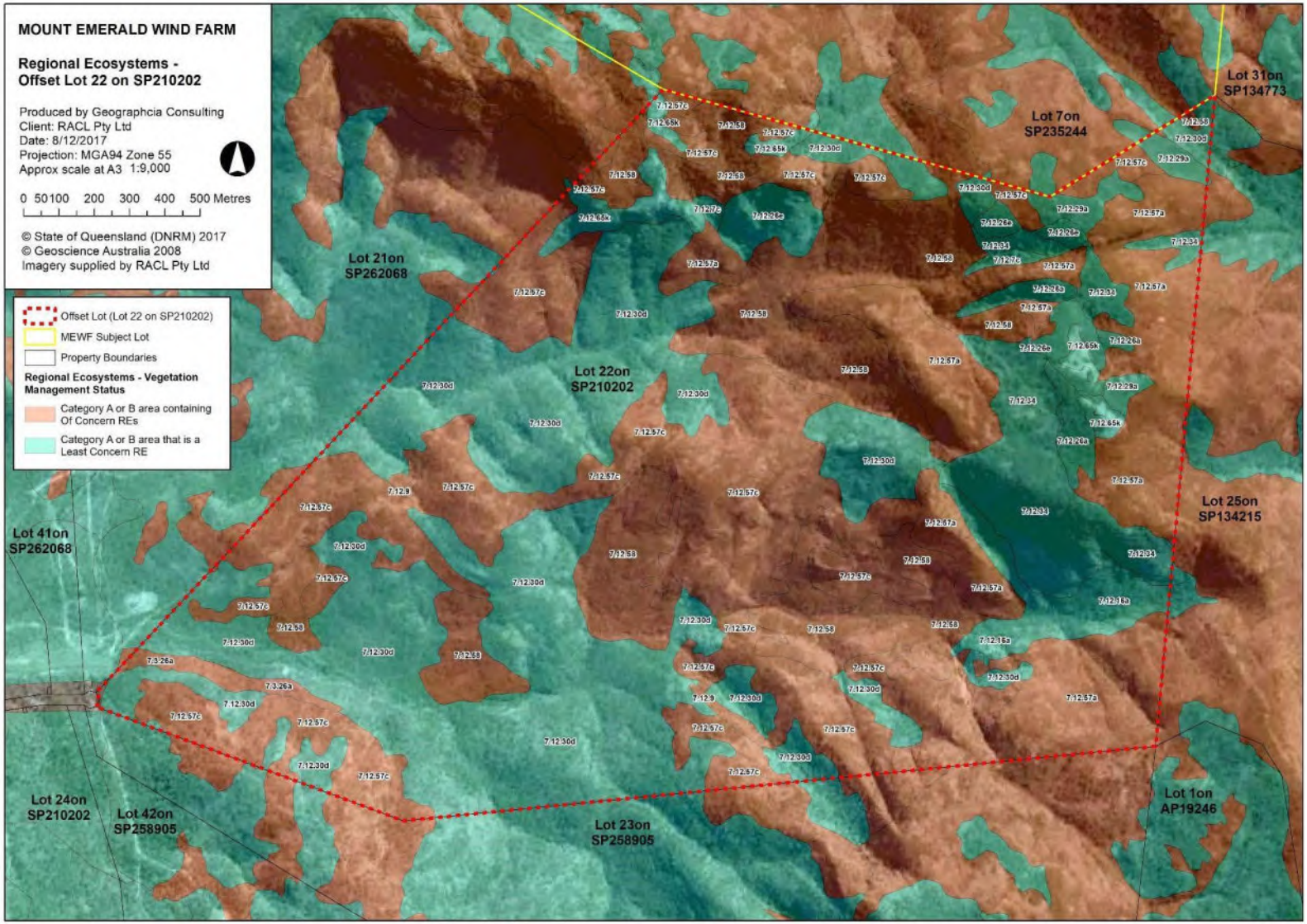

Figure 2 MEWF Regional Ecosystems on Offset Lot

2.0 Methods

The following sections detail the methods employed for the 2019 ecological offset area monitoring program. The methods employed as part of this monitoring program are consistent with those outlined in the MEWF Offset Area Management Plan (RPS, 2016).

Field surveys were conducted on site over six days between 26 February - 15 March 2019 with additional song meter surveys from the 25 March to the 11 April.

Total rainfall across the Mount Emerald range was recorded as 12 mm over that period. Minimum temperatures were 19.0°C and maximum temperatures were 32°C with the average nightly temperature falling to 19.7°C. Daily temperatures averaged 29.29°C. Wind speeds varied over the survey period with a minimum of 6 km/hr and a maximum 28 km/hr. Five days over the survey period resulted in calm winds. There was a mix of overcast and sunny days throughout the survey.

2.1 Targeted Fauna Surveys for Conservation Significant Fauna

2.1.1 Northern Quoll (*Dasyurus hallucatus*)

2.1.1.1 Methods

Camera Traps

The most suitable method for determining the presence of Northern Quoll is by undertaking a Camera Trapping Survey. This method follows that of Eyre *et al* (2014). Survey sites replicated those of the 2016 surveys conducted by RPS (2016) and 4 Elements Consulting (2017) shown in **Figure 3**.

A total of 19 camera traps (Scout Guard Boly units) were used for the camera trapping survey. At each survey site a single camera trap was attached horizontally to the trunk of a tree with a 'dbh' (diameter at breast height) of at least 15 cm with a metal angle bracket, at ~1 m above the ground so the camera faced the ground. Directly beneath the camera, a bait holder, consisting of a Rain Harvesting ™ PVC toilet vent pipe cap with a 50 mm PVC pipe insert, baited with two chicken necks and a single hand rolled ball of general fauna bait (oats, honey and peanut butter) was affixed to the ground with a 30 cm, 5 mm diameter tent peg.

Each camera was set at the medium-level trigger sensitivity. All loose vegetation (e.g. grass stalks, forbs and shrub branches) within the field of view of each camera were removed to minimize false triggers. Camera traps were active for a minimum period of 14 days.

Habitat Assessments

Habitat assessments were conducted at each site.

Measurements of habitat variables were made. Parameters monitored:

- Evidence of fire;
- Nature and extent of erosion;
- Extent of weed species;
- Presence of feral animals;
- Type of groundcover;
- Structure and floristics of vegetation cover; and
- Number of habitat trees.

2.1.2 Spectacled Flying-fox (*Pteropus conspicillatus*)

2.1.2.1 Methods

Diurnal searches for roosts and feeding signs were undertaken over a large proportion of the project site per Eyre *et al* (2014). Surveys followed meandering transects while completing camera trapping, and target surveys concentrated on regional ecosystems with a high likelihood of flowering myrtaceous species. A botanical assessment of the presence of feed trees and the percentage currently flowering (during this survey) across the site was undertaken by a qualified botanist.

Previously, survey efforts by both RPS (2016) and 4 Elements Consulting (2017 and 2018) have focused on foraging of Spectacled Flying-fox in suitable forage trees located during diurnal site traverse for nocturnal spotlighting efforts. This year, the survey effort relied solely on recording availability of forage trees as an indicator of habitat suitability for the Spectacled Flying-fox and nocturnal spotlighting was not conducted.

2.1.3 Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*)

2.1.3.1 Methods

Four ultrasonic bat call detectors (SM4 Songmeter, Wildlife Acoustics) were placed across the site (**Figure 3**), to determine presence and species composition of bats within the Offset Site. The bat call detectors were programmed to turn on automatically at 6 pm each evening and record for a 12-hour period.

All call analyses were conducted by Kelly Matthews from Green Tape Solutions, Brisbane. Ms Matthews is a recognised expert on bat call analysis and has an extensive library of reference calls from the FNQ Bioregion.

Due to equipment malfunction and limitations the Bare-rumped sheathtail bat survey was temporally separated into two survey periods, the first survey period ran from 26 February until 18 March and encompassed sites SM2 and SM4. The second survey period ran from 25 March until 11 April and encompassed Site 12 and Creek site.

2.2 Targeted Weed Surveys

The weed assessment of the offset site concentrated on the access track from Lemontree Drive to the small clearing adjacent to a tributary of Oaky Creek. The entire length of the track was traversed on foot. Additional spot observations of weed presence in remnant, undisturbed vegetation was undertaken previously in 2016, 2017, 2018 and during the current survey effort.

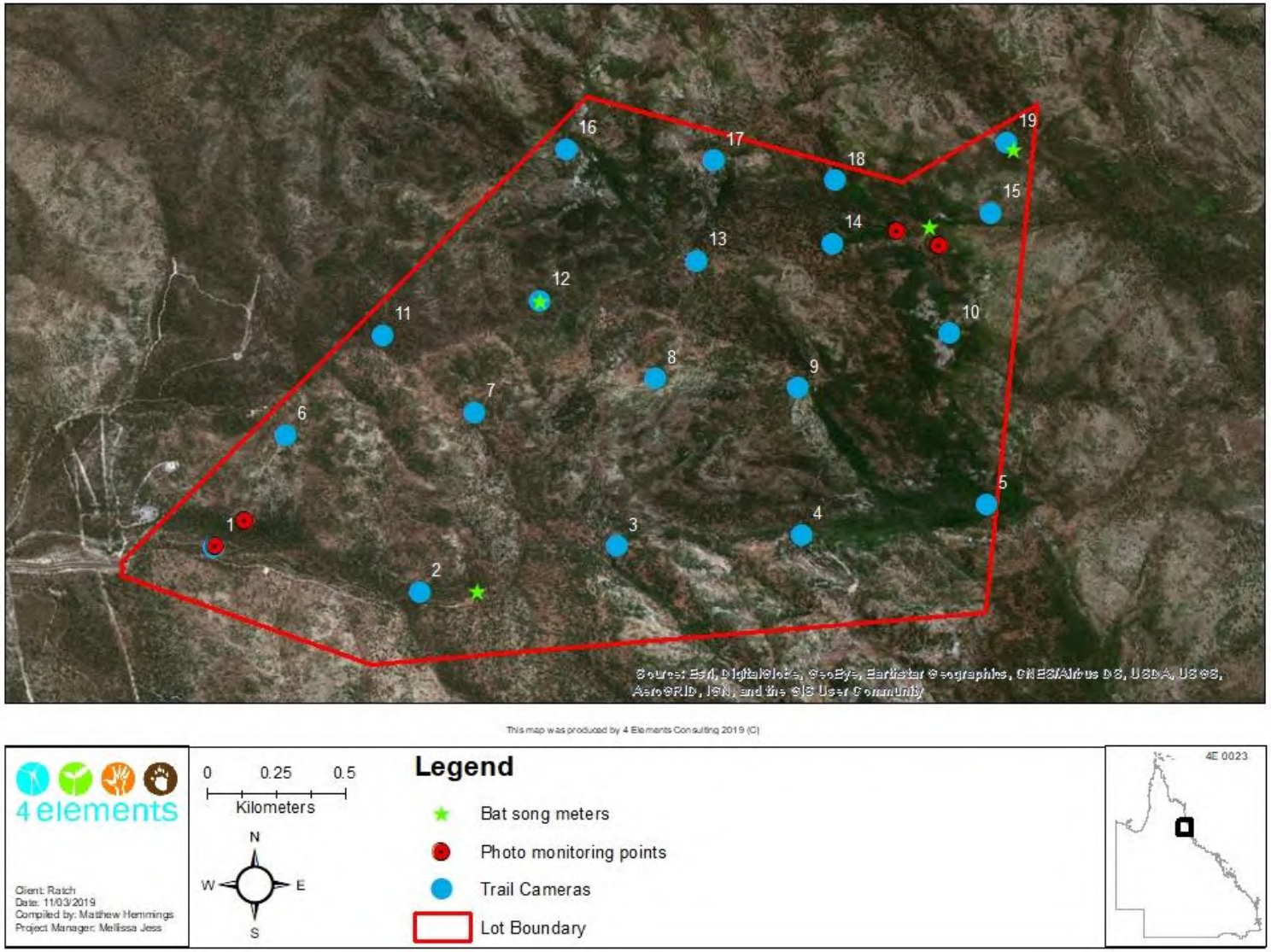

Figure 3 Monitoring Points on Offset Lot

2.3 Opportunistic Assessment

Fauna was monitored at 19 sites. Parameters monitored:

- Diurnal birds;
- Herpetofauna;
- Terrestrial mammals; and
- Threatened species presence.

2.4 Photo-monitoring Points

Four photo monitoring points were established within the offset area to enable a visual assessment of changes over time (**Figure 3**). Each point was:

- Marked with flagging tape and the GPS points recorded; and
- Photographed in north, south, east and west directions.

2.5 Pest Vertebrate Assessment

2.5.1 Camera Trap Locations

Secondary monitoring data was achieved from camera traps set at 19 Quoll monitoring traps (refer to **Section 2.1**). Pigs, feral dogs and cats are all known to be attracted to this bait.

Data collection included:

- Species identification (feral pigs and other animals);
- Number of each species;
- Age class of feral pigs; and
- Sex of feral pigs.

2.6 Results and Discussion

2.6.1 Northern Quoll

A total of 266 camera trap nights were conducted on the offset site and all units captured images. Northern Quolls were captured at 9 of the camera trap sites, and all animals showed evidence that they were in a healthy condition. A total of 12 Northern Quoll individuals were recorded during the current camera trapping survey and several quolls revisited the same site on multiple nights. While fewer individuals than the previous years' survey (4 Elements, 2018) this is not a substantial variation

to other years. Individual quoll counts over the previous survey periods are presented in **Table 2**. A possible explanation for the lower individual quoll count is possibly due to the season in which quolls were surveyed. A higher number is expected to be recorded earlier in the breeding season (July 2018) as opposed to later in the season (September 2018) with males rapidly dying off after completion of their breeding season (Burnett *et al*, 2013). Additionally, the difference is quite small, and unlikely to be statistically significant.

Table 2 Northern Quoll Annual Count Comparison

Year	Individual Quoll count
2016 (RPS)	13
2017 (4 Elements)	10
2018 (4 Elements)	16
2019 (4 Elements)	12

Site 17 recorded the highest number (4) of individual Northern Quolls. The remainder of Quolls were detected at sites 1, 3, 4, 6, 7, 8, 13 and 14. This identifies that Northern Quolls in the current survey were distributed over a relatively large proportion of the offset site, which is likely due to the large extent of optimal habitat resulting from the extended wet season.

Plate 1 Northern Quoll

The Offset Site has maintained its integrity and the habitat was observed to be high quality with large refugial areas of rock outcrops, tree hollows and fallen logs for Northern Quoll. The seasonal creeks from the Mt Emerald massif have had sufficient water flow from the wet season, with an abundance of fish and crustaceans observed within the creek system.

2.6.2 Spectacled Flying-fox

Targeted diurnal search for the SFF habitat was undertaken across the entire site whilst conducting camera trapping surveys, however searches were concentrated in areas where vegetation was considered optimal for this species. No Spectacled Flying-foxes were observed in the current survey effort. As with the previous year, the lower creek lines were considered important as they contained fruiting Burdekin Plum (*Pleigynium timorense*) which is a food source for Spectacled Flying-foxes. Fruits from this species were small and not yet ripe. Furthermore, no Eucalypt species were observed as flowering on site which is counter to the previous years survey findings. As identified the OAMP (RPS, 2016) and 4 Elements (2017) foraging habitat is available across the offset site and is considered in moderate to high quality. It is highly likely each species will utilise the site widely when available vegetation is flowering.

2.6.3 Bare-rumped Sheathtail Bat (*S. saccolaimus*)

A total of 36 detector nights of microchiropteran bat call surveys were conducted within the project site between 26 February and 11 April 2019.

A total of nine microbat species were detected as a definite occurrence on the site. Four microbat species were identified to be probably occurring on site, whilst 2 species were identified as possibly occurring on site (**Table 3**).

The presence of Bare-rumped Sheathtail Bat (BRSB), listed as 'Endangered' under NC Act, and listed as 'Vulnerable' under EPBC Act, was analysed. AS in previous years this species could not be definitely confirmed due the similarity in call with sympatric species and overlap in their distribution. This species also presents a number of call variations which makes it difficult to confirm its presence using only echolocation techniques. However, a number of calls presented harmonics that were a highly probable match for BRSB. Based on previous confirmed records of this species within the locality in recent years, we would consider BRSB is highly likely to occur within the surveyed area (**Appendix A**).

Characteristic call attributes of BRSB include:

- A dominant harmonic with characteristic frequency around 22-25 kHz;

- At least three and up to five distinct harmonics at approximately 13 kHz intervals (1 below and up to 3 above the dominant harmonic); and
- Call pulses sometimes in "triplet" sets with pulse intervals of approximately 10-20 ms between first and second pulses and 20-40 ms between second and third pulses and an inter-triplet interval of about 80100 ms (**Appendix A**).

In both 2016 and 2017, probable calls were recorded at Site 19 which is the high altitude *Corymbia citriodora* (lemon scented gum) +/- *Eucalyptus portuensis* (white mahogany) woodland to open forest aspect of the site. Again, in this round of survey the Bat was a probable detection in the same location Site 19 and possibly Site 14 which is also a higher elevation site.

All bats identified on the site were expected to be present within the region. Bat activity levels at the site are considered to be similar compared to other surveys within similar areas in the surrounding region. A total of fifteen (15) species were recorded this year which is six (6) more species than were identified during the previous year's effort. Baselines surveys in 2016 recorded the lowest number with seven (7) species being recorded, therefore no trend can be concluded other than general microchiropteran bat diversity is relatively consistent on site. Weather conditions indicated low wind, and good insect availability due to relatively recent rains which provided ideal conditions for collecting bat call data during this survey period.

Table 3 summarises the Call Analysis.

Table 3 Summary of Call Analysis

Species	Status NCA	Status EPBC	Confidence
Austronomus australis	Least Concern	Not of Concern	Definite
Chaerophon jobensis	Least Concern	Not of Concern	Definite
Chalinobus nigrogiseus	Least Concern	Not of Concern	Definite
Myotis macropus	Least Concern	Not of Concern	Probable
Miniopterus australis	Least Concern	Not of Concern	Definite
Miniopterus orianae oceanensis	Least Concern	Not of Concern	Definite
Mormopterus lumsdenae	Least Concern	Not of Concern	Probable
Mormopterus ridei	Least Concern	Not of Concern	Definite
Nyctophilus sp	Least Concern	Not of Concern	Probable
Saccolaimus flaviventris	Least Concern	Not of Concern	Possible

Species	Status NCA	Status EPBC	Confidence
Saccolaimus saccolaimus	Endangered	Vulnerable	Probable
Taphozous troughtoni	Least Concern	Not of Concern	Possible
Rhinolophus megaphyllus	Least Concern	Not of Concern	Definite
Vespadelus pumilus	Least Concern	Not of Concern	Definite
Vespadelus troughtoni	Least Concern	Not of Concern	Definite

2.7 General Fauna

A combination of camera trap surveys and opportunistic diurnal sightings resulted in 36 species being positively identified on site. One rodent and a *Eulamprys* skink could not be identified to species level. The 36 species identified comprised of 20 birds, 10 mammals, 5 reptiles, and one amphibian (Cane toad).

Bird species commonly observed in the current survey effort included honeyeaters such as Bridled and Yellow-faced honeyeaters. These species were not observed in the previous surveys. Other species commonly observed included the Rainbow bee-eater, Grey and Rufous fantail, Spotted and Striated Pardalotes and the Pale-headed Rosella. Raptors on site included the Black Kite (*Milvus Migrans*) and the Nankeen Kestral (*Falco cenchroides*).

The cryptic Mareeba rock-wallaby (*Petrogale mareeba*) was located on the mid to low mountain slopes at sites 3, 5, 14 and 16. This is an increase to the previous years' findings where this species was located only at site 14. The Echidna (*Tachyglossus aculeatus*) was identified at several locations across the site.

Five reptiles were identified. One reptile (water skink) could only be identified to genus level (*Eulamprus spp.)*. The remainder comprised the Eastern water dragon (*Intellagama lesueurii*), Freckled monitor (*Varanus tristis*), Lace monitor (*Varanus varius*) and Two-lined dragon (*Diporiphora bilineata*).

Several tadpoles were observed in the creeks and are believed to be the Bumpy Rocket frog (*Litoria inermis*).

A complete list of the fauna species identified on site is provided in **Appendix B**.

2.8 Baseline Bio-Condition Surveys

Bio-Condition monitoring was undertaken in April 2019. In the previous year a total of eight (8) sites were completed. This survey effort did not capture baseline measurements of all discreet remnant vegetation communities represented on the site. Therefore, a further effort was undertaken this year

to include an additional ten (10) Bio-condition sites. This brings the combined total of Bio-condition sites to 18, which completes baseline collection all of the remnant vegetation communities that occur on the MEWF Biodiversity Offset Site. The next planned biennial assessment of all sites will continue from late in the wet season 2020. These sites were assessed using the Bio-Condition methodology (Eyre *et al* and Nelder *et al* 2017) and were all deemed to be in high ecological condition. These results are used to monitor for any changes in these communities across site in future annual monitoring. Full report is attached in Error! Reference source not found..

2.9 Weed Control

Several weeds were observed on the main access track from Lemontree Drive. A high proportion of mature invasive grasses were recorded along the access track growing with native grasses. The invasive grass species of concern were Grader Grass (*Themeda quadrivalvis*) and Rhodes Grass (*Chloris gayana*). Grader Grass is considered a priority weed species to be managed for the MEWF Offset Site. It is a prolific species and is quick to establish. It initially colonises disturbed areas such as vegetation clearing and track formation. This species, once established, has the potential to penetrate areas of undisturbed open woodland where it can outcompete native flora species and alter recruitment of native vegetation.

This infestation was removed (14 March 2019) by hand pulling all plants by carefully removing roots, leaf and seed material. This was then placed into large 80 L garbage bags and disposed of off-site. A total of five (5) 80 L garbage were filled with material during this process. A subsequent visit to the site after the wet season (in April) was required to remove any more exotic grasses that had matured in the moist soil.

Seveal broadleaf species of weeds were also identified along the access track from Lemontree Drive. These species are:

- Mint Bush (*Hyptis Sauveolens*)
- Wynn Cassia (*Chamaecrista rotundifolial)*
- Praxelis (*Praxelis clematidea*) and
- Common Stylo (*Stylosanthes guianensis)*

Selective targeted back-pack weed spraying was undertaken over several days to control these species. Herbicide used was Grazeon, which was diluted at a rate of 75ml herbicide/15litre water. A total of 90 litres Grazon mixture was used on the Lemontree Drive access track.

3.0 Pest Vertebrate Monitoring

The availability of freshwater pools throughout the site appears to have influenced the presence of large feral animals in the 2019 monitoring season. Evidence of pig (*Sus scrofa*) activity was found close to Site 9, Site 16 and Site 18. This included a recently constructed grass nest and some extensive foraging.

Feral pig observations are provided in **Table 4** below.

Table 4 Evidence of Feral Pigs on Offset Site

Survey	Location	Species	Number
Rooting	Site	Pig	Unknown
Nesting	Site 19	Pig	1

Plate 2 Evidence of pig rooting 14 March, 2019

Plate 3 Pig nest recorded 13 March, 2019

Feral cats were camera trapped during the current survey period at sites 4, 11 and 17. This is likely to be from two individual cats.

Plate 4 Feral Cat

3.1 Photo Monitoring Points

A visual assessment was undertaken at four photo monitoring points. These locations were selected based on habitat quality, Regional Ecosystem attribute and location. **Table 5** below summarises the characteristics of these sites where photographs are oriented towards the North, South, East and West. Whilst the photo will aid in the broad structural comparisons over time, they are best used in combination with floristic data (Gleed, 2017) as they are unlikely to show fine scale changes on their own.

Table 5 Photo Monitoring Points

Site ID	Description	Photograph from North, South, East, West	
Photo Point 1 Location :0327999, 8096486	Mapped as RE 7.3.26a Site only partially conforms to mapped RE absence of *Allocasuarina cunninghammii* in community however some key associates were present in canopy and shrub layer. Alluvial sandy loam on riverine wetland. Canopy of *Eucalyptus tereticornis*, *Corymbia Leichardtii* with a sparse shrub layer containing *Lophostemon grandiflorus*, *Bursaria tenuifolia*, *Exocarpus cupressiformis, Callitris intratropica, Acacia spp.* with a ground layer containing *Heteropogon triticeus*, *Sarga spp.* and *Themada triandra*. Weeds present: *Stylo guianensis*	 North	 South
		 East	 West

Site ID	Description	Photograph from North, South, East, West	
Photo Point 2 Location: 0328099, 8096579	Mapped 7.12.30d Site conforms to RE containing dominant canopy and key lower level associates. Rocky slopes on granite and rhyolite. Canopy *Eucalyptus cloeziana*, *Corymbia leichardtii* and Eucalyptus *crebra* with a very sparse shrub layer containing *Petalostigma pubescens*, *Coelospermun reticulatum, Persoonia falcata, Grevillea parrallela* and a ground layer containing *Heteropogon triticeus*, *Sarga spp.* and *Themada triandra*. Weeds present *Melenis repens*	 North	 South
		 East	 West

Site ID	Description	Photograph from North, South, East, West	
Photo Point 3 Location 0330501, 8097591	Site conforms to RE 7.12.57a containing low open woodland to shrubland containing key canopy and lower level associates. High uplands slopes on granite and rhyolite. Tall shrub/ low tree layer *Syncarpia glomulifera, Corymbia abergiana, Eucalyptus portuensis, Eucalyptus crebra, Allocasuarina littoralis. Banksia aquilonia. Ground layer Xanthorrea johnsoni, Themeda triandra, Imperata cylindrical, Pteridium esculentum,*	 North	 South
		 East	 West

Site ID	Description	Photograph from North, South, East, West	
Photo Point 4 Location: 0330355, 8097647	Mapped as RE 7.12.16a Site conforms to mapped RE containing simple to complex notophyll vine forest with emergent *Agathis microstachya* on granite and rhyolite in the uplands of the moist rainfall zone.	 North	 South
		 East	 West

4.0 Management Actions

4.1 Comparison to Previous Monitoring

Since the baseline monitoring collection in 2016 and previous years field investigations the conditions of the site have changed very little. The absence of fire improving the condition of some habitat on the site in combination with the availability of freshwater pools which has increased the availability of resources and mobility for some species. Fauna distribution and population of target species is very similar and although no statistical analysis could be undertaken, there was no indication of a population decline in Northern Quoll, Spectacled Flying-fox, or Bare-rumped Sheathtail Bat due to habitat impacts on the offset site.

4.2 Biodiversity Management Issues

Several minor biodiversity management issues were identified during monitoring. These include the state of the access track, and signs of feral pigs within the Biodiversity Offset Area.

4.2.1 Access Track

Since collection of baseline monitoring data in 2016, the conditions of access tracks within the Biodiversity Offset Site have been improved through the establishment of perimeter fencing. The tracks were however, showing signs of rill erosion, as well as disturbance by unauthorised vehicular access (primarily motorbikes). Unauthorised access by vehicles has not stopped with fencing however as the main entrance gate to the site remains unlocked. Several weeds have been identified on the access track, with particular concern - Grader grass (*Themeda quadrivalvis*). Manual and chemical control has resulted in a reduction of weeds on the access track however manual removal of any new weed growth will be ongoing. This management action will likely lead to the overall reduction of weeds on the access track.

4.2.2 Pest Species

The biodiversity offset area is considered to contain a low density of pest fauna species. Feral cats were recorded on site during the current survey effort and have been recorded on previous surveys. There is no evidence to suggest that feral cat presence on site has changed over time. Feral pig signs were recorded on site during the current and previous survey periods. On ground evidence of feral pigs reveals uprooting of vegetation and soil disturbance. Left unmanaged, these impacts can become severe. Aerial shooting and the MEWF pest management plan should target this offset site in the next

round of pest management activities, particularly in the vicinity of Camera site 19 and the Mt Emerald proper area which backs onto the MEWF project.

Camera traps should be selectively used to record feral pig activity across the site. This will give an indication of the proportion of pigs which are impacting the habitat. The employment of bait stations will assist in obtaining more accurate records of feral pig visitation rates.

5.0 Summary

The ecological surveys undertaken in the MEWF offset site during 2019 provided the fourth round of annual monitoring data. The ecological monitoring surveys include information that will be used with weed survey information to fulfil obligations to include in the annual reporting required for the conservation agreement with DEE and DES. A total of three threatened species were recorded in the MEWF Offset site in 2019:

- Northern Quoll (*Dasyurus hallucatus*);
- Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus*).
- Spectacled Flying Fox (*Pteropus conspicillatus*)

Fauna habitat resources remain abundant within the MEWF offset site and the habitat is of high quality.

The site has a high density of the large hollows that several nocturnal birds of prey, bat and large mammal species require for breeding. In addition, small mammals (terrestrial and arboreal), which are the respective prey of a number of predatory species, were identified throughout the site. Canopy tree species and understorey shrubs within the site provide abundant foraging resources such as foliage, seeds, pollen, nectar and invertebrates for variety of species on a seasonal basis and may potentially influence the occurrence and abundance of arboreal mammal species and birds.

Groundcover has improved since baselines surveys due to increased rainfall and rehabilitation since a fire event therefore small reptiles and amphibians have increasingly utilised a wider distribution of the offsets site.

Feral pigs are evident on the site and are at a stage that management actions require appropriate measures.

Weed surveys indicated there are currently no priority listed weed species on site, however vigilance will be required along the access track and road entry to ensure there are no access points for these threats. Continued management measures to remove weeds from tracks and external site boundaries will reduce the risks significantly.

The ecological condition of the MEWF Offset site has been maintained since baselines surveys were conducted in 2016.

6.0 References

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Appendix A Bat Call Analysis Report

Greentape Solutions – 31/05/2019

Green Tape Solutions

Quality, Integrity, Experience

Bat Call Analysis Report

Mt Emerald Wind Farm - May 2019

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Report Number: PR19092_Mt Emerald Bat Call Analysis

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Document Records - Quality

TITLE	Bat Call Analysis – Mt Emerald Wind Farm May 2019
FILED AS	PR19092_Mt Emerald Bat Call Analysis

Revision	Date	Prepared by (name/title)	Reviewed by (name/ title)	Approved by (name/title)
Version A	29/05/2019	Kelly Matthews, Director / Principal Ecologist	Kelly Matthews, Director / Principal Ecologist	Mellissa Jess from Four Elements Consulting

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TABLES

FIGURES

1.0 Introduction

1.1 Background

An assessment on the likelihood of the presence of microbat species using echolocation detectors was conducted during an ecological survey at Mt Emerald Wind Farm. The detectors recorded data form the 26th February 2019 to the 11th April 2019. The site is located in Mareeba Shire, Queensland.

1.2 Scope of Works

The specific scope of works for this report includes the following:

- Outline the methodology used to survey microbat species within the subject site;
- Analyse and provide an assessment of the likelihood of occurrence of threatened microbat species listed under State and Commonwealth legislation; and,
- Identify of local statutory considerations relevant to ecological aspects (relevant to bats) of the site.

2.0 Methodology

2.1 Capture

Data was collected over seven weeks from 26th February 2019 using bat detectors. The original call files display Australian Eastern Standard Time. The majority of calls were considered to be of medium to good quality calls.

Data was received on the 8th May 2019 and was analysed using Kaleidoscope Pro. In total, 16,799 call sequence files were recorded and 11,353 marked as containing recognisable bat calls.

2.2 Call Identification

Call identification for this dataset was based on call keys and descriptions published for Queensland (Reinhold, 2001) and Northern Territory (PWCNT, 2002) with reference to descriptions for New South Wales (Pennay *et al.*, 2004).

Species' identification was further refined using the probability of occurrence of each species based on their geographic distribution (Churchill, 2008, Van Dyck and Strahan, 2008). Species nomenclature used in this report follows Churchill (2008).

The reliability of identification is as follows:

- **Definite** - one or more calls where there is no doubt about the identification of the species;
- **Probable** - most likely to be the species named, low probability of confusion with species that use similar calls; and,
- **Possible -** call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

2.3 Survey Limitations

The ability to detect call and accurately identify them to species level can vary greatly with the surrounding environment and the location of the echolocation device. The survey undertaken as part of this assessment only represents a 'snapshot' in time and therefore, may not provide a true indication of species presence at the site. Hence, this survey should not be regarded as conclusive evidence that certain protected microbats species do not occur at the site.

2.4 National Standard

The format and content of this report complies with the nationally accepted standards for the interpretation and reporting of bat call (Reardon, 2003), which is currently available from the Australasian Bat Society at www.ausbats.org.au.

3.0 Results

3.1 Total of Species Recorded

A total of 11,353 call sequence files were marked as recognised bat calls.

A total of nine microbat species were definitely identified being present on site and an additional six (6) species were potentially recorded on site. A summary of the species present on site is provided in **Table 1**. The microbats species calls are separated by devices.

The devices SM4 recorded the most calls. The site creek recorded less calls that were in good quality.

Table 1: Summary of bat calls

Species	NC Act	EPBC Act	Site 12	Site Creek	SM2	SM4
Austronomus australis	LC	NOC	-	-	Definite	Definite
Chaerephon jobensis	LC	NOC	Definite	-	Definite	Definite
Chalinolobus nigrogriseus	LC	NOC	-	-	Definite	Definite
Myotis macropus	LC	NOC	Possible	-	Possible	Probable
Miniopterus australis	LC	NOC	Definite	Definite	Definite	Definite
Miniopterus orianae oceanensis	LC	NOC	Definite	Definite	Definite	Definite
Mormopterus lumsdenae	LC	NOC	-	-	Probable	Probable
Mormopterus ridei	LC	NOC	Definite	-	Definite	Definite
Nyctophilus sp	LC	NOC	Possible	-	Probable	Probable
Saccolaimus flaviventris	LC	NOC	-	-	Possible	Possible
Saccolaimus saccolaimus	Endangered	Vulnerable	-	-	Possible	Probable
Taphozous troughtoni	LC	NOC	-	-	Possible	Possible
Rhinolophus megaphyllus	LC	NOC	Definite	-	Definite	Definite
Vespadelus pumilus	LC	NOC	-	-	Definite	Definite
Vespadelus troughtoni	LC	NOC	-	Definite	Definite	Definite

3.2 Analysis of the presence of Saccolaimus saccolaimus

The purpose of the bat survey was to identify the presence of *S. saccolaimus* on site. Characteristic call attributes of *S. saccolaimus* (PWCNT, 2002) include:

- A dominant harmonic with characteristic frequency around 22-25 kHz;
- At least 3 and up to five distinct harmonics at approximately 13 kHz intervals (1 below and up to 3 above the dominant harmonic); and
- Call pulses sometimes in "triplet" sets with pulse intervals of approximately 10-20ms between first and second pulses and 20-40ms between second and third pulses and an inter-triplet interval of about 80-100ms.

Saccolaimus saccolaimus is listed under the *Nature Conservation Act 1992* as Endangered and under the *Environmental Protection and Biodiversity Act 1999* as Vulnerable. This species cannot be definitely confirmed due the similarity in call with sympatric species and overlap in their distribution. The full spectrum of twelve recorded calls were clustered closely with those of *S. saccolaimus* and one call presented harmonics that was probably be attributed to *S. saccolaimus*. *S. saccolaimus* was previously recorded within the site and it is considered that *S. saccolaimus* would still probably occur on site.

Most of the sympatric calls could be reliably separate from *T. troughtoni and S flaviventris* due to the lack of harmonics and characteristics.

3.3 Samples of Calls / Sequences Files

Samples of call extracted from the dataset for each species identified is provided in the following figures.

Figure 1: Definite *Austronomus australis*

This species is one of the few bat species with calls audible to human ears. This species exhibits a characteristic frequency ranging from 10.5 to 15 kHz (Pennay *et al,* 2004).

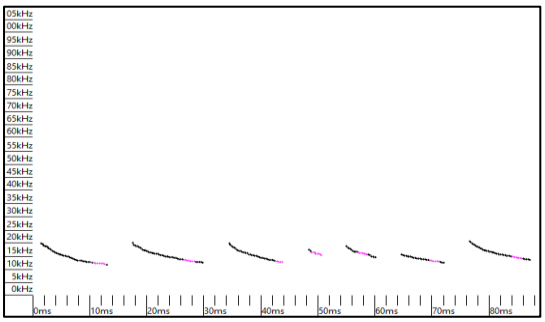


Figure 2: Definite *Chaerephon jobensis*

C. jobensis produce paired call pulses at alternating frequencies with intermittent, "excited", linear pulses. Their characteristic frequency of the search phase calls is around 14-17kHz and is generally easy to identify. All calls in the relevant frequency range were attributable to C. jobensis with no evidence of typical S. flaviventris calls.

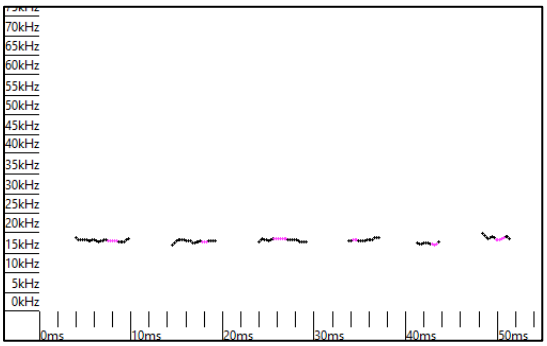
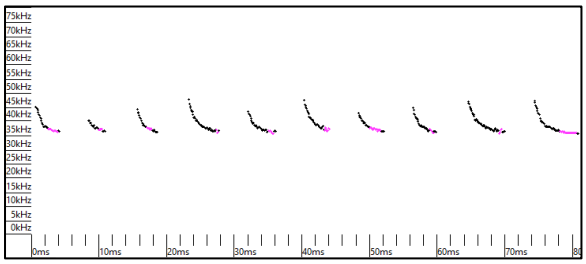
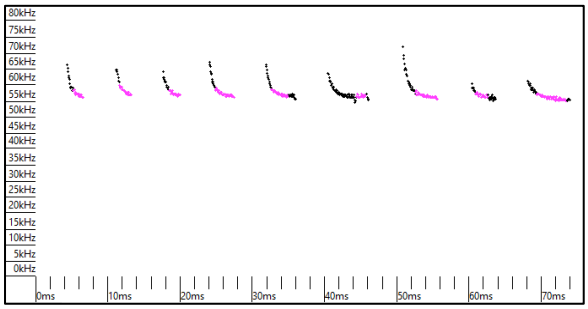


Figure 3: Definite *Chalinolobus nigrogriseus*



Curved shape with characteristic frequency 37 to 40kHz (Reinhold *et al,* 2001). Usually has no tail. Characteristic section and tail takes up at least 2/3 if the time of the pulse when in search phase.

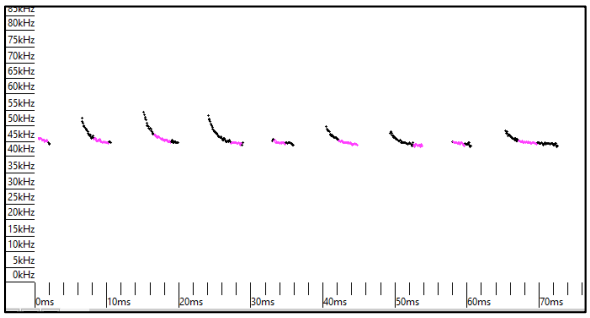
Figure 4: Definite *Miniopterus australis*



This species displays a characteristic frequency between 54.5 – 64.5 kHz with a curved, usually down-sweeping tail (Pennay et al 2004). It overlaps in frequency with *Vespadelus pumilus* between 57 – 58 kHz but the latter exhibits curved up-sweeping tail.

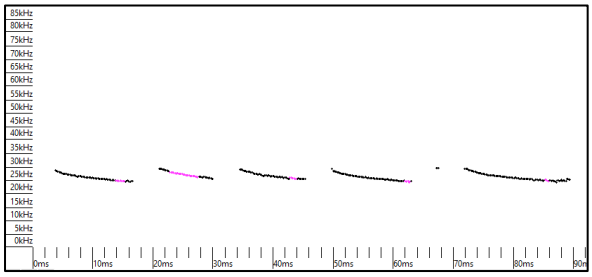
This species represented more than 40% of the calls on the data set.

Figure 5: Definite *Miniopterus orianae oceanensis*



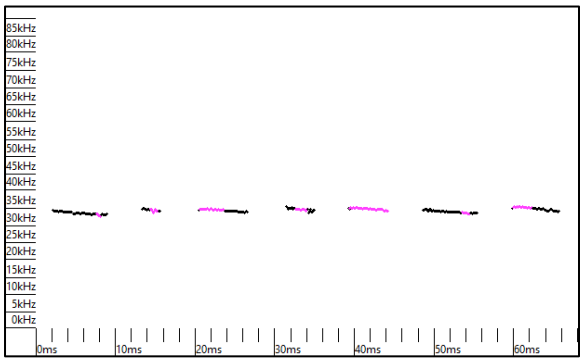
The species call is characterised by its relatively long curved pulse with a small down-sweeping tail and its frequency 43-47kHz (Reinhold, 2001).

Figure 6: Probable *Mormopterus lumsdenae*



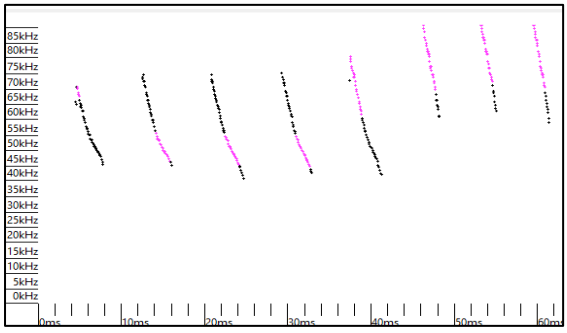
M. lumsdenae was positively identified from calls with distinctive curved pulses and frequency in the range 25-27 kHz. This frequency range, however, overlaps with *S. saccolaimus* and some calls had flatter pulses that could have been from one or other of these species. None of the calls at this frequency had multiple harmonics. Furthermore, there was no evidence of triplet pulse patterns, rather pulses were either uniformly spaced in nature.

Figure 7: Definite *Mormopterus ridei*



Characteristic frequency 30 to 36 kHz. May be flat but sometime with short initial and down-sweeping tail (Reinhold *et al,* 2001).

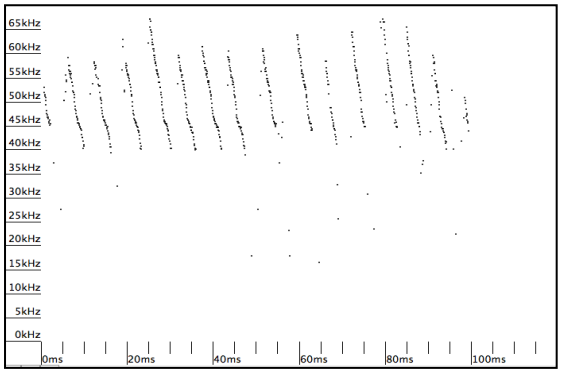
Figure 8: Probable *Myotis macropus*



This species displays a near-vertical pulse, characteristic frequency between 80 and 35KHz (Pennay *et al*, 2004). Good quality calls (similar to the one here) have a central kink around 47 to 50 kHz and very occasionally another prior to the tail dropping off around 35 kHz. Pulse interval <75ms, an initial slope of greater than 400 octaves per second (OPS) and shape often with a central kink in slope, the second part of the call having a lesser slope than the first part.

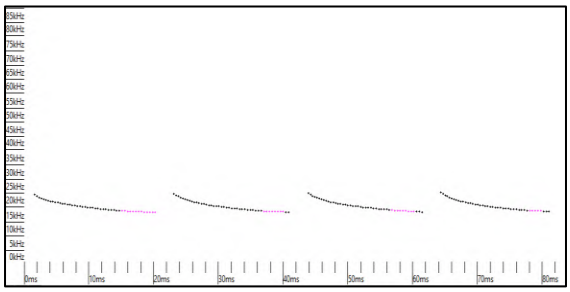
Some of the call could not be distinguished with *Nyctophilus spp which* occurring within the site area. *N. geoffroyi, N. gouldi* and *N. bifax*.

Figure 9: Possible *Nyctophilys sp*



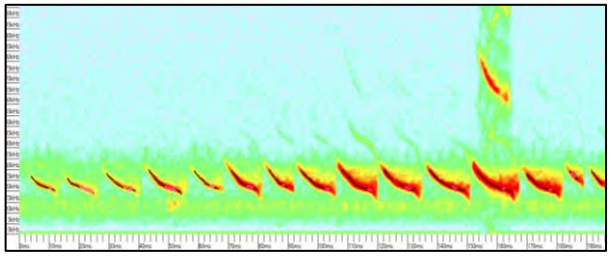
All *Nyctophillus sp* cannot be distinguished by their calls. They have a near vertical pulse with interval greater than 95ms which differentiate them to *M. macropus* (Reinhold *et al,* 2001).

Figure 10: Probable *Saccolaimus flaviventris*

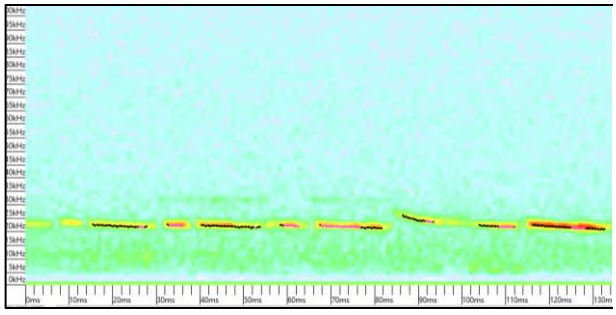


This species displays a curved pulse, characteristic frequency between 17.5 to 22.5 kHz (Pennay *et al.,* 2004). Dominant harmonics are between 18-20 kHz. This frequency range, however, overlaps with *S. saccolaimus* and some calls had flatter pulses that could have been from one or other of these species. None of the calls at this frequency had multiple harmonics. Furthermore, there was no evidence of triplet pulse patterns, rather pulses were either uniformly spaced or erratic in nature.

Figure 11: Possible *Saccolaimus saccolaimus*



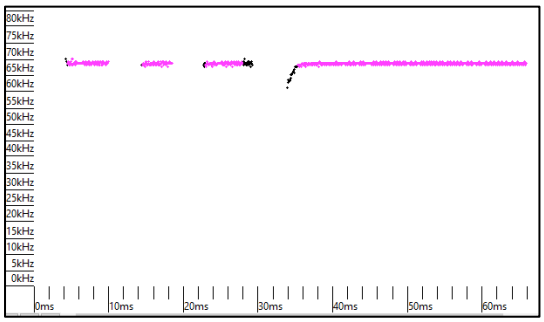
A total of twelve sequence files were possible recorded on site that may be representative of *Saccolaimus saccolaimus*.



Echolocation calls for *S. saccolaimus* have peak energy in the range 21-25kHz, similar to the frequency band of other large sheathtail bats in Australia. The call shown beside illustrate a number of harmonics on one pulse and would probably be attributed to *S. saccolaimus.* However, this was the only call illustrating harmonics (Device SM4 reference S4U04405_20190228_221806).

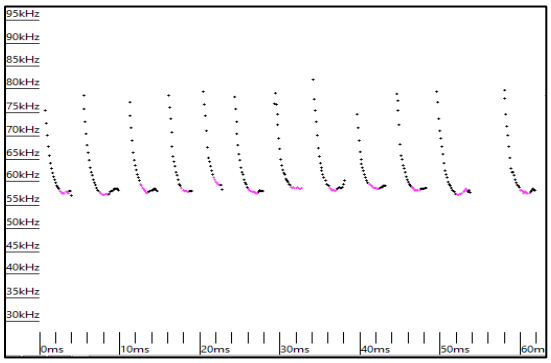
Most of the possible call were registered from the device SM4 (Reference S4U04405_20190305_185847 and S4U04405_20190306_185902) The second call illustrated beside with flat pulse; no apparent steep initial sweep and no harmonics. This call could be confused with *S flaviventris*. It is possible that the call came from *T. troughtoni* as this species can generate flatter pulses.

Figure 12: Definite *Rhinolophus megaphyllus*



The species call cannot be misidentified with any other species. Pulses have an up-sweeping initial section a perfectly flat, relatively long characteristic section and a down sweeping tail (Reinhold, 2001). Characteristic frequency ranges from 66 to 72 kHz.

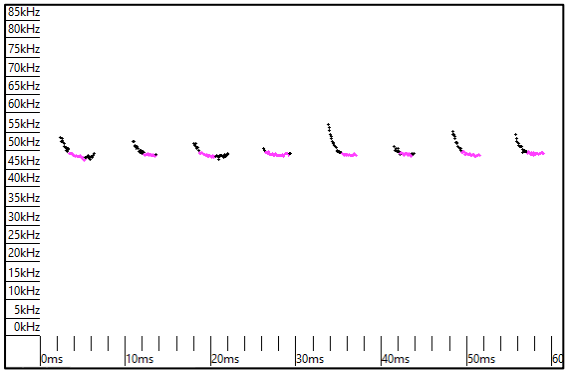
Figure 13: Definite *Vespadelus pumilus*



This species displays a characteristic frequency between 50 – 58 kHz and has a prominent up-sweeping tail (Pennay et al, 2004).

Calls of this species may be easily confused with V. troughtoni, unless the end frequency is higher than 54 kHz, which is representative of V. pumilus.

Figure 14: Definite *Vespadelus troughtoni*



This species displays a curved pulse, characteristic frequency between 48.5 to 55 kHz (Pennay *et al*, 2004). If the end, frequency is lower than 51 kHz, then the call can be identified to *V. troughtoni* and be differentiated from *V. pumilus.*

4.0 Conclusion

A total of nine microbat species were detected as definitely occurring within the site. Six other microbat species were probably/possibly recorded on site.

The presence of *S. saccolaimus,* listed as Endangered under NC Act, and listed as Vulnerable under EPBC Act, was analysed. This species also presents a number of call variation which makes it difficult to confirm its presence using only echolocation techniques. However, a total of twelve sequence were potentially recorded as representing this species and one call presented harmonics that could likely be attributed to S. *Saccolaimus*. Therefore, we would consider that *S. saccolaimus* occurs within the surveyed area but the activity recordefour

d in the device were very low.

All bats identified on the site were expected to be present within the region. Bat activity levels at the site are considered to be similar compared to other surveys within similar areas in the surrounding region.

5.0 References

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Appendix B Biocondition Report

Bio-condition Survey

Mount Emerald Wind Farm Offset Site

April 2019

4 elements

Bio-condition Survey

Mount Emerald Wind Farm Offset Site

April 2019

Revision History

Version	Purpose	Issued by	Date	Reviewer	Date
0.01	Draft	Ryan Hughes	18-05-2019	Mellissa Brown	18-05-2019

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Bungalow, QLD 4870
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Contents

Tables

Figures

1.0 Introduction

A summary of results for Bio-condition assessments on the MEWF Biodiversity Offset Site have been provided by 4 Elements Consulting on behalf of RATCH Australia Corporation Ltd (RATCH). The purpose of the Bio-condition assessments is to provide information on the vegetation communities that are present within the MEWF Offset site and repeat the effort biennially to monitor vegetation condition through time. It is important that the widest variety of regional ecosystems are captured in the baseline round of survey to detect any future changes to vegetation condition across the site. In the previous year a total of eight (8) sites were completed. This survey effort did not capture baseline measurements of all discreet remnant vegetation communities represented on the site. Therefore, a further effort was undertaken this year to include an additional ten (10) Bio-condition sites. This brings the combined total of Bio-condition sites to 18, which completes baseline collection all of the remnant vegetation communities that occur on the MEWF Biodiversity Offset Site. This report will be included as an addendum to the original survey effort. The next planned biennial assessment of all sites will continue from late in the wet season 2020.

2.0 Methodology

The methodology of this year's Bio-condition sampling follows closely the work in the previous year's effort (Gleed, 2018). The methods used for the Bio-condition assessments followed those described by Eyre et al. (2017) and Neldner et al. (2017). The method works on a series of plots and transects nested within a survey area of 10,000 m2 (1 ha).

2.1 Survey Limitations

Every effort was made to provide two replicate sites for each of the discreet remnant vegetation communities and relevant sub-categories mapped under the Regional Ecosystem Description Database Version 11.1 (REDD 2019). Due to difficulty in accessing some regional ecosystems (RE's) associated with steep and loose rocky terrain, not all could be replicated twice. Both RE 712.57a and RE 7.12.26e were only sampled with a single replicate due to difficulty in site access. Other regional ecosystems were rare on site occurring only at a single location and therefore, these RE's were also only sampled utilizing a single replicate. These included the communities of RE 7.12.9, RE 7.12.7c, RE 7.3.26a and RE 7.2.16a. These regional ecosystems are also not well represented on the Mount Emerald Wind Farm site and therefore not considered as high a priority for monitoring. All other regional ecosystems have two (2) independent replicates for future monitoring. Summary of sampled vegetation communities are summarised in **Table 1**.

For some REs (e.g. RE 7.12.65k and RE 7.12.57a) a 100 m transect within the plot was not possible due to the limited extent of the community on narrow rock outcrops. A 50 m transect was used instead in these situations and data extrapolated to the 1 ha survey area. Where a 50m transect was utilised it is listed in (table 1) below.

Table 1 Bio-condition Sampling Frequency on the MEWF Offset Site

Regional Ecosystem (REDD)	Survey Number	No. of Replicates	Transect Length (m)
RE 7.12.58	Site 1, Site 18	2	100
RE 7.12.65k	Site 2, Site 17	2	50
RE 7.12.57a	Site 15	1	50
RE 7.12.57c	Site 3, Site 16	2	100
RE 7.12.30d	Site 4, Site 8	2	100
RE 7.12.9	Site 5	1	100
RE 7.12.16a	Site 6	1	100
RE 7.3.26a	Site 7	1	100
RE 7.12.29a	Site 9, Site 14	2	50
RE 7.12.26e	Site 10	1	100
RE 7.12.7c	Site 11	1	100
RE 7.12.34	Site 12, Site 13	1	100

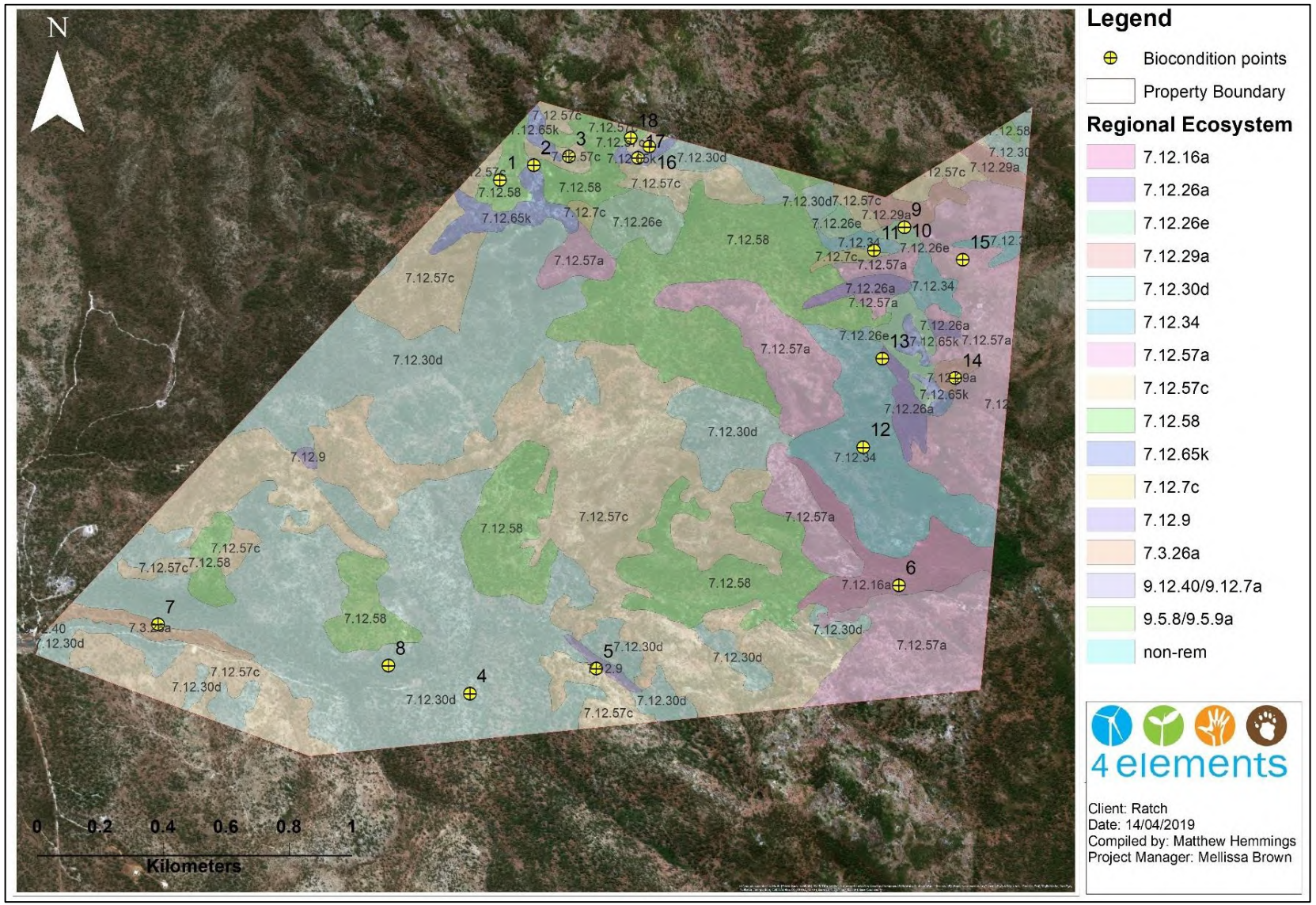

Figure 1 MEWF Offset Bio-condition Assessment Locations

3.0 Biocondition Report

Table 2 Bio-condition Site 9

Bio-condition Site 9				
Date:	**09-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.19764	Long: 145.40849	Elevation: 984m
Plot Centre:	Zone 55K	Lat: 17.19720	Long: 145.40770	Elevation: 980m
Plot Bearing:	SW	**Plot Alignment:**	Mid-slope running parallel to the hill contour.	
				
North			East	
				
South			West	
Habitat Description:	Open forest with a canopy dominated by *Corymbia intermedia*, *Eucalyptus drepanophylla* and *Eucalyptus tereticornis*. Sparse shrub layer (5m) contains *Allocasuarina littoralis*, *Acacia flavescens* and *Lophostemon suaveolens*. Grassy understorey (<1.5m) of *Themeda triandra* and *Mnesithea rottboellioides*.			
Regional Ecosystem (Mapped):	**RE 7.12.29a** *Corymbia intermedia* and/or *Lophostemon suaveolens* open forest to woodland +/- areas of *Allocasuarina littoralis* and *A. torulosa* on uplands on granite and rhyolite.			

Bio-condition Site 9			
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	5
		Shrubs:	9
		Grasses:	7
		Forbs/Other:	23
	Tree Canopy	Median Height (m)	9
		Tree Canopy Cover (%)	31.5
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	21.0
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	14
		Large non-eucalypt trees threshold (cm)	20
		Large non-eucalypt trees per hectare	6
	Shrubs	Native Shrub Cover (%)	11.2
	Ground Cover	Native Perennial Grass Cover (%)	23
		Forbs and Non-grass (%)	14
		Shrubs (%)	10
		Organic litter cover (%)	37
		Rock (%)	53
		Bare Ground (%)	4.4
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	111
Native Species Richness:	Trees	*Corymbia intermedia, Eucalyptus tereticornis, Eucalyptus drepanophylla, Allocasuarina littoralis, Euroschinus falcata*	
	Shrubs	*Acacia flavescens, Lophostemon suaveolens, coelospermum reticulatum, Capparis canescens, Xanthorrhea johnsonii, Pomaderris argyrophylla, Acacia calyculata, Ficus opposita, Breynia oblongifolia.*	
	Grasses	*Themeda triandra, Mnesithia rottboellioides, Capillipedium spicigerum, Panicum effusum, Arundinella setosa, Heteropogon triticeus, Chleistochloa subjuncea,*	
	Forbs and Others	*Lepidosperma laterale, Lomandra filiformis, Lomandra longifolia, Adiantum hispidulum, Desmodium rhytidophyllum, Flemingia parviflora, Oxalis corniculata,*	

Bio-condition Site 9		
		scleria mackaviensis, Dianella nervosa, Pteridium esculentum, Praxelis clematidea, Hibbertia longifolia, Persoonia falcata, Commelina diffusa, Phyllanthus spp, Indigofera bancroftii, Widelia spilanthoides, Galactia tenuifolia, Xerochrysum bracteatum, Cyanthillium cinereum, Pimelia seriostachya, Poranthera microphylla, Rostellularia adscendens*

Table 3 Bio-condition Site 10

Bio-condition Site 10				
Date:	**09-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.19918	Long: 145.40564	Elevation: 1061m
Plot Centre:	Zone: 55K	Lat: 17.19905	Long: 145.4540	Elevation: 1062m
Plot Bearing:	SW	**Plot Alignment:**	Mid-slope running parallel to the hill contour	
				
North			East	
				
South			West	

Bio-condition Site 10			
Habitat Description:	Open forest with a canopy (11m) dominated by *Syncarpia glommulifera* with occasional *Eucalyptus drepanophylla*. Open shrub layer (5m) contains *Acacia aulococarpa* and *Leptospermum amboinense*. Grassy understorey (<1m) of *Cleistochloa subjuncea* and *Panicum simile*.		
Regional Ecosystem (Mapped):	**7.12.26e** *Syncarpia glomulifera* low open forest and low woodland. Uplands on steep rocky slopes, of the moist and dry rainfall zone. Granite and rhyolite.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	2
		Shrubs:	14
		Grasses:	3
		Forbs/Other:	27
	Tree Canopy	Median Height (m)	11
		Tree Canopy Cover (%)	56.6
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	10.2
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	12
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	24
	Shrubs	Native Shrub Cover (%)	33.4
	Ground Cover	Native Perennial Grass Cover (%)	38
		Forbs and Non-grass (%)	11
		Shrubs (%)	3
		Organic litter cover (%)	21
		Rock (%)	21
		Bare Ground (%)	2
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	92
Native Species Richness:	Trees	*Syncarpia glommulifera, Eucalyptus drepanophylla*	
	Shrubs	*Acacia aulococarpa, Acrothamnus spathaceus, Achronychia leavis, Astrotricha pterocarpa, Allyxia spicata, Alphitonia excelsa, Breynia oblongifolia, Clerodendrum longiflorum, Hibiscus meraukenensis, Hovea densivellosa, Leptospermum amboinense, Pittosporum venulosum,*	

Bio-condition Site 10		
		Pomaderris argyrophylla, Psychotria loniceroides, Glochidion sumatranum, Bursaria Spinosa
	Grasses	*Oplismenus aemulus, Panicum effusum, Chleistochloa subjuncea*
	Forbs and Others	*Lepidosperma laterale, Lomandra multiflora, Lomandra longifolia, Adiantum aethiopicum, Adiantum atroviride, Adiantum hispidulum, Gonocarpus acanthocarpus, Oxalis corniculata, Scleria mackaviensis, Dianella caerulea, Commelina diffusa, Widelia spilanthoides, Xerochrysum bracteatum, Pterostylis stricta, Plexaure crassicula, Plectranthus hirtus, Plectranthus amoenus, Plectranthus parviflorus, Wickstroemia indica, Stephania japonica, Smilax australis, Smilax calophylla, Parsonsia straminea, Drynaria rigidula, Pseuderanthemum variable, Notelaea punctata*
Non-native Species		*Praxelis clematidea**

Table 4 Bio-condition Site 11

Bio-condition Site 11				
Date:	**09-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.19979	Long: 145.40494	Elevation: 1008m
Plot Centre:	Zone: 55K	Lat: 17.19971	Long: 145.40448	Elevation: 984m
Plot Bearing:	NW	**Plot Alignment:**	Running NW downslope across the contour line within a steep rocky gully	
				
North			East	

Bio-condition Site 11			
			
South		West	
Habitat Description:	Open forest with a canopy (18m) dominated by *Olea paniculata, Mallotus phillipensis, Pleigynium timorense, Pittosporum venulosum, Euroshinus falcata and Cupaniopsis anacardioides*. Emergent (25m) *Agathis robusta*.		
Regional Ecosystem (Mapped):	**7.12.7c** Simple to complex microphyll to notophyll vine forest, often with *Agathis robusta or A. microstachya,* on granites and rhyolites of moist foothills and uplands.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	19
		Shrubs:	18
		Grasses:	3
		Forbs/Other:	30
	Tree Canopy	Median Height (m)	11
		Tree Canopy Cover (%)	56.6
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	10.2
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	12
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	24
	Shrubs	Native Shrub Cover (%)	33.4
	Ground Cover	Native Perennial Grass Cover (%)	38
		Forbs and Non-grass (%)	11
		Shrubs (%)	3
		Organic litter cover (%)	21
		Rock (%)	21
		Bare Ground (%)	2

Bio-condition Site 11			
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	92
Native Species Richness:	Trees	*Agathis robusta, Polyscias elegans, Corymbia intermedia, Schefflera actinophylla, Brachychiton acerifolius, Acronychia laevis, Olea paniculata, Mallotus phillipensis, Pleigynium timorense, Pittosporum venulosum, Euroshinus falcata, Guioa acutifolia, Cupaniopsis anacardioides, Atractocarpus fitzilanii, Drypetes deplanchii, Bursaria tenuifolia, Polyalthia nitidissima, Syzigium johnsonii, Elaeodendron melanocarpum.*	
	Shrubs	*Achronychia leavis, Alyxia ruscifolia, Alyxia spicata, Alectryon tomentosus, Breynia oblongifolia, Clerodendrum longiflorum, Dendrocnide moroides, Pomaderris argyrophylla, Psychotria loniceroides, Wikstroemia indica, Wilkea pubescens, Myrsine variabilis, Callicarpa pedunculata, Pipturus argenteus Platysace valida, Christella dentata, Flueggea virosa.*	
	Grasses	*Ottochloa gracimilis, Oplismenus aemulus, Oplismenus compositus*	
	Forbs and Others	*Adiantum aethiopicum, Adiantum atroviride, Adiantum hispidulum, Oxalis corniculata, Scleria mackaviensis, Dianella caerulea, Commelina diffusa, Widelia spilanthoides, Plectranthus hirtus, Plectranthus amoenus, Plectranthus spp., Wickstroemia indica, Stephaina japonica, Smilax australis, Smilax calophylla, Parsonsia straminea, Drynaria rigidula, Pseuderanthemum variable, Sigisbeckia orientalis, Microsorum puntatum, Tetrastigma nitens, Neoachmandra cunninghamii, Pyrrosia rupestris, Dioscorea transversa, Eustrephus latifolius, Alpinia caerulea, Asplenium nidus, Clematis spp., Pereromia blanda, Alpinia modesta, Calochlaena dubia*	
Non-native Species		*Praxelis clematidea, Lantana camara*	

Table 5 Bio-condition Site 12

<table>
<tr><th colspan="6">Bio-condition Site 12</th></tr>
<tr><td>Date:</td><td colspan="5">10-04-2019</td></tr>
<tr><td>Plot Origin:</td><td>Zone: 55K</td><td>Lat: 17.20494</td><td colspan="2">Long: 145.40387</td><td>Elevation: 1075m</td></tr>
<tr><td>Plot Centre:</td><td>Zone: 55K</td><td>Lat: 17.20531</td><td colspan="2">Long: 145.40411</td><td>Elevation: 1071m</td></tr>
<tr><td>Plot Bearing:</td><td>W</td><td>Plot Alignment:</td><td colspan="3">Near to ridge top following the contour</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">North</td><td colspan="3">East</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">South</td><td colspan="3">West</td></tr>
<tr><td>Habitat Description:</td><td colspan="5">Open forest with a canopy (12m) dominated by Eucalyptus drepanophylla, Corymbia intermedia and Syncarpia glommulifera. Sparse shrub layer (3m) contains Acrothamnus spathaceus, Allocasuarina torulosa, Acacia aulococarpa and Lophostemon grandiflorus. Grassy understorey (<1.5m) of Themeda triandra and Mnesithea rottboellioides</td></tr>
<tr><td>Regional Ecosystem (Mapped):</td><td colspan="5">7.12.34 Eucalyptus portuensis and/or E. drepanophylla, +/- C. intermedia +/- C. citriodora, +/- E. granitica open woodland to open forest on uplands on granite</td></tr>
<tr><td rowspan="4">Vegetation Attributes:</td><td colspan="3">Recruitment of Dominant Canopy Species (%):</td><td colspan="2">100%</td></tr>
<tr><td rowspan="3">Native plant species richness:</td><td>Trees:</td><td colspan="2">4</td></tr>
<tr><td>Shrubs:</td><td colspan="2">19</td></tr>
<tr><td>Grasses:</td><td colspan="2">5</td></tr>
</table>

Bio-condition Site 12			
		Forbs/Other:	25
	Tree Canopy	Median Height (m)	12
		Tree Canopy Cover (%)	33.6
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	14.7
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	26
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	7
	Ground Cover	Native Perennial Grass Cover (%)	67
		Forbs and Non-grass (%)	5
		Shrubs (%)	4
		Organic litter cover (%)	14
		Rock (%)	10
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	45
Native Species Richness:	Trees	*Syncarpia glommulifera, Eucalyptus drepanophylla, Corymbia intermedia, Allocasuarina torulosa*	
	Shrubs	*Acacia aulococarpa, Acacia flavescens, Acrothamnus spathaceus, Achronychia leavis, Astrotricha pterocarpa, Euroschinus falcata, Pomaderris argyrophylla, Polyscias elegansm, Psychotria loniceroides, Trema tomentosa, Glochidion sumatranum, Platysace vallida, Banksia aquilonia, Larsenakia ochreata, Notelaea punctata, Xanthorrea johnsonii, Acacia implexa, Bursaria spinosa, Maytenus disperma*	
	Grasses	*Themeda triandra, Mnesithea rottbelioides, Panicum simile, Entolasia stricta, Chleistochloa subjuncea*	
	Forbs and Others	*Lomandra filiformis, Lomandra longifolia, Desmodium rhytidophyllum, Scleria mackaviensis, Dianella caerulea, Hyperanicum gramineum, Scleria mackaviensis, Persoonia falcata, Widelia spilanthoides, Galactia tenuifolia, Flemingia parviflora, Xerochrysum bracteatum, Cyanthillium cinereum,*	

Bio-condition Site 12		
		Chamaecrista nomane, Drynaria rigidula, Cymbidium madidum, Dendrobium speciosum, Geitonoplesium cymosum, Ghania aspera, Thysanotus tuberosus, Hibbertia longifolia, Ajuga australis, Dianella nervosa, Poranthera microphylla, Rostellularia adscendens
Non-native species		*Praxelis clematidea*, Crassocephalum crepidioides*

Table 6 Bio-condition Site 13

Bio-condition Site 13				
Date:	**10-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.20323	Long: 145.40465	Elevation: 1083m
Plot Centre:	Zone: 55K	Lat: 17.20279	Long: 145.40471	Elevation: 1087m
Plot Bearing:	W	**Plot Alignment:**	Steep mid-slope, following contour	
				
North			East	
				
South			West	

Bio-condition Site 13			
Habitat Description:	Open woodland with a canopy (12m) dominated by *Eucalyptus drepanophylla, Corymbia intermedia* and *Lophostemon grandiflorus*. Understorey of *Allocasuarina torulosa* and canopy associates (5-8). Sparse shrub layer (3m) contains *Acacia aulococarpa.* Grassy understorey (<1.0m) of *Themeda triandra* and *Mnesithea rottboellioides* and *Capillipedium spicigerum.*		
Regional Ecosystem (Mapped):	**7.12.34** *Eucalyptus portuensis* and/or *E. drepanophylla*, +/- *C. intermedia* +/- *C. citriodora*, +/- *E. granitica* open woodland to open forest on uplands on granite		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	4
		Shrubs:	19
		Grasses:	5
		Forbs/Other:	25
	Tree Canopy	Median Height (m)	12
		Tree Canopy Cover (%)	20.0
	Tree Sub-canopy	Tree sub-canopy median Height (m)	6.5
		Tree Sub-canopy Cover	4.9
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	20
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	1
	Shrubs	Native Shrub Cover (%)	5.8
	Ground Cover	Native Perennial Grass Cover (%)	77
		Forbs and Non-grass (%)	4
		Shrubs (%)	1
		Organic litter cover (%)	16
		Rock (%)	2
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	111
Native Species Richness:	Trees	*Eucalyptus drepanophylla, Corymbia intermedia, Allocasuarina torulosa, Lophostemon grandiflorus*	

Bio-condition Site 13		
	Shrubs	*Acacia aulococarpa, Lophostemon suaveolens, Pomaderris argyrophylla, Breynia oblongifolia, Dodonea lanceolata, Platysace vallida, Alphitonia pomaderoides, Notelaea punctata, Trema tomentosa, Maytenis disperma, Hakea plurinervia, Xanthorrhea johnsonii*
	Grasses	*Themeda triandra, Mnesithia rottboellioides, Capillipedium spicigerum, Panicum effusum, Arundinella setosa, Heteropogon triticeus, Melinis minutiflora, Alloteropsis semialata*
	Forbs and Others	*Lepidosperma laterale, Lomandra filiformis, Lomandra longifolia, Desmodium rhytidophyllum, Scleria mackaviensis, Dianella nervosa, Pteridium esculentum, Hyperanicum gramineum, Persoonia falcata, Phyllanthus virgatus, Indigofera bancroftii, Widelia spilanthoides, Galactia tenuifolia, Flemingia parviflora, Xerochrysum bracteatum, Cyanthillium cinereum, Chamaecrista nomane. Drynaria rigidula, Cymbidium madidum, Dendrobium speciosum, Rostellularia adscendens, Geitonoplesium cymosum, Poranthera microphylla, Eustrephus latifolius, Chelanthes distans, Cheilanthes sieberi*
Non-native Species		*Praxelis clematidea*

Table 7 Bio-condition Site 14

Bio-condition Site 14				
Date:	**10-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.20341	Long: 145.40645	Elevation: 1114m
Plot Centre:	Zone: 55K	Lat: 17.20336	Long: 145.40688	Elevation: 1120m
Plot Bearing:	E	**Plot Alignment:**	Near to top of ridgeline, following contour	
				
North			East	

Bio-condition Site 14			
			
South		West	
Habitat Description:	Open woodland with a canopy (10m) dominated by *Corymbia intermedia* and *Eucalyptus drepanophylla* and *Syncarpia glomulifera*. Understorey of *Allocasuarina torulosa* and canopy associates (5-8). Sparse shrub layer (3m) contains *Acacia aulococarpa*. Grassy understorey (<1.0m) of *Themeda triandra* and *Mnesithea rottboellioides* and *Capillipedium spicigerum*		
Regional Ecosystem (Mapped):	**7.12.29a** *Corymbia intermedia*, *Eucalyptus tereticornis*, *E. drepanophylla* open forest to low open forest and woodland with *Allocasuarina torulosa*, *A. littoralis*, *Lophostemon suaveolens*, *Acacia cincinnata*, *A. flavescens*, *Banksia aquilonia* and *Xanthorrhoea johnsonii*. Uplands, on granite and rhyolite.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	3
		Shrubs:	16
		Grasses:	5
		Forbs/Other:	18
	Tree Canopy	Median Height (m)	10
		Tree Canopy Cover (%)	25.6
	Tree Sub-canopy	Tree sub-canopy median Height (m)	4
		Tree Sub-canopy Cover	11.8
	Large Trees	Large Eucalypt tree DBH threshold (cm)	20
		Large Eucalypt trees per hectare	18
		Large non-eucalypt trees threshold (cm)	20
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	15
	Ground Cover	Native Perennial Grass Cover (%)	64
		Forbs and Non-grass (%)	1
		Shrubs (%)	12

Bio-condition Site 14			
		Organic litter cover (%)	23
		Rock (%)	0
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	3
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	Nil
Native Species Richness:	Trees	*Eucalyptus drepanophylla, Corymbia intermedia, Syncarpia glomulifera*	
	Shrubs	*Hakea plurinervia, Xanthorrhea johnsonii, Acrothamnus spathaceus, Acrotriche aggregata, Banksia aquilonia, Acacia implexa, Acacia aulococarpa, Lophostemon suaveolens, Allocasuarina littoralis, Allocasuarina torulosa, Pomaderris argyrophylla, Alphitonia excelsa, Hibiscus meraukenensis, Glochidion sumatranum, Bursaria spinosa, Trema tomentosa*	
	Grasses	*Themeda triandra, Mnesithia rottboellioides, Capillipedium spicigerum, Panicum effusum, Arundinella setosa, Eriachne pallescens*	
	Forbs and Others	*Lomandra multiflora, Desmodium rhytidophyllum, Hyperanicum gramineum, Pteridium esculentum, Plectranthus amoenus, Widelia spilanthoides, Galactia tenuifolia, Flemingia parviflora, Xerochrysum bracteatum, Plectranthus mirus, Plectranthus parviflorus, Cyanthillium cinereum, Chamaecrista nomane. Drynaria rigidula, Dendrobium speciosum, Geitonoplesium cymosum, Eustrephus latifolius, Pimelia seriostachya*	
Non-native Species		*Praxelis clematidea, Melinis minutiflora, Cyperus involucratus*	

Table 8 Bio-condition Site 15

<table>
<tr><th colspan="6">Bio-condition Site 15</th></tr>
<tr><td>Date:</td><td colspan="5">11-04-2019</td></tr>
<tr><td>Plot Origin:</td><td>Zone: 55K</td><td>Lat: 17.19982</td><td>Long: 145.40669</td><td colspan="2">Elevation: 1056m</td></tr>
<tr><td>Plot Centre:</td><td>Zone: 55K</td><td>Lat: 17.19999</td><td>Long: 145.40713</td><td colspan="2">Elevation: 1055m</td></tr>
<tr><td>Plot Bearing:</td><td>NE</td><td>Plot Alignment:</td><td colspan="3">Mid-slope very steep slope following contour</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">North</td><td colspan="3">East</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">South</td><td colspan="3">West</td></tr>
<tr><td>Habitat Description:</td><td colspan="5">Open shrubland (<3m) dominated by Corymbia abergiana, Eucalyptus lockyeri and Syncarpia glomulifera. Grassy understorey (<1.0m) of Themeda triandra and Mnesithea rottboellioides and Capillipedium spicigerum</td></tr>
<tr><td>Regional Ecosystem (Mapped):</td><td colspan="5">7.12.57a Shrubland and low woodland mosaic with Syncarpia glomulifera, Corymbia abergiana, Eucalyptus portuensis, Allocasuarina littoralis and Xanthorrhoea johnsonii. Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones</td></tr>
<tr><td rowspan="4">Vegetation Attributes:</td><td colspan="3">Recruitment of Dominant Canopy Species (%):</td><td colspan="2">N/A</td></tr>
<tr><td rowspan="3">Native plant species richness:</td><td colspan="2">Trees:</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Shrubs:</td><td colspan="2">12</td></tr>
<tr><td colspan="2">Grasses:</td><td colspan="2">6</td></tr>
</table>

Bio-condition Site 15			
		Forbs/Other:	22
	Tree Canopy	Median Height (m)	N/A
		Tree Canopy Cover (%)	0
	Tree Sub-canopy	Tree sub-canopy median Height (m)	N/A
		Tree Sub-canopy Cover	0
	Large Trees	Large Eucalypt tree DBH threshold (cm)	N/A
		Large Eucalypt trees per hectare	0
		Large non-eucalypt trees threshold (cm)	N/A
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	13.5
	Ground Cover	Native Perennial Grass Cover (%)	49
		Forbs and Non-grass (%)	3
		Shrubs (%)	10
		Organic litter cover (%)	17
		Rock (%)	12
		Bare Ground (%)	6
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	3
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	Nil
Native Species Richness:	Trees		
	Shrubs	*Corymbia abergiana, Eucalyptus lockyeri, Syncarpia glomulifera, Hakea plurinervia, Xanthorrhea johnsonii, Acrothamnus spathaceus, Acacia calyculata, Hovea nana, Bursaria incana, Lophostemon suaveolens, Platysace vallida, Allocasuarina littoralis*	
	Grasses	*Themeda triandra, Mnesithia rottboellioides, Panicum effusum, Capillipedium spicigerum, Arundinella setosa, Chleistochloa subjuncea*	
	Forbs and Others	*Rostellularia adscendens, Melichrus adpressus, Melichrus urceolatus, Lomandra multiflora, Scleria brownii, Poranthera microphylla, Hibbertia longifolia, Crotalaria brevis, Crotalaria montana, Desmodium rhytidophyllum, Hyperanicum gramineum, Widelia spilanthoides, Oxalis corniculatus, Dianella nervosa, Galactia tenuifolia, Xerochrysum bracteatum, Coronidium newcastlanum, Cyanthillium cinereum, Chamaecrista nomane,*	

Bio-condition Site 15		
		Geitonoplesium cymosum, Pimelia seriostachya, Cheilanthes nitida
Non-native Plant Species		*Praxelis clematidea, Crassocephala crepidioides*

Table 9 Bio-condition Site 16

Bio-condition Site 16				
Date:	**12-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.19669	Long: 145.39780	Elevation: 1036m
Plot Centre:	Zone: 55K	Lat: 17.19627	Long: 145.39784	Elevation: 1036m
Plot Bearing:	SE	**Plot Alignment:**	Top of ridge following contour	
				
North			East	
				
South			West	
Habitat Description:	Open shrubland to heathland (<2m) with occasional rock pavement outcrops			
Regional Ecosystem (Mapped):	**7.12.57c** Shrubland/low woodland (1.5-9m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana, Corymbia abergiana, E. portuensis, E. reducta, E. lockyeri, C. leichhardtii, Callitris intratropica, E. atrata, E. pachycalyx, E. shirleyi, E. drepanophylla and Homoranthus porteri*, on rhyolite and granite. There is occasionally a very sparse to sparse secondary tree layer of *Corymbia abergiana and/or C. stockeri*. A very sparse to sparse tall			

Bio-condition Site 16			
	shrub layer may be present and can include *Persoonia falcata, Exocarpos cupressiformis and Melaleuca viridiflora var. viridiflora*. A sparse to dense lower shrub layer may include *Jacksonia thesioides, Acacia calyculata, Coelospermum reticulatum, Xanthorrhoea johnsonii, Acacia humifusa, Dodonaea lanceolata var. subsessilifolia, Grevillea dryandri subsp. dryandri, Grevillea glossadenia, Acacia umbellata and Ericaceae spp*. The ground layer may be dominated by species such as *Themeda triandra, Xanthorrhoea johnsonii, Eriachne pallescens var. pallescens, Cleistochloa subjuncea, Borya septentrionalis, and Eriachne spp*. Includes open rocky dominated by herbs and grasses. This RE includes areas of 7.12.65k (rocky areas with shrubby/herbaceous cover) which are too small to map. Rocky slopes on granite and rhyolite.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		N/A
	Native plant species richness:	Trees:	0
		Shrubs:	14
		Grasses:	9
		Forbs/Other:	22
	Tree Canopy	Median Height (m)	N/A
		Tree Canopy Cover (%)	0
	Tree Sub-canopy	Tree sub-canopy median Height (m)	N/A
		Tree Sub-canopy Cover	0
	Large Trees	Large Eucalypt tree DBH threshold (cm)	N/A
		Large Eucalypt trees per hectare	0
		Large non-eucalypt trees threshold (cm)	N/A
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	13.5
	Ground Cover	Native Perennial Grass Cover (%)	49
		Forbs and Non-grass (%)	3
		Shrubs (%)	10
		Organic litter cover (%)	17
		Rock (%)	12
		Bare Ground (%)	6
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	3
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	Nil
Native Species Richness:	Trees	*Eucalyptus reducta*	
	Shrubs	*Corymbia abergiana, Eucalyptus lockyeri, Syncarpia glomulifera, Hakea plurinervia, Xanthorrhea johnsonii, Acrothamnus spathaceus, Acacia aulococarpa, Allocasuarina*	

Bio-condition Site 16		
		inophloia, Acacia calyculata, Platysace vallida, Allocasuarina littoralis, Sannantha angusta, Leptospermum amboinense, Melaleuca uxorum
	Grasses	*Themeda triandra, Cymbopogon bombycinus, Eragrostis shultzii, Mnesithia rottboellioides, Eriachne ciliata, Panicum simile, Chleistochloa subjuncea, Mnesithea Formosa, Schizachyrium fragile*
	Forbs and Others	*Pseudanthus ligulatus, Boronia occidentalis, Rostellularia adscendens, Melichrus adpressus, Melichrus urceolatus, Poranthera microphylla, Hibbertia bicarpillata, Hovea nana, Hibbertia longifolia, Hyperanicum gramineum, Cyanthillium cinereum, Chamaecrista nomane, Cheilanthes nudiscula, Gonocarpus acanthocarpus, Lepidosperma laterale, Borya septentrionalis, Monotoca scoparia, Xanthorrea johnsonii, Hybanthus enneaspermus, Trichoryne anceps, Cryptandra debilis, Thysonotus tuberosus*
Non-native Plant Species		*Praxelis clematidea, Crassocephala crepidioides*

Table 10 Bio-condition Site 17

Bio-condition Site 17				
Date:	**12-04-2019**			
Plot Origin:	Zone: 55K	Lat: 17.19696	Long: 145.39706	Elevation: 1045m
Plot Centre:	Zone: 55K	Lat: 17.19702	Long: 145.39746	Elevation: 1045m
Plot Bearing:	SE	**Plot Alignment:**	Top of ridge following the contour	
				
North			East	

Bio-condition Site 17			
			
South		West	
Habitat Description:	Rhyolite rock pavement outcrops sloping on a SW aspect. Mosaic of rock pavement and heathland vegetation.		
Regional Ecosystem (Mapped):	**7.12.65k** Granite and rhyolite rock outcrop, of dry western areas, associated with shrublands to closed forests of *Acacia spp.* and/or *Lophostemon spp.* and/or *Allocasuarina spp.* In the Mount Emerald area, shrubs may include *Acacia umbellata, Melaleuca borealis, Homoranthus porteri, Leptospermum neglectum, Melaleuca recurva, Melaleuca uxorum, Grevillea glossadenia, Corymbia abergiana, Eucalyptus lockyeri, Sannantha angusta, Pseudanthus ligulatus subsp. ligulatus, Acacia aulacocarpa, Leptospermum amboinense, Xanthorrhoea johnsonii and Jacksonia thesioides*. Ground-cover species may include *Borya septentrionalis, Lepidosperma laterale, Eriachne spp., Cleistochloa subjuncea, Boronia occidentalis, Cheilanthes spp., Coronidium newcastlianum, Schizachyrium spp., Tripogon loliiformis, Gonocarpus acanthocarpus and Eragrostis spp.* Dry western areas. Granite and rhyolite.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		N/A
	Native plant species richness:	Trees:	0
		Shrubs:	9
		Grasses:	8
		Forbs/Other:	22
	Tree Canopy	Median Height (m)	N/A
		Tree Canopy Cover (%)	0
	Tree Sub-canopy	Tree sub-canopy median Height (m)	N/A
		Tree Sub-canopy Cover	0
	Large Trees	Large Eucalypt tree DBH threshold (cm)	N/A
		Large Eucalypt trees per hectare	0
		Large non-eucalypt trees threshold (cm)	N/A
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	7.7

Bio-condition Site 17			
	Ground Cover	Native Perennial Grass Cover (%)	16
		Forbs and Non-grass (%)	7
		Shrubs (%)	7
		Organic litter cover (%)	4
		Rock (%)	65
		Bare Ground (%)	0
		Cryptograms (%)	1
		Non-native plant cover (%)	<1
		Total Non-native species richness	2
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	Nil
Native Species Richness:	Trees	N/A	
	Shrubs	*Eucalyptus lockyeri, Acrothamnus spathaceus, Acacia aulococarpa, Acacia calyculata, Monotoca scoparia, Sannantha angusta, Leptospermum amboinense, Melaleuca uxorum, Notelaea punctata*	
	Grasses	*Themeda triandra, Eragrostis shultzii, Cymbopogon bombycinus, Eriachne ciliata, Panicum simile, Chleistochloa subjuncea, Mnesithea Formosa, Schizachyrium fragile*	
	Forbs and Others	*Boronia occidentalis, Melichrus adpressus, Melichrus urceolatus, Poranthera microphylla, Hibbertia bicarpillata, Hibbertia longifolia, Hibbertia stirlingii, Hyperanicum gramineum, Chamaecrista nomane, Cheilanthes nudiscula, Gonocarpus acanthocarpus, Lepidosperma laterale, Borya septentrionalis, Xanthorrea johnsonii, Trichoryne anceps, Xerochrysum bracteatum, Drynaria rigidula, Plectranthus amoenus, Dianella nervosa, Pterocaulon redolens.*	
Non-native Plant Species		*Praxelis clematidea, Crassocephala crepidioides*	

Table 11 Bio-condition Site 18

<table>
<tr><th colspan="6">Bio-condition Site 18</th></tr>
<tr><td>Date:</td><td colspan="5">12-04-2019</td></tr>
<tr><td>Plot Origin:</td><td>Zone: 55K</td><td>Lat: 17.19645</td><td colspan="2">Long: 145.39725</td><td>Elevation: 1064m</td></tr>
<tr><td>Plot Centre:</td><td>Zone: 55K</td><td>Lat: 17.19612</td><td colspan="2">Long: 145.39754</td><td>Elevation: 1058m</td></tr>
<tr><td>Plot Bearing:</td><td>SE</td><td>Plot Alignment:</td><td colspan="3">Mid-slope running parallel to the hill contour</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">North</td><td colspan="3">East</td></tr>
<tr><td colspan="3">  </td><td colspan="3">  </td></tr>
<tr><td colspan="3">South</td><td colspan="3">West</td></tr>
<tr><td>Habitat Description:</td><td colspan="5">Open forest (14m) dominated by Eucalyptus reducta. Grassy understorey (<1.0m) of Themeda triandra and Mnesithea rottboellioides combined with a low heathy shrub layer</td></tr>
<tr><td>Regional Ecosystem (Mapped):</td><td colspan="5">7.12.58 Eucalyptus reducta +/- E. granitica +/- Corymbia dimorpha +/- C. citriodora woodland to open forest on granite and rhyolite</td></tr>
<tr><td rowspan="5">Vegetation Attributes:</td><td colspan="3">Recruitment of Dominant Canopy Species (%):</td><td colspan="2">100%</td></tr>
<tr><td rowspan="4">Native plant species richness:</td><td>Trees:</td><td colspan="2">1</td></tr>
<tr><td>Shrubs:</td><td colspan="2">15</td></tr>
<tr><td>Grasses:</td><td colspan="2">3</td></tr>
<tr><td>Forbs/Other:</td><td colspan="2">19</td></tr>
</table>

Bio-condition Site 18			
	Tree Canopy	Median Height (m)	14
		Tree Canopy Cover (%)	43.8
	Tree Sub-canopy	Tree sub-canopy median Height (m)	5
		Tree Sub-canopy Cover	1.0
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	30
		Large non-eucalypt trees threshold (cm)	20
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	35.8
	Ground Cover	Native Perennial Grass Cover (%)	42
		Forbs and Non-grass (%)	1
		Shrubs (%)	38
		Organic litter cover (%)	11
		Rock (%)	8
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	0
		Total Non-native species richness	0
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	112
Native Species Richness:	Trees	*Eucalyptus reducta*	
	Shrubs	*Allocasuarina littoralis, Astrotriche pterocarpus, Corymbia intermedia, Eucalyptus drepanophylla, Melaleuca recurva, Xanthorrhea johnsonii, Acrothamnus spathaceus, Pultanea millarii, Exocarpus curessiformis, Acacia calyculata, Platysace vallida, Melichrus urceolatus, Hakea plurinervia, Monotoca scoparia, Breynia oblongifolia.*	
	Grasses	*Themeda triandra, Panicum simile, Chleistochloa subjuncea*	
	Forbs and Others	*Tricoryne anceps, Thysanotus tuberosa, Lepidosperma laterale, Pimelia linarifolia, Lomandra multiflora, Coronidium newcastlanum, Oxalis corniculata, Dianella nervosa, Hibbertia stirlingii, Hibbertia longifolia, Keraudrenia lanceolata, Dodonea lanceolata, Cheilanthes nudiscula, Cheilanthes nitida, Plectranthus parviflorus, Poranthera microphylla, Widela spilanthoides, Geitonoplesium cymosum, Hibiscus normanii*	

4.0 References

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Appendix C Fauna List

A summary of species identified during survey on the MEWF Offset Site

Species	Common Name
Bird	
Milvus migrans	Black kite
Coracina novaehollandiae	Black-faced cuckoo shrike
Bolemoreus frenatus	Bridled honeyeater
Lichmera indistincta	Brown honeyeater
Eudynamys orientalis	Eastern koel
Rhipidura albiscapa	Grey fantail
Dacelo novaeguineae	Laughing kookaburra
Myiagra rubecula	Leaden flycatcher
Meliphaga lewinii	Lewins honeyeater
Colluricincla megarhyncha	Little shrike-thrush
Falco cenchroides	Nankeen kestral
Platycercus adscitus	Pale-headed Rosella
Merops ornatus	Rainbow bee-eater
Rhipidura rufifrons	Rufous fantail
Chalcites lucidus	Shining bronze-cuckoo
Dicrurus bracteatus	Spangled drongo
Pardalotus punctatus	Spotted pardalote
Lalage leucomela	Varied triller
Hirundapus caudacutus	White-throated needletail
Caligavis chrysops	Yellow faced honeyeater
Terrestrial Mammal	
Trichosurus vulpecula	Common Brushtail Possum
Felis catus	Feral Cat
Uromys caudimaculatus	Giant white-tailed rat
Petrogale mareeba	Mareeba rock-wallaby
Isoodon macrourus	Northern brown Bandicoot
Dasyurus hallucatus	Northern Quoll
Melomys cervinipes	Fawn-footed Melomys

Species	Common Name
	Rodent sp
Tachyglossus aculeatus	Short-beaked Echidna
Microbats	
Austronomus australis	White-striped free-tailed bat
Chaerophon jobensis	Northern freetail bat
Chalinobus nigrogiseus	Hoary wattled bat
Myotis macropus	Large-footed myotis
Miniopterus australis	Little bent-wing bat
Miniopterus orianae oceanensis	Eastern bent-wing bat
Mormopterus lumsdenae	Northern free-tailed bat
Mormopterus ridei	Ride's Free-tailed Bat
Nyctophilus sp	Long-eared bat
Saccolaimus flaviventris	Yellow-bellied sheathtail bat
Saccolaimus saccolaimus	Bare-rumped sheathtail bat
Taphozous troughtoni	Troughton's sheathtail bat
Rhinolophus megaphyllus	Eastern horseshoe-bat
Vespadelus pumilus	Eastern forest-bat
Vespadelus troughtoni	Eastern cave bat
Reptile	
Intellagama lesueurii	Eastern water dragon
Varanus tristus	Feckled Monitor
Varanus varius	Lace Monitor
Diporiphora bilineata	Two-lined dragon
Eulamprus sp.	Water Skink