Lot 5 DP 838497 Sutton Road, Sutton

Summary Report - Spring Survey 2016

Prepared for
Tony Carey Consulting

14 November 2016

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Cover photo	(From top clockwise) Red-Stringybark – Scribbly Gum – Red-anthered Wallaby Grass Open Forest; *Daphoenositta chrysoptera* (Varied Sittella), *Polytelis swainsonii* (Superb Parrot), *Swainsona sericea*.

This report should be cited as 'Eco Logical Australia 2016. *Lot 5 DP 838497 Sutton Road, Sutton – Summary Report of Flora and Fauna Survey.* Prepared for Tony Carey Consulting.'

ACKNOWLEDGEMENTS

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1 Introduction

1.1 Background

Eco Logical Australia Pty Ltd (ELA) was engaged by Tony Carey Consulting on behalf of Paul and Peter Cartwright to undertake a flora and fauna survey at Lot 5 DP 838497 Sutton Road, Sutton. This site is proposed for subdivision sympathetic with the sites ecological and planning constraints, whereby lots sizes will be commensurate with site constraints.

ELA Ecologist Bruce Mullins undertook a rapid site survey in June 2016 (Eco Logical Australia 2016) to identify major constraints which included:

- The threatened ecological community (TEC) White Box, Yellow Box, Blakely's Red Gum woodland (Box-Gum woodland) including areas meeting the criteria for the Commonwealth EPBC listed community.
- Numerous hollow-bearing trees
- Potential habitat for threatened flora and fauna species
- Two first order streams and a fifth order stream (Yass River)

Further flora and fauna survey was recommended in Eco Logical Australia (2016), particularly targeted survey during spring, when many threatened flora in the region are in flower. Survey conducted at this time can more reliably conclude the presence or absence of a species on site.

This report provides a summary of these survey results including refined vegetation mapping and recommendations for subdivision layout. This report should also be read in conjunction with Eco Logical Australia (2016).

1.1.1 Objectives of this study

The key objectives of the survey were to:

- refine vegetation mapping
- undertake biometric plots within each vegetation zone and use this data to determine the presence of Commonwealth and state listed ecological communities
- conduct threatened flora species searches via transects of potential habitat
- targeted surveys for threatened microbats
- record incidental observations of fauna species and potential habitat for threatened fauna
- provide a revised vegetation condition map to inform the subdivision layout plan.

2 Methodology

2.1 Data review

Data from Eco Logical Australia (2016) was reviewed, which included searches of wildlife databases to determine the likely occurrence of threatened flora and fauna.

ELA consulted with other local experts (i.e. OEH and National Botanic Gardens) to ensure that target species were likely to be flowering when the survey was undertaken.

2.2 Field survey

Prior to the survey, the site was spelled from grazing for a period of 6 weeks to allow plants to flower, which enabled greater detection and identification of plant species.

The field survey was undertaken between the 11 and 14 October 2016 by senior ecologist Bruce Mullins and ecologist Karen Spicer. Approximately 64 person hours were spent on site.

The weather was fine and sunny with some light cloud at times. During the survey, the temperature ranged from 6 - 18ºC with cold south-westerly winds between 10-26 km/hr. The winds became east and northerly on Thursday afternoon through to Friday. Monthly rainfall in the months leading up to the survey were average or above average: July 71.0 mm (average 41.4 mm), August 46.2 mm (average 46.2) and September 149.2 mm (average 52.0 mm). There was no rain during the survey period.

2.2.1 Vegetation communities

The study area was divided into 7 paddocks as shown in **Figure 1**. A list of visible flora species and their relative abundance was collected for paddocks 1 to 7 in Eco Logical Australia (2016) and during this survey in paddocks 5 and 7 as shown in the flora list (**Appendix A**).

Eleven biometric plots consistent with the Biobanking Assessment Methodology (OEH 2014) were undertaken to sample the different vegetation zones within the study area. Permanent star pickets were installed to mark the start and end of the 50 m transect within each plot. The location of the plots is shown in **Figure 2**.

The flora survey and biometric plots assisted with mapping vegetation communities across the site. The vegetation communities were further analysed to determine whether any conformed with threated ecological communities (TECs) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.2.2 Flora

Threatened species transects were undertaken consistent with OEH guidelines for surveying threatened herbs and forbs in open vegetation, which requires a maximum distance between parallel field traverses of 10 m (OEH 2016). Transects were recorded with a hand held GPS and are shown in **Figure 2**. Some variation in the distance between transects was applied in patches of unsuitable habitat (eg. exotic dominated groundcover).

2.2.3 Fauna and fauna habitat

Microbat surveys using three Anabat detectors were conducted across three consecutive nights between the 11 and 13 October 2016. Total survey effort equals nine Anabat survey nights. The Anabats were

placed in a variety of habitats and locations to maximise the diversity of species recorded (**Figure 2**). The recorded echolocation calls of microbats are used to identify bat species. However, there are a number of factors that affect the confidence in the identification (eg. length of the call, distance of the microbat from the microphone, similarity of calls between species). Thus, the confidence of the identification is ranked as positive or possible. Further detail is provided in **Appendix C**.

Rock rolling occurred in areas containing surface rock to search for *Aprasia parapulchella* (Pink-tailed Worm Lizard). Potential habitat included partially embedded, dinner plate-sized surface rocks. Care was taken to replace rocks back to their original position.

Opportunistic fauna observations were made throughout the survey period. Threatened birds were observed for periods to help determine their use of the site for foraging and breeding. Other ecological values such as rock outcrops, surface rock and termite mounds were recorded with a hand held GPS.

2.2.4 Limitations

The field survey was undertaken in spring to maximise detection of threatened flora species. However, the full suite of flora and fauna occurring on site cannot be determined by a single survey.

Hand held GPS have a degree of error of approximately 10 m.

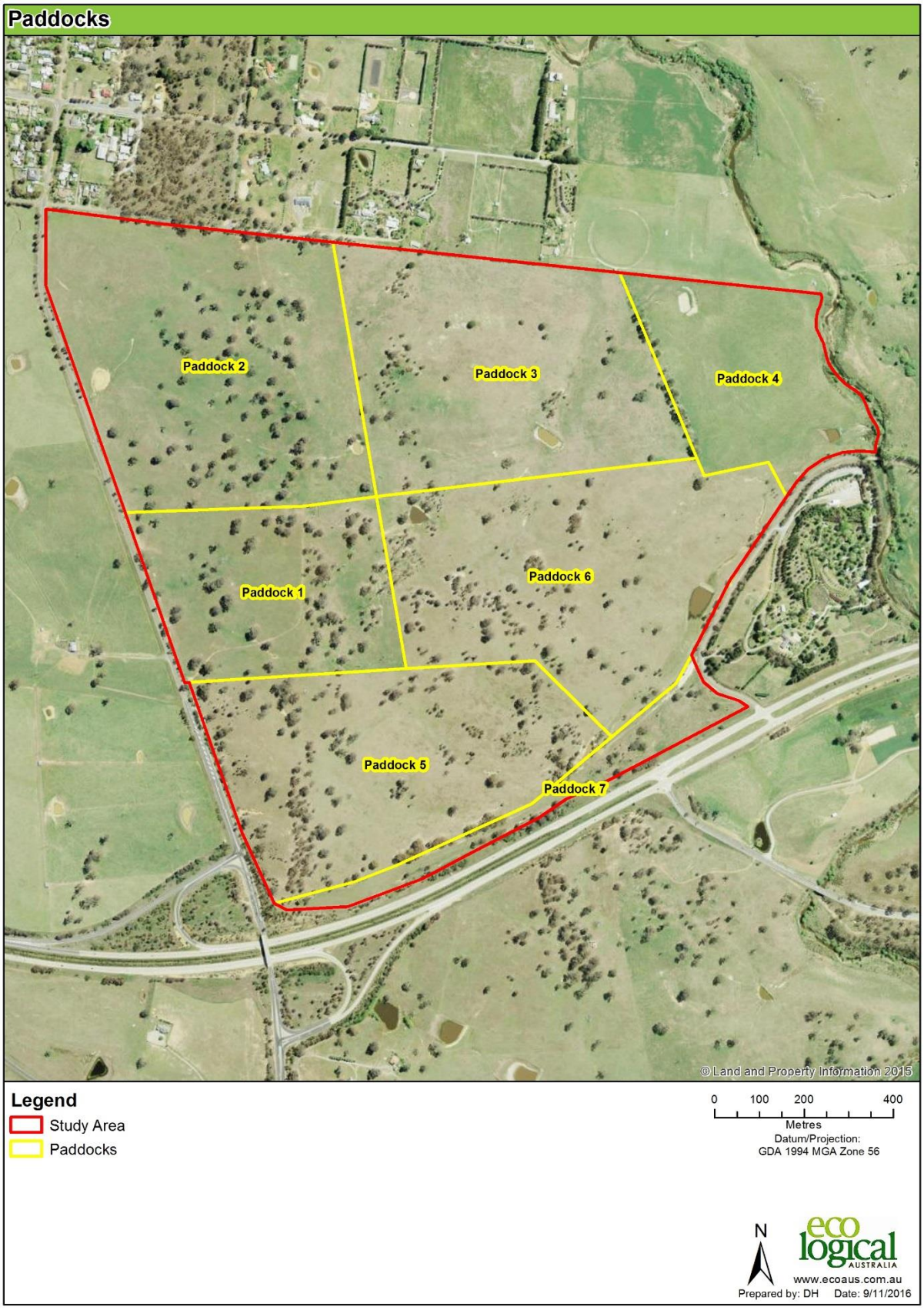


Figure 1: The division of the study area into seven paddocks.

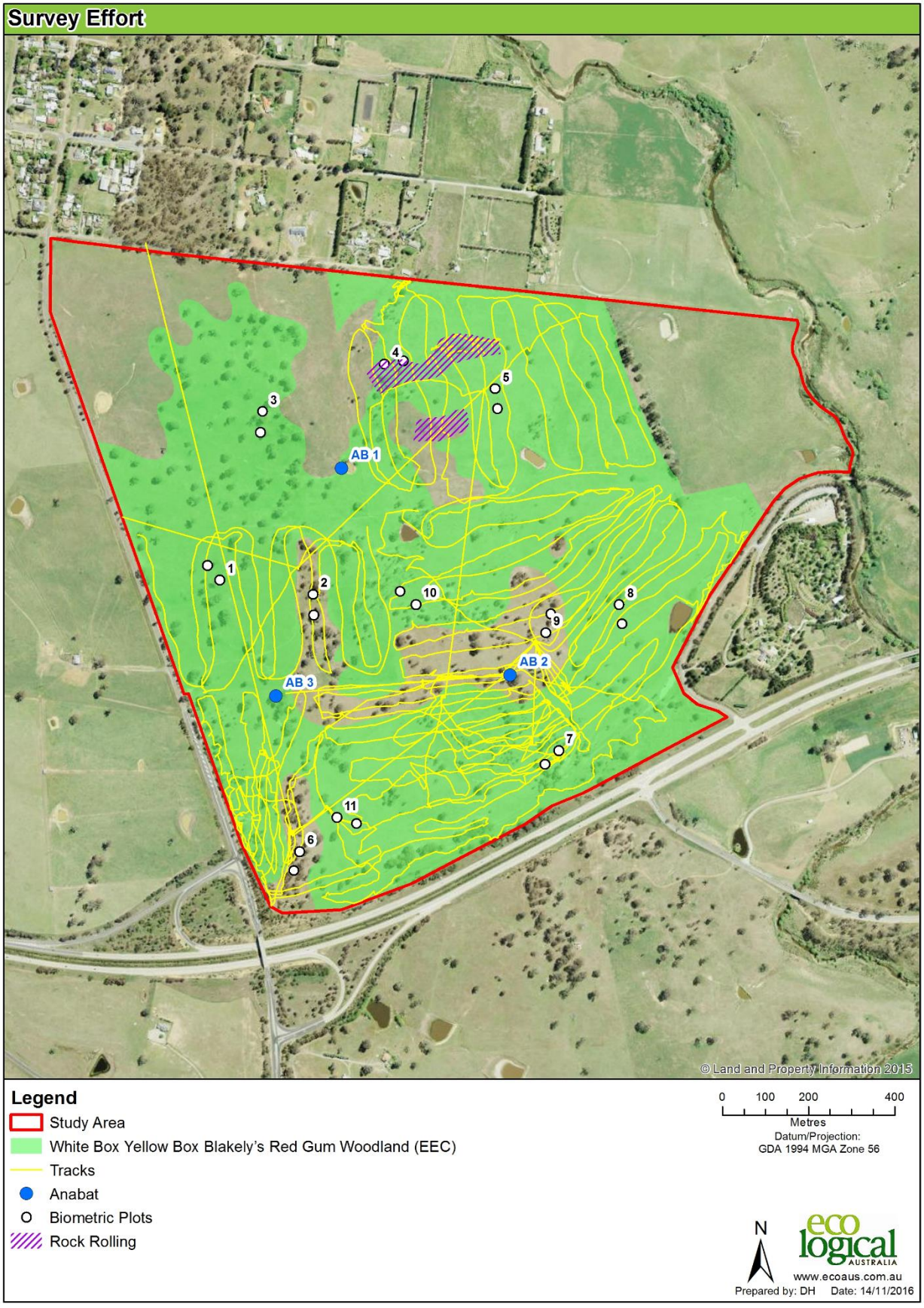


Figure 2: Survey methodology map showing the location of transects, biometric plots and Anabat detectors.

3 Results

3.1 Data review

Based on pervious database searches (Eco Logical Australia 2016), species subject to target survey were:

- *Aprasia parapulchella* (Pink-tailed Worm Lizard)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Chthonicola sagittata* (Speckled Warbler)
- *Climacteris picumnus victoriae* (Brown Treecreeper)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Hieraaetus morphnoides* (Little Eagle)
- *Leucochrysum albicans* var. *tricolor*
- *Melanodryas cucullata cucullata* (Hooded Robin)
- Microbats
- *Petroica boodang* (Scarlet Robin)
- *Petroica phoenicea* (Flame Robin)
- *Polytelis swainsonii* (Superb Parrot)
- *Rutidosis leptorrhynchoides*
- *Stagonopleura guttata* (Diamond Firetail)
- *Swainsona recta*
- *Swainsona sericea*
- *Thesium australe*

3.2 Field survey

3.2.1 Vegetation communities

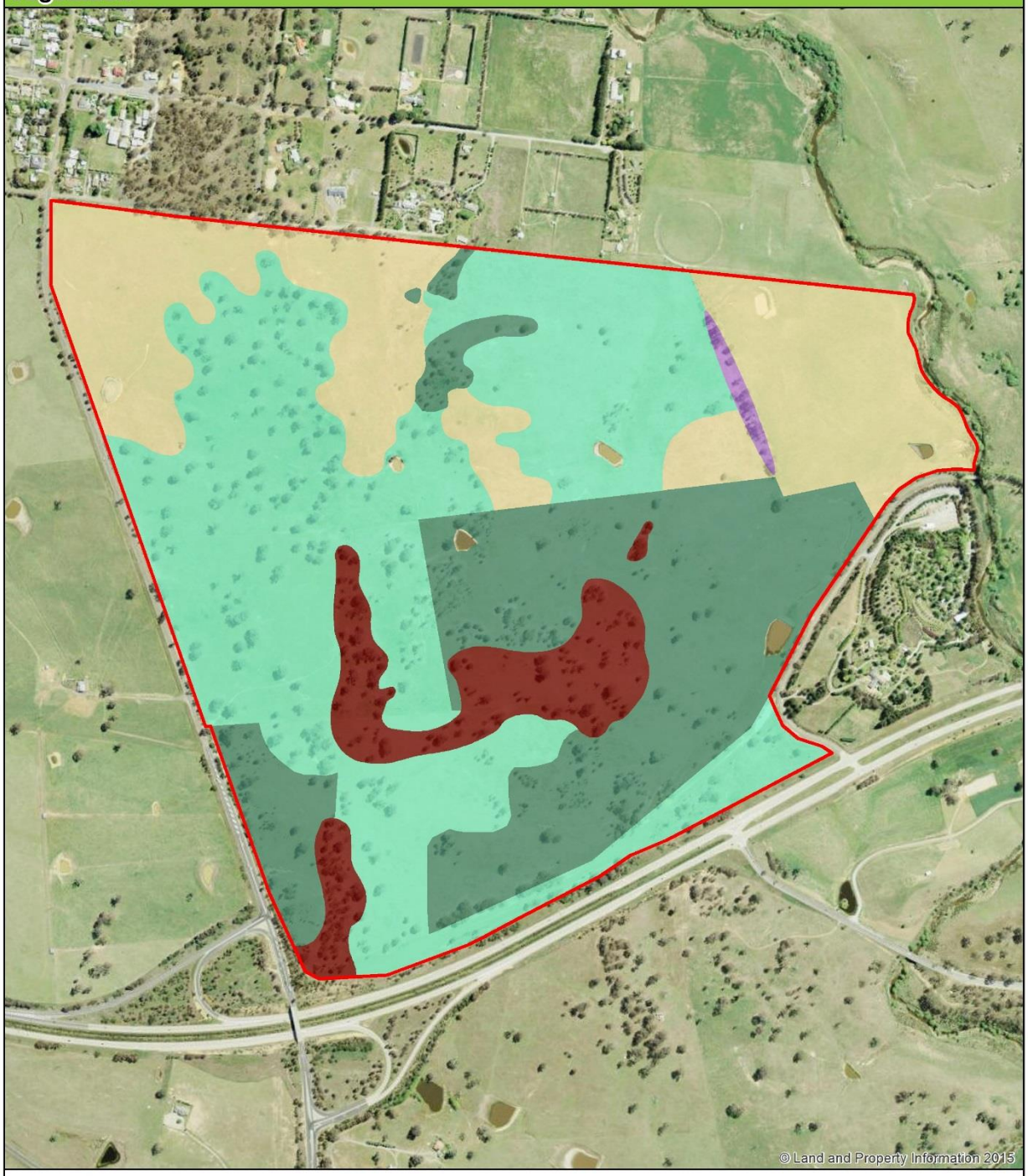
More detailed assessment of the site helped to refine vegetation mapping on site (**Figure 3**). Adjustments were made to some vegetation boundaries, reducing the extent of Box Gum Woodland under State and Commonwealth definitions. The names of the Plant Community Types originally mapped has not changed:

- Red Stringybark – Scribbly Gum – Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion (P14) (Red Stringybark – Scribbly Gum open forest)
- Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands (U178) (Yellow Box ± Apple Box woodland).

Changes to the extent of EPBC Act listed Box-Gum Woodland was primarily due to the state of the understorey, which had a higher cover of perennial exotic species than perennial native species. Floristic data collected along traverses through paddocks 6 and 7 was undertaken to map vegetation boundaries more precisely.

High quality examples of derived native grassland (from what was likely Yellow Box ± Apple Box Woodland) occurs in paddock 6. This area retained a high diversity of native species, and few weeds (**Figure 4**).

Vegetation



Legend

- Study Area
- Pine
- Exotic

Vegetation (ELA 2016)

- P14 Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass
- RP24 Yellow Box - Blakely's Red Gum EPBC listed
- RP24 Yellow Box - Blakely's Red Gum TSC listed

0 100 200 400
Metres
Datum/Projection:
GDA 1994 MGA Zone 56

N

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Prepared by: DH Date: 11/11/2016

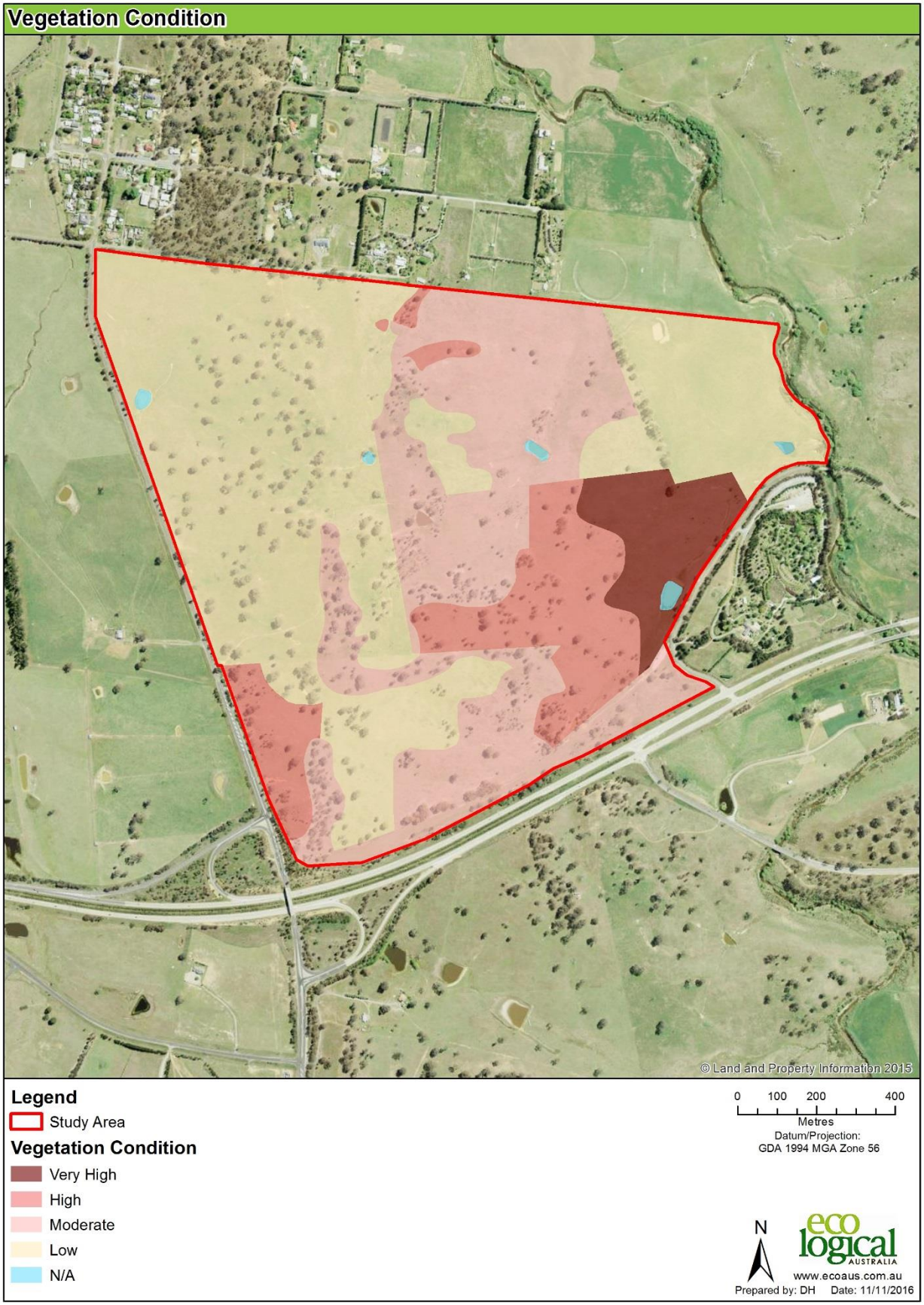

Figure 4: Updated vegetation condition within the study area

3.2.2 Flora

A total of 153 flora species were identified within the study area during field investigations, of which 63 are exotic species (**Appendix A**). No additional noxious weeds or Weeds of National Significance (WoNS) were recorded during this study.

One threatened flora species was recorded during the survey; *Swainsona sericea* was recorded within Paddock 6, near the western fenceline with Paddock 5 (**Figure 6**). Three individuals were present with only one in flower (**Figure 5**). This species is listed as vulnerable under the TSC Act. No other threatened flora were observed. ELA notes that *Leucochrysum albicans* var. *tricolor* and *Swainsona recta* were in flower at other sites during the survey period.

Figure 5: *Swainsona sericea* found within paddock 6 (top left clockwise: flowers; leaves; habitat).

3.2.3 Fauna and fauna habitats

Five threatened fauna species were recorded within the study area during the survey period. These species are listed in **Table 1** and include two birds and three microbats. The locations where these species were recorded is shown in **Figure 6**.

A single male *Polytelis swainsonii* (Superb Parrot) (listed as vulnerable under the TSC Act and EPBC Act) was observed perching in several different trees within the north eastern corner of paddock 6 before joining a female near the ridge between paddock 5 and 6 (**Figure 6**). It is likely that they were a breeding pair. However, no nesting site was observed within the study area. It is unlikely that the pair nest on site because the species was only observed on one day, the species in not known to breed in *Eucalyptus rossii* (Inland Scribbly Gum) (TSSC 2016). On the south west slopes they have a high reliance on *E. blakelyi* (Blakely's Red Gum) for nest sites (TSSC 2016; B. Mullins pers. obs.), and the use of *E. melliodora* (Yellow Box) is uncertain (TSSC 2016). While there are scattered *E. blakelyi*, most were young and did not have hollow bearing limbs or trunks.

A single Varied Sittella (listed as vulnerable under the TSC Act) was observed at two locations on the same day (**Figure 6**). It is possible that the same bird was observed twice. The species is sedentary, and is likely to be a long-time resident in the area.

Saccolaimus flaviventris (Yellow-bellied Sheathtail Bat) was positively identified at Anabat site 1 only, on the ridge containing Red Stringybark – Scribbly Gum open forest. *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat) was positively identified at Anabat sites 2 and 3, and possibly identified at site 1, while *Myotis macropus* (Large-footed Myotis) was possibly identified at Anabat site 2 and 3; Anabat 2 was located next to a dam which is important habitat for this species. The location of these records is in (**Figure 6**) and more detail on the analyses in **Appendix C**.

Table 1: Threaten fauna recorded within the study area.

Scientific name	Common name	Conservation Status	
		TSC Act	EPBC Act
Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not listed
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable
Miniopterus schreibersii (orianae) *oceanensis*	Eastern Bentwing Bat	Vulnerable	Not listed
Myotis macropus	Large-footed Myotis	Vulnerable	Not listed
Saccolaimus flaviventris	Yellow-bellied Sheath-tailed Bat	Vulnerable	Not listed

Target searches for Pink-tailed Worm Lizard did not find any individuals. *Ctenotus robustus* (Robust Ctenotus) was recorded under three rocks. Most rock on site is deeply embedded granite with few surface rocks. Partially embedded and more deeply embedded rocks were turned during the survey, however, there is very little suitable habitat on site.

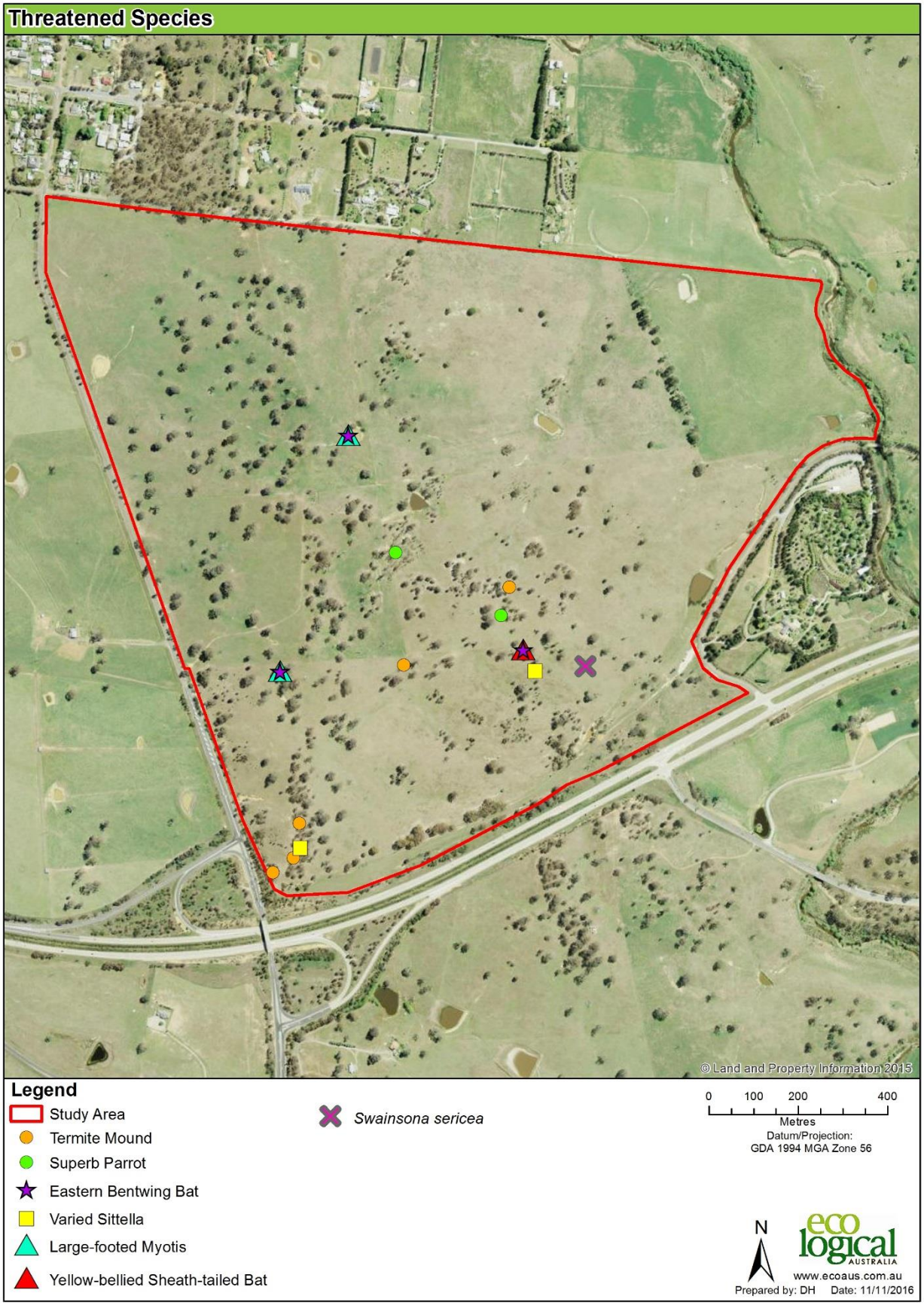

Figure 6: Threatened species and habitat features

4 Recommendations and conclusions

A targeted flora and fauna survey was undertaken from 11 – 14 October 2016, to determine threatened species and map more accurately TECs within the study area.

The following threatened species were recorded:

- *Swainsona sericea*
- Superb Parrot
- Varied Sittella
- Large-footed Myotis
- Eastern Bentwing-bat
- Yellow-bellied Sheathtailed Bat

Adjustments were made to the vegetation and vegetation condition maps, reducing the extent of Box-Gum Woodland listed under EPBC Act and/or TSC Act.

The following recommendations are provided based on the outcomes of the survey.

- Plan higher density housing in areas of low constraint.
- Retain large remnant trees in the future subdivision, wherever possible.
- Locate building envelopes in current open spaces to minimise tree removal
- Retain areas of high and very high condition vegetation in a conservation lot, where possible.
- Include the *Swainsona sericea*, recorded on site, within the conservation lot
- Confirm that first order streams within the study area still function as streams and require protection of the riparian corridor. Any development within 40 m of a stream will require a controlled activity approval from DPI – Water.
- Protect ecological values in the long term through measures such as:
    - Tree preservation orders – for large trees and hollow bearing trees
    - Planning agreement/Voluntary conservation agreement /Section 88b instrument/Biobanking Agreement – for the conservation lot. These protection measures have different requirements, durations and security. However, changes to threatened species legislation and the Native Vegetation Act (refer to the Biodiversity Conservation Bill 2016) mean that new protection measures may be available in the next 12 months. These include Biodiversity Stewardship Agreements (formerly a Biobanking Agreement), Conservation Agreements and Wildlife Refuge Agreement. Voluntary Conservation Agreements will no longer be available, and are currently being discouraged. The relevant regulations have not been released for the Bill, which will contain important information relating to these agreements.
    - A management plan would be required for the retained lot to maintain and improve biodiversity values. A management plan would relate to the protection measure selected.
    - Section 88b or other instrument restricting pasture improvement and stocking rates on larger lots in areas of moderate to high ecological constraint.

References

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Threatened Species Scientific Committee (2016) Approved Conservation Advice for *Polytelis swainsonii* Superb Parrot). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/738-conservation-advice-05052016.pdf.

Appendix A: Flora species list

Scientific name	Common name	Paddock						
		1	2	3	4	5	6	7
Acacia dealbata	Silver Wattle							X
Acacia pravissima	Wedge-leaved Wattle					X		X
Acaena sp.				X				
Acaena ovina						X	X	
Acetosella vulgaris *	Sheep Sorrel			X		X	X	X
Aira sp. *						X	X	X
Alternanthera sp.							X	
Amaranthus sp. *					X			
Amyema sp.	Mistletoe							X
Aphanes australiana							X	X
Arctotheca calendula *	Capeweed	X	X	X		X		X
Arenaria sp. *	Sandwort			X		X	X	
Aristida ramosa	Purple Wiregrass			X		X	X	
Arthropodium minus	Small Vanilla Lily					X	X	
Astroloma humifusum	Native Cranberry					X	X	
Austrostipa bigeniculata		X	X			X		
Austrostipa scabra	Speargrass	X				X	X	X
Avena sp. *	Oats		X	X	X	X	X	X
Bothriochloa macra	Red Leg Grass	X	X	X	X	X	X	X
Brachyloma daphnoides	Daphne Heath			X				
Briza maxima *						X		X
Briza minor *						X		
Bromus sp. *						X	X	X
Bulbine bulbosa						X	X	
*Capsella bursa-pastoris**	Shepherd's Purse		X	X				
Carex appressa	Sword Sedge					X		
Carex inversa	Knob Sedge					X	X	
Carthamus lanatus *	Saffron Thistle		X	X		X	X	
Cassinia sp.						X		
Centaurium sp. *						X	X	
Cerastium glomeratum *	Mouse-eared Chickweed					X	X	X
Cheilanthes sieberi	Rock Fern			X		X	X	
Chenopodium pumilio	Small Crumbweed	X	X	X	X			
Chloris truncata	Windmill Grass				X	X	X	
Chondrilla juncea *	Skeleton Weed		X	X				
Chrysocephalum apiculatum	Common everlasting			X	X	X	X	
Cicendia quadrangularis *				X			X	
Cirsium vulgare *	Spear Thistle		X	X	X	X	X	
Convolvulus erubescens complex							X	
Conyza sp. *	Fleabane		X			X		
Cotoneaster sp. *							X	
Cotula australis						X		X

Scientific name	Common name	Paddock						
		1	2	3	4	5	6	7
Crassula colorata		X		X				
Crassula decumbens				X		X	X	
Crassula sieberana						X	X	X
Cymbonotus lawsonianus	Bears Ear					X	X	
Cynosurus echinatus *	Rough Dog's Tail			X	X			
Dactylis glomerata *	Cocksfoot							X
Daucus glochidiatus	Native Carrot						X	
Daviesia genistifolia	Broom Bitter Pea					X		
Desmodium varians							X	
Dianella revoluta	Blueberry Lily					X		
Dillwynia sericea						X		
Drosera peltata						X	X	
Echium plantagineum *	Patterson's Curse			X	X	X		
Elymus scaber	Wheatgrass	X					X	
Einadia nutans	Climbing Saltbush			X	X			
Epilobium billardierianum							X	
Eragrostis cilianensis *	Lovegrass			X				
Eragrostis curvula * #	African Lovegrass				X			
Erodium botrys *	Long Storksbill	X	X	X		X		X
Erodium cicutarium *	Common Storksbill			X				
Erodium crinitum	Blue Crowsfoot					X		
Eucalyptus blakelyi	Blakely's Red Gum	X	X	X		X	X	X
Eucalyptus bridgesiana	Apple Box			X		X		X
Eucalyptus dives	Broad-leaved Peppermint					X		
Eucalyptus goniocalyx	Long-leaved Box					X		
Eucalyptus mannifera	Brittle Gum					X		
Eucalyptus melliodora	Yellow Box	X	X	X		X	X	X
Eucalyptus rossii	Scribbly Gum	X				X		
Euchiton sphaericus						X	X	
Fimbristylis dichotoma	Common Fringe-sedge					X	X	
Galium gaudichaudii							X	
Gamochaeta sp. *							X	
Geranium solanderi	Native Geranium	X				X	X	
Gonocarpus tetragynus						X	X	
Goodenia hederacea						X	X	
Helichrysum scorpioides ?						X	X	
Heliotropium amplexicaule *	Blue Heliotrope					X	X	
Hibbertia obtusifolia	Hoary Guinea Flower			X		X	X	
Hirschfeldia incana *	Buchan Weed				X			
Hordeum leporinum *	Barley Grass	X			X	X		
Hydrocotyle laxiflora						X		
Hypericum gramineum	Native St Johns Wort						X	
Hypericum perforatum * #	St Johns Wort			X	X	X	X	X
Hypochaeris radicata *	Catsear	X	X	X	X	X	X	X
Isoetopsis graminifolia	Grass Cushions						X	
Juncus sp.						X	X	X

Scientific name	Common name	Paddock						
		1	2	3	4	5	6	7
Juncus usitatus		X				X		
Kunzea ericoides	Burgan					X		
Lepidium africanum *	Peppercress	X	X		X			X
Leptorhynchos squamatus	Scaly Buttons					X	X	
Linaria arvensis *						X		
Linaria pelisseriana *	Pelisser's Toadflax					X	X	
Linum trigynum *	French Flax					X		
Lissanthe strigosa	Peach Heath					X	X	
Lolium rigidum *	Wimmera Ryegrass					X	X	X
Lomandra filiformis		X		X		X	X	X
Lomandra multiflora	Many-flowered Mat-rush					X		
Malva parviflora *	Marshmallow			X	X			
Medicago sp. *							X	X
Melichrus urceolatus	Urn Heath			X		X	X	
Microlaena stipoides	Weeping Grass	X				X	X	
Nassella trichotoma * # *w*	Serrated Tussock		X	X	X	X		
Onopordum acanthium *	Scotch Thistle		X	X	X	X	X	
Orchidaceae sp.							X	
Oxalis perennans				X		X		
Panicum effusum	Hairy Panic			X		X		
Parentucellia latifolia *	Red Bartsia					X	X	X
Paronychia brasiliana *	Chilean Needle Wort	X	X	X	X	X		
Paspalum dilatatum *	Paspalum			X		X		X
Pentaschistis airoides *	False Hairgrass			X		X	X	
Petrorhagia nanteuilii *	Proliferous Pinks					X	X	
Phalaris aquatic *	Phalaris	X	X		X			
Pimelea curviflora						X		
Plantago lanceolata *	Plantain			X	X	X	X	X
Plantago varia						X	X	X
Poa bulbosa *	Bulbous Poa					X	X	
Poa labillardieri	Poa			X		X	X	
Poa sieberiana	Snow grass					X		
Portulaca oleraceus	Pigweed			X				
Pseudognaphalium luteoalbum	Jersey Cudweed						X	
Pterostylis sp.						X		
Ranunculus sessiliflorus	Small-flowered Buttercup						X	
Rosa rubiginosa *	Sweet Briar			X	X	X	X	X
Rubus fruticosus sp agg * # *w*	Blackberry		X	X	X	X	X	
Rumex brownii	Brown Dock	X			X	X	X	X
Rytidosperma pallidum	Red-anthered Wallaby Grass					X		
Rytidosperma sp.		X	X	X	X	X	X	X
Salvia verbenaca *	Wild Sage				X	X	X	
Schoenus apogon	Bog Rush					X	X	
Senecio quadridentatus	Cotton Fireweed					X		
Solenogyne dominii							X	
Solanum nigrum *	Blackberry Nightshade			X				

Scientific name	Common name	Paddock						
		1	2	3	4	5	6	7
Sonchus asper *	Prickly Sowthistle							X
Spergularia rubra *	Red Sand Spurrey						X	
Stackhousia monogyna	Creamy Candles			X		X	X	
Stellaria pungens	Prickly Starwort					X		
Stuartina muelleri	Spoon Cudweed					X		
Taraxacum officinale *	Dandelion						X	
Themeda triandra	Kangaroo Grass			X		X	X	X
Thysanotus tuberosus						X		
Tolpis umbellata *	Yellow Hawkweed					X		
Tricoryne elatior	Yellow Autumn-lily			X		X	X	
Trifolium sp. *		X	X	X	X	X	X	X
Trifolium angustifolium *	Narrow-leaved Clover					X		X
Trifolium arvense *	Haresfoot Clover							X
Triptilodiscus pygmaeus	Common Sunray					X	X	
Ulex europaeus * # *w*	Gorse				X		X	
Verbascum virgatum *	Twiggy Mullein							X
Vicia sp. *						X		
Vulpia sp. *	Silver Grass	X	X	X	X	X	X	X
Wurmbea dioica	Early Nancy			X		X	X	

* = exotic species. # = noxious weeds in NSW. **w** = Weed of National Significance

Appendix B Fauna species list

REPTILES AND AMPHIBIANS

Scientific name	Common name
Crinia signifera	Common Eastern Froglet
Ctenotus robustus	Eastern Striped Skink
Limnodynastes dumerilii	Southern Banjo Frog
Pogona barbata	Eastern Water Dragon
Tiliqua rugosa	Shingleback
Uperoleia laevigata	Smooth Toadlet

BIRDS

Scientific name	Common name
Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Acanthiza reguloides	Buff-rumped Thornbill
Anas superciliosa	Pacific Black Duck
Anthochaera carunculata	Red Wattlebird
Cacatua galerita	Sulphur-crested Cockatoo
Cacatua sanguinea	Little Corella
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo
Chenonetta jubata	Australian Wood Duck
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Corvus coronoides	Australian Raven
Cracticus tibicen	Australian Magpie
Cracticus torquatus	Grey Butcherbird
Dacelo novaeguineae	Laughing Kookaburra
Daphoenositta chrysoptera ^	Varied Sittella
Eolophus roseicapilla	Galah
Falco berigora	Brown Falcon
Falco cenchroides	Nankeen Kestrel
Gerygone olivacea	White-throated Gerygone
Grallina cyanoleuca	Magpie-lark
Hirundo neoxena	Welcome Swallow
Lichenostomus chrysops	Yellow-faced Honeyeater
Manorina melanocephala	Noisy Miner
Melithreptus brevirostris	Brown-headed Honeyeater
Pachycephala rufiventris	Rufous Whistler
Pardalotus striatus	Striated Pardalote

Scientific name	Common name
Petrochelidon nigricans	Tree Martin
Platycercus elegans	Crimson Rosella
Platycercus eximius	Eastern Rosella
Polytelis swainsonii ^	Superb Parrot
Psephotus haematonotus	Red-rumped Parrot
Rhipidura albiscapa	Grey Fantail
Rhipidura leucophrys	Willie Wagtail
Smicrornis brevirostris	Weebill
Strepera graculina	Pied Currawong
Sturnus vulgaris *	European Starling
Vanellus miles	Masked Lapwing

* Denotes exotic species; ^ Threatened species

MAMMALS

Scientific name	Common name
Austronomus australis	White-striped freetail Bat
Chalinolobus gouldii	Gould's Wattled Bat
Chalinolobus morio	Chocolate Wattled Bat
Macropus giganteus	Eastern Grey Kangaroo
Miniopterus schreibersii (orianae) *oceanensis* ^	Eastern Bentwing Bat
Mormopterus (Ozimops) *ridei*	Eastern Freetail Bat
Myotis macropus ^	Large-footed Myotis
Nyctophilus spp.	Long-eared Bats
Oryctolagus cuniculus	European Rabbit
Saccolaimus flaviventris^	Yellow-bellied Sheath-tailed Bat
Vespadelus darlingtoni	Large Forest Bat
Vespadelus regulus	Southern Forest Bat
Vespadelus vulturnus	Little Forest Bat

^ Threatened species

Appendix C Anabat detector results

Anabat surveys were conducted across consecutive nights between the 11 and 13 October, 2016. Total survey effort equals nine Anabat survey nights.

Results

505 sequences were recorded across these survey period. Of these, 423 (83.8%) were of sufficient quality or length to enable positive identified to genus or species. The remaining 82 sequences were either too short or of low quality, thus preventing positive identification.

There were at least 11 species identified during this survey (**Table 2**). This includes three species listed as vulnerable under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (**Table 2**Error! Reference source not found. **- Table 4** and **Figure 7 - Figure 17**). The three threatened species recorded included two positive identifications for the following species:

- *Miniopterus schreibersii* (*orianae) oceanensis* (Eastern Bentwing Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)

The calls of the third threatened species, *Myotis macropus* (Large-footed Myotis), were not able to be positively identified.

The species diversity was similar across most survey sites and between the survey periods, with at least 11 species recorded. The most commonly recorded species included *Chalinolobus gouldii* (Gould's Wattled Bat), *Vespadelus darlingtoni* (Large Forest Bat), *V. regulus* and *V. vulturnus* (Little Forest Bat) (**Table 2**Error! Reference source not found. **- Table 4**). The majority of the activity was recorded during the early evening and late morning periods. However, high levels of activity from Gould's Wattled Bat was recorded on B3266RG (Anabat 1) on survey nights between 0100 am and 0130 am.

Feeding buzzes were irregularly observed in the data set indicating that bats were foraging in these areas, but not to high degrees.

Most of the bat calls that were recorded during both surveys were clear, often long and easily interpreted. Only a few feeding buzzes were observed in the data set indicating that there were some levels of active foraging at the study site.

Survey limitations

Calls were only positively identified when the defining characteristics, such as call shape and characteristic frequency were present to allowed discrimination of a species. In this survey, there were a number of species who, because of similarities within the shape and frequency of their calls, cannot be positive separated. Where and when this was apparent, those species with similar call profiles were lumped together into groups of two or three potential species depending on the characteristics of the call. When this occurred these calls were assigned to the lowest certainty level of 'possible'

In this survey, the calls of Gould's Wattle Bat and Free-tail Bat Species were difficult to separate. Calls were identified as Eastern Freetail Bat if the call shape was flat and the frequency was between 27.5 – 33 kHz with alternation in call frequency between pulses whilst Gould's Wattled Bat was distinguished by a frequency of 28.5 – 31.5 kHz (no alternation among pulses). When no distinguishing characteristics were present, calls were assigned as follows (Gould's Wattle Bat / Free-tail Bat Species).

The calls of Chocolate Wattled Bat and Little Forest Bat can be difficult to separate in the range 50.5 – 53 kHz. Calls were identified as Chocolate Wattled Bat when a down-sweeping tail was present within the call profiles. Alternatively, calls with clear up-sweeping tails were generally identified as a Forest Bat species. When no distinguishing characteristics (e.g. some pulses with downward while others have upward sweeping tails) were present within the calls, they were assigned as Chocolate Wattled Bat / Forest Bat combination.

Calls of Eastern Bentwing Bat overlap in frequency with those of Large Forest Bat. Calls were identified as Eastern Bentwing Bat when there was a down-sweeping tail, drop of more than 2 kHz in the pre-characteristic section, and the pulse shape and time between calls was variable. Calls were identified as Southern Forest Bat when the characteristic frequency fell between 40 – 44 kHz and the characteristic section was long. When no distinguishing characteristics (e.g. some pulses with downward while others have upward sweeping tails) were present within the calls, they were assigned as Eastern Bentwing Bat / Large Forest Bat combination.

The calls of Large-footed Myotis are very similar to all *Nyctophilus* species and it is often difficult to separate these species. Calls were identified as *Nyctophilus* spp. when the time between calls (TBC) was higher than 95 ms and the initial slope (OPS) was lower than 300. Calls were identified as Large-footed Myotis when the TBC was lower than 75 ms and the OPS was greater than 400. When no distinguishing characteristics (e.g. some pulses with downward while others have upward sweeping tails) were present within the calls, they were assigned as Large-footed Myotis / *Nyctophilus* spp combination.

Calls of Southern Forest Bat overlap in frequency in the southern regions of NSW with those of Large Forest Bat. Calls were identified as Southern Forest Bat when the duration of characteristic section appeared to short in duration (<1.8 ms). Calls were identified as Large Forest Bat when the characteristic section appeared to be longer than (>1.8 ms). With no distinguishing characteristics these call profiles were assigned as Southern Forest Bat / Southern Forest Bat.

Table 2. Summary of microbat species diversity recorded between 11 and 13 October 2016 at Lot 5 DP 838497 Sutton Road. Sutton.

Species Name	Common Name	Anabat 1 - B3266RG		SN82241		SN82243	
		Positively identified	Possibly present	Positively identified	Possibly present	Positively identified	Possibly present
Austronomus australis	White-striped freetail Bat	X		X			
Chalinolobus gouldii	Gould's Wattled Bat	X		X		X	
Chalinolobus morio	Chocolate Wattled Bat						X
Miniopterus schreibersii (orianae) *oceanensis* ^	Eastern Bentwing Bat		X	X		X	
Mormopterus (Ozimops) *ridei*	Eastern Freetail Bat	X		X			
Myotis macropus ^	Large-footed Myotis				X		X
Nyctophilus spp.	Long-eared Bats			X			X
Saccolaimus flaviventris ^	Yellow-bellied Sheath-tailed Bat	X					
Vespadelus darlingtoni	Large Forest Bat		X	X		X	
Vespadelus regulus	Southern Forest Bat		X	X		X	
Vespadelus vulturnus	Little Forest Bat	X		X		X	
Species Diversity (Positive identification)		**5**		**8**		**5**	
Species Diversity (Possible)			**3**		**1**		**3**
Total (at least) number of species		**8**		**9**		**8**	

^ Threatened species listed under TSC Act

Table 3. Anabat results for B3266RG (Anabat 1) over three surveys nights between 11 and 13 October 2016

Scientific Name	Common Name	Positive	Probable	Possible	Total number of calls
Austronomus australis	White-striped freetail Bat	4	0	0	4
Chalinolobus gouldii	Gould's wattled Bat	130	11	3	144
Miniopterus schreibersii (orianae) *oceanensis** / *Vespadelus vulturnus*	Eastern Bentwing Bat / Little Forest Bat	0	0	1	1
Mormopterus (Ozimops) *ridei*	Eastern Freetail Bat	10	0	0	10
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	1	0	0	1
Vespadelus darlingtoni / *Vespadelus regulus*	Large Forest Bat / Southern Forest Bat	0	0	14	14
Vespadelus vulturnus	Little Forest Bat	6	2	0	8
Low					12
Short					16
Useable calls					**182**
Total Calls					**210**
Percentage usable calls					**86.67 %**

*** Threatened species**

Table 4. Anabat results for SN82243 (Anabat 2) over three surveys nights between 11 and 13 October 2016

Scientific Name	Common Name	Positive	Probable	Possible	Total number of calls
Chalinolobus gouldii	Gould's wattled Bat	19	2	0	21
Chalinolobus morio	Chocolate Wattled bat	0	2	0	2
Miniopterus schreibersii (*orianae*) *oceanensis**	Eastern Bentwing Bat	1	0	0	1
Miniopterus schreibersii (*orianae*) *oceanensis** / *Vespadelus vulturnus*	Eastern Bentwing Bat / Little Forest Bat	0	0	11	11
Nyctophilus spp. / *Myotis macropus*	Long-eared Bat / Large-footed Myotis	0	0	1	1
Vespadelus darlingtoni	Large Forest Bat	7	2	0	9
Vespadelus regulus	Southern Forest Bat	55	2	0	57
Vespadelus darlingtoni / *Vespadelus regulus*	Large Forest Bat / Southern Forest Bat	0	0	30	30
Vespadelus vulturnus	Little Forest Bat	5	0	0	5
Low					14
Short					29
Useable calls					**29**
Total Calls					**137**
Percentage usable calls					**21.1 %**

Table 5. Anabat results for SN82241 (Anabat 3) over three surveys nights between 11 and 13 October 2016

Scientific Name	Common Name	Positive	Probable	Possible	Total number of calls
Austronomus australis	White-striped freetail Bat	2	0	0	2
Chalinolobus gouldii	Gould's wattled Bat	23	5	4	32
Miniopterus schreibersii (*orianae*) *oceanensis**	Eastern Bentwing Bat	2	0	0	2
Miniopterus schreibersii (*orianae*) *oceanensis** / *Vespadelus vulturnus*	Eastern Bentwing Bat / Little Forest Bat	0	0	10	10
Mormopterus (Ozimops) *ridei*	Eastern Freetail Bat	15	2	0	17
Nyctophilus spp.	Long-eared Bat	1	0	0	1
Nyctophilus spp. / *Myotis macropus**	Long-eared Bat / Large-footed Myotis	0	0	4	4
Vespadelus darlingtoni	Large Forest Bat	1	1	0	2
Vespadelus regulus	Southern Forest Bat	1	0	0	1
Vespadelus darlingtoni / *Vespadelus regulus*	Large Forest Bat / Southern Forest Bat	0	0	1	1
Vespadelus vulturnus	Little Forest Bat	25	5	2	32
Low					7
Short					4
Useable calls					**104**
Total Calls					**115**
Percentage usable calls					**90.4 %**

*** Threatened species**

Call profiles

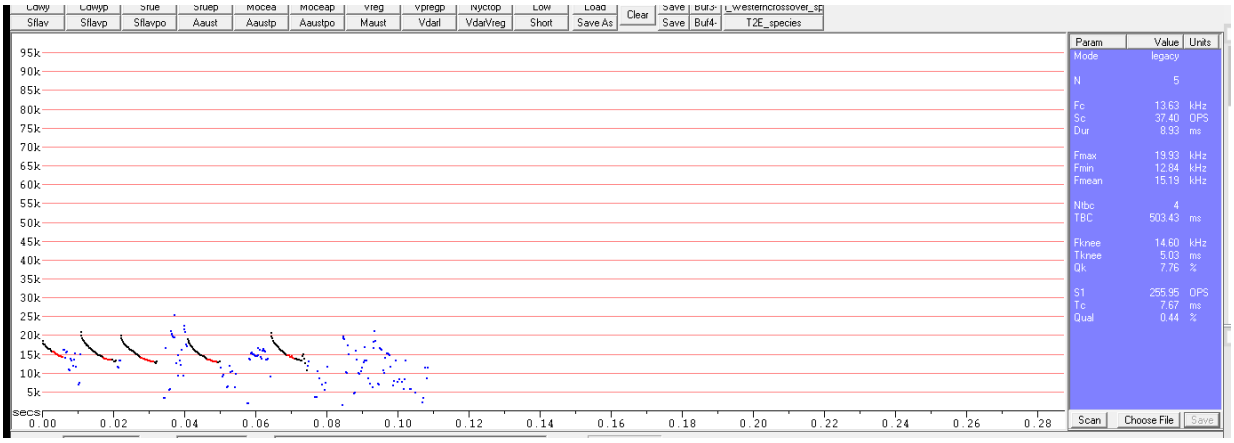

Figure 7. Call profile for *Austronomus australis* recorded on SN82241 at 0036 (pm), 13 October 2016

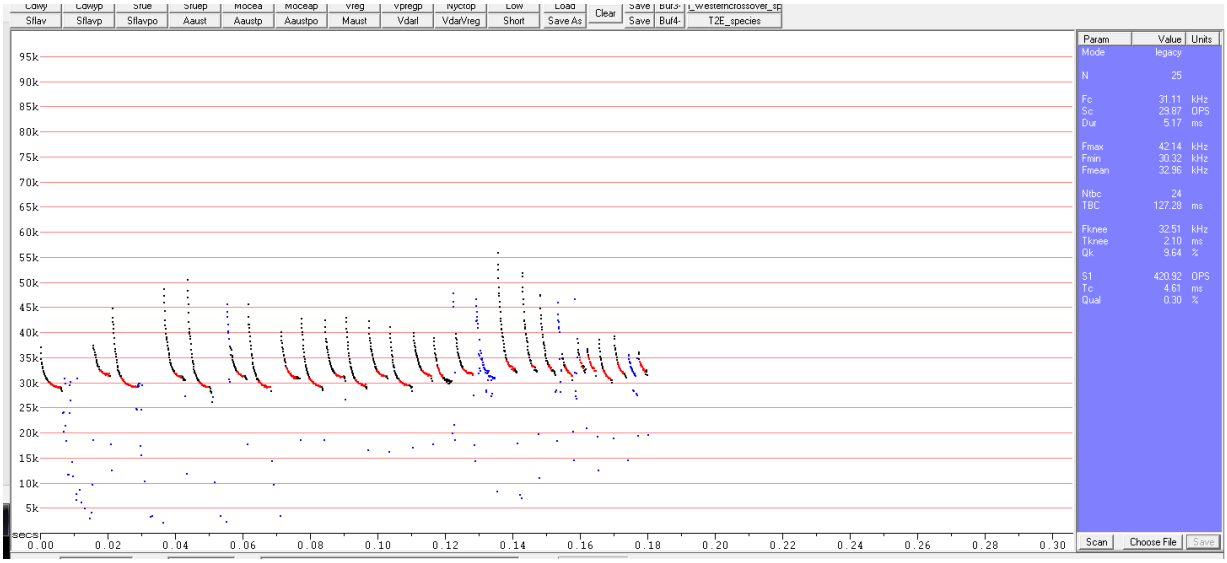

Figure 8. Call profile for *Chalinolobus gouldii* (Gould's Wattled Bat) recorded on SN82241 at 1923 (pm), 13 October 2016

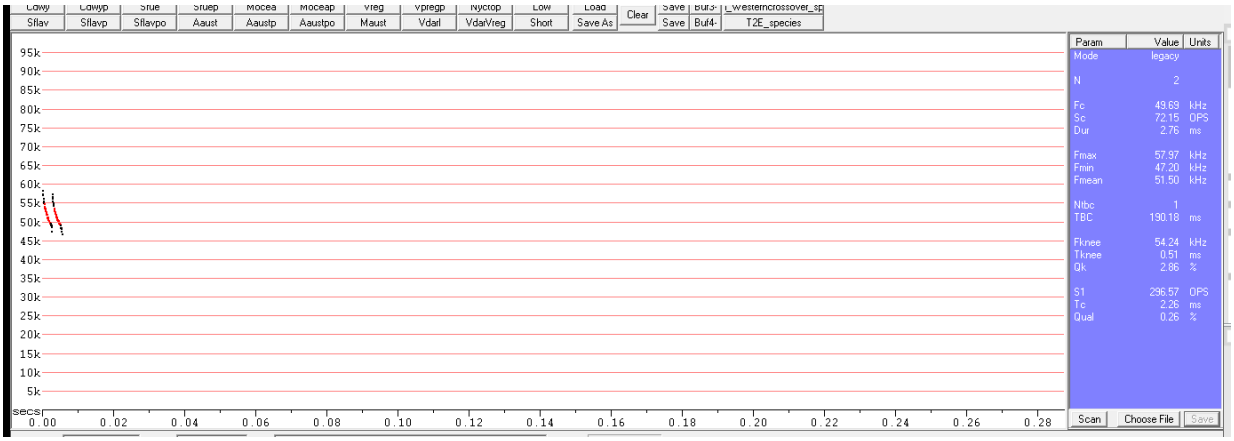

Figure 9. Probable call profile for *Chalinolobus morio* (Chocolate Wattled Bat) recorded on SN82243 at 2206 (pm) on 11 October 2016

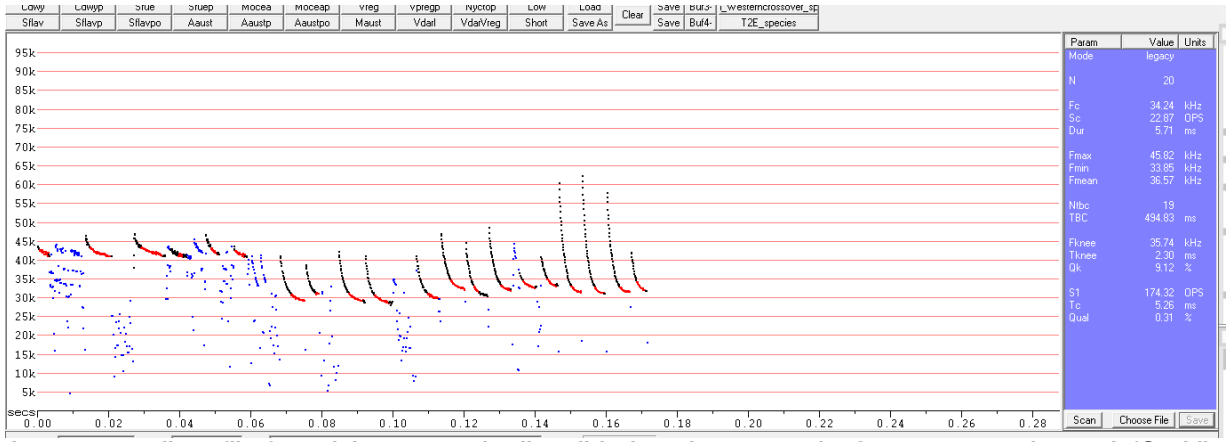

Figure 10. Call profile for *Miniopterus schreibersii* (*orianae*) *oceanensis (Eastern Bentwing Bat) (Gould's Wattled Bat) on SN82243 at 2153, 13 October 2016**

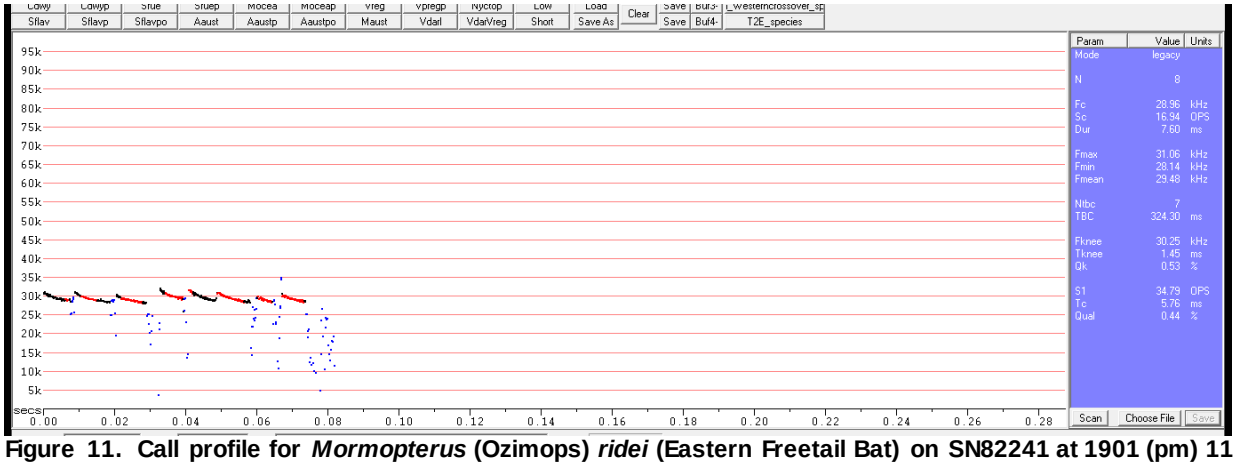

Figure 11. Call profile for *Mormopterus* (Ozimops) *ridei* (Eastern Freetail Bat) on SN82241 at 1901 (pm) 11 October 2016

Figure 12. Potential call profile for *Myotis macropus* (Large-footed Myotis) / *Nyctophilus* spp. recorded SN82241 at 1936 (pm), 13 October 2016

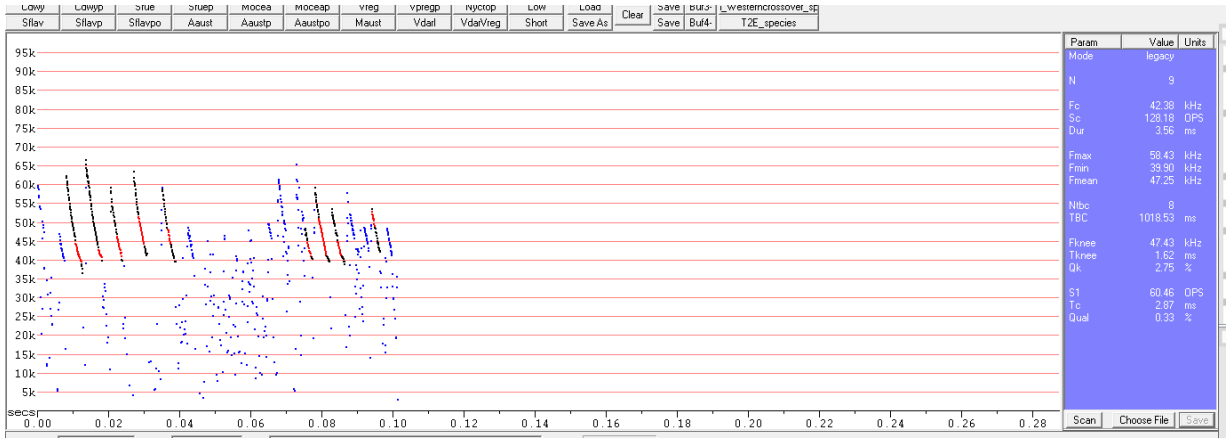

Figure 13. Call profile for *Nyctophilus sp.* recorded on SN82241 at 1949 (pm) on 13 October 2016

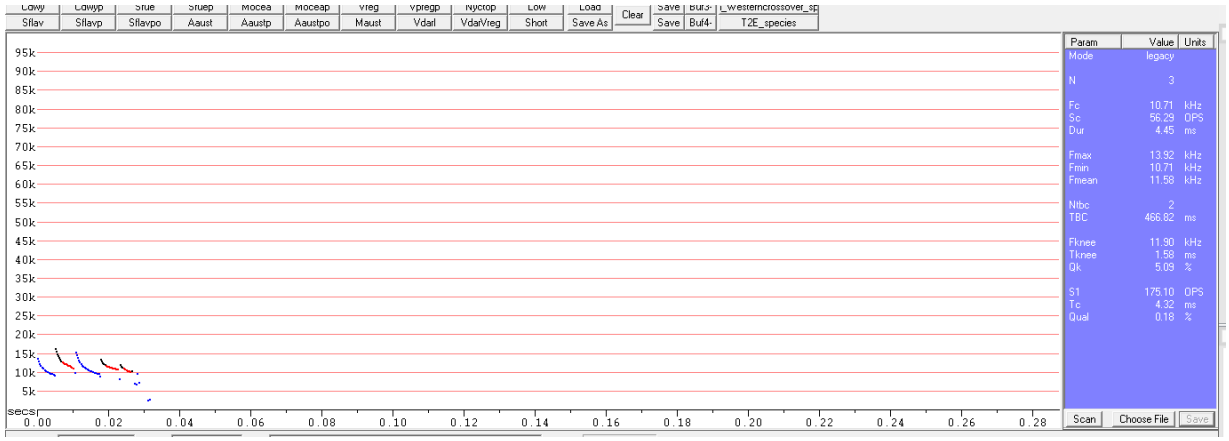

Figure 14. Call profile for *Saccolaimus flaviventris* recorded on B3266RG at 0223 (am) on 14 October 2016. This Anabat is faulty and the frequency of the call profile is half of what it should be

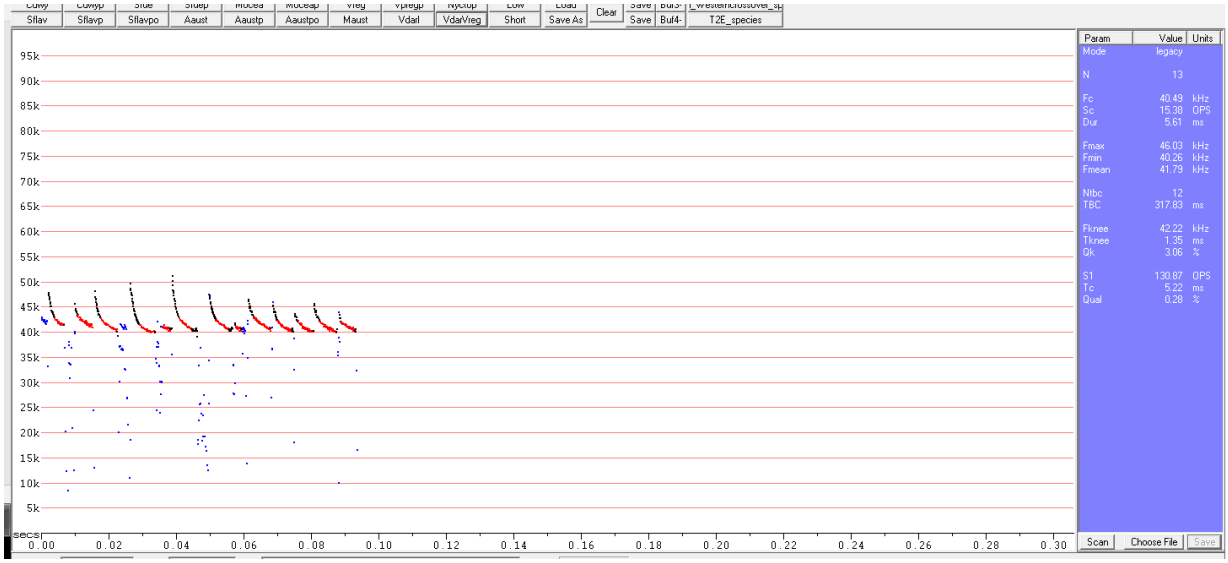

Figure 15. Call profile for *Vespadelus darlingtoni* (Eastern Forest Bat) recorded on SN82243 at 2233 (pm), 13 October 2016.

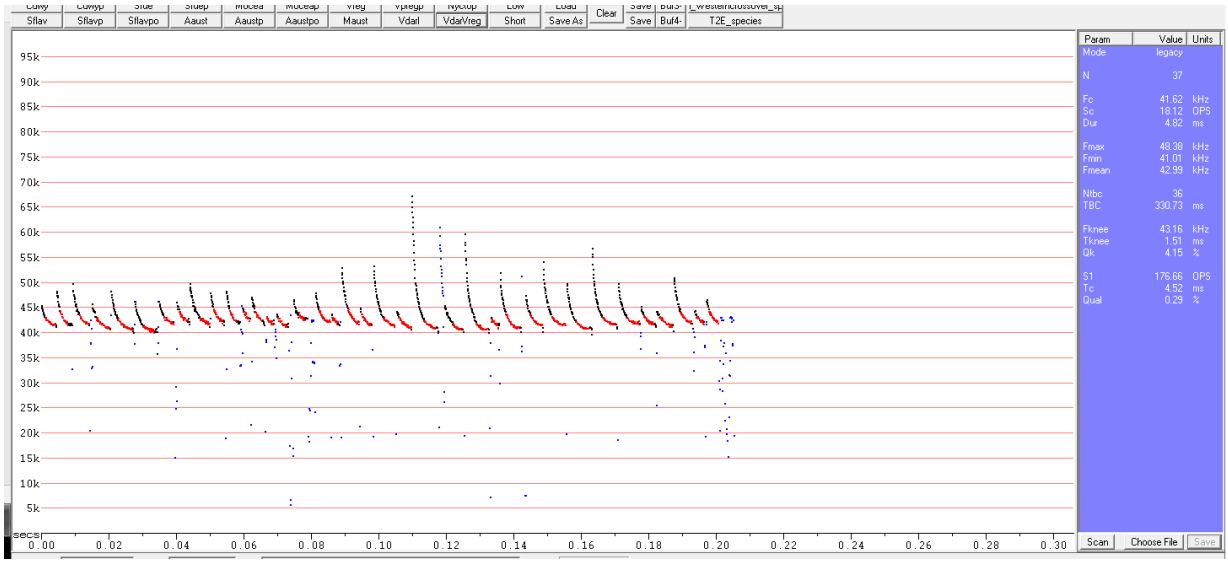

Figure 16. Call profile for *Vespadelus regulus* recorded on SN32243 at 2224 (pm) on 13 October 2016.

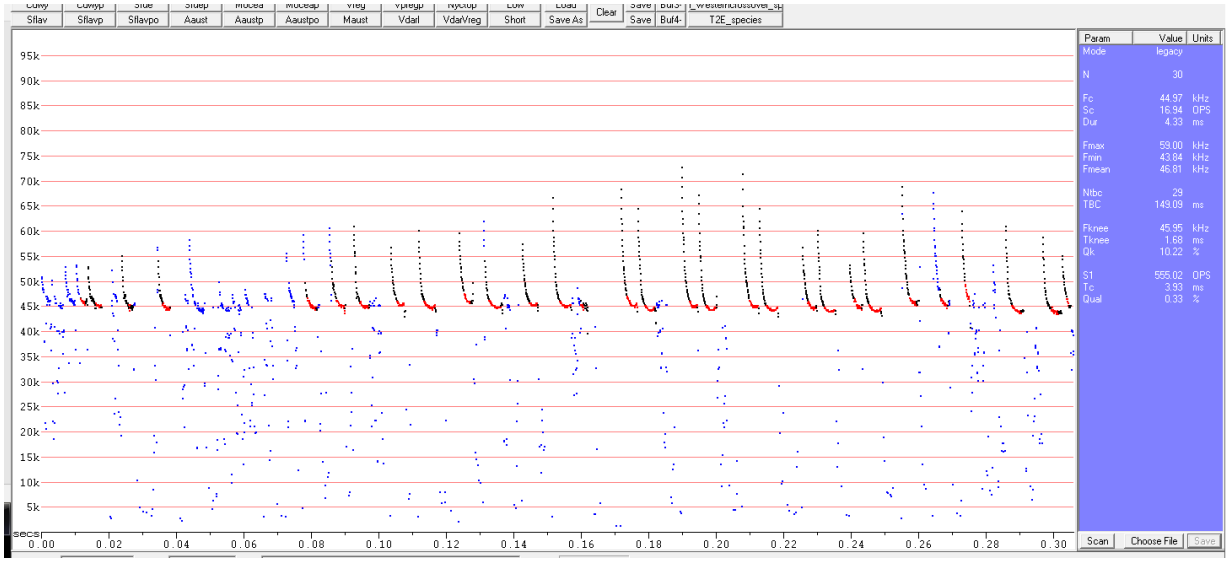

Figure 17. Call profile for *Vespadelus vulturnus* (Little Forest Bat) recorded on SN82241 at 1905 (pm) 13 October 2016

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