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BIODIVERSITY STEWARDSHIP SITE ASSESSMENT REPORT

FOR

PROPOSED STEWARDSHIP SITE

ON

414 OLD MAITLAND ROAD, MARDI, NSW

Prepared for: **Transnational Pastoral Pty Ltd & The Stevens Group**

Revision Draft - June 2021

AEP Ref: 1910.06

BOAMS Ref: BAAS18147/21/00025873

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EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Transnational Pastoral Pty Ltd & The Stevens Group to undertake a Biodiversity Stewardship Site Assessment Report (BSSAR - 00025868/BAAS18147/21/00025873) over land within Lot 1 DP 120512, Lot 1 DP554423, Lot 1 DP 229970, Lot 1 DP 229971, Lot 101 DP 604655, Lot 41 DP 123953 and Lot 36 DP 755249, at 414 Old Maitland Road, Mardi NSW.

A proposed subdivision is located in the central portion of the site, involving the establishment of approximately 246 large residential lots. The biodiversity stewardship site surrounds the development area, which totals approx. 141.6ha of the area. Site surveys have been undertaken within the study area over a range of seasonal periods between 1998 and 2021. Previous data has been compiled within a draft Biodiversity Stewardship Site Report (BSSAR) prepared by Travers Bushfire & Ecology. This data has been reviewed by AEP and incorporated into this assessment where appropriate.

The proposed Biodiversity Stewardship Agreement will capture a diversity of ecosystem types, flora and fauna species, habitat niches and landscapes, to benefit from long term conservation and management. The following species / communities have been recorded within the Study Area, which will generate Credits under the Biodiversity Offset Scheme (BOS);

Six (6) plant communities types are captured within the Stewardship Site generating credits: PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest, northern Sydney Basin Bioregion (Shrubby sub-formation), PCT 1568 - Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (Shrubby sub-formation),PCT 1568 - Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (Shrubby sub-formation), PCT 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Coastal Swamp Forests), PCT 1720 Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Coastal Floodplains Forest) and PCT 1723 - Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central (Coastal Swamp Forests).

Three (3) the above communities are associated with threatened ecological communities (TECs): PCT 1718 and PCT 1723 Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion, PCT 1590 - Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions and PCT 1720 River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;

Three (3) flora species: *Rhodamnia rubescens* (Scrub Turpentine), *Syzygium paniculatum* (Magenta Lilly Pilly), and *Melaleuca biconvexa* (Biconvex Paperbark); and

Four (4) fauna species Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Large-eared Pied Bat (*Chalinolobus dwyeri*), Southern Myotis (*Myotis Macropus*), and Green-thighed Frog (*Litoria brevipalmata*).

Averted loss and active management will improve vegetation integrity and threatened species habitat values over time.

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Study Certification and Licensing

This report was written by Tim Mouton BEnvSc (BAAS: 19083) and reviewed by Ian Benson BEng GDip Ecology (BAAS: 18147) of Anderson Environment & Planning.

Field survey and technical assistance was provided by:

Staff	Title/Qualification	Tasks
Tim Mouton	Senior Ecologist BEnvSc MEnvSc BAAS: 19083	Targeted threatened flora survey, weed survey Reporting and Management Plan
Bonni Yare	Ecologist BSc NRM	Targeted threatened flora survey, weed survey
Justin Chey	Ecologist BEnvSciMgt	Targeted threatened flora survey
Angela Metcalfe	Ecologist BEnvSc Hons	Targeted threatened flora survey, weed survey
Dennis Neader	Senior Ecologist BSc EnvGeo	Targeted threatened flora survey
Alex McNamara	Ecologist BEnvScMgt (*in progress*)	Targeted threatened flora survey
Stevie Kay	Ecologist BSc Marine	Targeted threatened flora survey
Ian Benson	Principal Ecologist BEng (Civil), GradDipSc (Ecology) BAAS:18147	Technical Review

Baseline field survey data contained in this report was sourced from Travers Bushfire & Ecology, who previously prepared a Draft BSSAR for the site, titled *Biodiversity Stewardship Site Assessment Report 414 Old Maitland Road* (April 2020). All data provided by Travers was reviewed, confirmed and updated in the field as necessary by AEP as part of ground truthing surveys and additional targeted flora surveys.

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 14/600(2)) issued by NSW Agriculture.

Certification:

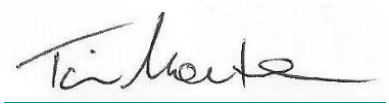
As the certifying author, I, Tim Mouton, make the following certification:

- This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered

likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;

- BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:



Tim Mouton
Senior Ecologist
Anderson Environment & Planning
BAAS 19083
Calculator Ref: 00025868/BAAS18147/21/00025873
1 June 2021

Glossary of Terms

BAM	The *Biodiversity Assessment Method Order* (2020) that determines: ● Methodology applicable to quantifying biodiversity values inherent within a development site; ● Avoid and mitigation efforts required to be employed as part of any development proposal; and ● Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.
BC Act	The *Biodiversity Conservation Act 2016*.
Biodiversity Credit Report	Specifies the number and type of biodiversity credits generated to offset the impacts of a development.
BAM Calculator	The online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
Biodiversity credits	Ecosystem or Species Credits generated via conservation actions within a stewardship site or required to offset the loss of biodiversity values on a development site.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity values	The composition, structure and function of ecosystems, threatened species, populations and ecological communities, and their habitats.
Council	Central Coast.
DoEE	The Commonwealth Department of the Environment and Energy.
DPI	The NSW Department of Primary Industries.
DSEWPaC	The former Department of Sustainability Environment Water Populations and Communities, now the Commonwealth Department of the Environment.
Ecosystem credit	The class of biodiversity credits created or required for the impact on a Plant Community Type.
Ecosystem Credit Species	A threatened species that can be reliably predicted by a PCT.
EEC	Endangered Ecological Community (under BC Act).
EPBC Act	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
OEH	The NSW Office of Environment and Heritage.
PFC	Percentage Foliage Cover.
Site	Lot 1 DP 120512, Lot A DP 396415, Lot 1 DP554423, Lot 1 DP 229970, Lot 1 DP229971, Lot 41 DP 123953, Lot 36 DP 755249 and Lot 101 DP 604655, at 414 Old Maitland Road, Mardi, NSW.
Species credit	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.
Stewardship Site	Land upon which the stewardship agreement is proposed.
TBDC	Threatened Biodiversity Data Collection.
TEC	Threatened Ecological Community.

1 Stage 1 – Biodiversity Assessment

1.1 Introduction

It is proposed that a Stewardship Site be established within Lot 1 DP 120512, Lot 1 DP554423, Lot 1 DP 229970, Lot 1 DP 229971, Lot 101 DP 604655, Lot 41 DP 123953 and Lot 36 DP 755249, at 414 Old Maitland Road, Mardi, NSW (*the Stewardship Site*).

At the request of Transnational Pastoral Pty Ltd & The Stevens Group (*The Client*), Anderson Environment & Planning (AEP) have undertaken required investigations and calculations to inform this Biodiversity Stewardship Site Assessment Report (BSSAR).

The assessment was undertaken as per the requirements outlined in the Biodiversity Assessment Methodology (OEH 2020), (the BAM).

Extensive surveys of the Study Area, inclusive of the proposed Stewardship Site and Development Site, have been undertaken since 1998. *Ecotone Ecological Consultants* have previously undertaken field surveys of the Study Area from September 1998 to January 1999. These surveys were summarised by *Biosis* (2014) whom also performed supplementary fauna surveys in April 2014. *Travers Bushfire & Ecology* (TBE) undertook further surveys and assessment work for the Study Area both within the proposed subdivision and the proposed Stewardship Site, and compiled previous work by *Biosis* in a draft BSSAR report prepared in 2020 (TBE, 2020). AEP have reviewed and incorporated these results where appropriate, as well as undertaken additional surveys, including ground-truthing previous work, to inform this BSSAR.

1.1.1 The Proposal

A Biodiversity Stewardship Agreement is proposed for approx. 141.6 ha, which excludes easements, within the site as shown in **Figure 1**.

The agreement would see the long-term protection and conservation of land, which consists of remnant forest on low to upper slopes surrounding grazed floodplain areas. The proposal would also provide protection of approx. 2km of Deep Creek and tributaries.

A large residential subdivision is proposed to be developed directly adjacent to the BSA, which encompasses existing pasture, remnant patches, and scattered paddock trees. A number of easements dissect the southern portion of the site, including a transmission line, water pipeline, and access track. These areas have been excluded from the BSA.

1.1.2 Assessment Scope

The BSSAR presented herewith aims to quantify contributions of the site to regional biodiversity values based upon the methods described within the Biodiversity Assessment Method Order 2020 (BAM), including threatened entities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act).

This report includes:

- **Stage 1 – Biodiversity Assessment** – including the mapping of remnant vegetation communities including Endangered Ecological Communities (EECs) within the Stewardship

Site, the location of previously identified threatened species and their habitats, and potential occurrence of threatened species identified within the BAM Calculator; and

- **Stage 2 – Improving Biodiversity Values** – including the identification of management actions to improve biodiversity values, preparation of a management plan for the stewardship site, a projection of future vegetation integrity scores based on management options, and quantifying the ecosystem credits generated by the improvement in biodiversity values.

1.1.3 Site Particulars

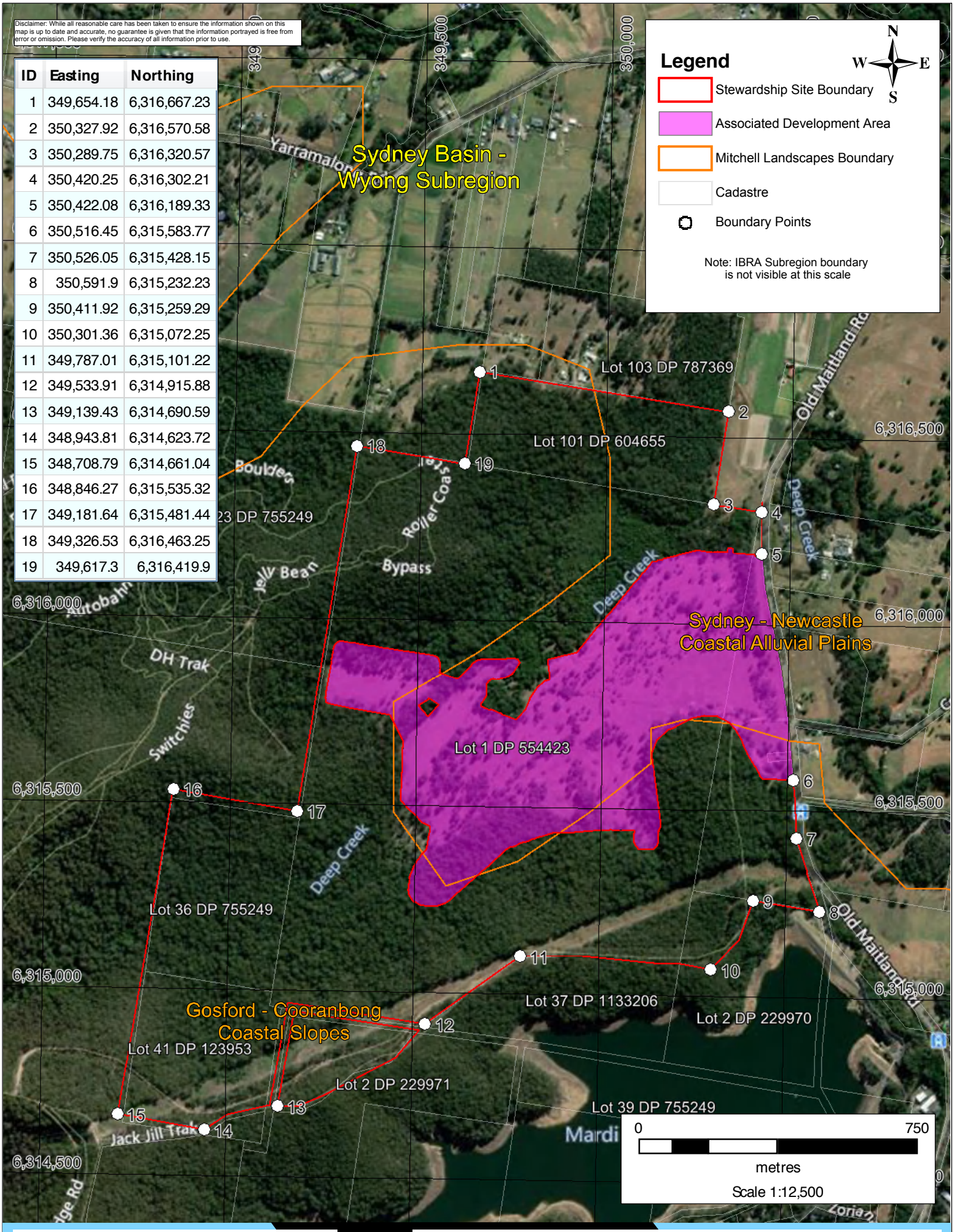
- **Address** – 414 Old Maitland Road, Mardi, NSW.
- **Title** – Lot 1 DP 120512, Lot 1 DP554423, Lot 1 DP 229970, Lot 1 DP 229971, Lot 101 DP 604655, Lot 41 DP 123953 and Lot 36 DP 755249.
- **LGA –** Central Coast.
- **Site** – The proposed Biodiversity Stewardship Site comprises 141.55 hectares.
- **Zoning –**The stewardship site is currently zoned as E2 – Environmental Conservation, of which approximately 141.6 hectares is proposed to be the subject of a Stewardship Agreement. Rezoning was undertaken to allow development of large lot residential (R5) within the grazed lowlands (the development site), with the surrounding lands zoned E2 (the stewardship site), forming the offset (or part thereof) for the development.
- **Current Land Use –** The E2 Environmental Conservation lands exists as native wet and dry sclerophyll forests and coastal swamps, whilst the R5 Large Lot Residential lands is primarily utilised for cattle and horse production.
- **Surrounding Land Use –** The floodplain paddock in the centre of the site is zoned R5 Large Lot Residential, which is currently utilised for grazing stock and horses, and will form part of the proposed development. Within the R5 lands, a second order stream traverses the paddock, which is zoned as E3 Environmental Management. The proposed Stewardship Site adjoins the Ourimbah State Forest to the immediate west. The properties adjoining to the north and east are zoned RU1 Primary Production, and are utilised for producing cattle, horses and private residence, whilst the land adjoined to the south is the Mardi Dam, zoned SP2 Infrastructure.

Figure 1 depicts the extent of the Site and **Figure 2** depicts the location of the Site within the landscape.

1.1.4 Information Sources

Information and spatial data provided within this BSSAR has been compiled from various sources including:

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- Wyong Vegetation Map v1 2016, Eco Logical Australia, prepared for Wyong Council (ELA 2016);
- OEH Threatened Species, Populations and Ecological Communities website (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile);
- Collective knowledge gained from previous ecological surveys and assessments in the Central Coast area over the past 25 years;
- BioNet Vegetation Classification (formerly known as the NSW Vegetation Information System Classification Database);
- Threatened Biodiversity Data Collection (formerly known as the Threatened Species Profile Database);
- BioNet Atlas (formerly known as the NSW Wildlife Atlas);
- eSPADE Soil Classification Portal (https://www.environment.nsw.gov.au/eSpade2Webapp);
- Spatial data collected from the online OEH spatial data catalogue (www.mapdata.environment.nsw.gov.au) and LPI spatial information exchange (https://shop.lpi.nsw.gov.au).
- Travers Ecology & Bushfire (TBE) (2020) *Biodiversity Stewardship Site Assessment Report, 414 Old Maitland Road, Mardi* (Final Draft). Unpublished report for Transnational Pastoral Pty Ltd & The Stevens Group.



ID	Easting	Northing
1	349,654.18	6,316,667.23
2	350,327.92	6,316,570.58
3	350,289.75	6,316,320.57
4	350,420.25	6,316,302.21
5	350,422.08	6,316,189.33
6	350,516.45	6,315,583.77
7	350,526.05	6,315,428.15
8	350,591.9	6,315,232.23
9	350,411.92	6,315,259.29
10	350,301.36	6,315,072.25
11	349,787.01	6,315,101.22
12	349,533.91	6,314,915.88
13	349,139.43	6,314,690.59
14	348,943.81	6,314,623.72
15	348,708.79	6,314,661.04
16	348,846.27	6,315,535.32
17	349,181.64	6,315,481.44
18	349,326.53	6,316,463.25
19	349,617.3	6,316,419.9

AEP

Title: Figure 1 - Site Map

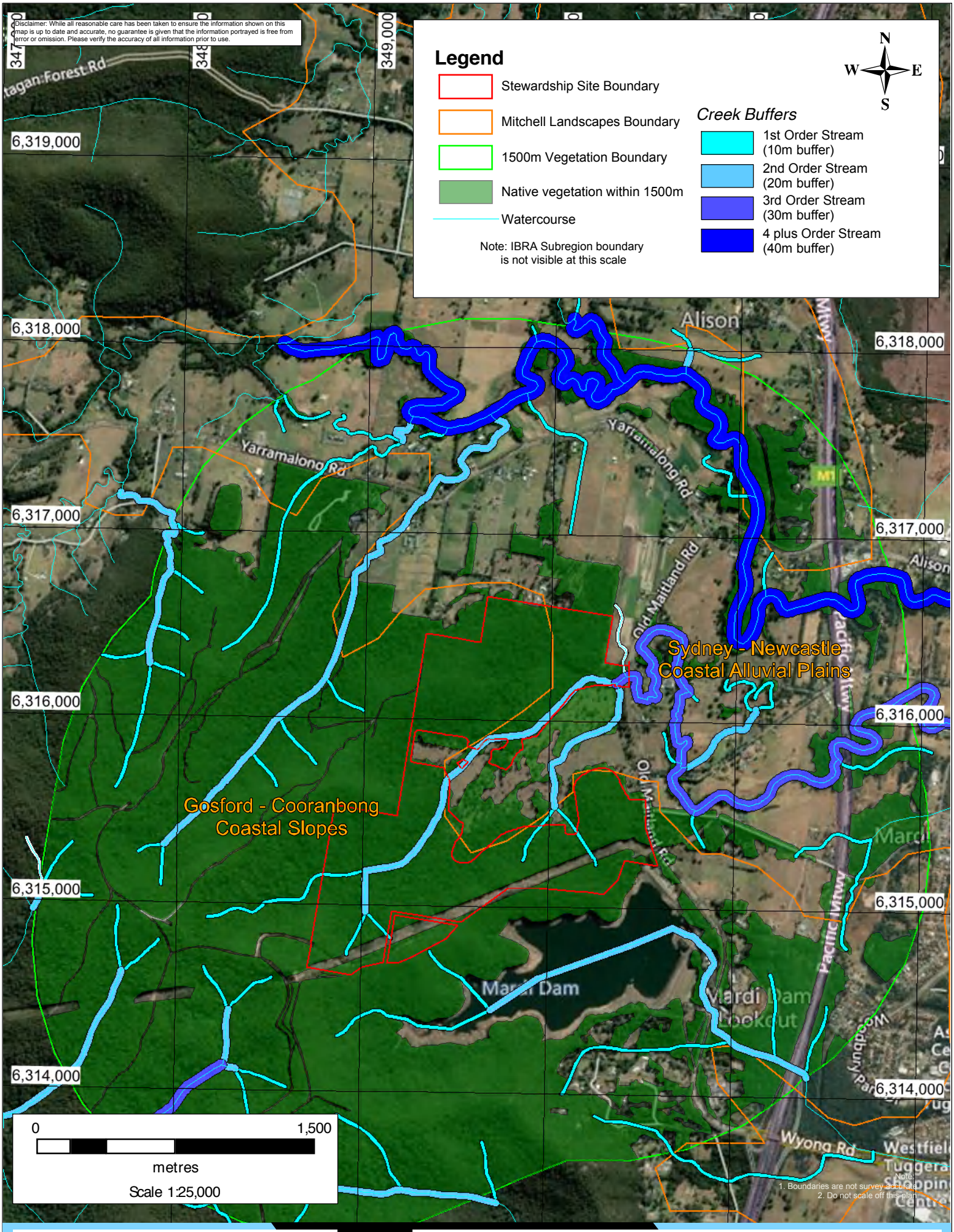
Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.02



AEP

Title: Figure 2 - Location Map

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

1.2 Landscape Features

1.2.1 Regional Landscapes

The site was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – Sydney Basin;
- *IBRA Subregion* – Wyong;
- *NSW Mitchell Landscape* – Gosford-Cooranbong Coastal Slopes landscape forms the majority of the site, predominantly on the rises surrounding floodplain areas. A small proportion of the site occurs on the floodplain forming part of the Sydney – Newcastle Coastal Alluvial Plains landscape.

Delineation of *Mitchell Landscape* areas are shown in both the Site (**Figure 1**) and Location Maps (**Figure 2**).

1.2.2 Identified Landscape Features

The Calculator identifies six (6) landscape features that require assessment for their relevance to the site. These features include:

- *Rivers and Streams*: Deep Creek (2nd order stream) runs across the entire site, with several minor tributaries spreading in the upper reaches of the site, particularly in the valley to the south-west. Deep Creek drains into the Wyong River, which in turn drains into Tuggerah Lake further to the east. Mardi Dam lies directly south of the Study Area.
- *Wetlands*: No mapped wetlands (SEPPCM or otherwise) occur within the Site.
- *Connectivity Features*. Ourimbah State Forest directly adjoins the site to the west.
- *Areas of geological significance and soil hazard features*: No areas of geological significance or soil hazard features are present.
- *Features identified in SEARs for major projects*: N/A
- *Areas of Outstanding Biodiversity Value (AOBV) under the BC Act*: None.

1.3 Site Context Components

1.3.1 Assessment Method

Layout of the Site allowed for the landscape values to be determined based upon a site-based method, rather than that of a linear method.

Extensive surveys of the Study Area, inclusive of the proposed Stewardship Site and Development Site, have been undertaken since 1998. *Ecotone Ecological Consultants* have previously undertaken field surveys of the Study Area from September 1998 to January 1999. These surveys were summarised by *Biosis* (2014) whom also performed supplementary fauna surveys in April 2014. *Travers Bushfire & Ecology* (TBE) undertook further surveys and assessment work for the

Study Area, and compiled previous work by *Biosis* in their draft BSSAR report prepared in 2020 (TBE, 2020). AEP have reviewed and incorporated these results where appropriate, as well as undertaken additional surveys to ground-truth previous work, to inform this BSSAR. The Field Survey Effort table in **Appendix E** details the aforementioned field survey effort.

1.3.2 Landscape Native Vegetation Cover

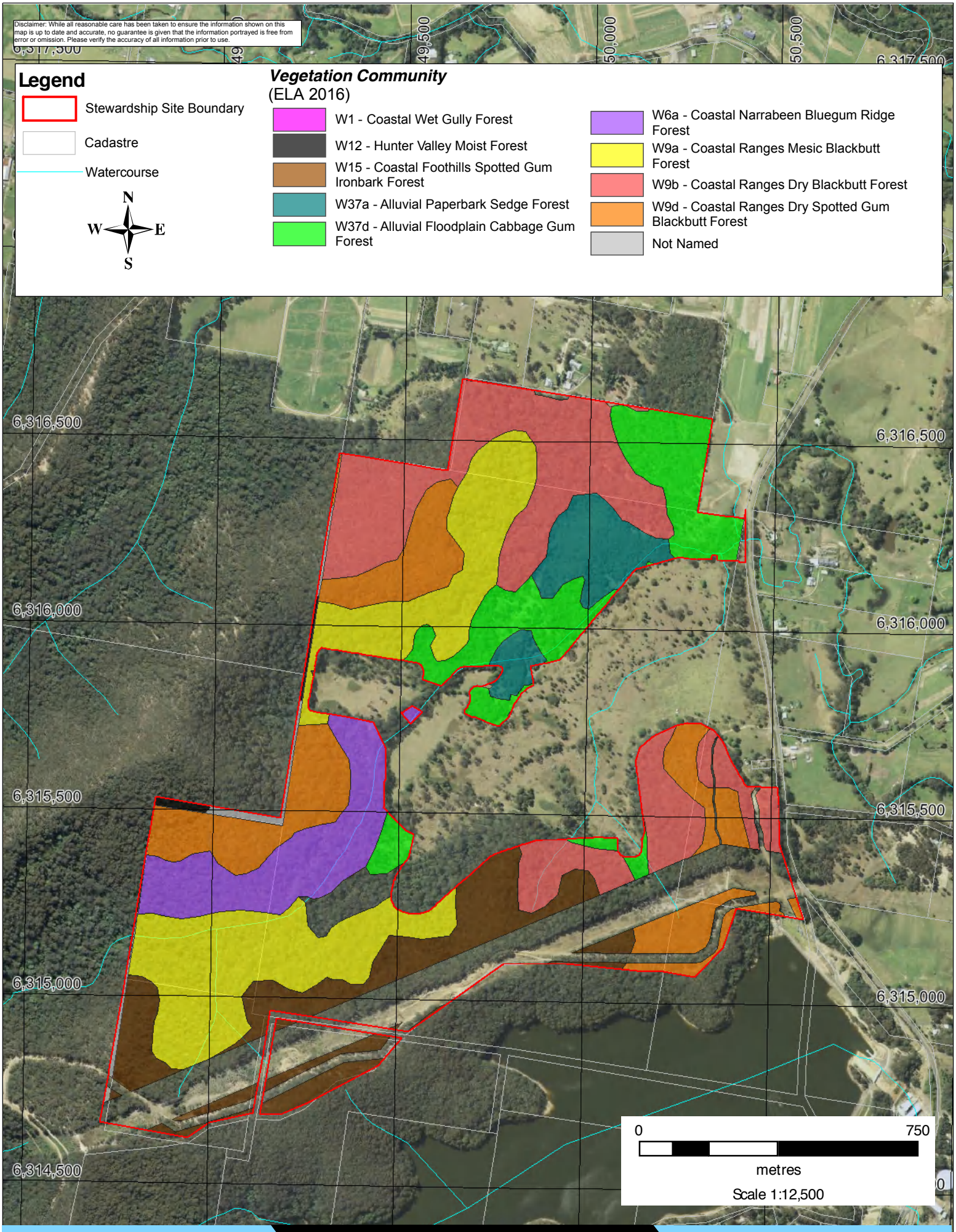
The 1500m buffer placed around the Site is approximately 1,844 ha in size. Of this, approximately 1,141 ha comprises of native vegetation as per **Section 4.3.2** of the BAM. This equates to approximately **62%** native vegetation cover and was entered as such within the Calculator.

1.3.3 Regional Mapping

The Wyong Vegetation Map (ELA, 2016) was used to determine the vegetation communities likely present on the Site, as shown below in **Tables 1** below, and **Figure 3**.

Table 1 – Wyong Vegetation Map Results

Eco Logical Australia (2016) Vegetation Unit	Vegetation Unit	Area (ha)
Coastal Wet Gully Forest	W1	2.36
Coastal Narrabeen Bluegum Ridge Forest	W6a	12.67
Coastal Ranges Mesic Blackbutt Forest	W9a	31.54
Coastal Ranges Dry Blackbutt Forest	W9b	52.39
Hunter Valley Moist Forest	W12	0.6
Coastal Foothills Spotted Gum Ironbark Forest	W15	16.86
Alluvial Paperbark Sedge Forest	W37a	7.95
Alluvial Floodplain Cabbage Gum Forest	W37d	16.56
Not named	NNV	1.2
Total		**142.13**



AEP

Title: Figure 3 - Regional Vegetation

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and The Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

1.3.4 Habitat Trees

Hollow-bearing tree (HBT) surveys were conducted as traverses across the site, and opportunistically during site surveys by *Biosis* for a flora and fauna assessment report in January 2014 and by *Travers Bushfire & Ecology* in 2019. *Biosis* identified 20 hollow bearing trees, whilst *Travers* identified 14 HBT's providing large hollows, within the proposed Stewardship Site. A total of 24 HBT's were observed during these surveys (**Figure 6**).

A wide range of hollow sizes were observed and would represent a viable habitat resource for most guilds of native fauna that utilise tree hollows including birds, microbats, possums, and gliders, and herpetofauna. All 14 hollows recorded by *Travers* were large hollows, providing potentially suitable use by threatened Owls, Cockatoos and other large birds.

1.4 Vegetation Zones

1.4.1 Zone 1 (PCT 684) - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest, northern Sydney Basin Bioregion (Shrubby sub-formation).

Location: Most of the southern portion of the site occurs on ridgelines, in the centre-north and in forested patched of the centre east and west (Plots 1, 2, 3, 4, 5 & 6).

Disturbance History: Firetails with several offshoots traverse the southern portion of this PCT. While the majority of this PCT is in good to moderate condition, the zone along the slope in the north-west, and a patch in the south-east adjacent to Old Maitland Road, has large Lantana thickets. Edge effects including grazing by stock and horses, weed cover and occasional dumping are evident at the margins of the grazed paddock, and adjacent to Old Maitland Road.

Structure: Shrubby sub-formation

Weed Load: Low. Primarily species associated with pastures and roadsides. Includes, Lantana *(Lantana camara)*, Camphor Laurel (*Cinnamomum camphora*), Narrow-leaved Carpet Grass (*Axonopus fissifolius*), Asparagus Fern (*Asparagus aethiopicus*) and Large-leaved Privet (*Ligustrum lucidum*).

Upper Stratum: Includes, Blackbutt *(Eucalyptus pilularis)*, Sydney Blue Gum *(E. saligna)*, Red Mahogany *(E. resinifera)*, Turpentine *(Syncarpia glomulifera)*, Spotted Gum *(Corymbia maculata)*, Rough-barked Apple *(Angophora floribunda)* and Forest Red Gum (*Eucalyptus tereticornis)* dominate the upper stratum. The lower canopy includes species Cheese Tree *(Glochidion ferdinandi)*, Forest Oak *(Allocasuarina torulosa)*, Cabbage Tree Palm *(Livistona australis)*,(Willow Bottlebrush *(Callistemon salignus)*, Snow in Summer *(Melaleuca linariifolia*) and Prickly-leaved Tea Tree (*M. styphelioides*).

Mid-Stratum: *Acacia irrorata* (Green Wattle), *A. maidenii* (Maiden's Wattle), *Notelaea longifolia* (Mock Olive), *Breynia oblongifolia* (Coffee Bush), *Persoonia linearis* (Narrow-leaved Geebung, *Acacia ulicifolia* and *Leucopogon juniperinus* (Prickly Beard-heath).

Lower-Stratum: *Echinopogon ovatus* (Forest Hedgehog Grass), *Entolasia marginata* (Bordered Panic), *Microlaena stipoides* (Weeping Grass), *Lomandra longifolia* (Spiky-headed Mat-rush), *L. filiformis* (Wattle Matt-rush), *Dichondra repens* (Kidney Weed), *Centella asiatica* (Swamp

Pennywort), *Gymnostachys anceps* (Settlers Flax), *Oplismenus aemulus* (Basket Grass), *O. imbecillis*, *Pteridium esculentum* (Bracken), *Carex longebrachiata* (Bergalia Tussock), *Dianella caerulea* (Blue Flax-lily), *Adiantum aethiopicum* (Common Maidenhair), *Blechnum cartilagineum* (Gristle Fern), *Calochlaena dubia* (Rainbow fern), *Lobelia purpurascens* (Whiteroot) and *Entolasia stricta* (Wiry Panic).

Plate 1 – PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest, northern Sydney Basin Bioregion (Shrubby sub-formation).

1.4.2 Zone 2 (PCT 1723) - Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast (Coastal Swamp Forests).

Location: A large portion occurs predominantly in the north adjacent to grazed paddocks (Plots 7, 8, 9 & 11)

Disturbance History: Occurs within margins to canopy edges and has been grazed and compacted but is in otherwise good condition.

Structure: Forested Wetlands. A creek and small tributaries run across the PCT area.

Weed Load: Low. *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), and *Cinnamomum camphora* (Camphor Laurel).

Upper Stratum: Predominately comprises of *Melaleuca biconvexa* (Biconvex Paperbark), *M. linariifolia* (Snow in Summer), *M. nodosa* (Ball Honey Myrtle). Co-dominant species are *Eucalyptus robusta* (Swamp Mahogany), *E. saligna* (Sydney Blue Gum) with occasional *E. tereticornis* (Forest Red Gum), *E. amplifolia*, (Cabbage Gum), E. *Pilularis* (Blackbutt), *Angophora floribunda* (Rough

Barked Apple). The lower canopy includes *Callistemon salignus* (Willow Bottlebrush), *Alphitonia excelsa* (Red Ash) and *Glochidion ferdinandi* (Cheese Tree).

Mid-Stratum: Consists of *Persoonia linearis* (Narrow-leaved Geebung), *Breynia oblongifolia* (Coffee Bush), *Pultenaea retusa*, *Maytenus sylvestris* (Orange Bush), *Pittosporum multiflorum* (Orange Thorn) and *Notelaea longifolia* (Mock Olive).

Lower-Stratum: Comprises of *Entolasia marginata* (Bordered Panic), *Microlaena stipoides* (Weeping Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Oplismenus aemulus* (Basket Grass), *O. imbecillis*, *Centella asiatica* (Swamp Pennywort), *Brunoniella pumilio* (Dwarf Blue Trumpet), *Dichondra repens* (Kidney Weed), *Lomandra longifolia* (Spiky-headed Mat-rush), *Oxalis perennans* (Yellow-flowered Wood Sorrel), *Carex appressa* (Tall Sedge), *C. longebrachiata* (Bergalia Tussock), *Gahnia clarkei* (Tall Saw-sedge), *Pseuderanthemum variabile* (Pastel Flower) and *Adiantum aethiopicum* (Common Maidenhair).

Plate 2 – PCT 1723 - Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast (Coastal Swamp Forests).

1.4.3 Zone 3 (PCT 1568) - Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (Shrubby sub-formation).

Location: Occurs throughout the creeks and it's several tributaries, steep ridges and valleys within the south-west of the Stewardship Site (Plots 10, 12, 14 & 14).

Disturbance History: Some trails meander throughout the PCT area.

Structure: High canopy cover, typically 70% or more as well as regrowth canopy species, with an open to moderate shrub layer at higher elevations, and denser towards the mesic drainage lines below.

Weed Load: Predominately low, with higher loads of *Lantana camara* (Lantana) in parts of the creek.

Upper Stratum: *Syncarpia glomulifera* (Turpentine), *Eucalyptus pilularis* (Blackbutt), *E. saligna* (Sydney Blue Gum), *E. deanei* (Mountain Blue Gum), *Cryptocarya microneura* (Thick-leaved Laurel), *Archontophoenix cunninghamiana* (Bangalow Palm), *Livistona australis* (Cabbage Tree Palm), *Backhousia leptopetala* (Brush Turpentine), *Synoum glandulosum* (Scentless Rosewood), *Acmena smithii* (Lillypilly), *Pittosporum multiflorum* (Orange Thorn), *Glochidion ferdinandi* (Cheese Tree) and *Livistona australis* (Cabbage Tree Palm).

Mid-Stratum: *Diospyros australis* (Black Plum), *Ripogonum album* (White Supplejack), *Wilkiea huegeliana*, *Rhodamnia rubescens* (Scrub Turpentine), *Pittosporum multiflorum* (Orange Thorn), *Maytenus sylvestris* (Orange Bush), *Breynia oblongifolia* (Coffee Bush), *Notelaea longifolia* (Mock Olive) and *Ficus coronata* (Sandpaper Fig).

Lower-Stratum: *Lomandra longifolia* (Spiky-headed Mat-rush), *Carex longebrachiata* (Bergalia Tussock), *Gymnostachys anceps* (Settlers Flax), *Dianella caerulea* (Blue Flax-lily), *Adiantum aethiopicum* (Common Maidenhair), *Blechnum cartilagineum* (Gristle Fern), *Calochlaena dubia* (Rainbow Fern) and *Doodia aspera* (Prickly Rasp Fern).

Plate 3 – PCT 1568 - Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (Shrubby sub-formation).

1.4.4 Zone 4 (PCT 1720) - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Coastal Floodplains Forest).

Location: Occurs as fragmented patches in the north-east, adjacent to Old Maitland Road, and is associated with PCT 1723 (Plots 15, 16 & 30).

Disturbance History: Edge effects including grazing by stock and horses, weed cover and occasional dumping are evident at the margins of the grazed paddock, and adjacent to Old Maitland Road.

Weed Load: Low, and consists of *Lantana camara* (Lantana), *Axonopus fissifolius* (Narrow-leaved Carpet Grass), *Cinnamomum camphora* (Camphor Laurel), *Rubus fruticosus agg.* (Blackberry complex).

Upper Stratum: *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum), *Angophora floribunda* (Rough-barked Apple) as well as occasional *E. robusta* (Swamp Mahogany) and *Alphitonia excelsa* (Red Ash).

Mid Stratum: *Melaleuca styphelioides* (Prickly-leaved Tea Tree), *M. nodosa* (Ball Honey Myrtle), *M. linariifolia* (Snow in Summer), *Callistemon salignus* (Willow Bottlebrush), *Glochidion ferdinandi* (Cheese Tree), *Breynia oblongifolia* (Coffee Bush) and *Acacia irrorata* (Green Wattle).

Lower-Stratum: *Entolasia marginata* (Bordered Panic), *Imperata cylindrica* (Blady Grass), *Oplismenus aemulus* (Basket Grass), *Pteridium esculentum* (Bracken), *Dichondra repens* (Kidney Weed), *Carex longebrachiata* (Bergalia Tussock), and *Lobelia purpurascens* (Whiteroot).

Plate 4 – PCT 1720 - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Coastal Floodplains Forest).

1.4.5 Zone 5 (PCT 1590) - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (shrub/grass sub-formation).

Location: Occurs on the tops of ridgelines, at 30-80 meters elevation, predominately in the north-west and centre-west corners, with a patch in the south and south-east of the Stewardship Site (Plots 17, 18, 19, 21 & 24).

Disturbance History: Two firetails occur within the north-western and south-eastern sections of this PCT area and is in otherwise in good condition.

Structure: Open forest with a shrub layer of 15-20%, with a sparse shrub and ground layer consisting of native species.

Weed Load: Low. Pockets of weeds occur throughout this vegetation zone including, *Lantana camara* (Lantana), *Cinnamomum camphora* (Camphor Laurel), *Asparagus aethiopicus* (Asparagus Fern) and *Verbena rigida var. rigida* (Veined Verbena).

Upper Stratum: Consists of *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark), *E. siderophloia* (Northern Grey Ironbark), *E. acmenoides* (White Mahogany), *E. pilularis* (Blackbutt), *E. umbra* (Broad-leaved White Mahogany) and *Allocasuarina torulosa* (Forest Oak).

Mid Stratum: *Persoonia linearis* (Narrow-leaved Geebung), *Podolobium ilicifolium* (Prickly Shaggy Pea), *Bursaria spinosa* (Native blackthorn), *Leucopogon juniperinus* (Prickly Beard-heath), *Breynia oblongifolia* (Coffee Bush), *Daviesia ulicifolia* (Gorse Bitter Pea), *Bossiaea obcordata* (Spiny Bossiaea), *Acacia elongata* (Swamp Wattle) and *Acacia longifolia* (Sydney Golden Wattle).

Lower Stratum: *Imperata cylindrica* (Blady Grass), *Microlaena stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *E. marginata* (Bordered Panic), *Themeda triandra* (Kangaroo

Grass), *Lomandra longifolia* (Spiky-headed Mat-rush), *L. filiformis* (Wattle Matt-rush), *Lepidosperma laterale* (Variable Sword-sedge), *Pteridium esculentum* (Bracken), *Dianella caerulea* (Blue Flax-lily), *Pomax umbellata* (Pomax), *Lobelia purpurascens* (Whiteroot) and *Cheilanthes sieberi* (Rock Fern).

Plate 5 – PCT 1590- Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (shrub/grass sub-formation).

1.4.6 Zone 6 (PCT 1718) Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Coastal Swamp Forests).

Location: Occurs on low-lying and relatively flat areas of the site, predominately in the north-east, and a patch to the south-east of the paddock (Plots 22, 23 & 28).

Disturbance History: This PCT is in good condition with low disturbance observed. The larger patch in the north-east is enclosed within the Lot by barbed-wire fencing.

Structure: Swamp forest on a floodplain, with an open canopy of 10-50% PFC, with a fuller PFC in the mid-storey of 20-60%.

Weed Load: Low, with some occurrence of *Lantana camara* (Lantana), *Paspalum dilatatum* (Paspalum) and *Solanum nigrum* (Black Nightshade).

Upper Stratum: *Eucalyptus robusta* (Swamp Mahogany), *E. resinifera* (Red Mahogany), *E. saligna* (Sydney Blue Gum), *E. tereticornis* (Forest Red Gum), *Melaleuca linariifolia* (Snow in Summer), *M. biconvexa* (Biconvexa Paperbark), and *M. nodosa* (Ball Honey Myrtle).

Mid Stratum: *Notelaea longifolia* (Mock Olive), *Acacia longifolia* (Sydney Golden Wattle), *A. irrorata* (Green Wattle), *Breynia oblongifolia* (Coffee Bush), *Myrsine variabilis* (Muttonwood) and *Leptospermum polygalifolium* (Tantoon).

Lower Stratum: *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry Panic*), Oplismenus Aemulus* (Basket Grass), *Pteridium esculentum* (Bracken), *Dichondra repens* (Kidney Weed), *Dianella caerulea* (Blue Flax-lily), *Lomandra longifolia* (Spiky-headed Mat-rush), *Carex longebrachiata* (Bergalia Tussock) and *Gahnia clarkei* (Tall Saw-sedge).

Plate 6 – PCT 1718 Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Coastal Swamp Forests).

The area of each vegetation zone within the Stewardship Site is provided in **Table 2** and **Figure 4**.

Zones were largely ascribed to age class, transitional nature, degree of disturbance and dominant assemblages as there is a homogenous presence of disturbance responsive among native species across the site which are not always indicative of the stable community composition.

Table 2 – Vegetation Zones

Zone	PCT	Vegetation Type	Condition	Area (ha)
1	684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest, northern Sydney Basin Bioregion (Shrubby sub-formation).	Good	51.1
2	1723	Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast (Coastal Swamp Forests).	Good	15.12
3	1568	Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (Shrubby sub-formation).	Good	30.66
4	1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Coastal Floodplains Forest).	Good	3.37
5	1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (shrub/grass sub-formation).	Good	29.37
6	1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Coastal Swamp Forests).	Good	11.93
Total – Remnant Vegetation (Stewardship Site)				**141.55**

1.5 Plant Community Types (PCTs)

The Stewardship Site was found to be comprised of six (6) Plant Community Types (PCTs). In determining the PCTs the management history of the site was also taken into account. Whilst the flat paddock areas which the Stewardship Site envelopes has a historic and current usage for grazing, the ridges and slopes of the Stewardship Site itself is a combination of remnant vegetation, and regenerated native vegetation, marginally disturbed in recent history.

Emphasis was placed on PCTs 'best fit' to describe the vegetation composition, structure, geophysical, and threatened species habitat values of the site.

1.5.1 Plant Community Types (PCTs) considered

Table 3 details the considerations taken in determining relevant PCTs and search sequence in the NSW Bionet Vegetation Classification PCT database. The results are based on PCT diagnostic species from plot data, as detailed in **Section 1.4** and **Appendix A**, and other factors such as disturbance history and surrounding vegetation characteristics. Species in **bold** were filtered in search sequence in the NSW Bionet Vegetation Classification PCT database, whilst the other species listed are diagnostic species of the resultant PCT, recorded within BAM plots within each zone.

Table 3 – PCT Determination

Search Item	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Wyong	Wyong	Wyong	Wyong	Wyong	Wyong
NSW Landscape	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.	Gosford-Cooranbong Coastal Slopes and Sydney – Newcastle Coastal Alluvial Plains.
Vegetation Formation	Wet Sclerophyll (shrubby sub-formation).	Coastal Swamp Forests.	Wet Sclerophyll (shrubby sub-formation).	Coastal Floodplains Forest.	Dry Sclerophyll (shrub/grass sub-formation).	Coastal Swamp Forests.
Upper Stratum Species	***Eucalyptus pilularis, Corymbia maculata***, *Angophora floribunda, Allocasuarina torulosa, Syncarpia glomulifera,*	***Melaleuca biconvexa***, *Eucalyptus robusta, Melaleuca linariifolia, Eucalyptus saligna.*	***Eucalyptus saligna***, ***Syncarpia glomulifera***, *Eucalyptus pilularis.*	***Eucalyptus tereticornis***, ***Angophora floribunda,*** *Eucalyptus amplifolia.*	***Corymbia maculate.***	***Eucalyptus robusta, Angophora floribunda.***
Mid Stratum Species	***Breynia oblongifolia***, ***Persoonia linearis***, *Syncarpia glomulifera.*	*Callistemon salignus,, Glochidion ferdinandi, Melaleuca linariifolia.*	***Cryptocarya microneura***, ***Acmena smithii***, *Wilkiea huegeliana, Glochidion ferdinandi, Livistona australis, Rhodamnia rubescens, Dioscorea transversa.*	***Melaleuca linariifolia.***	***Allocasuarina torulosa,*** *Daviesia ulicifolia, Persoonia linearis, Breynia oblongifolia, Leucopogon juniperinus, Daviesia ulicifolia.*	***Melaleuca linariifolia, Glochidion ferdinandi***, *Callistemon salignus, Acacia longifolia.*
Ground Stratum Species	***Pteridium esculentum***, ***Imperata cylindrica,*** *Dianella caerulea, Lomandra longifolia, Pseuderanthemum variabile.*	*Oplismenus aemulus, Entolasia marginata..*	*Blechnum cartilagineum, Doodia aspera, Calochlaena dubia, Gymnostachys anceps, Dianella caerulea.*	***Carex longebrachiata***, *Dichondra repens,* ***Microlaena stipoides.***	*Lepidosperma laterale, Cheilanthes sieberi, Microlaena stipoides, Lobelia purpurascens, Dianella caerulea, Lomandra multiflora.*	*Gahnia clarkei, Entolasia marginata, Lomandra longifolia, Dianella caerulea, Pteridium esculentum, Oplismenus aemulus.*
PCT Options	684, 1556, 1564, 1579, 1584	1723	1568	1718, 1720	1183, 1590, 1602	659, 1650, 1718

Search Item	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
PCT Justification	Diagnostics not right for 1556, 1579 & 1584. Difficult to split 684 & 1564 based on canopy and shrub layer. In this case 684 is more appropriate based on absence of ferns in the ground layer.	*Melaleuca biconvexa* dominant, no other suitable alternatives.	Dominant canopy and shrub layer species in BAM plots are diagnostic of 1568, no other suitable alternatives	Presence of *Angophora. floribunda* & *Eucalyptus robusta* indicates 1718, however E. tereticornis & E. amplifolia indicates 1720. In this case 1720 is more appropriate based on diagnostics in the ground layer.	Landform and diagnostics not right for 1183. 1602 occurs further north in the Hunter Valley.	Dominant canopy and shrub layer species in BAM plots are diagnostic of 1718, no other suitable alternatives.
Result	**684**	**1723**	**1568**	**1720**	**1590**	**1718**

1.5.2 Vegetation Information System (VIS) Characteristics

Table 4 shows the analysis of the online VIS database has identified the following characteristics for the identified PCTs.

Table 4 – VIS Classification

Plant Community Type (PCT) ID	PCT 684	PCT 1723	PCT 1568	PCT 1720	PCT 1590	PCT 1718
PCT Name	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion.	Melaleuca biconvexa – Swamp Mahogany – Cabbage Palm swamp forest of the Central Coast.	Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast.	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast.	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest.	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast.
Vegetation Formation (Keith 2004)	Wet Sclerophyll Forests (Shrubby sub-formation)	Forested Wetlands	Wet Sclerophyll Forests (Shrubby sub-formation)	Forested Wetlands	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Forested Wetlands
Vegetation Class (Keith 2004)	North Coast Wet Sclerophyll Forests	Coastal Swamp Forests	North Coast Wet Sclerophyll Forests	Coastal Floodplain Wetlands	Hunter-Macleay Dry Sclerophyll Forests	Coastal Swamp Forests
Defining Species – Canopy	*Eucalyptus. pilularis, E. acmenoides, E. paniculata, Syncarpia glomulifera, Angophora floribunda, Allocasuarina torulosa.*	*M. biconvexa, Acmena smithii, Livistona australis, E. robusta, E. saligna.*	*E. pilularis, Syncarpia glomulifera, E. saligna, E. acmenoides.*	*E. tereticornis, E. amplifolia*	*Corymbia. maculata, E. umbra, E. fibrosa.*	*E. robusta, A. floribunda.*
Defining Species – Shrub	*Breynia oblongifolia, Eustrephus latifolius, Notelaea longifolia, Persoonia linearis, Synoum glandulosum.*	*Callistemon salignus, Glochidion ferdinandi, Melaleuca linariifolia, Melaleuca styphelioides.*	*Acmena smithii, Pittosporum revolutum, Glochidion ferdinandi, Livistona australis, Rhodamnia rubescens.*	*Carex appressa, Cynodon dactylon, Dichondra repens, Carex longebrachiata, Microlaena stipoides.*	*Pultenaea villosa, Persoonia linearis, Breynia oblongifolia, Bursaria oblongifolia, Leucopogon juniperinus.*	*Melaleuca linariifolia, Glochidion ferdinandi, Callistemon salignus, Acacia longifolia.*
Defining Species – Ground	*Dianella caerulea, Lomandra longifolia, Pteridium esculentum.*	*Gahnia clarkei, Hypolepis muelleri, Carex appressa, Oplismenus imbecillis.*	*Blechnum cartilagineum, Doodia aspera, Calochlaena dubia, Gymnostachys anceps.*	*Melaleuca linariifolia, Melaleuca ericifolia.*	*Lepidosperma laterale, Cheilanthes sieberi, Microlaena stipoides, Themeda australis.*	*Gahnia clarkei, Entolasia marginata, Lomandra longifolia, Viola hederacea, Pteridium esculentum.*
Estimate cleared value of PCT (%) in CMA	42	92	40	90	48	74

Plant Community Type (PCT) ID	PCT 684	PCT 1723	PCT 1568	PCT 1720	PCT 1590	PCT 1718
Associated TEC	None.	Swamp Sclerophyll Forest on Coastal Floodplains.	None.	River-Flat Eucalypt Forest on Coastal Floodplains	Lower Hunter Spotted Gum Ironbark Forest.	Swamp sclerophyll forest on coastal floodplains

1.5.3 Patch Size

The native vegetation within the Stewardship Site forms a largely contiguous parcel of remnant native vegetation in and connected to the Ourimbah State Forest to the west, in excess of 10,000 ha. The Ourimbah State Forest connects to the larger Watagan Mountain Range to the north, and Yengo National Park as a contiguous remnant vegetation, which all form part of the forested, south-eastern part of the Great Dividing Range.

Therefore, as per the definition of a patch within the BAM, the maximum patch size of '≥100ha' is appropriate for each vegetation zone and was entered as such within the Calculator.

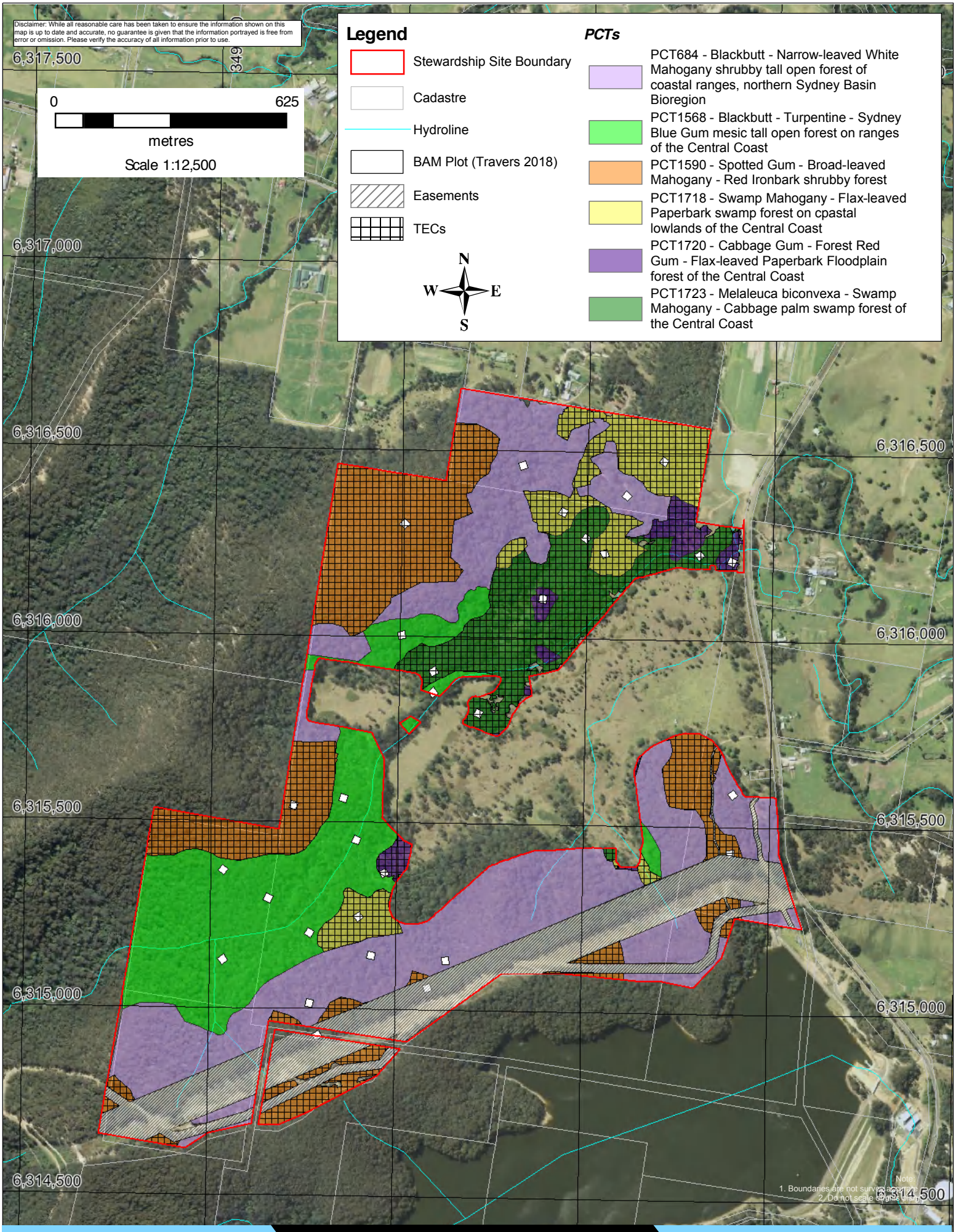
1.5.4 Vegetation Integrity Score

Thirty-one (31) plots were completed within the study area between May and June 2018 within each vegetation zone as per requirements within Table 4 of the BAM (see **Figure 4**). Plot data was used to determine the composition, structure and function condition score for each zone, which together comprise the vegetation integrity score. Plot data has been tabulated below in **Table 5** and includes corresponding condition scores along with the overall vegetation integrity score for each zone.

See **Appendix A** for individual Plot attributes. See **Figure 4** for the location of each plot.

Table 5 – Vegetation Integrity Score

		Current Vegetation Integrity Score			
PCT	**Vegetation Zone**	**Composition**	**Structure**	**Function**	**Current VIS**
684	1	60.6	55	99.8	69.3
1723	2	87.6	59.6	46.7	62.5
1568	3	65.2	70.4	100	77.2
1720	4	76.9	75.1	99.5	83.1
1590	5	72.6	61.6	95.5	75.3
1718	6	94.4	97.3	62.8	83.3



AEP

Title: Figure 4 - PCTs and BAM Plot Locations

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and The Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

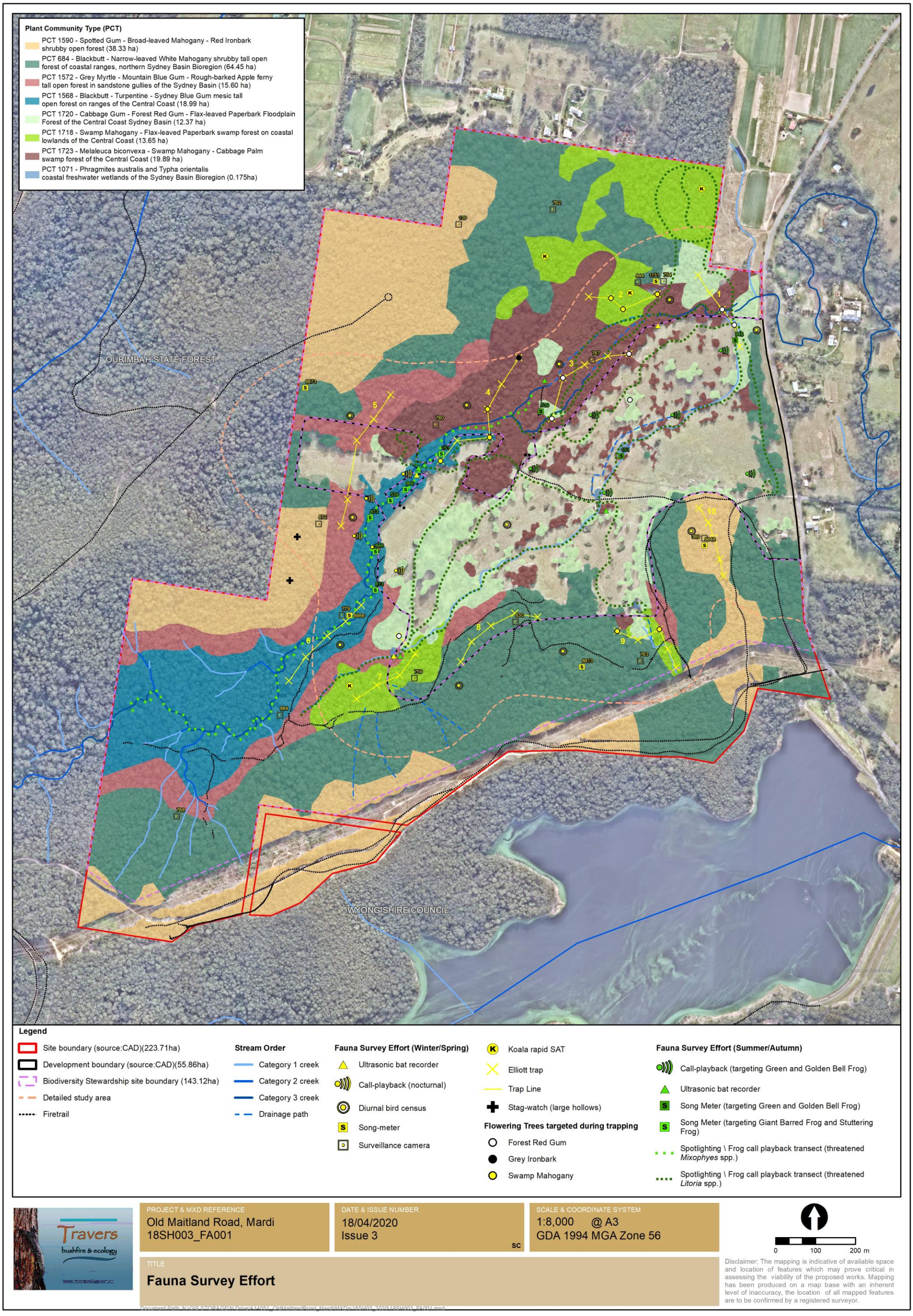
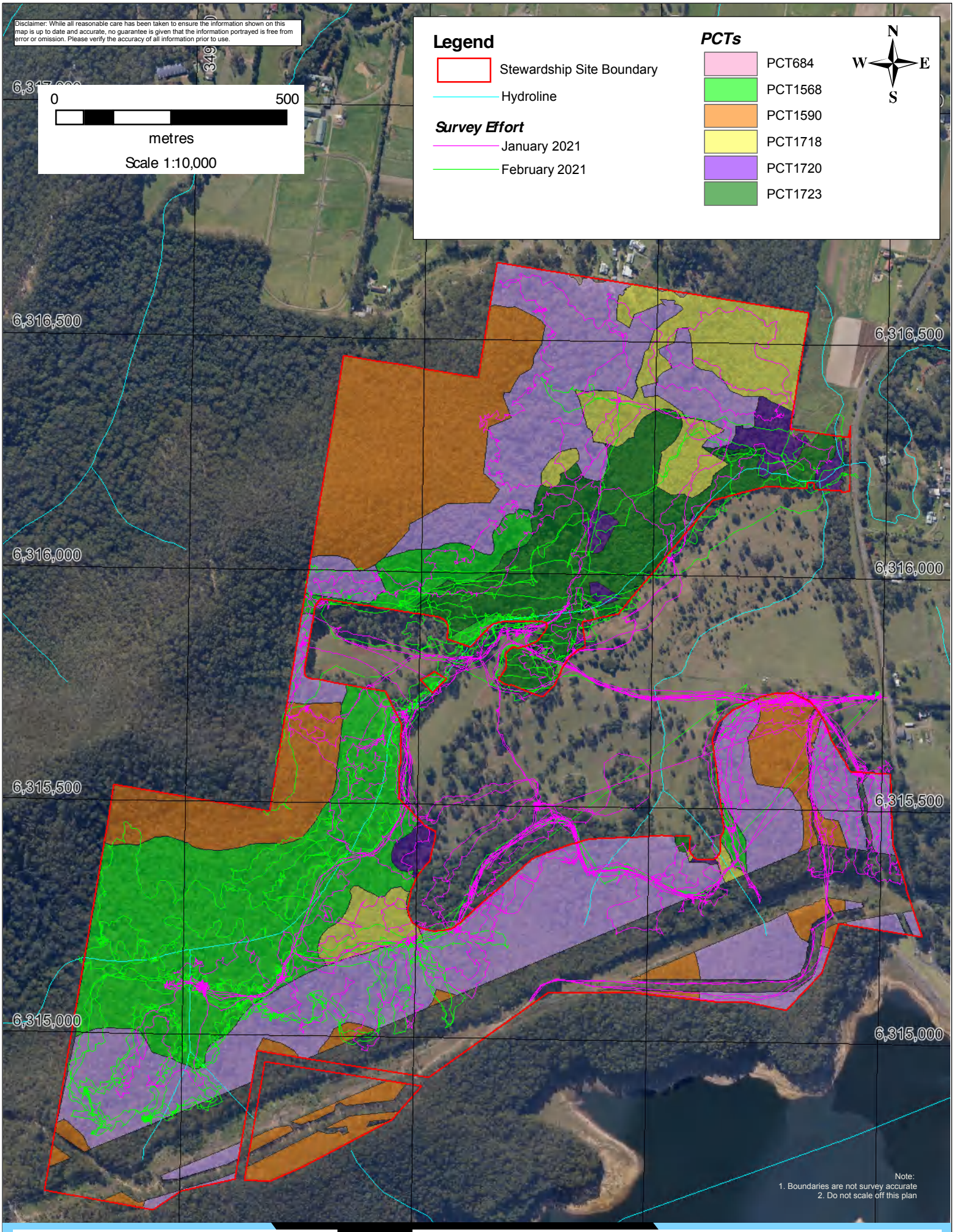


Figure 3.2 – Fauna survey effort



AEP

Title: Figure 6 - AEP Threatened Flora Survey Effort

Date: May 2021

Location: Old Maitland Road, Mardi

BOAMS Ref: 14546

Client: Transnational Pastoral Pty Ltd and The Stevens Group

AEP Ref: 1910.06

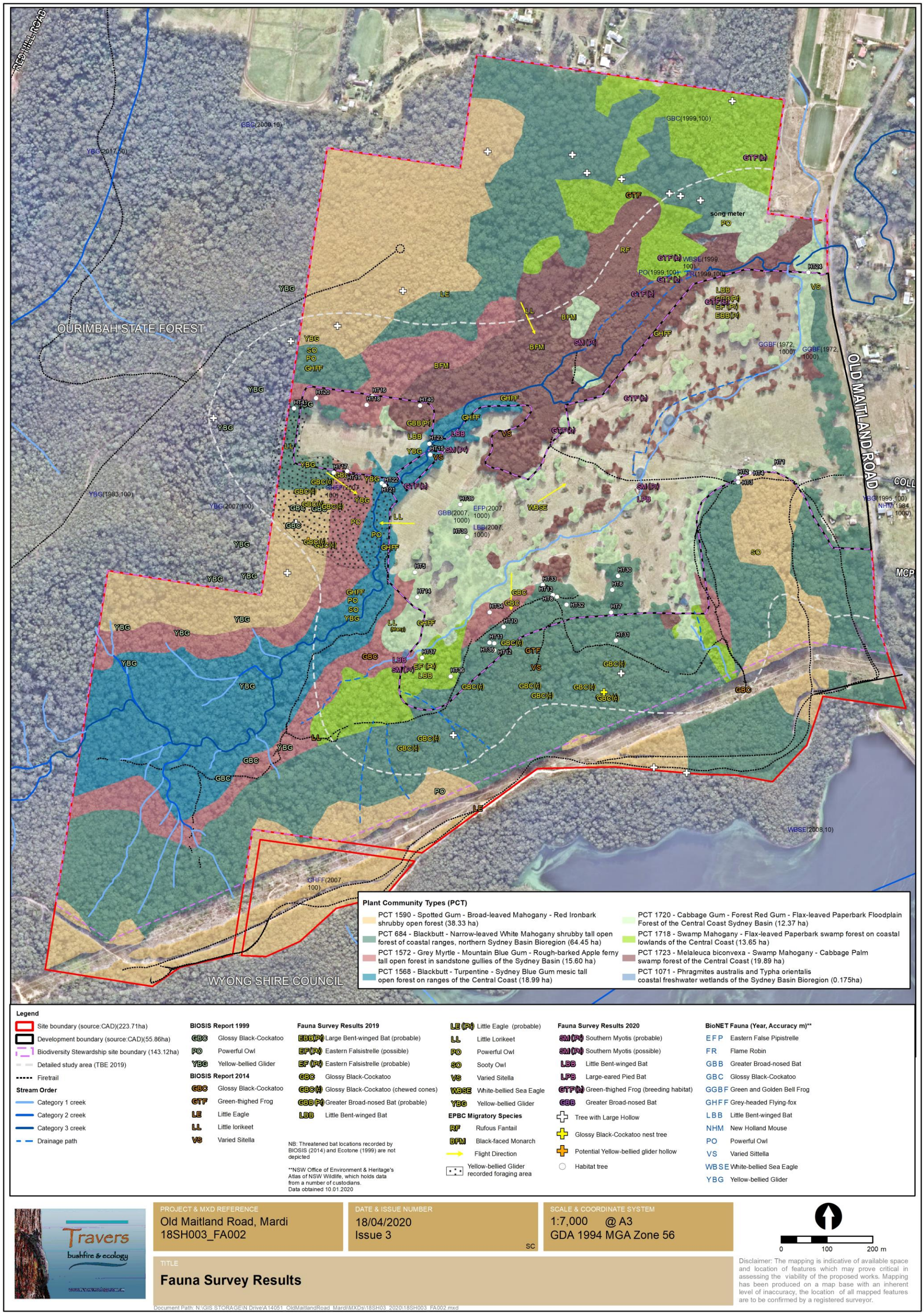
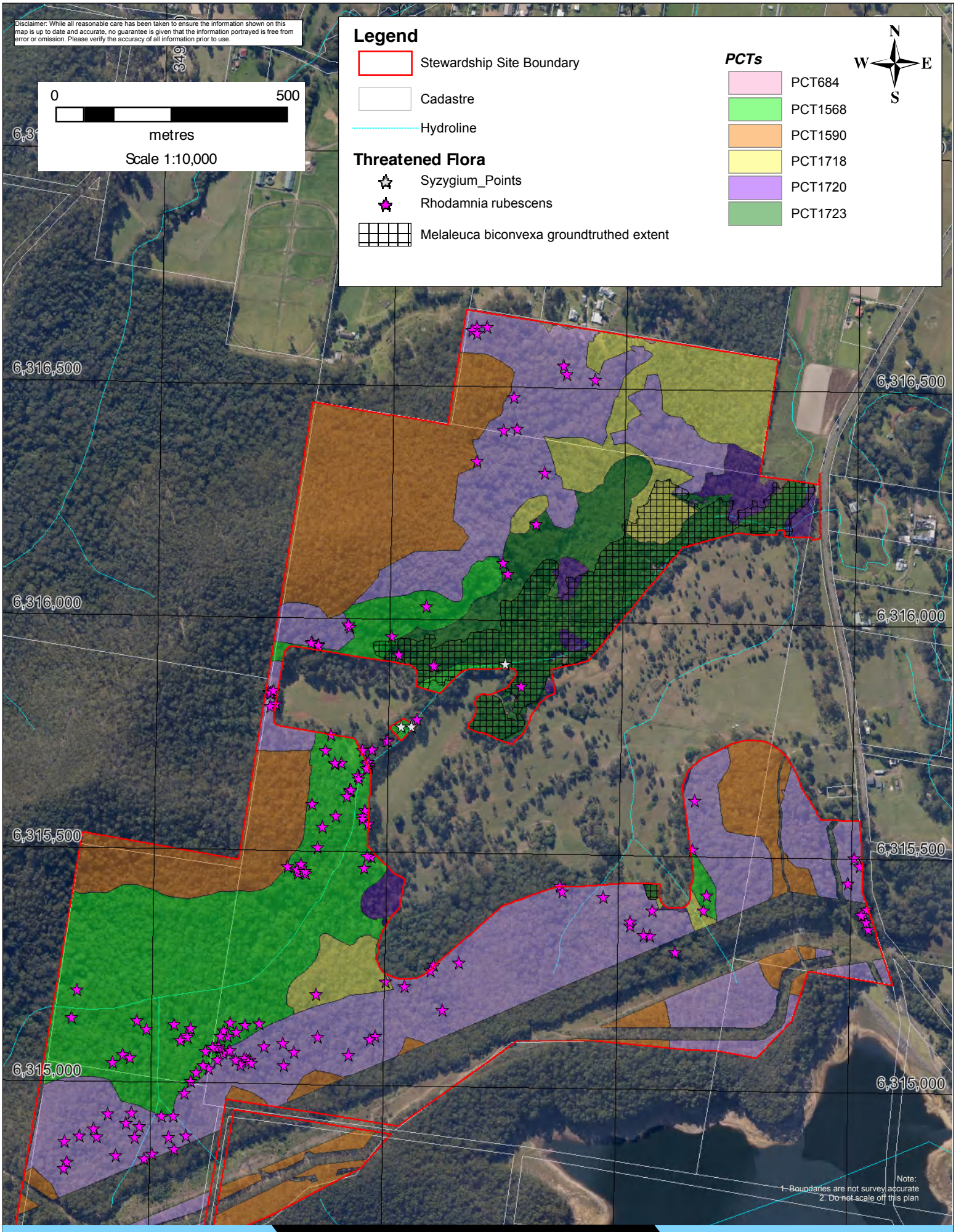


Figure 3.3 – Fauna survey results



AEP

Title: Figure 8 - Threatened Flora Locations

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and The Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

1.6 Threatened Species

Under the BAM, threatened species are classified into two types; 'Ecosystem Credit' and 'Species Credit' type species, as detailed within the BioNet Atlas Threatened Species Profile Database (OEH). Ecosystem Credit species are associated with PCTs and other habitat surrogates that are used to predict their occurrence on a particular site.

The 'biodiversity risk weighting' for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix 7 of the BAM, and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit species.

Those Ecosystem Credit species predicted to occur within the Stewardship Site on the site are provided in **Table 6**.

Table 6 - Predicted Ecosystem Credit Species

Common Name	Scientific Name	Sensitivity to Gain Class
Barking Owl	*Ninox connivens*	High
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Moderate
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	High
Diamond Firetail	*Stagonopleura guttata*	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Moderate
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	High
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	High
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	High
Gang-gang Cockatoo	*Callocephalon fimbriatum*	High
Glossy Black- Cockatoo	***Calyptorhynchus lathami***	**High**
Golden-tipped Bat	***Phoniscus papuensis***	**High**
Greater Broad-nosed Bat	*Scoteanax rueppellii*	High
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	Moderate

Common Name	Scientific Name	Sensitivity to Gain Class
Grey-headed Flying- fox	***Pteropus poliocephalus***	**High**
Koala	*Phascolarctos cinereus*	High
Large Bent-winged Bat	***Miniopterus orianae oceanensis***	**High**
Little Bent-winged Bat	***Miniopterus australis***	**High**
Little Eagle	*Hieraaetus morphnoides*	Moderate
Little Lorikeet	*Glossopsitta pusilla*	High
Masked Owl	*Tyto novaehollandiae*	High
Powerful Owl	***Ninox strenua***	**High**
Regent Honeyeater	*Anthochaera phrygia*	High
Rosenberg's Goanna	*Varanus rosenbergi*	High
Rose-crowned Fruit- Dove	*Ptilinopus regina*	Moderate
Scarlet Robin	*Petroica boodang*	Moderate
Sooty Owl	***Tyto tenebricosa***	**High**
Speckled Warbler	*Chthonicola sagittata*	High
Spotted-tailed Quoll	*Dasyurus maculatus*	High
Square-tailed Kite	*Lophoictinia isura*	Moderate
Superb Fruit-Dove	*Ptilinopus superbus*	Moderate
Swift Parrot	*Lathamus discolor*	Moderate
Turquoise Parrot	*Neophema pulchella*	High
Varied Sittella	*Daphoenositta chrysoptera*	Moderate
White-bellied Sea- Eagle	*Haliaeetus leucogaster*	High

Common Name	Scientific Name	Sensitivity to Gain Class
Wompoo Fruit-Dove	*Ptilinopus magnificus*	Moderate
Yellow-bellied Glider	*Petaurus australis*	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	High

^ Habitat surrogates relating to Ecosystem Credits relevant for foraging habitat only, **bold** indicates species recorded onsite.

1.7 Species Credit Species

Species survey recorded a number of threatened species within the Stewardship Site. Under the BAM species are classified as 'Ecosystem' or 'Species' Credit Species. **Table 7** below details the determination of 'Species Credit' species based on suitable survey effort undertaken and habitat constraints, and whether they will generate credits under the BSA.

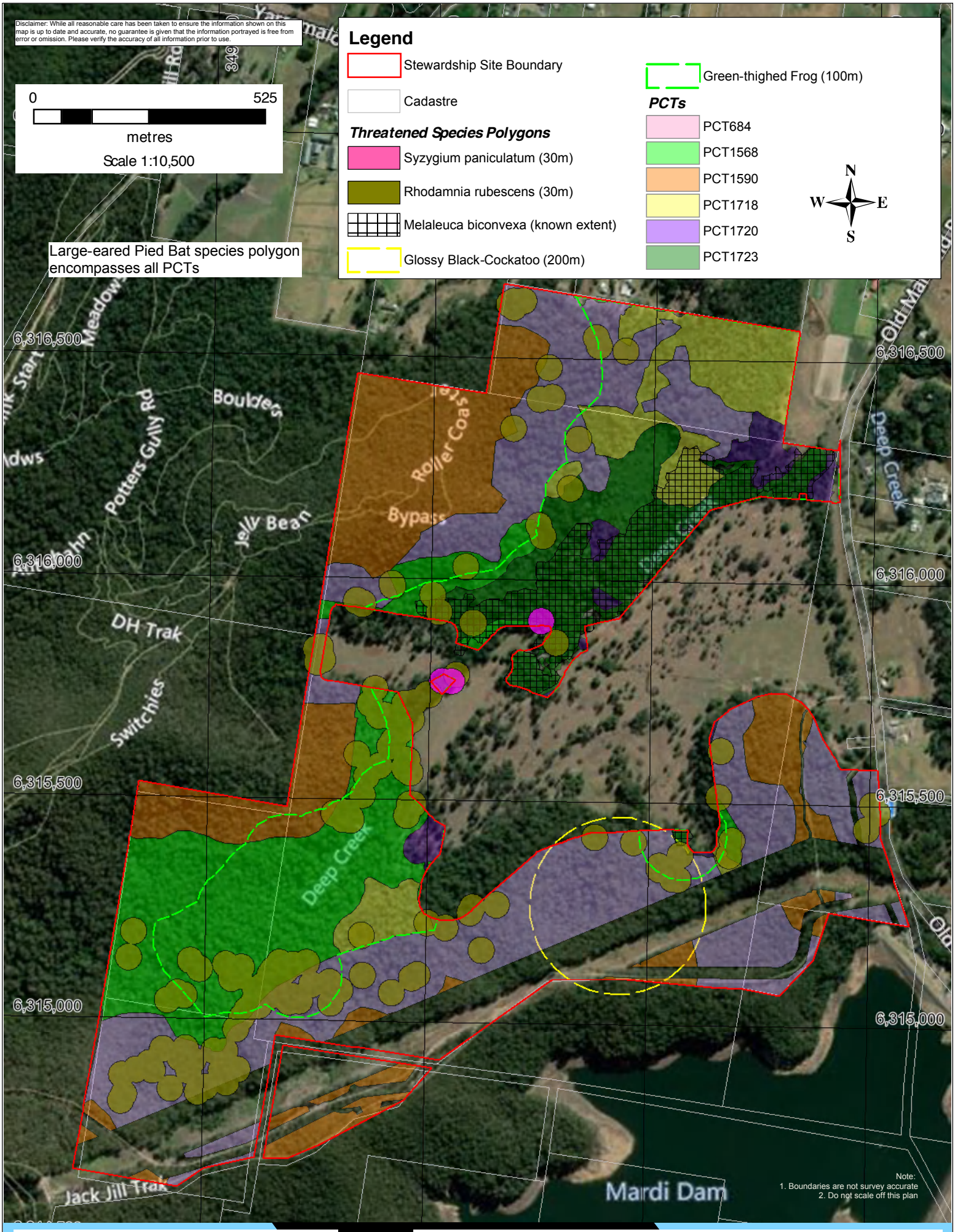
Species Credits Generated, see **Section 2.4**.

Table 7 – Species Credit Species

Species	BC Act	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Technique	Timing and Effort	Conclusion
Species Credit Species - Flora						
Melaleuca biconvexa (Biconvex Paperbark)	V	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire. Associated PCT's: 1723 & 1718	Parallel walking transects – Maximum distance between transects was 20m in open areas, and 10m in dense vegetation. For each hectare of potential habitat average field traverse length was 1km at 10m separation or 0.5km at 20m separation. BAM-C/ TBDC Survey Period: All year	Habitat Assessment Targeted Search Parallel Transects	Sep 2018, Sep 2019 & Mar 2020: Parallel field traverses (TBE). Jan 2021: Targeted Search, ground truthing and updating *Melaleuca biconvexa* extent mapped by *Travers* (AEP).	Present as a large patch in the Stewardship Site, on the northern boundary adjacent to the Development Site. **Confirmed Candidate Species.**
Rhodamnia rubescens (Scrub Turpentine)	CE	Widespread in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. Mainly coastal; north from Batemans Bay. Associated PCT's: 1590	Parallel walking transects – Maximum distance between transects was 20m in open areas, and 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation. BAM-C/ TBDC Survey Period: All year	Habitat Assessment Targeted Search Parallel Transects	Sep 2019 & Mar 2020: Targeted survey (TBE). Jan & Feb 2021: Targeted search of previously unsurveyed areas, and ground truthing TBE records (AEP).	Present in large numbers throughout the site in wet sclerophyll and swamp sclerophyll forest, with the exception of dry, exposed ridgetops. **Confirmed Candidate Species**
Syzygium paniculatum (Magenta Lilly Pilly)	E	On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. Associated PCT's: 1723 & 1718	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation. BAM-C/ TBDC Survey Period: April to June	Habitat Assessment Targeted Search Parallel Transects	Sep 2019 & Mar 2020: Targeted survey (TBE). Feb 2021: Targeted search of previously unsurveyed areas, and ground truthing TBE records (AEP).	Isolated individuals present in small numbers along Deep Creek. **Confirmed Candidate Species**
Species Credit Species - Fauna						
Glossy Black-Cockatoo	V	The species inhabits open forest and woodlands of the coast where stands of She-oak occur. The species is dependent on large hollow-bearing eucalypts for nest sites.	Survey for signs of breading; (begging birds or lone adult males during the breeding season – April to August). Survey for potential nesting opportunities (large hollows). Where potential nest trees are identified, monitoring during the breeding season to confirm presence. BAM-C/TBDC Survey Period: March to Aug	Diurnal bird survey observations All potential nesting opportunities	2019: Diurnal observations (TBE) August 2019: Survey for potential nesting opportunities. September 2019: Birding expert John Young confirmed breeding habitat is present on site (large hollow), located >150m from the development edge within the Stewardship site. (TBE). (see **Appendix X**)	Recorded present by *Travers Bushfire & Ecology* in 2019 and Biosis in 2014, 1999 and 1998 in the southern and eastern portions of the study area. **Confirmed Candidate Species**

Species	BC Act	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Technique	Timing and Effort	Conclusion
Grey-headed Flying-fox	V	Foraging and occasional roost habitat is considered an ecosystem credit while roost camps are considered a species credit. Survey effort included targeted search for roost camps, during all aspects of fieldwork as well as incidental observations during nocturnal survey works.	Diurnal search for camp survey. BAM-C/ TBDC Survey Period: Oct to Dec.	Spotlighting flowering / fruiting feed trees. Audial survey of calls. Diurnal search for suitable roosting habitat.	Nov 2019: Spotlighting (TBE). Nov 2020: Diurnal search for suitable roosting habitat.	Previously recorded by *Biosis* in 2014 and *Travers Bushfire & Ecology* in 2019. No diurnal roosting was recorded within the suitable floodplain roosting habitat areas of the stewardship site. **No credits are generated for this species.**
White-bellied Sea Eagle	V	Terrestrial habitat includes coastal dunes, tidal flats, grassland, heathland, woodland and forest. Requires large emergent eucalypts for nesting. Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitat. BAM-C/ TBDC Survey Period: Jul to Dec.	Habitat and nest tree survey. Diurnal bird survey observations.	Aug 2019: Habitat and nest tree assessment (TBE). Aug 2019: Diurnal observations (TBE). Dec & Jan 2020: Diurnal observations (AEP).	A breeding location of this species is known in the Mardi Dam in the valley to the south. No breeding is currently present in the study area itself. **No credits are generated for this species.**
Powerful Owl	V	This species inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tree hollows (≥0.5m deep) in large eucalypts (DBH 80-240cm) that are at least 150 years old.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. BAM-C/ TBDC Survey Period: May to Aug.	Spotlighting. Call-playback during nocturnal surveys. Opportunistic searches for roosting activity. Stag-watching of large hollow-bearing trees. Song-meter recording	June to July 2019: Deployment of Songmeters. June 2019: Spotlighting for nocturnal birds. Aug 2019: Habitat Tree Assessment for roosting activity, Spotlighting and Stagwatching.	Recorded responding to call-playback during early winter survey in 2019. A male and female were heard calling after dusk. Powerful Owl was regularly recorded on each of the Songmeters from late June through to July, however at this point in time the breeding hollow has not been located. **No credits are generated for this species.**

Species	BC Act	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Survey Technique	Timing and Effort	Conclusion
Sooty Owl	V	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Nests in very large tree-hollows.	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset. BAM-C/ TBDC Survey Period: Apr to Aug.	Spotlighting. Call-playback during nocturnal surveys. Opportunistic searches for roosting activity. Stag-watching of large hollow-bearing trees. Song-meter recording.	June to July 2019: Deployment of Songmeters. June 2019: Spotlighting for nocturnal birds. Aug 2019: Habitat Tree Assessment for roosting activity, Spotlighting and Stagwatching.	Recorded from 3 Songmeter locations during 2019 surveys, during dawn and after dark. Potential breeding location could not be determined. **No credits are generated for this species.**
Large-eared Pied Bat	V	Roost types for this species include caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*). Maternity roosts form from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Any impacts on breeding habitat could be considered potentially serious and irreversible. The species is retained as dual credit because foraging habitat is broad ranging but breeding habitat is highly specific.	Minimum four hours of recording immediately after dusk, with whole night recording recommended, ultrasonic recorders located in areas of greatest potential activity. BAM-C/TSDC Survey Period: Nov to Jan.	Ultrasonic Microbat Recording. Ultrasonic Microbat Recording (Active Monitoring).	Nov 2019: Three (3) ultrasonic microbat recorders deployed (TBE). Nov 2019: Active monitoring used in conjunction with spotlighting or during stag-watching (TBE).	Recorded present by *Travers Bushfire & Ecology* in 2019. **Confirmed Candidate Species.**
Green-thighed Frog	V	The species was allocated to species credit species because presence cannot be predicted from vegetation or landscape surrogates. Survey: reliant on rainfall events for calling/breeding when it is usually detected/surveyed, strongly suggest >75 mm in 24 hrs or 150 mm over 72 hrs as the most probable time to survey and detect the species. Note that tadpoles are susceptible to injury during netting, they can be identified from observation. A ground-dwelling frog that inhabits coastal forest and bushland. Calling males gather around temporary or semi-permanent ponds and flooded ditches after heavy rain. Egg masses are often laid in temporary ponds. Tadpoles are predominately surface dwellers, but feed throughout the water body.	Aural-visual surveys and tadpole targeting potential breeding habitat during the calling period. A search of the breeding site for tadpoles and metamorphosing froglets approximately 30 to 60 days later (Lemckert et al. 2006). BAM-C/ TBDC Survey Period: Oct-Mar.	Aural-visual survey. Tadpole search for amphibians. Mapping potential breeding habitat. Targeted aural-visual survey.	2014: Aural-visual survey (*Biosis*). June 2019: Tadpole search for amphibians (*TBE*). September 2019: Mapping potential breeding habitat. (*TBE*) November 2019 and 2020: Targeted aural-visual survey (*TBE*). Targeted aural-visual surveys after heavy summer rainfall (*TBE, 2020*).	Targeted aural-visual surveys after heavy summer rainfall recorded four breeding locations with calling males within the Stewardship Site (*TBE, 2020*). **Confirmed Candidate Species.**
Southern Myotis	V	The habitat constraint for Southern Myotis is hollow bearing trees within 200 m of riparian zone. This species is dependent on waterways with pools of 3m wide or greater for foraging (which will be protected under legislation), habitat surrounding waterways is used for breeding and roosting.	Minimum four hours of recording immediately after dusk, with whole night recording recommended, ultrasonic recorders located in areas of greatest potential activity. BAM-C/TSDC Survey Period: Oct to Mar.	Ultrasonic Microbat Recording. Ultrasonic Microbat Recording (Active Monitoring).	Dec & Feb 2019, Feb 2020: Ten (10) ultrasonic microbat recorders deployed (TBE). Nov 2019: Active monitoring used in conjunction with spotlighting or during stag-watching (TBE).	Recorded present by *Travers Bushfire & Ecology* in 2019. **Confirmed Candidate Species.**



AEP

Title: Figure 9 - Threatened Species Polygons

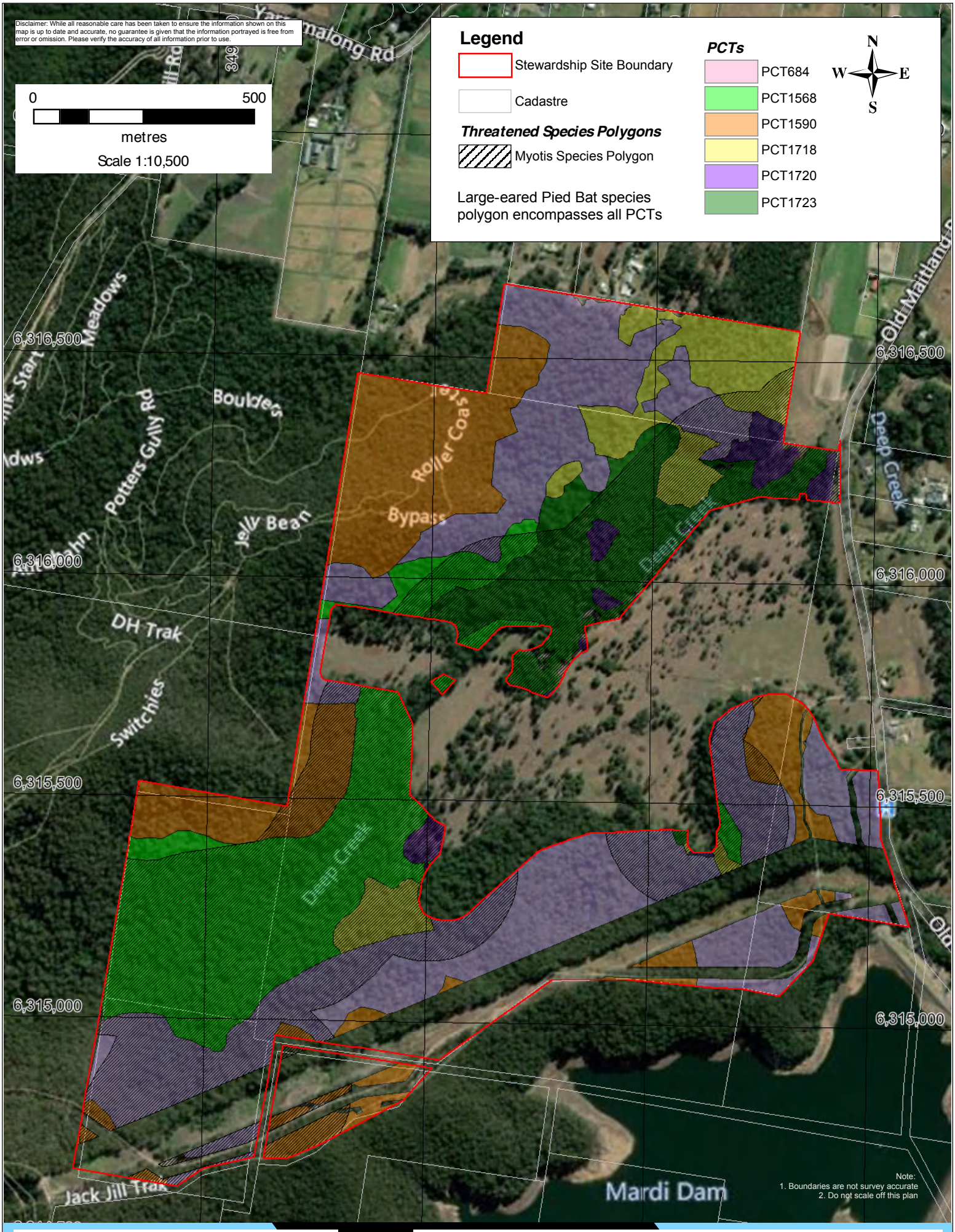
Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and The Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06



AEP

Title: Figure 10 - Threatened Species Polygons

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and The Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

Stage 2 – Improving Biodiversity Values

Section 13 of the **BAM** provides a list of measures that need to be taken into consideration during Stewardship Site Assessment to improve biodiversity. Considerations of management actions applicable to the Site to increase biodiversity values as part of this agreement are provided below.

1.8 Management Actions to Improve Biodiversity Values

In order to create biodiversity credits from a Stewardship Site, management actions or active restoration management actions which improve biodiversity values are to be carried out for a 20-year period in accordance with **Section 13.3** of the **BAM**.

The nine (9) prescribed actions which must be considered include preparation of a management plan;

- Fire management;
- Grazing management;
- Native vegetation management;
- Threatened species habitat management;
- Integrated pest animal control;
- Integrated weed management and control of high threat weeds;
- Management of human disturbance; and
- Monitoring.

Site specific management actions are proposed to control myrtle rust within the *Rhodamnia rubescens* population in order to improve condition and overall health of the population within the Stewardship Site. Studies have shown (Carnegie 2016), that monthly fungicide application can be effective in controlling myrtle rust, particularly during spring and summer when plants are more susceptible when in flush of new growth. The Biodiversity Stewardship Site Management Plan (**Appendix C**) contains further details of the proposed management actions, monitoring requirements, and references papers.

A Management Plan for the Site addressing all the relevant considerations has been prepared and is included as **Appendix C**.

1.9 Future Vegetation Integrity Scores (with and without management)

Table 8 shows the future Vegetation Integrity Scores with and without management within the Stewardship Site.

Table 8 – Future Vegetation Integrity Scores

		Future VI (without management)					Future VI (with management)					
PCT	**Vegetation Zone**	**Comp.**	**Struct.**	**Funct.**	**VIS**	**Change in VI**	**Comp.**	**Struct.**	**Funct.**	**VIS**	**Change in VI**	**Gain in VI**
684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges.	Good	**58.2**	**54.2**	**99.6**	**68**	**-**	**81.6**	**82**	**100**	**87.4**	**19.4**	**22.5**
1723 - Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest.	Good	**86**	**54.5**	**46.3**	**60.1**	**-**	**95.8**	**97.4**	**52.4**	**78.8**	**18.7**	**21.2**
1568 - Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest.	Good	**62.7**	**68.3**	**99.9**	**75.3**	**-**	**84.9**	**94.5**	**100**	**92.9**	**17.6**	**21.1**
1720 - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest.	Good	**75.7**	**68.1**	**99.3**	**80**	**-**	**87.6**	**99.3**	**99.9**	**95.4**	**15.5**	**19.1**
1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest.	Good	**70.4**	**55.6**	**94.4**	**71.8**	**-**	**84.3**	**97.2**	**99.6**	**93.4**	**21.7**	**25.1**
1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands.	Good	**93.3**	**96.9**	**59.2**	**81.2**	**-**	**98.2**	**98.5**	**82**	**92.6**	**11.4**	**15.1**

1.10 Ecosystem Credits Generated

Table 9 – Ecosystem Credits Generated

PCT	Community	Threatened Ecological Community (TEC)	Ecosystem Credits
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges.	Not a TEC	288
1723	Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest.	Swamp Sclerophyll Forest	80
1568	Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest.	Not a TEC	162
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest.	River-Flat Eucalypt Forest	16
1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest.	Lower Hunter Spotted Gum Ironbark Forest	184
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands.	Swamp Sclerophyll Forest	45
Total – Ecosystem Credits			**775**

1.11 Species Credits Generated

Table 10 – Species Credits Generated

Common Name	Scientific Name	Species Buffer	Species Count	Species Credits
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	9.3	N/A	43
Large-eared Pied Bat	*Chalinolobus dwyeri*	141.6	N/A	775
Green-thighed Frog	*Litoria brevipalmata*	60.3	N/A	297
Melaleuca biconvexa	*Biconvex Paperbark*	12.6	N/A	63
Southern Myotis	*Myotis macropus*	73.9	N/A	431
Scrub Turpentine	*Rhodamnia rubescens*	N/A	319	265
Magenta Lilly Pilly	*Syzygium paniculatum*	N/A	4	3

Species polygons (buffers) for the purpose of credit generation and management actions are shown in **Figures 9 & 10**.

Note that the species polygon for Large-eared Pied Bat (*Chalinolobus dwyeri*) incorporates all mapped vegetation present within the site, as detailed in **Table 2**.

1.12 Biodiversity Credit Report

The Biodiversity Credit Report generated within the BAM Calculator is provided in **Appendix D**.

2.0 Conclusion

Application of the BAM has quantified biodiversity values within the Stewardship Site, and calculated biodiversity credits created, following the implementation of management activities outlined in **Appendix C** to improve vegetation integrity and threatened species habitat.

The vegetation within the Stewardship Site was found to contain six (6) PCT's which generated the following credits shown in **Table 11** and **Table 12**.

Table 11 – Summary of Ecosystem System Credits

PCT	Community	Threatened Ecological Community (TEC)	Ecosystem Credits
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges.	Not a TEC	288
1723	Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest.	Swamp Sclerophyll Forest	80
1568	Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest.	Not a TEC	162
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest.	River-Flat Eucalypt Forest	16
1590	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest.	Lower Hunter Spotted Gum Ironbark Forest	184
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast.	Swamp Sclerophyll Forest	45
Total – Ecosystem Credits			**775**

Table 12 – Summary of Species Credits Species

Common Name	Scientific Name	Species Credits
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	43
Large-eared Pied Bat	*Chalinolobus dwyeri*	775
Green-thighed Frog	*Litoria brevipalmata*	297
Melaleuca biconvexa	*Biconvex Paperbark*	63
Southern Myotis	*Myotis macropus*	431
Scrub Turpentine	*Rhodamnia rubescens*	265
Magenta Lilly Pilly	*Syzygium paniculatum*	3

3.0 References

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Appendix A – Plot Data

Family	Scientific Name	Common Name	BAM Growth Form	BAM Growth Form Group	HTE	Present on Site	Plot 1 GP01 30/05/18	Plot 2 GP02 30/5/18	Plot 3 GP03 30/5/18	Plot 4 GP04 30/5/18	Plot 5 GP05 31/5/18	Plot 6 GP06 31/5/18	Plot 7 GP07 31/5/18	Plot 8 GP08 7/6/2018	Plot 9 GP09 7/6/2018	Plot 10 GP10 7/6/2018	Plot 11 GP11 7/6/18	Plot 12 GP12 8/6/2018	Plot 13 GP13 8/6/2018	Plot 14 GP14 8/6/18	Plot 15 GP15 13/7/2018
Acanthaceae	*Brunoniella australis*	Blue Trumpet	Forb	Forb (FG)		1												0.5			
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	Forb	Forb (FG)		1		0.10%	0.10%					0.001		0.001	0.001				
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	Fern and fern allies	Fern (EG)		1		2%		1%				0.02			0.001				
Adiantaceae	*Adiantum formosum*	Giant Maidenhair	Fern and fern allies	Fern (EG)		1										0.1		0.001	0.002		
Anacardiaceae	*Euroschinus falcatus var. falcatus*	Ribbonwood	Tree	Tree (TG)		1											0.001	0.005			
Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily	Forb	Forb (FG)		1							0.001								
Apiaceae	*Centella asiatica*	Swamp Pennywort	Forb	Forb (FG)		1		0.10%		0.50%					0.002						0.001
Apiaceae	*Hydrocotyle peduncularis*	Pennywort	Forb	Forb (FG)		1	0.10%		0.10%		0.001				0.005						0.001
Apiaceae	*Hydrocotyle tripartita*	Pennywort	Forb	Forb (FG)		1															
Apocynaceae	*Marsdenia rostrata*	Common Milk Vine	Vine	Other (OG)		1										0.001		0.001	0.001		
Apocynaceae	*Marsdenia viridiflora ssp viridiflora*	Native Pear	Vine	Other (OG)		1			0.10%												
Apocynaceae	*Parsonsia straminea*	Common Silkpod	Vine	Other (OG)		1	0.001		0.10%	2%	0.01	0.001	0.01	0.001	0.05					0.02	0.005
Araceae	*Gymnostachys anceps*	Settlers Flax	Forb	Forb (FG)		1										0.001		0.001	0.005	0.001	
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax	Shrub	Shrub (SG)		1															
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	Palm & palmlike	Other (OG)		1													0.002		
Arecaceae	*Livistona australis*	Cabbage Tree Palm	Palm & palmlike	Other (OG)		1				15%			0.001		0.01	0.01		0.001	0.001	0.001	
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern	nil - exotic		Y	1	0.50%				0.02										
Asparagaceae	*Asparagus sp.**		nil - exotic			1					0.001										
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	nil - exotic		Y	1															
Asteraceae	*Cirsium vulgare**	Spear Thistle	nil - exotic			1															
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane	nil - exotic			1					0.001										
Asteraceae	*Cyanthillium cinereum*		Forb	Forb (FG)		1		0.10%					0.001	0.001							
Asteraceae	*Hypochaeris radicata**	Flatweed	nil - exotic			1					0.001										0.001
Asteraceae	*Hypochaeris sp.**	A Catsear	nil - exotic			1									0.001						
Asteraceae	*Lagenifera stipitata*	Blue Bottle-daisy	Forb	Forb (FG)		1									0.001						
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting	Shrub	Shrub (SG)		1		0.10%													
Asteraceae	*Senecio madagascariensis**	Fireweed	nil - exotic		Y	1															
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	Vine	Other (OG)		1			0.10%	0.50%				0.001	0.03	0.01	0.002		0.002		
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	Fern and fern allies	Fern (EG)		1			0.20%									0.05	0.001		
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern	Fern and fern allies	Fern (EG)		1								0.001		0.01		0.03	0.01	0.002	
Boraginaceae	*Ehretia acuminata var. acuminata*	Koda	Tree	Tree (TG)		1												0.005	0.001		
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	Tree	Tree (TG)		1	0.08	10%	15%	0.50%			0.001	0.03							
Celastraceae	*Maytenus silvestris*	Orange Bush				1								0.001		0.001	0.001	0.001			
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wande	Forb	Forb (FG)		1	0.10%				0.002					0.001	0.001				
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew	nil - exotic		Y	1					0.002										
Convolvulaceae	*Calystegia sepium subsp. roseata*		Vine	Other (OG)		1															
Convolvulaceae	*Dichondra repens*	Kidney Weed	Forb	Forb (FG)		1	0.20%			0.50%	0.001				0.07	0.03	0.001		0.001		0.005
Convolvulaceae	*Polymeria calycina*	Bindweed	Vine	Other (OG)		1															0.002
Cunoniaceae	*Callicoma serratifolia*	Black Wattle	Shrub	Shrub (SG)		1														0.001	
Cyperaceae	*Carex appressa*	Tall Sedge	Sedge	Grass & grasslike (G		1															
Cyperaceae	*Carex longebrachiata*	Bergalia Tussock	Sedge	Grass & grasslike (G		1					0.005				0.05	0.01	0.002	0.001	0.001		0.001
Cyperaceae	*Cyperus sp.*		Sedge	Grass & grasslike (G		1								0.04							
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	Sedge	Grass & grasslike (G		1	0.10%														0.005
Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge	Sedge	Grass & grasslike (G		1		2%													
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	Sedge	Grass & grasslike (G		1			0.20%	1%	0.002			0.001							
Cyperaceae	*Schoenus nitens*		Sedge	Grass & grasslike (G		1									0.001						
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	Fern and fern allies	Fern (EG)		1	0.20%														
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	Fern and fern allies	Fern (EG)		1	0.01		0.50%	2%	0.02	0.01		0.002							
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	Tree fern	Other (OG)		1		2%		2%				0.001				0.01	0.002	0.002	0.002
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	Shrub	Shrub (SG)		1			0.20%												
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower	Vine	Other (OG)		1															
Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower	Shrub	Shrub (SG)		1		0.10%													
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	Vine	Other (OG)		1				0.10%	0.001	0.001	0.001								
Dioscoreaceae	*Dioscorea transversa*	Native Yam	Vine	Other (OG)		1										0.001		0.001	0.001	0.001	
Ebenaceae	*Diospyros australis*	Black Plum	Shrub	Shrub (SG)		1												0.001	0.02	0.02	
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Shrub	Shrub (SG)		1															
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath	Heath shrub	Shrub (SG)		1		0.20%	0.50%			0.001	0.001	0.001							
Epacridaceae	*Leucopogon lanceolatus*	Lance-leaf Beard-heath	Heath shrub	Shrub (SG)		1		0.20%	1%				0.001								
Epacridaceae	*Trochocarpa laurina*	Tree Heath	Tree	Tree (TG)		1			1%									0.002	0.03		
Ericaceae	*Acrotriche divaricata*		Heath shrub	Shrub (SG)		1			0.50%												
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	Shrub	Shrub (SG)		1	13.00%	0.50%	2%	0.10%	0.005	0.01			0.001	0.001	0.001	0.001	0.001		
Eupomatiaceae	*Eupomatia laurina*	Bolwarra	Shrub	Shrub (SG)		1												0.001			
Fabaceae	*Acacia binervata*	Two-veined Hickory	Tree	Tree (TG)		1															
Fabaceae	*Acacia elongata*	Swamp Wattle	Shrub	Shrub (SG)		1															

Fabaceae	*Acacia irrorata*	Green Wattle	Shrub	Shrub (SG)		1						0.03								0.1
Fabaceae	*Acacia longifolia var. longifolia*	Sydney Golden Wattle	Shrub	Shrub (SG)		1														
Fabaceae	*Acacia longissima*	Long-leaf Wattle	Shrub	Shrub (SG)		1	0.20%													
Fabaceae	*Acacia maidenii*	Maiden's Wattle	Tree	Tree (TG)		1						0.002	0.001							
Fabaceae	*Acacia saliciformis*		Shrub	Shrub (SG)		1														
Fabaceae	*Acacia schinoides*	Green Cedar Wattle	Shrub	Shrub (SG)		1														
Fabaceae	*Acacia sp.*	Wattle				1			0.10%										0.02	
Fabaceae	*Bossiaea obcordata*	Spiny Bossiaea	Shrub	Shrub (SG)		1														
Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea	Shrub	Shrub (SG)		1		0.20%	0.20%											
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil	Forb	Forb (FG)		1														
Fabaceae	*Desmodium varians*	Slender Tick-trefoil	Vine	Other (OG)		1					0.001				0.01		0.001			
Fabaceae	*Glycine clandestina*	Twining Glycine	Vine	Other (OG)		1	0.10%			0.10%	0.001				0.001		0.001			0.001
Fabaceae	*Hardenbergia violacea*	False Sarsparilla	Vine	Other (OG)		1							0.001							
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea	Vine	Other (OG)		1	0.10%													
Fabaceae	*Podolobium ilicifolium*	Prickly Shaggy Pea	Shrub	Shrub (SG)		1														
Geraniaceae	*Geranium homeanum*	Northern Cranesbill	Forb	Forb (FG)		1					0.001				0.001					
Goodeniaceae	*Goodenia paniculata*	Swamp Goodenia	Forb	Forb (FG)		1														0.001
Haloragaceae	*Gonocarpus teucrioides*	Raspwort	Forb	Forb (FG)		1		0.10%												
Juncaceae	*Juncus usitatus*	Common Rush	Rush	Grass & grasslike (G		1					0.02				0.001					
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	Tree	Tree (TG)		1													0.001	
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower	Forb	Forb (FG)		1											0.001			
Lauraceae	*Cassytha glabella*		Vine	Other (OG)		1														
Lauraceae	*Cinnamomum camphora**	Camphor Laurel	nil - exotic		Y	1	15.00%	0.50%		0.10%	0.001	0.005			0.001		0.002			0.001
Lauraceae	*Cryptocarya microneura*	Murrogun	Tree	Tree (TG)		1										0.02		0.001	0.05	0.001
Lauraceae	*Cryptocarya sp.*					1														
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge-fern	Fern and fern allies	Fern (EG)		1			0.10%											
Lobeliaceae	*Lobelia purpurascens*	Whiteroot	Forb	Forb (FG)		1	0.001	1%	0.10%					0.001	0.001		0.001			0.001
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush	Rush	Grass & grasslike (G		1	0.50%		0.20%											
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	Rush	Grass & grasslike (G		1	0.005	10%				0.02	0.02	0.02			0.001		0.001	0.002
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	Rush	Grass & grasslike (G		1														
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	Vine	Other (OG)		1					0.001	0.005					0.005	0.001	0.001	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	Vine	Other (OG)		1	0.02	0.20%	0.20%	0.20%				0.001		0.001	0.001	0.001	0.001	
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	nil - exotic			1					0.01									
Meliaceae	*Melia azedarach*	White Cedar	Tree	Tree (TG)		1													0.03	
Meliaceae	*Synoum glandulosum subsp. glandulo*	Scentless Rosewood	Tree	Tree (TG)		1													0.002	
Menispermaceae	*Stephania japonica*	Snake vine	Vine	Other (OG)		1				0.10%							0.002		0.001	
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine	Vine	Other (OG)		1														
Monimiaceae	*Wilkiea huegeliana*	Wilkiea, Veiny Wilkiea	Shrub	Shrub (SG)		1								0.001		0.02		0.003	0.002	0.001
Moraceae	*Ficus coronata*	Sandpaper Fig	Shrub	Shrub (SG)		1										0.001				
Moraceae	*Trophis scandens*	Burny Vine				1										0.02				
Myrsinaceae	*Myrsine variabilis*	Muttonwood	Shrub	Shrub (SG)		1											0.001		0.001	
Myrtaceae	*Acmena smithii*	Lillypilly	Tree	Tree (TG)		1										0.05		0.6	0.15	0.02
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	Tree	Tree (TG)		1	0.1				0.1	0.04		0.02						
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	Shrub	Shrub (SG)		1		10%				0.1		0.03	0.1	0.05				0.03
Myrtaceae	*Callistemon sp.*		Shrub	Shrub (SG)		1														0.001
Myrtaceae	*Choricarpia leptopetala*	Brown Myrtle, Brush Turpen	Shrub	Shrub (SG)		1													0.3	
Myrtaceae	*Corymbia maculata*	Spotted Gum	Tree	Tree (TG)		1	10.00%	40%	8%	10%	0.03									
Myrtaceae	*Eucalyptus acmenoides*	White Mahogany	Tree	Tree (TG)		1														
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum	Tree	Tree (TG)		1														0.05
Myrtaceae	*Eucalyptus deanei*	Mountain Blue Gum	Tree	Tree (TG)		1												0.05	0.03	0.05
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	Tree	Tree (TG)		1														
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Tree	Tree (TG)		1	0.15	20%	40%	50%	0.4	0.6		0.05				0.08	0.03	
Myrtaceae	*Eucalyptus propinqua*	Small Fruited Grey Gum	Tree	Tree (TG)		1														
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	Tree	Tree (TG)		1		2%	2%											
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	Tree	Tree (TG)		1							0.1	0.05						0.05
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	Tree	Tree (TG)		1				10%				0.08		0.2	0.25	0.03	0.1	0.3
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark	Tree	Tree (TG)		1														
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	Tree	Tree (TG)		1														
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	Shrub	Shrub (SG)		1														
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree	Shrub	Shrub (SG)		1					0.05									
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	Shrub	Shrub (SG)		1								0.2	0.5	0.05	0.4			
Myrtaceae	*Melaleuca decora*	White Feather Honeymyrtle	Shrub	Shrub (SG)		1														
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer	Shrub	Shrub (SG)		1						0.05	0.8	0.15	0.3					
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle	Shrub	Shrub (SG)		1														
Myrtaceae	*Melaleuca sieberi*		Shrub	Shrub (SG)		1						0.005								0.05
Myrtaceae	*Melaleuca stypheloides*	Prickly-leaved Tea Tree	Shrub	Shrub (SG)		1						0.01				0.1				
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	Shrub	Shrub (SG)		1													0.001	
Myrtaceae	*Syncarpia glomulifera*	Turpentine	Tree	Tree (TG)		1			10%									0.15	0.5	0.1

Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant	nil - exotic		Y	1					0.001				0.001						
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet	nil - exotic		Y	1	0.50%														
Oleaceae	*Ligustrum sinense**	Small-leaved Privet	nil - exotic		Y	1					0.001				0.02		0.002				
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive	Tree	Tree (TG)		1				0.20%			0.001	0.001			0.002	0.001			
Orchidaceae	*Cryptostylis erecta*	Bonnet Orchid	Forb	Forb (FG)		1			0.10%												
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorre	Forb	Forb (FG)		1		0.10%	0.10%												0.001
Phormiaceae	*Dianella caerulea*	Blue Flax-lily	Forb	Forb (FG)		1	0.001	0.50%	2.00%	0.50%	0.001	0.002	0.001	0.002	0.001		0.001		0.001		0.001
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree	Tree	Tree (TG)		1											0.001		0.01		0.5
Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree	Tree	Tree (TG)		1	0.05	15%	3%	8%	0.2	0.05	0.001	0.002	0.03						
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry	Vine	Other (OG)		1			0.10%												
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn	Shrub	Shrub (SG)		1			0.20%					0.01	0.02	0.001	0.02	0.01	0.002	0.005	
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum	Shrub	Shrub (SG)		1									0.005						
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	Shrub	Shrub (SG)		1															
Plantaginaceae	*Plantago lanceolata**	Ribwort	nil - exotic			1					0.001				0.001						
Poaceae	*Aristida vagans*	Three-awn Speargrass	Tussock Grass	Grass & grasslike (G		1															
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass	nil - exotic		Y	1					0.02										0.02
Poaceae	*Cymbopogon refractus*	Barbwire Grass	Tussock Grass	Grass & grasslike (G		1			0.10%			0.001									
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass	Tussock Grass	Grass & grasslike (G		1					0.001										
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	Tussock Grass	Grass & grasslike (G		1					0.001										0.001
Poaceae	*Ehrharta erecta**	Panic Veldtgrass	nil - exotic		Y	1					0.01										
Poaceae	*Ehrharta sp.**	Veldtgrass	nil - exotic			1										0.02					
Poaceae	*Entolasia marginata*	Bordered Panic	Tussock Grass	Grass & grasslike (G		1		3%		0.50%		0.02	0.2								
Poaceae	*Entolasia sp.*			Grass & grasslike (G		1									0.01	0.01					
Poaceae	*Entolasia stricta*	Wiry Panic	Tussock Grass	Grass & grasslike (G		1			2%			0.02		0.2		0.02	0.02				0.03
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	Tussock Grass	Grass & grasslike (G		1					0.001		0.001								0.001
Poaceae	*Eriochloa procera*	Spring Grass		Grass & grasslike (G		1					0.02										
Poaceae	*Imperata cylindrica*	Blady Grass	Tussock Grass	Grass & grasslike (G		1	3.00%	30%	1%	5%		0.05					0.001				
Poaceae	*Microlaena stipoides*	Weeping Grass	Other Grass	Grass & grasslike (G		1	0.005	2%	0.10%		0.4			0.15	0.02		0.002				0.03
Poaceae	*Oplismenus aemulus*	Basket Grass	Other Grass	Grass & grasslike (G		1	0.1			2%	0.02			0.003	0.1	0.05	0.001		0.005		0.4
Poaceae	*Oplismenus imbecillis*		Other Grass	Grass & grasslike (G		1			1%		0.01										
Poaceae	*Panicum simile*	Two Colour Panic	Tussock Grass	Grass & grasslike (G		1							0.002								
Poaceae	*Paspalum dilatatum**	Paspalum	nil - exotic		Y	1															
Poaceae	*Poa labillardierei var. labillardierei*	Tussock Grass	Tussock Grass	Grass & grasslike (G		1											0.002				
Poaceae	*Themeda triandra*	Kangaroo Grass	Tussock Grass	Grass & grasslike (G		1		2%													
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	Shrub	Shrub (SG)		1		2%	5%	0.20%		0.002									
Proteaceae	*Stenocarpus salignus*	Scrub Beefwood	Shrub	Shrub (SG)		1								0.01							
Pteridaceae	*Cheilanthes sieberi*	Rock Fern	Fern and fern allies	Fern (EG)		1															
Ranunculaceae	*Clematis aristata*	Old Man's Beard	Vine	Other (OG)		1	0.50%			1%							0.001				
Ranunculaceae	*Clematis glycinoides var. glycinoides*	Headache Vine	Vine	Other (OG)		1	2.00%														
Ranunculaceae	*Ranunculus plebeius*	Hairy Buttercup	Forb	Forb (FG)		1															
Rhamnaceae	*Alphitonia excelsa*	Red Ash	Tree	Tree (TG)		1	2.00%				0.001	0.001	0.001		0.001						
Rhamnaceae	*Pomaderris ferruginea*	Rusty Pomaderris	Shrub	Shrub (SG)		1															
Rhamnaceae	*Pomaderris intermedia*		Shrub	Shrub (SG)		1								0.001							
Ripogonaceae	*Ripogonum brevifolium*	Small-leaved Supplejack				1															
Rosaceae	*Rubus fruticosus agg.**	Blackberry complex	nil - exotic		Y	1															0.001
Rosaceae	*Rubus moluccanus*	Broad-leaf Bramble				1				1					0.001						
Rubiaceae	*Galium proquinquum*	Bedstraw	Forb	Forb (FG)		1									0.001						
Rubiaceae	*Morinda jasminoides*	Sweet Morinda	Vine	Other (OG)		1	0.003	0.20%	1%	5%	0.001		0.001	0.05	0.02	0.05	0.005	0.001	0.01	0.001	0.003
Rubiaceae	*Opercularia hispida*	Hairy Stinkweed	Forb	Forb (FG)		1		0.10%													
Rubiaceae	*Pomax umbellata*	Pomax	Forb	Forb (FG)		1		0.10%					0.001								
Rutaceae	*Citrus sp.**		nil - exotic			1											0.001				
Rutaceae	*Melicope micrococca*	White Euodia, Hairy-leaved	Doughwood			1	0.50%												0.001	0.001	
Santalaceae	*Exocarpos cupressiformis*	Native Cherry	Shrub	Shrub (SG)		1															
Sapindaceae	*Alectryon subcinereus*	Native Quince	Shrub	Shrub (SG)		1													0.001		
Sapindaceae	*Guioa semiglauca*	Guioa	Tree	Tree (TG)		1										0.002					
Scrophulariaceae	*Veronica plebeia*	Creeping Speedwell	Forb	Forb (FG)		1								0.001			0.001				
Smilacaceae	*Ripogonum album*	White Supplejack	Vine	Other (OG)		1								0.001	0.001			0.001	0.01	0.04	
Smilacaceae	*Smilax australis*	Lawyer Vine	Vine	Other (OG)		1	0.001	1%	0.20%	0.10%				0.005				0.002	0.02	0.01	
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla	Vine	Other (OG)		1							0.001								
Solanaceae	*Duboisia myoporoides*	Corkwood	Shrub	Shrub (SG)		1				1%											
Solanaceae	*Physalis peruviana**	Cape Gooseberry	nil - exotic			1										0.001					
Solanaceae	*Solanum mauritianum**	Wild Tobacco	nil - exotic			1	0.10%														
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berr	nil - exotic			1															
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower	Shrub	Shrub (SG)		1							0.001								
Verbenaceae	*Lantana camara**	Lantana	nil - exotic		Y	1	0.05	10%	1%	10%			0.005	0.05	0.05	0.2	0.05	0.002	0.01		0.01
Verbenaceae	*Verbena bonariensis**	Purpletop	nil - exotic			1															
Verbenaceae	*Verbena rigida var. rigida**	Veined Verbena	nil - exotic			1					0.001										
Vitaceae	*Cayratia clematidea*	Native Grape	Vine	Other (OG)		1															

Vitaceae	*Cissus antarctica*	Kangaroo Vine	Vine	Other (OG)		1									0.002	0.08		0.02	0.02	0.02	
Vitaceae	*Cissus hypoglauca*	Water Vine	Vine	Other (OG)		1		0.10%	2%	5%			0.001	0.001				0.005			
Xanthorrhoeaceae	*Xanthorrhoea sp.*		Xanthorrhoea	Other (OG)		1			1%												

Family	Scientific Name	Common Name	BAM Growth Form	BAM Growth Form Group	HTE	Present on Site	Plot 16 GP16 13/6/2018	Plot 17 RS01 30/5/2018	Plot 18 RS02 30/5/2019	Plot 19 RS03 30/5/18	Plot 20 RS04 30/5/18	Plot 21 RS05 31/5/18	Plot 22 RS06 31/5/18	Plot 23 RS07 31/5/18	Plot 24 RS08 7/6/18	Plot 25 RS09 7/6/18	Plot 26 RS10 7/6/18	Plot 27 RS11 7/6/18	Plot 28 RS12 13/6/18	Plot 29 RS13 13/6/18	Plot 30 RS14 13/6/19	Plot 31 RS15 13/6/18
Acanthaceae	*Brunoniella australis*	Blue Trumpet	Forb	Forb (FG)		1																
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	Forb	Forb (FG)		1	0.1														0.1	
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	Fern and fern allies	Fern (EG)		1					4					2	0.5	1	0.1	2		
Adiantaceae	*Adiantum formosum*	Giant Maidenhair	Fern and fern allies	Fern (EG)		1																
Anacardiaceae	*Euroschinus falcatus var. falcatus*	Ribbonwood	Tree	Tree (TG)		1																
Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily	Forb	Forb (FG)		1																
Apiaceae	*Centella asiatica*	Swamp Pennywort	Forb	Forb (FG)		1	0.4				2		0.1	1				0.2	2		0.2	
Apiaceae	*Hydrocotyle peduncularis*	Pennywort	Forb	Forb (FG)		1	0.1				1								0.1		0.1	
Apiaceae	*Hydrocotyle tripartita*	Pennywort	Forb	Forb (FG)		1															0.1	
Apocynaceae	*Marsdenia rostrata*	Common Milk Vine	Vine	Other (OG)		1																
Apocynaceae	*Marsdenia viridiflora ssp viridiflora*	Native Pear	Vine	Other (OG)		1																
Apocynaceae	*Parsonsia straminea*	Common Silkpod	Vine	Other (OG)		1	0.1	0.2			2	2	0.5	1	0.4	0.5			3	2	0.5	
Araceae	*Gymnostachys anceps*	Settlers Flax	Forb	Forb (FG)		1					2						0.1	0.5		1		
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax	Shrub	Shrub (SG)		1									1							
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	Palm & palmlike	Other (OG)		1																
Arecaceae	*Livistona australis*	Cabbage Tree Palm	Palm & palmlike	Other (OG)		1											0.1			2		
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern	nil - exotic		Y	1		0.5													0.1	
Asparagaceae	*Asparagus sp.**		nil - exotic			1																
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	nil - exotic		Y	1	0.1															
Asteraceae	*Cirsium vulgare**	Spear Thistle	nil - exotic			1	0.1															
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane	nil - exotic			1																
Asteraceae	*Cyanthillium cinereum*		Forb	Forb (FG)		1															0.1	
Asteraceae	*Hypochaeris radicata**	Flatweed	nil - exotic			1	0.1															
Asteraceae	*Hypochaeris sp.**	A Catsear	nil - exotic			1																
Asteraceae	*Lagenifera stipitata*	Blue Bottle-daisy	Forb	Forb (FG)		1				0.1												
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting	Shrub	Shrub (SG)		1			0.2													
Asteraceae	*Senecio madagascariensis**	Fireweed	nil - exotic		Y	1	0.1															
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	Vine	Other (OG)		1	0.1	0.2		0.5	2		2			1	1	2	3	2	0.1	
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	Fern and fern allies	Fern (EG)		1											25	4				
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern	Fern and fern allies	Fern (EG)		1										2	3	1				
Boraginaceae	*Ehretia acuminata var. acuminata*	Koda	Tree	Tree (TG)		1																
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	Tree	Tree (TG)		1		4	12	15		6	0.4			3	5	6				
Celastraceae	*Maytenus silvestris*	Orange Bush				1						0.2			0.5		0.5	2		0.3		
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wande	Forb	Forb (FG)		1																
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew	nil - exotic		Y	1																
Convolvulaceae	*Calystegia sepium subsp. roseata*		Vine	Other (OG)		1											1					
Convolvulaceae	*Dichondra repens*	Kidney Weed	Forb	Forb (FG)		1	1				2		2	0.5			0.2	2	5	0.5	2	
Convolvulaceae	*Polymeria calycina*	Bindweed	Vine	Other (OG)		1																
Cunoniaceae	*Callicoma serratifolia*	Black Wattle	Shrub	Shrub (SG)		1										3						
Cyperaceae	*Carex appressa*	Tall Sedge	Sedge	Grass & grasslike (G		1										0.5	2	1		4	1	
Cyperaceae	*Carex longebrachiata*	Bergalia Tussock	Sedge	Grass & grasslike (G		1	3				4		4						15		20	
Cyperaceae	*Cyperus sp.*		Sedge	Grass & grasslike (G		1																
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	Sedge	Grass & grasslike (G		1							0.5	10					1	2	0.2	
Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge	Sedge	Grass & grasslike (G		1								60								
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	Sedge	Grass & grasslike (G		1			1	2		0.1		2	1							
Cyperaceae	*Schoenus nitens*		Sedge	Grass & grasslike (G		1																
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	Fern and fern allies	Fern (EG)		1																
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	Fern and fern allies	Fern (EG)		1	2	10			3		0.5	0.2	1		25	10		2		
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	Tree fern	Other (OG)		1										2	25	8		2		
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	Shrub	Shrub (SG)		1																
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower	Vine	Other (OG)		1			0.2		2					0.2	2	2		0.5		
Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower	Shrub	Shrub (SG)		1																
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	Vine	Other (OG)		1	0.2		0.5		2			1								
Dioscoreaceae	*Dioscorea transversa*	Native Yam	Vine	Other (OG)		1															0.1	
Ebenaceae	*Diospyros australis*	Black Plum	Shrub	Shrub (SG)		1																
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Shrub	Shrub (SG)		1										1						
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath	Heath shrub	Shrub (SG)		1			0.1	3		0.5		1	0.5							
Epacridaceae	*Leucopogon lanceolatus*	Lance-leaf Beard-heath	Heath shrub	Shrub (SG)		1				0.2		0.5			1							
Epacridaceae	*Trochocarpa laurina*	Tree Heath	Tree	Tree (TG)		1									5	6	2	8	1			
Ericaceae	*Acrotriche divaricata*		Heath shrub	Shrub (SG)		1									1							
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	Shrub	Shrub (SG)		1		6	2				0.5	0.5	0.5	1	1	1	0.3	3	0.1	
Eupomatiaceae	*Eupomatia laurina*	Bolwarra	Shrub	Shrub (SG)		1																
Fabaceae	*Acacia binervata*	Two-veined Hickory	Tree	Tree (TG)		1													2			
Fabaceae	*Acacia elongata*	Swamp Wattle	Shrub	Shrub (SG)		1			3			0.5			0.1					2		
Fabaceae	*Acacia irrorata*	Green Wattle	Shrub	Shrub (SG)		1	2							1					2		2	
Fabaceae	*Acacia longifolia var. longifolia*	Sydney Golden Wattle	Shrub	Shrub (SG)		1		4											1			
Fabaceae	*Acacia longissima*	Long-leaf Wattle	Shrub	Shrub (SG)		1				0.2												
Fabaceae	*Acacia maidenii*	Maiden's Wattle	Tree	Tree (TG)		1																

Fabaceae	*Acacia saliciformis*		Shrub	Shrub (SG)		1									0.8							
Fabaceae	*Acacia schinoides*	Green Cedar Wattle	Shrub	Shrub (SG)		1			0.7													
Fabaceae	*Acacia sp.*	Wattle				1																
Fabaceae	*Bossiaea obcordata*	Spiny Bossiaea	Shrub	Shrub (SG)		1			2						1							
Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea	Shrub	Shrub (SG)		1		4	5	6		5			3							
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil	Forb	Forb (FG)		1		0.2														
Fabaceae	*Desmodium varians*	Slender Tick-trefoil	Vine	Other (OG)		1		0.2				0.5							0.1		0.1	
Fabaceae	*Glycine clandestina*	Twining Glycine	Vine	Other (OG)		1	0.1	0.2	1		1	0.1		0.5		1					0.1	
Fabaceae	*Hardenbergia violacea*	False Sarsparilla	Vine	Other (OG)		1		0.2				2			1							
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea	Vine	Other (OG)		1																
Fabaceae	*Podolobium ilicifolium*	Prickly Shaggy Pea	Shrub	Shrub (SG)		1						0.5			3	1						
Geraniaceae	*Geranium homeanum*	Northern Cranesbill	Forb	Forb (FG)		1	0.1												0.2			
Goodeniaceae	*Goodenia paniculata*	Swamp Goodenia	Forb	Forb (FG)		1															0.1	
Haloragaceae	*Gonocarpus teucrioides*	Raspwort	Forb	Forb (FG)		1								1	1				1	0.3		
Juncaceae	*Juncus usitatus*	Common Rush	Rush	Grass & grasslike (G		1					1								1			
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	Tree	Tree (TG)		1																
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower	Forb	Forb (FG)		1																
Lauraceae	*Cassytha glabella*		Vine	Other (OG)		1		0.5					0.5			1						
Lauraceae	*Cinnamomum camphora**	Camphor Laurel	nil - exotic		Y	1	0.1	0.3													0.1	
Lauraceae	*Cryptocarya microneura*	Murrogun	Tree	Tree (TG)		1											1			1		
Lauraceae	*Cryptocarya sp.*					1		0.1														
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge-fern	Fern and fern allies	Fern (EG)		1									0.5							
Lobeliaceae	*Lobelia purpurascens*	Whiteroot	Forb	Forb (FG)		1	1	0.5	0.3	1	1	0.1	1		1			2	3	0.2	0.2	
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush	Rush	Grass & grasslike (G		1		0.1	1	0.1		0.1										
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	Rush	Grass & grasslike (G		1		0.8	4	3	2	2	1	2	5	6	2	1		1		
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	Rush	Grass & grasslike (G		1			2	0.8												
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	Vine	Other (OG)		1																
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	Vine	Other (OG)		1	0.2	1	1	0.4	1	1	0.4		0.4	1	1	2		0.5	0.1	
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	nil - exotic			1	0.1															
Meliaceae	*Melia azedarach*	White Cedar	Tree	Tree (TG)		1																
Meliaceae	*Synoum glandulosum subsp. glandulo*	Scentless Rosewood	Tree	Tree (TG)		1																
Menispermaceae	*Stephania japonica*	Snake vine	Vine	Other (OG)		1	0.1				1		0.4									
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine	Vine	Other (OG)		1											0.1	0.2				
Monimiaceae	*Wilkiea huegeliana*	Wilkiea, Veiny Wilkiea	Shrub	Shrub (SG)		1											2	2	0.1	0.7		
Moraceae	*Ficus coronata*	Sandpaper Fig	Shrub	Shrub (SG)		1																
Moraceae	*Trophis scandens*	Burny Vine				1																
Myrsinaceae	*Myrsine variabilis*	Muttonwood	Shrub	Shrub (SG)		1													0.1			
Myrtaceae	*Acmena smithii*	Lillypilly	Tree	Tree (TG)		1											3	3		6		
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	Tree	Tree (TG)		1	30							4								
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	Shrub	Shrub (SG)		1								3		1	2				2	
Myrtaceae	*Callistemon sp.*		Shrub	Shrub (SG)		1																
Myrtaceae	*Choricarpia leptopetala*	Brown Myrtle, Brush Turpen	Shrub	Shrub (SG)		1																
Myrtaceae	*Corymbia maculata*	Spotted Gum	Tree	Tree (TG)		1		30	20	20		25			10	20	6	6				
Myrtaceae	*Eucalyptus acmenoides*	White Mahogany	Tree	Tree (TG)		1				5		3			2	2				5		
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum	Tree	Tree (TG)		1															3	
Myrtaceae	*Eucalyptus deanei*	Mountain Blue Gum	Tree	Tree (TG)		1																
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	Tree	Tree (TG)		1			3						2							
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Tree	Tree (TG)		1		10	6	4		4				5	2	10		5		
Myrtaceae	*Eucalyptus propinqua*	Small Fruited Grey Gum	Tree	Tree (TG)		1											2					
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	Tree	Tree (TG)		1								4					2			
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	Tree	Tree (TG)		1					1.5		20	12					2	2		
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	Tree	Tree (TG)		1					4					10	14	4		10		
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark	Tree	Tree (TG)		1						2										
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	Tree	Tree (TG)		1	10				6			4								
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	Shrub	Shrub (SG)		1							0.5									
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree	Shrub	Shrub (SG)		1																
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	Shrub	Shrub (SG)		1													25			
Myrtaceae	*Melaleuca decora*	White Feather Honeymyrtle	Shrub	Shrub (SG)		1								5								
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer	Shrub	Shrub (SG)		1					10		60	20					10	15	0.3	
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle	Shrub	Shrub (SG)		1					4		3						2			
Myrtaceae	*Melaleuca sieberi*		Shrub	Shrub (SG)		1																
Myrtaceae	*Melaleuca stypheloides*	Prickly-leaved Tea Tree	Shrub	Shrub (SG)		1								5				1			30	
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	Shrub	Shrub (SG)		1											1					
Myrtaceae	*Syncarpia glomulifera*	Turpentine	Tree	Tree (TG)		1									2	3	3	3		20		
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant	nil - exotic		Y	1																
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet	nil - exotic		Y	1	0.2															
Oleaceae	*Ligustrum sinense**	Small-leaved Privet	nil - exotic		Y	1															0.1	
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-oliv	Tree	Tree (TG)		1	0.1				0.4	0.1	0.5		1	2						
Orchidaceae	*Cryptostylis erecta*	Bonnet Orchid	Forb	Forb (FG)		1																
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorre	Forb	Forb (FG)		1	0.1												1			
Phormiaceae	*Dianella caerulea*	Blue Flax-lily	Forb	Forb (FG)		1	0.1	0.2	3	5	5	2	1	2	3	6	0.5	1	2	6	0.1	
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree	Tree	Tree (TG)		1	0.1				4		0.5	5	0.5	2	2	5	2	5	30	

Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree	Tree	Tree (TG)		1		3	2	0.1												
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry	Vine	Other (OG)		1		0.3	0.2	1												
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn	Shrub	Shrub (SG)		1				0.2		3								0.2	1	
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum	Shrub	Shrub (SG)		1															4	
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	Shrub	Shrub (SG)		1		0.1									2	2				
Plantaginaceae	*Plantago lanceolata**	Ribwort	nil - exotic			1	0.1															0.1
Poaceae	*Aristida vagans*	Three-awn Speargrass	Tussock Grass	Grass & grasslike (G		1			1	0.2												
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass	nil - exotic		Y	1	1															0.2
Poaceae	*Cymbopogon refractus*	Barbwire Grass	Tussock Grass	Grass & grasslike (G		1				0.1						5						
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass	Tussock Grass	Grass & grasslike (G		1				0.4												
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	Tussock Grass	Grass & grasslike (G		1	0.1				1		0.2							0.2		
Poaceae	*Ehrharta erecta**	Panic Veldtgrass	nil - exotic		Y	1	0.2															
Poaceae	*Ehrharta sp.**	Veldtgrass	nil - exotic			1																
Poaceae	*Entolasia marginata*	Bordered Panic	Tussock Grass	Grass & grasslike (G		1			0.1	1	6		20	20						15		2
Poaceae	*Entolasia sp.*			Grass & grasslike (G		1																
Poaceae	*Entolasia stricta*	Wiry Panic	Tussock Grass	Grass & grasslike (G		1		5	6	15		2	20	5	3	1		2	6	2		
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	Tussock Grass	Grass & grasslike (G		1				0.2				0.1								
Poaceae	*Eriochloa procera*	Spring Grass		Grass & grasslike (G		1																
Poaceae	*Imperata cylindrica*	Blady Grass	Tussock Grass	Grass & grasslike (G		1		25	4		2			6	2			0.5	0.3		0.5	
Poaceae	*Microlaena stipoides*	Weeping Grass	Other Grass	Grass & grasslike (G		1	2	3		8	5	3		3	8						4	
Poaceae	*Oplismenus aemulus*	Basket Grass	Other Grass	Grass & grasslike (G		1	30		0.2	0.6	3		10	4		2	2	3	15	8	2	
Poaceae	*Oplismenus imbecillis*		Other Grass	Grass & grasslike (G		1	0.1											1				
Poaceae	*Panicum simile*	Two Colour Panic	Tussock Grass	Grass & grasslike (G		1																
Poaceae	*Paspalum dilatatum**	Paspalum	nil - exotic		Y	1	0.1												0.1		0.1	
Poaceae	*Poa labillardierei var. labillardierei*	Tussock Grass	Tussock Grass	Grass & grasslike (G		1																
Poaceae	*Themeda triandra*	Kangaroo Grass	Tussock Grass	Grass & grasslike (G		1			5	8		20			6							
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	Shrub	Shrub (SG)		1		5	4	5	2	1		0.1	4	2	0.8	1				
Proteaceae	*Stenocarpus salignus*	Scrub Beefwood	Shrub	Shrub (SG)		1																
Pteridaceae	*Cheilanthes sieberi*	Rock Fern	Fern and fern allies	Fern (EG)		1			0.1	0.3												
Ranunculaceae	*Clematis aristata*	Old Man's Beard	Vine	Other (OG)		1	0.1					0.2			1		1	2		0.2		
Ranunculaceae	*Clematis glycinoides var. glycinoides*	Headache Vine	Vine	Other (OG)		1																
Ranunculaceae	*Ranunculus plebeius*	Hairy Buttercup	Forb	Forb (FG)		1																0.1
Rhamnaceae	*Alphitonia excelsa*	Red Ash	Tree	Tree (TG)		1	0.1															0.1
Rhamnaceae	*Pomaderris ferruginea*	Rusty Pomaderris	Shrub	Shrub (SG)		1			0.1						2							
Rhamnaceae	*Pomaderris intermedia*		Shrub	Shrub (SG)		1																
Ripogonaceae	*Ripogonum brevifolium*	Small-leaved Supplejack				1															0.2	
Rosaceae	*Rubus fruticosus agg.**	Blackberry complex	nil - exotic		Y	1	0.5															
Rosaceae	*Rubus moluccanus*	Broad-leaf Bramble				1											0.2	1.3		1	0.1	
Rubiaceae	*Galium propinquum*	Bedstraw	Forb	Forb (FG)		1	0.1															0.1
Rubiaceae	*Morinda jasminoides*	Sweet Morinda	Vine	Other (OG)		1	0.1				1		0.2									0.1
Rubiaceae	*Opercularia hispida*	Hairy Stinkweed	Forb	Forb (FG)		1																
Rubiaceae	*Pomax umbellata*	Pomax	Forb	Forb (FG)		1			1	1		0.2										
Rutaceae	*Citrus sp.**		nil - exotic			1																
Rutaceae	*Melicope micrococca*	White Euodia, Hairy-leaved Doughwood				1																
Santalaceae	*Exocarpos cupressiformis*	Native Cherry	Shrub	Shrub (SG)		1								0.5								
Sapindaceae	*Alectryon subcinereus*	Native Quince	Shrub	Shrub (SG)		1																
Sapindaceae	*Guioa semiglauca*	Guioa	Tree	Tree (TG)		1																
Scrophulariaceae	*Veronica plebeia*	Creeping Speedwell	Forb	Forb (FG)		1																0.1
Smilacaceae	*Ripogonum album*	White Supplejack	Vine	Other (OG)		1																
Smilacaceae	*Smilax australis*	Lawyer Vine	Vine	Other (OG)		1										1						
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla	Vine	Other (OG)		1					1		1				3	2				
Solanaceae	*Duboisia myoporoides*	Corkwood	Shrub	Shrub (SG)		1																
Solanaceae	*Physalis peruviana**	Cape Gooseberry	nil - exotic			1	0.1															
Solanaceae	*Solanum mauritianum**	Wild Tobacco	nil - exotic			1																
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berr	nil - exotic			1	0.1				0.5		0.2									
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower	Shrub	Shrub (SG)		1																
Verbenaceae	*Lantana camara**	Lantana	nil - exotic		Y	1	2	0.5	0.6		4							12	2		0.5	
Verbenaceae	*Verbena bonariensis**	Purpletop	nil - exotic			1	0.1															
Verbenaceae	*Verbena rigida var. rigida**	Veined Verbena	nil - exotic			1				1.5												
Vitaceae	*Cayratia clematidea*	Native Grape	Vine	Other (OG)		1	0.1						0.1									
Vitaceae	*Cissus antarctica*	Kangaroo Vine	Vine	Other (OG)		1																
Vitaceae	*Cissus hypoglauca*	Water Vine	Vine	Other (OG)		1		0.5	0.4						0.2	1	0.2	2		1		
Xanthorrhoeaceae	*Xanthorrhoea sp.*		Xanthorrhoea	Other (OG)		1											1					

Appendix B – BAM Field Sheets

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	684 GPD1	GP

Date	Zone	Datum	IBRA region	Photo #	Zone ID
30-8-18				126	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
		20 x 50m	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	684	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	3
	Grasses etc.	6
	Forbs	5
	Ferns	3
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	50
	Shrubs	15.7
	Grasses etc.	14.6
	Forbs	0.6
	Ferns	1.3
	Other	5.1
High Threat Weed cover		21

BAM Attribute (20 x 50 m plot)		# Tree Stems Count		
dbh		Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc	80 + cm	1		
	50 – 79 cm	3	2	
	30 – 49 cm	9	2	
	20 – 29 cm	6	5	
	10 – 19 cm	5	15	
	5 – 9 cm	1	6	n/a
	< 5 cm	2	10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		5+2 Tally space		total 7

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	100 90 90 85 85	0 0 0 2 0	2 2 2 1 1	0 0 0 0 0
Average of the 5 subplots	90	0.4	1.6	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	50cm
Lithology		Soil Surface Texture	loamy sand.	Soil Colour	grey	Soil Depth	?
Slope	3°	Aspect	E	Site Drainage	good	Distance to nearest water and type	?

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	NR	cut trees
Cultivation (inc. pasture)	0	R	
Soil erosion	1	NR	
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	2		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date __/__/__	Mardi	GP01	GP

GF Code		*Top 3 native species in each growth form group: Full species name mandatory* *All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E. pilularis	N	15	3		
T	2	C. maculata	N	10	2		
/	3	Camphor Laurel	HTE	15	20		
T	4	Angophora floribunda	N	10	4		
T	5	Allocas. torul.	N	8	4		
/	6	Lantana	HTE	5	10		
T	7	Alphitonia excelsa	N	2	5		
S	8	Breynia oblong.	N	15	50		
L	9	~~Eustrephus latifolius~~ Geitonoplesium cymosum	N	2	20		
L	10	~~Cissus hypoglauca~~ Clematis glyci.	N	~~2~~	8		
G	11	Imperata cylindrica	N	3	100		
D	12	Oplismenus aemulus	N	10	200		
L	13	Clematis aristata	N	0.5	1		
R	14	Lomandra filiformis	N	0.5	5		
F	15	Dianella caerulea	N	0.1	1		
E	16	fern (S)	N	0.1	1		
F	17	Dichondra repens	N	0.2	10		
G	18	Microlaena stipoides (S)✓	N	0.5	20		
/	19	Asparagus aethiopicum	HTE	0.5	5		
T	20	Glochidion ferd.	N	5	6		
E	21	Bracken	N	1	10		
/	22	Ligustrum lucid.	HTE	0.5	8		
F	23	Commelina cyanea	N	0.1	1		
F	24	Pratia purpurascens	N	0.1	5		
L	25	Glycine clandestina	N	0.1	3		
F	26	Hydrocotyle pedi. ~~Geranium homeanum~~ (P)	N	0.1	1		
L	27	Glycine tab.	N	0.1	3		
S	28	Acacia ~~flor.~~? (S) Acacia longissima	N	0.2	2		
E	29	Fern (S) Hypolepis muelleri	N	0.2	10		
L	30	Parsonsia stram.	N	0.1	5		
~~—~~	~~31~~	~~Dichondra repens~~	~~N~~	~~0.2~~	~~10~~		
R	32	Lomandra long.	N	0.5	4		
/	33	Tobacco bush	E	0.1	1		
L	34	Smilax aus.	N	0.1	3		
L	35	Pinnate vine (S) Morinda jasminoides		0.3	4		
V	36	Gahnia clarkei	N	0.1	1		
L	37	Kennedia rubi.	N	0.1	1		
S	38	Melicope micrococca	N	0.5	10		
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	684 GP02	GP

Date	Zone	Datum	IBRA region	Photo #	Zone ID
30-5-18	__	__		129	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _ _	20 x 50	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	684	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	8
	Grasses etc.	8
	Forbs	9
	Ferns	3
	Other	6
Sum of Cover of native vascular plants by growth form group	Trees	87
	Shrubs	13.3
	Grasses etc.	49.1
	Forbs	2.2
	Ferns	6
	Other	1.7
High Threat Weed cover		10.5

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	1		1
50 – 79 cm	2		1
30 – 49 cm	14		
20 – 29 cm	14	1	
10 – 19 cm	20	21 +10	
5 – 9 cm	1	23 +10	n/a
< 5 cm	3	47 +20	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 26

Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 75 70 80 80	1a 2 2 d 2	2 3 3 2 2	a b c d e
Average of the 5 subplots	79	1	2.4	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	1m
Lithology		Soil Surface Texture	loamy sand	Soil Colour	grey	Soil Depth	shallow
Slope	10°	Aspect	N	Site Drainage	good	Distance to nearest water and type	100m - stream

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	1		gully
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date __/__/__		GP02	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. pil.	N	20	5		
T	2 C. maculata	N	40	15		
T	3 Allo. tor.	N	10	8		
S	4 Persoonia linearis	N	2	5		
G	5 Microlaena stipoides	N	2	50		
G	6 Entolasia ~~stricta~~ marginata	N	3	100		
D	7 Oplismenus aemulus	N				
G	8 Themeda triandra	N	2	50		
G	9 Imperata cylindrica	N	30	3000		
T	10 Glochidion ferdinandi	N	15	15		
F	11 Pratia purpurascens	N	1	20		
F	12 Pseudanthemum variable	N	0.1	5		
F	13 Vernonia cinerea	N	0.1	5		
V	14 Glycine/Galium sieberiana	N	2	10		
E	15 Adiantum aethiopicum	N	~~10~~ 2	10		
/	16 Lantana	HTE	10	20		
R	17 Lomandra long.	N	10	20		
L	18 Smilax aus.	N	1	2		
S	19 Breynia obl.	N	0.5	5		
/	20 Camphora cinnamomum	HTE	0.5	5		
F	21 Dianella caerulea	N	0.5	5		
L	22 Geitonoplesium cymosum	N	0.2	10		
Z	23 Leucopogon juniperinus	N	0.2	4		
S	24 Daviesia ulicifolia	N	0.2	5		
F	25 Centella asiatica	N	0.1	5		
L	26 Morinda jasminoides	N	0.2	5		
F	27 Opercularia? (s) ~~aspera~~ hispida	N	0.1	2		
F	28 Oxalis perennans	N	0.1	3		
F	29 small shrub (s) Gonocarpus teucrioides	N	0.1	1		
L	30 Marsdenia virid (s) X	N	0.1	5		
Z	31 Leucopogon lance.	N	0.2	5		
S	32 Ozothamnus diosmifolius (s) fragrant	N	0.1	1		
F	33 Pomax umbel. Hairy leaf Forb opp leaves (s)	N	0.1	3		
V	34 graminoid indet	N	0.1	3		
S	35 Hibbertia?? (s) obtusifolia	N	0.1	1		
E	36 Calochlaena dubia	N	2	50		
S	37 Callistemon salignus ~~Melaleuca~~/Callistemon (s)	N	10	20		
L	38 Vine (s) ?	N	0.1	1		
T	39 E. ~~microcorys~~ resinifera	N	2	1		
L	40 Cissus hypoglauca	N	0.1	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

E Bracken N 2 20

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	684 GP03	GP

Date	Zone	Datum	IBRA region		Photo #	130	Zone ID	
30-5-18								

Easting	Northing	Dimensions	in	Orientation of midline from the 0 m point.	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	684	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	7
	Shrubs	9
	Grasses etc.	7
	Forbs	6
	Ferns	3
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	78
	Shrubs	4.7
	Grasses etc.	3.6
	Forbs	2.5
	Ferns	0.8
	Other	4.9
High Threat Weed cover		1

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	| 1	Non Euc	Hollows
50 – 79 cm	|| 2		
30 – 49 cm	10	| 1	
20 – 29 cm	8	| 1	
10 – 19 cm	25	21 +8	
5 – 9 cm	|| 2	11 +7 +20	n/a
< 5 cm		|| 37 +5 +30	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 50

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	70 75 70 80 80	0 0 5 0 0	2 2 2 3 2	5 0 0 0 0
Average of the 5 subplots	75	1	2.2	1

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	30cm
Lithology		Soil Surface Texture	loamy sand	Soil Colour	grey	Soil Depth	shallow
Slope	10°	Aspect	NW	Site Drainage	good.	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	stumps
Cultivation (inc. pasture)	O		
Soil erosion	1	NR	gully
Firewood / CWD removal	O		
Grazing (identify native/stock)	O		
Fire damage	1	O	
Storm damage	O		
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 30/5/19	Mordi	GP03	GP

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E. pil.	N	40	10		
T	2	C. mac.	N	8	5		
T	3	Allo. tor.	N	15	30		
S	4	Restionia lin.	N	5	10		
T	5	Syncarpia glom.	N	10	7		
S	6	Daviesia ulicifolia	N	0.2	3		
G	7	Cymbopogon refr.	N	0.1	1		
G	8	Imperata cylindrica	N	1	20		
Z	9	Lepyrodia lance.	N	1	3		
T	10	Glochidion ferd.	N	3	8		
S	11	Baeckia dol.	N	2	10		
F	12	Platia perp.	N	0.1	10		
F	13	Pseudercinthemum variable	N	0.1	5		
G	14	Microlaena stip.	N	0.1	10		
F	15	Dianella caer.	N	2	20		
F	16	Geranium homeanum? or Hydrocotyle bonariensis	N	0.1	5		
R	17	Lomandra filif	N	0.2	5		
L	18	Pandorea pand. vine (S)	N	0.1	B		
V	19	Lepidosperma lat	N	0.2	5		
L	20	Smilax glau	N	0.2	3		
F	21	ph 131-132 orchid – purple underleaf	N	0.1	1		
E	22	Lindsaea microphylla	N	0.1	1		
G	23	Entolasia stricta	N	2	20		
L	24	Cissus hypoglauca	N	2	5		
T	25	Trochocarpa laurina Shrub ph 133 (S)	N	1	1		
L	26	Parsonsia str.	N	0.1	1		
L	27	Morinda jas.	N	1	5		
D	28	Ophiopogon jab.	N	1	20		
L	29	Marsdenia viri – as Q02	N	0.1	1		
Z	30	Leuc. jun.	N	0.5	6		
L	31	Billardiera scandens	N	0.1	3		
/	32	Lantana	HTE	1	3		
E	33	Bracken	N	0.5	3		
L	34	Gertonoplesium cymosum	N	0.2	1		
F	35	Oxalis perdens	N	0.1	1		
Z	36	Acrotriche divaricata	N	0.5	4		
S	37	Hibbertia sp (S) aspera	N	0.2	5		
B	38	Blechnum cart.	N	0.2	3		
S	39	Pittosporum multiflorum	N	0.2	1		
X	40	Xanthorrhoea	N	1	5		
S		Acacia sp. seedling	N	0.1	1		
T		E. resinifera	N	2	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	684 GP04	GP

Date	Zone	Datum	IBRA region		Photo #		Zone ID	
30-5-18								

Easting	Northing	Dimensions		Orientation of midline from the 0 m point.	Magnetic °
			m		

		Confidence: H M L
Vegetation Class		
Plant Community Type	684	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	4
	Grasses etc.	4
	Forbs	4
	Ferns	3
	Other	10
Sum of Cover of native vascular plants by growth form group	Trees	18.7
	Shrubs	2.2
	Grasses etc.	9.5
	Forbs	1.6
	Ferns	5
	Other	29.1
High Threat Weed cover		0.1

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	1		
50 – 79 cm			
30 – 49 cm	18	1	
20 – 29 cm	10	3	
10 – 19 cm	8	18	
5 – 9 cm		59 +9 +30	n/a
< 5 cm	1	+10 55 +20 +20	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	20 + 8 + 5 + 10 + 30 Tally space		total 73

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	75	75	70	60	65	0	0	2	10	8	2	2	2	2	2	0	0	0	0	0
Average of the 5 subplots	69					4					2					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	40 cm
Lithology		Soil Surface Texture	loamy sand	Soil Colour	grey	Soil Depth	shallow
Slope	5°	Aspect	NW	Site Drainage	good	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	stumps
Cultivation (inc. pasture)	O		
Soil erosion	1	NR	gully
Firewood / CWD removal	O		
Grazing (identify native/stock)	O		
Fire damage	2	O	burnt stumps
Storm damage	O		
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m2 plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 30/5/18	Mardi	GP04	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. pilularis	N	50	15		
T	2 C. mac.	N	10	6		
P	3 Livistona aus.	N	15	10		
E	4 Bracken	N	2	20		
L	5 Cissus hypoglauca	N	5	10		
T	6 Glochidion ferd.	N	8	10		
E	7 Adiantum aethiopicum	N	1	10		
D	8 Oplismenus aemulus	N	2	50		
/	9 Lantana	N	10	20		
L	10 Pandorea pand.	N	0.5	3		
L	11 Morinda jas.	N	5	20		
S	12 Rubus moluccanus	N	1	5		
L	13 Clematis aristata	N	1	5		
F	14 Dianella caer.	N	0.5	10		
L	15 Stephania japonica	N	0.1	1		
L	16 Glycine cland.	N	0.1	3		
T	17 reticulate shrub (S) Notelaea longifolia	N	0.2	5		
L	18 Geitonoplesium cymosum	N	0.2	10		
S	19 ~~sapindaceae~~ Duboisia myoporoides	N	0.1	1		
G	20 Imperata cylindr.	N	5	50		
F	21 Dichondra repens	N	0.5	20		
L	22 Parsonsia str.	N	2	5		
T	23 Euc. saligna	N	10	5		
G	24 Entolasia marg.	N	0.5	20		
F	25 Pratia purpurascens	N	0.1	5		
F	26 Centella asiatica	N	0.5	20		
/	27 Cinamomum camphora	HTE	0.1	1		
L	28 Smilax aus.	N	0.1	1		
E	29 Calochlaena dubia	N	2	20		
V	30 Lepido. lat	N	1	3		
S	31 Persoonia line.	N	0.2	2		
S	32 Breynia obl.	N	0.1	1		
T	33 Allo. tor	N	0.5	1		
L	34 Hibbertia -climbing scandens	N	0.1	1		
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	684 GPOS	GP

Date	Zone	Datum	IBRA region	Photo #	Zone ID
31-5-18				138	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
		20 x 50 m	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	684	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	7
	Shrubs	11
	Grasses etc.	4
	Forbs	4
	Ferns	1
	Other	10
Sum of Cover of native vascular plants by growth form group	Trees	83.6
	Shrubs	14.5
	Grasses etc.	5.2
	Forbs	1.2
	Ferns	3
	Other	3.8
High Threat Weed cover		10.2

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†	# Tree Stems Count
dbh				
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows	
50 – 79 cm	4			
30 – 49 cm	6	1		
20 – 29 cm	9	4		
10 – 19 cm	12	9		
5 – 9 cm		10+10+10+10+40 = 80	n/a	
< 5 cm		10+20+30 = 60	n/a	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space			total 40

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	100, 95, 70, 95, 85	0, 0, 1, 1, 2	4, 4, 2, 2, 3	0, 0, 0, 0, 0
Average of the 5 subplots	86	0.8	3	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	loamy sand	Soil Colour	grey	Soil Depth	shallow
Slope	3°	Aspect	NE	Site Drainage	good	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	stumps
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1	NR	fallen trees
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 31/5/18	Mardi	GP05	AP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 C. mac.	N	3	1		
T	2 E. pil.	N	40	6		
T	3 A. floribunda	N	10	5		
T	4 Glochidion ferd.	N	20	30		
S	5 Leptospermum trinervium – red-br. flaky bark	N	5	6		
S	6 Breynia obl.	N	8	50		
L	7 Morinda jas.	N	2	10		
L	8 Parsonsia stram.	N	1	5		
V	9 Lepido. lat.	N	0.2	5		
E	10 Bracken	N	3	20		
Z	11 Leucopogon lanc.	N	0.5	3		
F	12 Pomax umb.	N	0.5	10		
D	13 Oplismenus aem.	N	2	20		
G	14 Entolasia stricta	N	0.1	10		
F	15 Dianella caer.	N	0.5	20		
S	16 Rubus ~~maurit.~~ moluccanus	N	0.1	1		
T	17 Alphitonia excel	N	0.1	1		
T	18 Allo. tor	N	10	5		
L	19 Desmodium varians	N	0.1	3		
G	20 Microlaena stip.	N	2	50		
S	21 Rubus parvifolius	N	0.1	3		
T	22 Ph. 139 reticulate shrub – ~~Wilkiea/Schizomeria~~ Notelaea longifolia	N	0.5	6		
L	23 Smilax glyci.	N	0.1	1		
/	24 Lantana	HTE	10	20		
L	25 Kennedia	N	0.1	5		
L	26 Cissus/Cleistopholis? Cephalaralia cephalobotrys? [illegible]	N	0.1	5		
P	27 Livistona aus.	N	0.1	1		
S	28 Pittosporum multi	N	0.1	3		
L	29 Glycine cland.	N	0.1	3		
F	30 Oxalis perennans	N	0.1	5		
Z	31 Leucopogon junip.	N	0.1	3		
L	32 Stephania japon.	N	0.1	1		
S	33 Sambucus australasica seedling ph 140	N	0.1	1		
S	34 Gompholobium latifolium ~~shrub trailing~~ ph 140	N	0.1	4		
S	35 Lepto. poly.	N	0.2	3		
S	36 Persoonia lin.	N	0.2	1		
/	37 Crofton weed	HTE	0.1	1		
/	38 Cinnamomum camphora	HTE	0.1	5		
L	39 ~~Goodenia – climbing~~ Hibbertia scandens	N	0.1	4		
F	40 Pratia purp.	N	0.1	5		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

	Survey Name	Plot Identifier	Recorders
Date 31/5/18	Nardi	684 GP06	GP

Zone	Datum	IBRA region		Photo #	146	Zone ID	
Easting	**Northing**	**Dimensions**	m	**Orientation of midline from the 0 m point.**	Magnetic °		

Vegetation Class			Confidence: H M L
Plant Community Type	684	**EEC:**	Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	10
	Grasses etc.	5
	Forbs	1
	Ferns	1
	Other	2
Sum of Cover of native vascular plants by growth form group	Trees	69.3
	Shrubs	22.9
	Grasses etc.	11.1
	Forbs	0.2
	Ferns	1
	Other	0.6
High Threat Weed cover		0.5

BAM Attribute (20 x 50 m plot) dbh	# Tree Stems Count: Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	I 1		very big [illegible] outside
50 – 79 cm	IIII III 8		
30 – 49 cm	IIII IIII 9		
20 – 29 cm	IIII I 6	I 1	
10 – 19 cm	IIII I 6	IIII IIII IIII +10 24	I 1
5 – 9 cm	II 2	IIII IIII III +10 +5 28	n/a
< 5 cm	II 2	IIII II +20 +10 +10 47	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 32

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	75	100	80	50	80	3	0	0	0	1	2	3	2	1	2	0	0	0	0	0
Average of the 5 subplots	77					0.8					2					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	loamy sand	Soil Colour	grey	Soil Depth	shallow
Slope	1°	Aspect	NE	Site Drainage	mod - poor	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	stumps
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	1	O	burnt stumps
Storm damage	0		fallen trees
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 31/5/18	Nardi	GP06	GP

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E. pil.	N	60	10		
S	2	Callistemon salignis	N	10	20		
T	3	Glodichion ferd.	N	5	10		
L	4	Parsonsia stram	N	0.1	5		
G	5	Imperata cylin	N	5	200		
L	6	~~Syntax glyc~~ E. Eucalyptus latifolius	N	0.5	10		
G	7	Entolasia marg.	N	2	50		
S	8	Breynia obl.	N	1	10		
T	9	Alphitonia excel.	N	0.1	1		
F	10	Pimelea caerulea	N	0.2	20		
T	11	Acacia ~~leg.~~ maidenii	N	0.2	3		
S	12	Persoonia lin.	N	0.2	3		
E	13	Brunken	N	1	20		
R	14	Lomandra ~~leg.~~ ~~maidenii~~ long.	N	2	10		
G	15	Entolasia stricta	N	2	30		
S	16	Hibbertia scandens	N	0.1	5		
\	17	Cinamomum camphora	~~N~~ E	0.5	5		
T	18	Ang. floribunda	N	4	1		
S	19	Melaleuca linear.	N	5	6		
S	20	Acacia irrorata	N	3	2		
S	21	Acacia ulicifolia	N	2	4		
Z	22	Leucopogon juniper.	N	0.1	3		
G	23	~~Echinopogon caespitosus~~ Cymbopogon refr.	N	0.1	3		
S	24	Mel. sieberi	N	0.5	1		
S	25	Mel. styphelioides	N	1	1		
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	~~1004~~ GP07	GP

Date	Zone	Datum	Easting	Northing	IBRA region	Photo #	Zone ID
31-5-18						143	

Dimensions	m	Orientation of midline from the 0 m point.	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	1723	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	5
	Grasses etc.	5
	Forbs	4
	Ferns	0
	Other	6
Sum of Cover of native vascular plants by growth form group	Trees	10.4
	Shrubs	80.4
	Grasses etc.	22.5
	Forbs	0.4
	Ferns	0
	Other	1.5
High Threat Weed cover		0.5

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
dbh	# Tree Stems Count		
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm			
30 – 49 cm	| 1		
20 – 29 cm	||| 3	| 1	
10 – 19 cm	|||| 4	20+15+20+20 230 +20+20+115 230	
5 – 9 cm	| 1	20+10+15+20 190 +10+20+95 190	n/a
< 5 cm		5+5+10+30 100 +50 100	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 5

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	65 70 80 85 85	5 3 1 0 1	3 0 1 1 2	0 0 0 1 0
Average of the 5 subplots	77	2	1	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	10cm
Lithology		Soil Surface Texture	sandy loam	Soil Colour	d. grey	Soil Depth	moderate
Slope	2°	Aspect	NE	Site Drainage	poor	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1		horse/cow, kangaroo scats
Fire damage	0		
Storm damage	0		
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

PCT1064

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 3/1/5/18	Mardi	GP07	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	1 Melaleuca linearifolia	N	80	200		
T	2 Euc. robusta	N	10	1		
/	3 Lantana	HTE	0.5	1		
S	4 Hibbertia scandens	N	0.1	3		
Z	5 Leucopogon junip.	N	0.1	3		
L	6 Hardenbergia violacea	N	0.1	5		
G	7 Entolasia marg.	N	20	2000		
L	8 Parsonsia stram.	N	1	50		
R	9 Lomandra long	N	2	20		
L	10 Plectranthus ja	N	0.1	5		
F	11 Pomax umbel.	N	0.1	10		
G	12 Grass (s) panicum simile	N	0.2	10		
S	13 Pimelea? (s) linifolia ✓	N	0.1	1		
P	14 Ligustrum ovale	N	0.1	3		
~~T~~	15 Acacia ~~longifolia~~ (s) maidenii	N	0.1	4		
L	16 Smilax glyci.	N	0.1	3		
T	17 reticulate shrub Notolaea longifolia	N	0.1	3		
T	18 Alphitonia exc.	N	0.1	4		
Z	19 Leucopogon lanc.	N	0.1	3		
T	20 Glochidion ferd.	N	0.1	3		
G	21 Eragrostis ? (s) brownii ✓	N	0.1	10		
G	22 grass 2 (s)	N	0.2	20		
T	23 Alloxylon flor.	N	0.1	1		
F	24 Dianella caer.	N	0.1	5		
F	25 graminoid (s) Laxmannia gracilis	N	0.1	1		
F	26 Veronica cinerea	N	0.1	3		
L	27 Cissus hypoglauca	N	0.1	1		
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	RIDGE GP08	GP

Date	Zone	Datum	Easting	Northing	IBRA region	Photo #	Zone ID
7-6-18						148	

Dimensions		Orientation of midline from the 0 m point.	Magnetic °

Vegetation Class	Confidence: H M L
Paperbark	

Plant Community Type	EEC:	Confidence: H M L
1723		

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	7
	Shrubs	9
	Grasses etc.	7
	Forbs	7
	Ferns	4
	Other	7
Sum of Cover of native vascular plants by growth form group	Trees	25.1
	Shrubs	40.3
	Grasses etc.	41.6
	Forbs	0.8
	Ferns	2.4
	Other	6
High Threat Weed cover		5

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	11		
50 – 79 cm	11		
30 – 49 cm	1111 1111	1	
20 – 29 cm	1111 11	1111	
10 – 19 cm	1111 1111 1111	15+7+10+20+10 111	
5 – 9 cm	1	20+10+10+20 10+20+10+20	n/a
< 5 cm		3+15+10 10+20	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 25

Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	60	75	65	70	4	5	2	3	4	2	3	4	4	16	0	0	0	0	0
Average of the 5 subplots	66																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	10cm
Lithology		Soil Surface Texture	loamy sand	Soil Colour	light grey	Soil Depth	shallow
Slope	30°	Aspect	SE	Site Drainage	poor	Distance to nearest water and type	2

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	1		~~holes~~ holes / diggings
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	1	R	Lantana
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	7/6/18	Marsh	GP08	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	1 Melaleuca bizonexa	N	20	10		
S	2 Mel. linearifolius	N	15	10		
T	3 E. pilularis	N	5	1		
T	4 E. saligna	N	8	2		
T	5 E. robusta	N	5	1		
/	6 Lantana	HTE	5	20		
L	7 Morinda jas.	N	5	30		
E	8 Adiantum aeth.	N	2	50		
L	9 Smilax aus.	N	0.5	3		
S	10 Callistemon salignus	N	3	4		
R	11 Lomandra long	N	2	15		
G	12 Entolasia stricta	N	20	2000		
F	13 Pratia purp.	N	0.1	5		
G	14 Microlaena stipoides	N	15	1000		
S	15 Pomaderris intermedia	N	0.1	3		
V	16 Carex? (s) Cyperus sp.	N	4	80		
S	17 Pittosporum multi-	N	1	30		
L	18 Pandorea pand.	N	0.1	10		
F	19 opp. leaved forb Pseuderanthemum variabile	N	0.1	3		
D	20 Oplismenus aem.	N	0.3	20		
Q	21 Calochlaena dubia	N	0.1	5		
T	22 Notelaea long.	N	0.1	3		
E	23 Doodia aspera	N	0.1	10		
T	24 Glochidion ferd.	N	0.2	10		
G	25 grass (s) - like a large Entolasia	N	0.2	5		
F	26 Veronica plebeia	N	0.1	1		
F	27 Vernonia cin.	N	0.1	3		
E	28 Bracken	N	0.2	5		
F	29 forb p.150	N	0.1	10		
F	30 Dianella caer.	N	0.2	6		
Z	31 Leucopogon juniperinus	N	0.1	3		
T	32 Angophora flor.	N	2	1		
L	33 Cissus hypo.	N	0.1	1		
S	34 shrub p.151 Maytenus silvestris	N	0.1	1		
V	35 Lepido. lat.	N	0.1	3		
T	36 Allocas. tor.	N	3	1		
L	37 Persoonia str.	N	0.1	1		
S	38 Stenocarpus salignus	N	1	2		
S	39 toothed-leaves p.152 Wilkiea huegeliana	N	0.1	3		
L	40 Ripogonum album shrub - sample Aumen Backhousia	N	0.1	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

L	Leitonoplesium cymosum	N	0.1	1
F	orchid	N	0.1	6

Form version 5 - designed March 2017 Printed 31 August 2017

Samples in blue bag

GP08

~~Veronica~~

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
Mardi	PCT1064 GP09	GP

Date	Zone	Datum	IBRA region	Photo #	Zone ID
7-6-18	__			153	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _ _ _	20 x 50 m	Magnetic °

		Confidence: H M L
Vegetation Class		
Plant Community Type	Paperbark 1064 1723	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	7
	Grasses etc.	8
	Forbs	8
	Ferns	0
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	5.2
	Shrubs	80.8
	Grasses etc.	24.2
	Forbs	8.2
	Ferns	0
	Other	11.4
High Threat Weed cover		7.3

BAM Attribute (20 x 50 m plot)		# Tree Stems Count	
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows
50 – 79 cm			
30 – 49 cm	III	I	
20 – 29 cm	II	IIII IIII IIII	
10 – 19 cm		30+20+10+20 10+10+10	
5 – 9 cm		10+10+10+10+10 10	n/a
< 5 cm		10+20+20+50 10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 4

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	50	30	30	25	50	10	1	0	50	5	1	1	2	1	2	0	0	0	0	0
Average of the 5 subplots																				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	20cm
Lithology		Soil Surface Texture	loam	Soil Colour	brown	Soil Depth	?
Slope	flat	Aspect	—	Site Drainage	poor	Distance to nearest water and type	?

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	NR	cleared areas nearby
Cultivation (inc. pasture)	0		
Soil erosion	1	NR	drainage channels
Firewood / CWD removal	0		
Grazing (identify native/stock)	1	R	cattle + roo dung
Fire damage	0		
Storm damage	0		
Weediness	1	R	Lantana, Ligustrum
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Dendrobium on melaleuca cuticle 20x20. (5)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 7/6/18	Mardi	GP09	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	1 Melaleuca bracteata	N	50	100		
S	2 Mel. linariifolius	N	30	70		
S	3 Callistemon salignus	N	10	5		
/	4 Lantana	HTE	5	20		
/	5 Ligustrum sinense	HTE	2	5		
S	6 Rubus moluccana	N	0.1	3		
T	7 Alph. ferd.	N	3	20		
L	8 Morinda jasm.	N	2	20		
D	9 Oplismenus aem.	N	10	2000		
F	10 Dichondra repens	N	7	50		
L	11 Desmodium varians.	N	1	20		
L	12 Pandorea pand.	N	3	30		
G	13 Microlaena stipoides	N	2	50		
G	14 Entolasia stricta	N	.5	100		
F	15 Hydrocotyle ped.	N	0.5	20		
T	16 Pittosporum multi	N	2	30		
F	17 Dianella caer.	N	0.1	3		
F	18 Pratia purp.	N	0.1	6		
V	19 Carex? weeping infl. (S) Carex longebrachiata	N	5	40		
L	20 Cissus antarctica	N	0.2	3		
L	21 shrub (S) Ripogonum album	N	0.1	3		
P	22 Livistona aust.	N	1	5		
S	23 Pitt. revol. tree/shrub 3m (S) whorled leaves	N	0.5	1		
S	24 indet shrub	N	0.1	1		
L	25 Parsonsia stram.	N	5	20		
V	26 Carex appressa	N	1	10		
R	27 Juncus usitatus	N	0.1	3		
F	28 Lagenophora stipitata forb - Goodenia/Viola (S)	N	0.1	10		
/	29 Plantago lanc	E	0.1	3		
G	30 Entolasia-like grass	N	1	10		
/	31 Cinnamomum camphora	HTE	0.1	5		
F	32 Centella asiatica	N	0.2	20		
T	33 Alphitonia excelsa	N	0.1	3		
/	34 Ochna Ses.	HTE	0.1	1		
S	35 Breynia obl.	N	0.1	3		
F	36 Geranium homeanum	N	0.1	5		
F	37 Cotula propinqua	N	0.1	3		
/	38 Flat weed	E	0.1	3		
L	39 Glycine cland.	N	0.1	3		
/	40 Rubus frut.	HTE	0.1	3		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

N 0.1 10

V Isolepis Schoenus nitens (S)

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	GP10	GP

Date	Zone	Datum	IBRA region		Photo #	154	Zone ID	
7-6-18								

Easting	Northing	Dimensions	m	Orientation of midline from the 0 m point.	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	Ra 1568	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	9
	Grasses etc.	4
	Forbs	4
	Ferns	2
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	32.2
	Shrubs	22.5
	Grasses etc.	9
	Forbs	3.3
	Ferns	11
	Other	17.4
High Threat Weed cover		20

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm	III	IIII	
30 – 49 cm	IIII 10	5	1
20 – 29 cm	10	1	
10 – 19 cm		+10	
5 – 9 cm		+10	n/a
< 5 cm		+10 10+10+10+10+10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	IIII +10 +8 Tally space		total 18+4=22

Number of Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	90	90	95	95	90	0	0	0	0	5	2	2	1	1	2	0	0	0	0	0
Average of the 5 subplots	92																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	10cm
Lithology		Soil Surface Texture	Sandy loam	Soil Colour	grey-brown	Soil Depth	moderate
Slope	1°	Aspect	W	Site Drainage	poor	Distance to nearest water and type	4km

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	1	NR	gully erosion
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1	NR	fallen logs
Weediness	2	R	Lantana
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	21/6/18	Mardi	GA0	GP

GF Code		*Top 3 native species in each growth form group: Full species name mandatory* *All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E. saligna	N	20	2		
S	2	Callistemon salignus	N	5	3		
S	3	Melaleuca styphelioides	N	10	5		
S	4	Mel. bicon vexa	N	5	3		
L	5	Morinda jas.	N	5	20		
L	6	Cissus antarctica	N	8	10		
D	7	Oplismenus aem.	N	5	500		
F	8	Dichondra repens	N	3	200		
L	9	Pandorea pand.	N	1	40		
G	10	Entolasia stricta	N	2	100		
F	11	Pseuderanthemum var	N	0.1	20		
S	12	Breynia obl.	N	0.1	5		
E	13	Doodia aspera	N	1	40		
L	14	vine (S) Dioscorea transversa	N	0.1	5		
L	15	? ~~Ehretia acuminata~~? (S) Trophis scandens	N	2	3		
T	16	Cryptocarya sp. (S) microneura	N	2	5		
S	17	Wilkiea huegeliana toothed leaf - Polyosma? (S) Notelaea?	N	2	10		
T	18	Ehretia acuminata (S) (P) 155	N	10	5		
S	19	Maytenus silvestris shrub narrow leaves, alt. (S)	N	0.1	1		
/	20	Lantana	HTE	20	50		
L	21	G. cymosum	N	0.1	3		
V	22	Carex/~~cyperus~~ Jos at GA09 longebrachiata	N	1	10		
G	23	Entolasia-like grass	N	1	20		
P	24	Livistona aus.	N	1	5		
F	25	sedge-like plant (S) Gymnostachys anceps	N	0.1	1		
L	26	Cayratia	N	0.1	3		
L	27	~~Milk vine~~? opp. leaved seedling (S) milky sap Marsdenia rostrata		0.1	1		
S	28	indet shrub	N	0.1	5		
E	29	Adiantum aeth. formosum	N	10	50		
/	30	hairy leaved forb (S) Physalis peruviana	E	0.1	15		
T	31	Acmena smithii	N	5	2		
F	32	Commelina cyanea	N	0.1	6		
T	33	opp. leaved t/s (S) Guioa semiglauca	N	0.2	3		
S	34	sandpaper fig Ficus coronata	N	0.1	5		
S	35	Pittosporum mult.	N	0.1	5		
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
Mardi	GP4	GP

Date	7-6-18	IBRA region		Photo #	156	Zone ID	
Zone	Datum						
Easting	Northing	Dimensions	m	Orientation of midline from the 0 m point.	Magnetic °		

Vegetation Class		Confidence: H M L
Plant Community Type	Paperbark 1723	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	5
	Grasses etc.	7
	Forbs	8
	Ferns	1
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	25.3
	Shrubs	42.3
	Grasses etc.	3.2
	Forbs	0.8
	Ferns	0.1
	Other	2
High Threat Weed cover		5.4

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm	1	1	
30 – 49 cm	HHT 1	1	
20 – 29 cm	IIII	IIII	
10 – 19 cm	III	10+20+10+10 +10+10+10	
5 – 9 cm		50+60+20+20 +20+10+10+20	n/a
< 5 cm		20+10+20+10 20+10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	4 Tally space		total

Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	50 55 30 40 25	0 0 5 2 0	2 1 1 2 2	0 0 0 0 0
Average of the 5 subplots	40			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	10 cm
Lithology		Soil Surface Texture	clay loam	Soil Colour	grey	Soil Depth	?
Slope	5°	Aspect	SE	Site Drainage	OK	Distance to nearest water and type	6m

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	clear patches nearby
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1		cattle / roo dung
Fire damage	0		
Storm damage	0		
Weediness	1		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 8/10/19	Mardi	GP11 PETLOG	GP.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. saligna.	N	25	8		
S	2 Mel. bidwillexa	N	40	100		
/	3 Lantana	HTE	5	6		
T	4 Notelaea long.	N	0.2	3		
E	5 Adiantum aeth.	N	0.1	20		
L	6 Morinda jas.	N	0.5	15		
L	7 Parsonsia str.	N	0.2	10		
L	8 Pandorea pand.	N	0.2	20		
L	9 Eustrephus lat.	N	0.5	30		
G	10 Evtolasia stricta	N	2	50		
/	11 Cinamomum camphora	HTE	0.2	20		
F	12 Dichondra repens	N	0.1	50		
V	13 Gahnia/cyperus sedge carex longibracteata	N	0.2	10		
/	14 Bush Lemon	E	0.1	1		
F	15 Centella asiatica	N	0.1	5		
S	16 Pittosporum multi.	N	2	50		
L	17 Gastonopsis cymosum	N	0.1	5		
D	18 Oplismenus aem.	N	0.5	30		
L	19 Desmodium varians	N	0.1	5		
G	20 Microlaena stipoides	N	0.2	20		
G	21 Poa ? labillardieri: tufted. (s)	N	0.2	15		
R	22 Lom. long.	N	0.1	5		
G	23 Imperata cyl.	N	0.1	10		
S	24 Breynia obl.	N	0.1	8		
L	25 Glycine cland	N	0.1	3		
F	26 Pseudocaulerpa varians	N	0.1	10		
S	27 narrow-leaved shrub (s) Maytenus silvestris	N	0.1	3		
S	28 Myrsine variabilis Banksia-like seedling ~~Wilkiea huegeliana~~	N	0.1	1		
T	29 Exocarpos falcata	N	0.1	3		
F	30 Dianella caer.	N	0.1	3		
/	31 Ligustrum sinense	HTE	0.2	1		
L	32 Stephania jap.	N	0.2	10		
L	33 Clematis aristata	N	0.1	3		
F	34 Hardia purp.	N	0.1	10		
F	35 Commelina cyanea	N	0.1	5		
T	36 Gladiolus ford.	N	0.1	3		
F	37 Veronica plebeia	N	0.1	10		
F	38 Plectranthus parviflorus herb (s) mint family?	N	0.1	3		
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	GP12	GP

Date	8-6-18	IBRA region		Photo #	157	Zone ID	
Zone	Datum						
Easting	Northing	Dimensions		in	Orientation of midline from the 0 m point.	Magnetic °	

Vegetation Class		Confidence: H M L
Plant Community Type	1568	EEC: Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	9
	Shrubs	8
	Grasses etc.	0
	Forbs	1
	Ferns	4
	Other	10
Sum of Cover of native vascular plants by growth form group	Trees	98.7
	Shrubs	7.9
	Grasses etc.	0.1
	Forbs	0.1
	Ferns	0.1
	Other	3.4
High Threat Weed cover		0.2

BAM Attribute (20 x 50 m plot)		# Tree Stems Count	
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	1		
50 – 79 cm	11		
30 – 49 cm	19	1	11
20 – 29 cm	5	3	
10 – 19 cm	12	13 +10	
5 – 9 cm		13 +10+5+10+10+5	n/a
< 5 cm		10+20+20+10 +5+20+10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 75

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	90	90	95	85	95	1	2	1	1	1	2	20	1	2	3	a	b	c	d	e
Average of the 5 subplots																				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	20cm
Lithology		Soil Surface Texture	Sandy-clay loam	Soil Colour	mid brown	Soil Depth	1-2m
Slope	2°	Aspect	E	Site Drainage	good	Distance to nearest water and type	3m ephemeral creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	old stumps
Cultivation (inc. pasture)	0		
Soil erosion	2		deep eroded ephemeral creek
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1	NR	fallen logs
Weediness	1		Lantana, moth vine < 1%
Other	—		mamal diggings

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 8/6/18	Mordi	GP12 PCT1294	GP

GF Code	Top 3 native species in each growth form group: *Full species name mandatory* All other native and exotic species: *Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. pil.	N	8	3		
T	2 Syncarpia glom.	N	15	18		
T	3 Acmena smithii	N	60	40		
E	4 Doodia aspera	N	3	200		
L	5 Morinda jas.	N	0.1	20		
T	6 E saligna	N	5	3		
E	7 Adiantum form.	N	0.1	20		
E	8 Blechnum cart	N	4.5	40		
L	9 climber  Dioscorea trans.	N	0.1	20		
L	10 Smilax aust.	N	0.2	8		
L	11 Cinnamomum-like (S) Ripogonum album	N	0.1	3		
T	12 Euroschinus falcata (S)	N	0.5	15		
L	13 Cissus ant.	N	2	10		
L	14 Geitonoplesium cymosum	N	0.1	10		
S	15 narrow-leaved shrub Maytenus silvestris	N	0.1	3		
F	16 sedge-like Gymnostachys anceps	N	0.1	3		
L	17 Cissus hypo.	N	0.5	5		
S	18 toothed leaf Wilkiea huegeliana	N	0.3	6		
T	19 Ehretia acuminata 2 - as per GP10 (S)	N	0.5	5		
S	20 Trochocarpa laurina	N	0.2	5		
S	21 alt-leaved tree/shrub (S) p.159 Eupomatia laurina	N	0.1	3		
T	22 Notelaea long.	N	0.1	3		
Q	23 Calochlaena dubia	N	1	10		
S	24 Breynia oblong.	N	0.1	5		
S	25 alt-leaved s/t yellow underside (S) p.160 Diospyros australis	N	0.1	3		
S	26 Pittosporum multifl.	N	1	10		
/	27 Lantana	HTE	0.2	5		
T	28 E. deanei	N	5	1		
P	29 Livistona aus	N	0.1	3		
L	30 ~~Moth vine~~ Marsdenia rostrata	~~HTE~~ N	0.1	1		
L	31 Eustrephus lat.	N	0.1	5		
G	32 sedge carex/~~cyperus~~ longebractia	N	0.1	2		
T	33 Cryptocarya microneura	N	0.1	3		
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
Mardi	GP13	GP

Date	8/6/18	Zone	Datum	IBRA region		Photo #	162	Zone ID	
Easting		Northing		Dimensions	20x50m	Orientation of midline from the 0 m point.		Magnetic °	

Vegetation Class		Confidence: H M L
Plant Community Type	1568	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	9
	Shrubs	9
	Grasses etc.	3
	Forbs	3
	Ferns	4
	Other	12
Sum of Cover of native vascular plants by growth form group	Trees	90.5
	Shrubs	3.1
	Grasses etc.	0.1
	Forbs	0.1
	Ferns	6.3
	Other	7.1
High Threat Weed cover		1

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	II Euc*	Non Euc	II Hollows†
50 – 79 cm	IIII I		
30 – 49 cm	IIII IIII	I	II
20 – 29 cm	IIII IIII II	II	
10 – 19 cm	IIII IIII IIII	IIII IIII II	
5 – 9 cm	$ IIII	5+20+10+10+10 10+10	n/a
< 5 cm	∞	10+10+10+10+10 +10+30	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 30

# of Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	95	100	70	60	2	0	0	3	5	3	3	3	2	1	0	0	0	0	0
Average of the 5 subplots																				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	30 cm
Lithology		Soil Surface Texture	sandy clay loam	Soil Colour	mid br	Soil Depth	mod.
Slope	2°-5°	Aspect	N	Site Drainage	good	Distance to nearest water and type	6m eph. creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	1		animal digging/scratching
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1		fallen logs
Weediness	1		Lantana, moth vine
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 8/6/18	Mardi	GP13	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Syncarpia glom	N	50	20		
T	2 E saligna	N	10	5		
T	3 Acmena smithii	N	15	10		
T	4 Trochocarpa laurina	N	3	5		
L	5 Morinda jas.	N	1	10		
D	6 Oplismenus aem.	N	0.5	50		
P	7 Livistona aus	N	0.1	3		
E	8 Adiantum form.	N	5	50		
L	9 Pandorea pand	N	0.2	10		
L	10 Smilax aus.	N	2	10		
S	11 alt-leaved t/s - yellow pithy under. (s) Diospyros australis	N	2	5		
L	12 Cinnamomum-like (Smilax?) Ripogonum album	N	1	20		
T	13 Cryptocarya microneura	N	5	10		
S	14 Alectryon subcinereus pinnate + toothed t/s (s) ~~Doryphora sassafras~~	N	0.1	5		
L	15 vine → Dioscorea transv.	N	0.1	10		
F	16 Sedge-like Gymnostachys anceps	N	0.5	10		
F	17 Dichondra repens	N	0.1	20		
S	18 Wilkiea huegeliana Banksia-like = toothed shrub calliconia?	N	0.2	10		
S	19 Melicope micrococca	N	0.1	3		
L	20 Eustrephus lat.	N	0.1	5		
R	21 Lomandra long	N	0.1	5		
T	22 Ehretia acuminata as per GP 10/12	N	0.5	10		
S	23 Rhodamnia rubescens opp-leaved t/s, hairy (s)	N	0.1	10		
E	24 Blechnum cart	N	0.1	5		
/	25 Lantana	HTE	1	5		
E	26 Doodia asp.	N	1	20		
G	27 Calochlaena dubium	N	0.2	10		
T	28 E. pilularis	N	3	2		
T	29 E. deanei	N	3	1		
F	30 Dianella caer.	N	0.1	5		
S	31 indet. opp leaved t/s smooth + fleshy (s)	N	0.1	3		
S	32 Synoum glandulosum	N	0.2	6		
L	33 Cissus ant.	N	2	3		
S	34 Pittosporum multi	N	0.2	10		
L	35 Geitonoplesium cymosum	N	0.1	3		
S	36 Breynia obl	N	0.1	5		
T	37 Glochidion ferd	N	1	3		
L	38 Moth ~~vine~~ (s) Marsdenia rostrata	N	0.1	1		
L	39 Stephania japonica	N	0.1	3		
V	40 Sedge carex/~~cyperus~~ longebrachiata	N	0.1	5		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

P Palm ph. Archontophoenix cunninghamiana N 0.2 3

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
Mardi	GP14	GP

Date	8/6/18	Zone	Datum	IBRA region		Photo #	164	Zone ID	
		Easting	Northing	Dimensions	20 X 50	Orientation of midline from the 0 m point.	Magnetic °		

Vegetation Class		Confidence: H M L
Plant Community Type	1568	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	8
	Shrubs	8
	Grasses etc.	0
	Forbs	1
	Ferns	2
	Other	7
Sum of Cover of native vascular plants by growth form group	Trees	52.8
	Shrubs	37.9
	Grasses etc.	0
	Forbs	0.1
	Ferns	0.4
	Other	8.3
High Threat Weed cover		0

BAM Attribute (20 x 50 m plot)		# Tree Stems Count		
dbh	Euc*		Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	1 Euc		Non Euc	1 Hollows
50 – 79 cm	///			
30 – 49 cm	//// //// ///		1	1
20 – 29 cm	//// //// /		//// //	.
10 – 19 cm	//// ////	+40	////	
5 – 9 cm	///	20 +20 +20	+20	n/a
< 5 cm		20+20 +20	10+20	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	'Shrubby' turpentine	Tally space		total 34

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 100 90 90 80	2 0 2 0 3	3 3 2 2 1	0 0 0 0 0
Average of the 5 subplots				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	10cm
Lithology		Soil Surface Texture	sandy clay loam	Soil Colour	brown grey	Soil Depth	mod,
Slope	± flat	Aspect	—	Site Drainage	OK	Distance to nearest water and type	20 m e/ Isemead creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	?		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1	NR	fallen logs
Weediness	0		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 5/6/19	Nardi	GP14	GP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. saligna	N	30	12		
T	2 Syncarpia glom	N	10	10		
L	3 Smilax aus	N	1	10		
E	4 Doodia aspera	N	0.2	20		
S	5 toothed leaf s/t Wilkiea huegeliana	N	0.1	3		
L	6 smilax-like Ripogon? Ripogonum album	N	4	10		
Q	7 Calochaena dubia	N	0.2	10		
S	8 Pitto. multi.	N	0.5	20		
F	9 Sedge-like Cymnostachys anceps.	N	0.1	10		
T	10 Cryptocarya micromeura	N	0.1	5		
L	11 Melinda sp.	N	0.1	5		
L	12 vine (S) Dioscorea transversa	N	0.1	3		
T	13 Purplish underside spp leaves s/t, toothed, soft + hairy (S) clerodendrum tomen?	N	0.1	B		
T	14 white cedar? – too tall to see	N	3	1		
S	15 Melaleuca sieberi	N	5	6		
S	16 Myrsine variabilis toothed leaf s/t – seed leaves (S)	N	0.1	3		
T	17 Acmena smithii	N	2	3		
L	18 Cissus ant.	N	2	5		
L	19 Parsonsia stram.	N	2	5		
S	20 alt. l. stipules, undersides Diospyros australis	N	2	6		
S	21 Melicope micrococca	N	0.1	3		
P	22 Livistona fust.	N	0.1	3		
S	23 Callicoma serratifolia	N	0.1	3		
T	24 Acacia sp.	N	2	1		
S	25 Choriceppia leptopetela 'smooth' turpentine – Euc. smell (S)	N	30	30		
T	26 E. deanei	N	5	5		
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
Mardi	GP15	GP

Date	Zone	Datum	IBRA region	Photo #	Zone ID
13/6/18	__			166	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _ _	m	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	Red Gum 1720	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	3
	Grasses etc.	8
	Forbs	8
	Ferns	1
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	10.5
	Shrubs	13.1
	Grasses etc.	47
	Forbs	1.2
	Ferns	0.2
	Other	1.1
High Threat Weed cover		3.2

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
dbh	# Tree Stems Count		
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows
50 – 79 cm	II		
30 – 49 cm	IIII IIII	I	
20 – 29 cm	IIII	IIII III I	
10 – 19 cm	IIII III	IIII IIII IIII IIII III	
5 – 9 cm	III	IIII II	n/a
< 5 cm	I	40+20+20+30+10 +10	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	20+10 Tally space		total 30

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 30 35 60 50	a b c d e	1 1 1 2 1e	a b c d e
Average of the 5 subplots	51			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern	–	Microrelief	
Lithology		Soil Surface Texture	sandy loam	Soil Colour	grey	Soil Depth	shallow
Slope	flat	Aspect	–	Site Drainage		Distance to nearest water and type	? 50m ephemeral ck.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	clear patches, stumps (old)
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	channels
Firewood / CWD removal	0		
Grazing (identify native/stock)	1	R	cropped forbs, scats
Fire damage	2	O	burnt stumps
Storm damage	0		
Weediness	1		Lantana, Buffalo grass
Other	–		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 13/7/18	Mardi	GP15 PG836	GP

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E. amplifolia	N	5	13		
T	2	E. robusta	N	5	5		
S	3	Acacia irrorata	N	10	30		
S	4	Callistemon salignus	N	3	50		
/	5	Lantana	HTE	1	10		
L	6	Parsonsia stram.	N	0.5	5		
D	7	Oplismenus aemulus	N	40	2000		
G	8	M. caelaena stip.	N	3	200		
G	9	Entolasia stricta	N	3	200		
V	10	Carex longebrachtia	N	0.1	20		
F	11	Pratia purpurescens	N	0.1	30		
F	12	Dichondra repens	N	0.5	30		
L	13	Polygveria calycina?	N	0.2	15		
F	14	Centella asiatica	N	0.1	10		
Q	15	Calochlaena dubia	N	0.2	10		
V	16	Gahnia clarkei	N	0.5	5		
S	17	Callistemon-like shrub (S) ? Callistemon sp.	N	0.1	3		
T	18	Glochidion ferd.	N	0.5	20		
F	19	forb (S)	I	0.1	3		
/	20	Bidalo gran? (S) Axonopus fissifolius	HTE	2	100		
F	21	Oxalis praeans	N	0.1	3		
F	22	Goodenia paniculata	N	0.1	10		
G	23	Echinopogon ovatus	N	0.1	3		
/	24	Rubus ffustic.	HTE	0.1	3		
L	25	Murinda jas.	N	0.3	3		
/	26	Cinamomum camphora	HTE	0.1	3		
R	27	Lomandra long.	N	0.2	5		
G	28	Eragrostis brownii	N	0.1	5		
L	29	Glycine cland.	N	0.1	3		
F	30	Hydrocotyl ped.	N	0.1	3		
/	31	flat weed Hypochaeris radicata	E	0.1	3		
F	32	Dianella caerulea	N	0.1	3		
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Greg Borg

BAM Site – Field Survey Form

Site Sheet no: 1 of 3

Survey Name	Plot Identifier	Recorders
Mardi	GP16	GP

Date	Zone	Datum	Easting	Northing	IBRA region	Photo #	Zone ID
13/6/18	__		_____	_____		167	

Dimensions		Orientation of midline from the 0 m point.	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	Red gum PCT 836 1720	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	1
	Grasses etc.	5
	Forbs	9
	Ferns	1
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	40.2
	Shrubs	2
	Grasses etc.	35.2
	Forbs	3
	Ferns	2
	Other	1.1
High Threat Weed cover		4.2

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows
50 – 79 cm			
30 – 49 cm	𝍸 III	IIII	
20 – 29 cm	IIII		
10 – 19 cm	𝍸 I	I	
5 – 9 cm	III	𝍸 II	n/a
< 5 cm	𝍸 II	𝍸 𝍸	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 21

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	70 30 20 25 30	5 10 1 4 10	2 0 1 0 2	0 0 0 0 0
Average of the 5 subplots	35			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	20cm
Lithology	–	Soil Surface Texture	sandy clay loam	Soil Colour	grey-brown	Soil Depth	? moderate
Slope	2°	Aspect	NW	Site Drainage	good - poor	Distance to nearest water and type	10m creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O-R	clear patches, stumps
Cultivation (inc. pasture)	0		slashing
Soil erosion	0		
Firewood / CWD removal	1		Few logs
Grazing (identify native/stock)	2	O-R	cow dung, kangaroos.
Fire damage	0		
Storm damage	1	R	fallen branch
Weediness	2	R	
Other	–		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 13/6_18	Mardi	GP16	GP.

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Syzygium floribunda	N	30	20		
T	2 E. tereticornis	N	10	5		
S	3 Acacia irrorata	N	2	1		
/	4 Lantana	HTE	2	5		
E	5 Pteridium esculentum	N	2	20		
L	6 Gleitonopterium cymosum	N	0.2	20		
F	7 Pratia purpurescens	N	1	100		
F	8 Dichondra repens	N	1	100		
F	9 Centella asiatica	N	0.4	50		
D	10 Oplismenus aemulus	N	30	200		
/	11 Cinamomum camphora	HTE	0.1	5		
L	12 Pandorea pand.	N	0.1	3		
L	13 Stephania japonica	N	0.1	3		
F	14 Geranium homeanum	N	0.1	5		
V	15 Carex longebrac.	N	3	30		
/	16 Paspalis grass (S) ?Ehrharta erecta ✓	HTE	0.2	20		
/	17 Paspalis persiviana spp. bearded forb-hairy (S)	E	0.1	3		
L	18 Hibbertia scandens	N	0.2	30		
/	19 Ligustrum lucidum	HTE	0.2	5		
D	20 Oplismenus imbecillis (S)	N	0.1	3		
F	21 Galium propinquum	N	0.1	3		
F	22 Pseuderanthemum variable	N	0.1	6		
/	23 Plantago lanc.	E	0.1	10		
L	24 Glycine clandl	N	0.1	10		
T	25 Notelea longifolia	N	0.1	5		
/	26 Sida rhomb.	E	0.1	3		
/	27 - Axonopus fissifolius	HTE	1	40		
/	28 Senecio madg.	HTE	0.1	3		
/	29 Rubus frut.	NTE	0.5	10		
L	30 Clematis aristata	N	0.1	3		
L	31 Cayratia clematidea	N	0.1	3		
/	32 Verbena bonariensis	E	0.1	5		
G	33 Echinopogon ovatus	N	0.1	5		
T	34 "Alphitonia" excelsior	N	0.1	3		
/	35 Bidens pilosa	HTE	0.1	5		
/	36 Hypochaeris radicata	E	0.1	5		
F	37 Oxalis perrans	N	0.1	5		
T	38 Glochidion ferd.	N	0.1	5		
G	39 Microlaena stipoides	N	2	200		
/	40 Paspalum (S) dilatatum	E	0.1	3		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

F Hydrocotyle P. N 0.1 10

F Viarella caer. N 0.1 3

white bag.

400 m² plot: Sheet 3 of 3	Survey Name	Plot Identifier	Recorders
Date 13/6/18	Masdi	GP16	AP

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
L	1 Morinda jasminoides	N	0.1	3		
L	2 Parsonsia straminea	N	0.1	3		
/	3 Cirsium vulgare	E	0.1	1		
/	4 Solanum nigrum	E	0.1	1		
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
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	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 . **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
Marchi	Q9 G9	GP, BT

Date	Zone	Datum	IBRA region	Photo #	Zone ID
21/2/19	__				

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _	20 x 50	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	1071	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	8
	Forbs	8
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	122.1
	Forbs	14.7
	Ferns	0
	Other	0
High Threat Weed cover		9

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
dbh	# Tree Stems Count		
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm			
30 – 49 cm			
20 – 29 cm			
10 – 19 cm			
5 – 9 cm			n/a
< 5 cm			n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		total 0

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	10 20 20 80 10	40 50 30 40 40	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	28			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	Sandy	Soil Colour	brown/grey	Soil Depth	
Slope		Aspect		Site Drainage	flood	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)			
Soil erosion	2-3		
Firewood / CWD removal			
Grazing (identify native/stock)	2-3		
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _

Date	Survey Name	Plot Identifier	Recorders
21/2/19	18SH002	99	GP BT

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species. Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
GG	1	Typha orientalis	N	70	2000		
	2	Cyperus eragrostis	HTE	2	100		
	3	carpet grass	HTE	5	200		
GG	4	Cynodon dactylon	N	2	100		
GG	5	Juncus usitatus	N	1	50		
FG	6	Alisma plantago-aquatica	N	0.1	5		
FG	7	Ludwigia peploides	N	1	20		
FG	8	Hydrocotyle laxiflora	N	5	20		
FG	9	Ranunculus inundatus	N	1	20		
FG	10	Alternanthera denticulata	N	2	20		
FG	11	Persicaria decipiens	N	3	200		
GG	12	Juncus prismatocarpus	N	2	50		
FG	13	Gaydenia paniculata	N	0.5	20		
GG	14	Eleiocharis cylindrostachys	N	40	3000		
FG	15	Centella asiatica	N	0.1	3		
	16	Paspalum distichum dilatatum	HTE	2	10		
	17	~~grass 1~~		~~3~~	~~30~~		
GG	18	grass 2	N	4	50		
GG	19	Eragrostis brownii	N	0.1	3		
GG	20	Paspalum distichum	N	3	30		
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

* Note: survey done to edge of wetland only

BAM Site – Field Survey Form

Site Sheet no: 1 of

		Survey Name	Zone ID	Recorders			
Date	27/2/19	188Hoor Hardi		GP			
Zone	Datum	Plot ID	G12	Plot dimensions		Photo #	
Easting	Northing	IBRA region	In m	Midline bearing from 0 m		Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type		1071		EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	9
	Forbs	7
	Ferns	2
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0.5
	Grasses etc.	105.5
	Forbs	4.6
	Ferns	5
	Other	0
High Threat Weed cover		4.2

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm		
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	30	40	20	10	10	4	3	0	80	70	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	22																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 22/2/19	18SHOOZ_Mardi	G12	GP

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
G	1	Typha orientalis	N	40	2000		
G	2	Eleocharis cylindrostachys	N	10	2000		
G	3	Eleocharis sphacelata	N	40	1500		
G	4	Schoenoplectus validus	N	1	20		
E	5	Azola pinnata	N	4	2000		
G	6	Juncus prismatocarpus	N	5	1000		
	7	Cyperus eragrostis	HTE	0.2	10		
G	8	Paspalum distichum	N	5	1000		
	9	Paspalum dilatatum	HTE	2	100		
F	10	Persecaria decipiens	N	1	50		
F	11	Ranunculus inundatus	N	0.2	20		
G	12	Cyperus difformis	N	0.4	20		
	13	carpet grass	HTE	2	100		
	14	Myriophyllum aquaticum	E	2	100		
GF	15	Ludwigea peploides	N	1	20		
F	16	Phyllidrum lanuginosum	N	2	20		
F	17	Alisma plantago-aquatica	N	0.2	10		
G	18	Cynodon dactylon	N	4	1000		
S	19	Melaleuca linariifolia	N	0.5	1		
F	20	Goodenia paniculata	N	0.1	10		
F	21	Centella asiatica	N	0.1	10		
G	22	Juncus usitatus	N	0.1	10		
E	23	Hypolepis muelleri	N	1	10		
	24	Isolepis prolifer	E	5	200		
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

18SH0003X MARDI

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BJSAR

BAM Site – Field Survey Form

Site Sheet no: 1 of 1

Survey Name	Zone ID	Recorders
17228 mardi		RS

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
30 / 5 / 2018	__		RS01 1216	50 x 20	RS 6592 6593

Easting	Northing	IBRA region	Midline bearing from 0 m	
_ _ _ _ _ _	_ _ _ _ _ _ _ _	In m	S	Magnetic °

Vegetation Class	1588	Confidence: H M L
Plant Community Type	1216 Spotted Gums	EEC: No; Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
T, M SCZY	Trees	4
	Shrubs RVGDH	6
Count of Native Richness	Grasses etc.	4
	Forbs F	3
	Ferns E	1
	Other PUC AxG	9
Sum of Cover of native vascular plants by growth form group	Trees	47
	Shrubs	19.2
	Grasses etc.	33.9
	Forbs	0.9
	Ferns	10
	Other	3.3
High Threat Weed cover		1.3

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1 | 1	—
50 – 79 cm	𝍸 5	—
30 – 49 cm	𝍸 𝍸 1 | 11	—
20 – 29 cm	𝍸 𝍸 11 | 12	—
10 – 19 cm	𝍸 𝍸 𝍸 𝍸 | 20	—
5 – 9 cm	𝍸 𝍸 𝍸 𝍸 1111 | 24	—
< 5 cm	𝍸 𝍸 11 | 12	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	5m	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%) 44					Bare ground cover (%) 0.8					Cryptogam cover (%) 3					Rock cover (%) 0				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	40	40	25	55	60	1	3	0	0	0	2	2	1	3	5	0	0	0	0	0

OCC Surface Rocks 1/2 30cm Sandstone

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type	Upper Ridge	Landform Element		Landform Pattern		Microrelief	20cm
Lithology		Soil Surface Texture	Fine	Soil Colour	Dark Grey	Soil Depth	? ?
Slope	12%	Aspect	E	Site Drainage	overland	Distance to nearest water and type	800m Dam

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	O	
Cultivation (inc. pasture)	1	R	
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1	R	Cattle
Fire damage	0		
Storm damage	0		
Weediness	1	R	Asparagus aethiopicus
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 30/5/2018	17228	RSO1 1216	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	C. mac	N	30	42	T	
T	2	E pil	N	10	12	T	
	3	~~E acmenioides~~	~~N~~		~~2~~	~~T~~	
	4	E umbra	~~N~~			T	
S	5	Persoonia linearis	N	5	8	S	
S	6	Breynia oblongif	N	6	20		
T	7	Glochidion ferdinandii	N	3	15		
S	8	Acacia longifolia	N	4	5		
/	9	Lantana camara	HTE	0.5	1		
T*	10	Allocas torulosa	N	4	4		
L	11	Geitonoplesium cymosum	N	1	3		
S	12	Davisia ulicifolia	N	4	3		
G	13	Imperata cylindrica	N	25	1000's		
G	14	Microlaena stipoides	N	3	20		
G	15	Entolasia stricta	N	5	35		
L	16	Cassytha glabella	N	0.5	3		
F	17	Dianella caerulea	N	0.2	2		
L	18	Glycine cladestina	N	0.2	3		
F	19	Pratia purpurascens	N	0.5	40		
E	20	Pteridium esculentum	N	10	40		
/	21	Cinnamomum camphora (Juv)	HTE	0.3	10		all seedling
L	22	Pandorea pandorana	N	0.2	2		
L	23	Desmodium varians	N	0.2	2		
L	24	Parsonsia straminea	N	0.2	1		
S	25	Shrub Photo 6594 6594 = ? Cryptocarya sp.	N	0.1	1		
F	26	Desmodium brachypodum	N	0.2	1		
R	27	Lomandra longifolia	N	0.8	5		
L	28	Cissus hypoglauca	N	0.5	1		
L	29	Billardiera scandens	N	0.3	2		
L	30	Hardenbergia violacea	N	0.2	2		
X T	31	Seedling Photo 6595 Glochidion ferdinandi	N	0.1	1		
S	32	Seedling " 6596 Pittosporum undulatum	N	0.1	1		
R	33	Lomandra filiformis	N	0.1	2		
/	34	Asparagus aethiopicus	HTE	0.5	3		
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Zone ID	Recorders
17228		RS

Date	Zone	Datum	Easting	Northing	Plot ID	Plot dimensions	Photo #
30/5/2018	__		_____	_____	RS02 1216	20 x 50	RS6597 6598

IBRA region	In m	Midline bearing from 0 m	Magnetic °
		ESE	

Vegetation Class		Confidence: H M L
Plant Community Type	PCT 1216 1588 EEC: No	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	9
	Grasses etc.	10
	Forbs	3
	Ferns	3
	Other	6
Sum of Cover of native vascular plants by growth form group	Trees	43
	Shrubs	16.95
	Grasses etc.	24.4
	Forbs	4.3
	Ferns	0.1
	Other	3.3
High Threat Weed cover		0-6

BAM Attribute (1000 m² plot) 50 x 20		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	|| (2)	
50 – 79 cm	|||| (5)	
30 – 49 cm	|||| |||| |||| |||| || (22)	
20 – 29 cm	|||| |||| |||| || (17)	3 x trunk splits 0-5cm
10 – 19 cm	|||| |||| || (12)	
5 – 9 cm	|||| |||| |||| |||| || (31)	
< 5 cm	|||| |||| ||| (13)	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	7, 5, 4, 6 Tally space (22)	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	30	35	30	40	35	0	0	2	0	0	1	1	0	1	2	30	0	0	0	5

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Mid Slope	Landform Pattern		Microrelief	(20cm) some ge rocks >1m
Lithology		Soil Surface Texture	Coarse Sady	Soil Colour	Light Gray	Soil Depth	?
Slope	30 deg	Aspect	N	Site Drainage	overland	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0 / 1	0	
Cultivation (inc. pasture)	0		
Soil erosion	1	R	
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	1	0	Very old fire scars on tree trunks. & burnt tree cavities.
Storm damage	0		
Weediness	1	R	Cantana
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 30/5/2018	17228	RS02 1216	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Epil	N	6	9	T	
T	2 C. mac	N	20	38	T	
T	3 Allo torulosa	N	12	30	st	
S	4 Parsonia linearis	N	4	4	S	
S	5 Daviesia ulicifolia	N	5	8	S	
/	6 Lantana Camara	HTE	0.6	2	S	
T	7 Euc paniculata	N	3	3	T	
G	8 Entolasia stricta	N	6	100's	G	
F	9 Dianella caerulea var prod.	N	3	15	G	
R	10 Lomandra longif	N	4	18	G	
T	11 Glochidion ferdinandi (Juv)	N	2	4	st	
G	12 Themeda australis	N	5	30	G	
S	13 Acacia elongata	N	3	3	S	
G	14 Imperata cylindrica	N	4	100	G	
F	15 Pomax umbellata	N	1	6	G	
L	16 Geitonoplesium cymosum	N	1	3	V	
S	17 Bossiaea obcordata	N	2	4	S	
S	18 Breynia oblongifolia	N	2	2	S	
L	19 Glycine clandestina	N	1	3	V	
R	20 Lomandra filiformis ssp filif.	N	1	2	G	
R	21 Lomandra multiflora	N	2	6	G	
G	22 Aristida vagans	N	1	3	G	
G	23 Entolasia marginata	N	0.2	2	G	
E	24 cheilanthes sieberi	N	0.1	3	G	
L	25 Billardiera scandens	N	0.2	4	V	
S	26 Lasiopetalum/Pomaderris? Photo 6599 P. ferrug? ✓	N	0.05	1	S	— Juv
Z	27 Leucopogon juniperinus	N	0.1	1	S	
L	28 Hibbertia scandens	N	0.5	5	V	
V	29 Lepidosperma laterale	N	1	6	G	
F	30 Platia purpurascens	N	0.3	26	G	
L	31 Hibbertia dentata	N	0.2	1	V	
S	32 Acacia schinoides ✓✓	N	0.7	1	st	
L	33 Cissus hypoglauca	N	0.4	1	V	
D	34 Oplismenus aemulus	N	0.2	4	G	
S	35 Ozothamnus diosmifolius	N	0.2	2	S	
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
17228	RS03 1216	RS

Date	Zone	Datum	IBRA region		Photo #	Zone ID
30/5/2018	__				6600	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _ _	20 × 50	WSW (Magnetic ?)

		Confidence: H M L
Vegetation Class		
Plant Community Type	PCT 1246 Spotted Gum 1588 — EEC: No	Confidence: (H) M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	7
	Grasses etc.	13
	Forbs	5
	Ferns	1
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	44.1
	Shrubs	14.9
	Grasses etc.	38.8
	Forbs	1.15
	Ferns	0.3
	Other	3.4
High Threat Weed cover		0

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc (allocas, Persoonia)	Hollows†
large trees for Euc* & Non Euc 80 + cm	1		
50 – 79 cm	1		
30 – 49 cm	𝍸 𝍸 𝍸 𝍸	𝍸	
20 – 29 cm	𝍸 𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸	
10 – 19 cm	𝍸 𝍸 𝍸 𝍸	𝍸 𝍸	
5 – 9 cm	𝍸 𝍸	𝍸 𝍸 𝍸	n/a
< 5 cm	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2, 1, 3, 1, 2, 2, 6, 4, 1, 3, 7, 2		total 33

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

* 2 x dead Stags Not counted Here

1 x 20-30 cm Trunk chimney Hollow

1 x 20cm Trunk chimney Hollow

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Subplot score (% in each)			58					1.4					2.6					4		
Average of the 5 subplots	60	45	75	60	50	2	0	0	5	0	1	5	5	1	1	0	0	0	20	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Mid Slope	Landform Pattern		Microrelief	30cm
Lithology		Soil Surface Texture	Medium Sandy	Soil Colour	Mid grey	Soil Depth	< 1m
Slope	55°	Aspect	NNW	Site Drainage	overland	Distance to nearest water and type	?

Some large rocks > 1m sandstone

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	1	O	very old burnt trunk bark.
Storm damage	0		
Weediness	0		
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 30/5/2018	17228	RS03 1216	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 C mac	N	20	25	t	
T	2 E pil	N	4	5	t	
T	3 E acmenoides	N	5	2	t	
T	4 Allo torulosa	N	15	28	t	
S	5 Persoonia linearis	N	5	6	s	
S	6 Daviesia ulicifolia	N	6	8	s	
G	7 Entolasia stricta	N	15	200	g	
G	8 Thomeda eustralis	N	8	100	g	
F	9 Diavella Caerulea var. prod.	N	5	30	g	
R	10 Lomandra longifolia	N	3	6	g	
V	11 Lepidosperma lateral e	N	2	25	g	
G	12 Microlaena stipoides	N	8	300	g	
Z	13 Leucopogon juniperinus	N	3	12	s	
F	14 Pomax umbellata	N	1	30	g	
L	15 Billiardera scandens	N	1	3	v	
F	16 Pratia purpurascens	N	1	25	g	
L	17 Geitonoplesium cymosum	N	0.4	6	v	
R	18 Lomandra multiflora	N	0.8	10	g	
G	19 Entolasia marginata	N	1	20	g	
T	20 Glochidion ferdinandii Juv seedling	N	0.1	1	st	
	21 ~~Acacia~~	~~N~~			s	
G	22 Cymbopogon refractus	N	0.1	1	g	
R	23 Lomandra filiformis	N	0.1	2	g	
F	24 Lagenifera stipitata?	N	0.05	1	g	
D	25 opliscmenus aemulus	N	0.6	10	g	
E	26 Chailantha sieberi	N	0.3	8	g	
L	27 Cissus hypoglauca	N	1.5	2	v	
F	28 Orchid leaf ? Photo 6602	N	0.1	2	g	
L	29 Pandorea pandorana	N	0.5	1	v	
G	30 Eragrostis brownii	N	0.2	10	g	
G	31 Dichelachne sp	N	0.4	10	g	
S	32 Acacia longissima	N	0.2	1	s	
G	33 Aristida vagans	N	0.2	4	g	
Z	34 Acrotriche sp	N	0.3	1	s	
S	35 Pittosporum pauciflorus? multiflora	N	0.2	1	s	
Z	36 Leucopogon lanceolatus	N	0.2	1	s	
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

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BAM Site – Field Survey Form	Site Sheet no: 1 of 1

		Survey Name	Zone ID	Recorders		
Date	30 / 5 /2018	17228		RS		
Zone _ _	Datum	Plot ID	RS04 1230	Plot dimensions	20x50	Photo # 6603 6604
Easting _ _ _ _ _ _	Northing _ _ _ _ _ _ _	IBRA region	In m	Midline bearing from 0 m	SW	Magnetic °
Vegetation Class						Confidence: H M L
Plant Community Type		PCT ~~1230~~ 1718		EEC:		Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	2
	Grasses etc.	7
	Forbs	6
	Ferns	2
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	18.9
	Shrubs	14
	Grasses etc.	23
	Forbs	13
	Ferns	7
	Other	13
High Threat Weed cover		4

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count (EVC)	(non EVC) ~~# Stems with Hollows~~ Hollows
80 + cm	|	
50 – 79 cm	卌 ||	
30 – 49 cm	卌 卌 |	卌 |
20 – 29 cm	卌 卌 |	卌 卌 卌 卌 卌 卌 卌
10 – 19 cm	卌 |	卌 卌 卌 卌 卌 卌
5 – 9 cm		卌 卌 卌 卌 卌 卌 ||
< 5 cm		卌 卌 卌 卌 卌 | n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2, 4, 2, 8	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	20	d	e	a	b	004	d	e	a	b	12	d	e	a	b	0	d	e
Average of the 5 subplots	20	15	25 (20)	10	30	0	0	2	0	0	2	1	1	1	1	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Flood Plain	Landform Pattern		Microrelief	20cm
Lithology		Soil Surface Texture	Fine	Soil Colour	Dark Grey	Soil Depth	> 50cm – Probably Deeper
Slope	2°	Aspect	NNW	Site Drainage	Overland	Distance to nearest water and type	30m – watercourse to N

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1	R	cattle
Fire damage	0		
Storm damage	0		
Weediness	1	NR	Lantana
Other	–	–	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 30 / 5 / 2018	RS04 1230	17228	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E robusta	N	15	1	+	
T	2	E pilularis	N	3	1	+	
T	3	E saligna / deanei?	N	4	4	+	
T	4	E tereticornis	N	6	6	+	
S	5	Mel linearifolius	N	10	15+	+	
/	6	Lantana camara	HTE	4	8	S	
S	7	Mel nodosa	N	4	4	St	
T	8	Glochidion ferdinandii	N	4	8	St	
L	9	Pandorea pandorana	N	2	10	V	
R	10	Lomandra longifolia	N	2	20	G	
E	11	Pteridium esculentum	N	3	15	G	
D	12	Oplismenus aemulus	N	3	100	G	
G	13	Entolasia marginata	N	6	150	G	
F	14	Diagella caerulea	N	5	30	G	
L	15	Smilax glyciphylla	N	1	3	V	
L	16	Geitonoplesium cymosum	N	1	5	V	
G	17	Microlaena stipoides	N	5	100+	G	
F	18	Dichondra repens	N	2	300	G	
G	19	Echinopogon ovatus	N	1	5	G	
V	20	Carex longibracteata	N	4	35	G	
F	21	Hydrocotyle peduncularis	N	1	100+	G	
L	22	Hibbertia ~~scandens~~ dentata	N	2	2	V	
L	23	Morinda jasminoides	N	1	4	V	
L	24	Parsonsia straminea	N	2	4	V	
F	25	Pratia purpurascens	N	1	100+	G	
F	26	Centella asiatica	N	2	200+	G	
L	27	Hibbertia Scandens	N	2	4	V	
E	28	Adiantum aethiop	N	4	60+	G	
L	29	Cassytha pubescens	N	1	5	V	
F	30	Gymnostachys anceps	N	2	15	G	
L	31	Glycine clandestina	N	1	8	V	
X	32	Solanum (nigrum?)	E?	0.5	2	G	
T	33	Woody Pear? Very leathery/bad leaves (leaf Bag)	N	0.4	2	St	
L	34	Vine ♡ = Stephania japonica	N	1	4	V	
G	35	Imperata Cylindrica	N	2	50+	G	
	36						
	37						
	38						
	39						
	40						

Notelaea longifolia

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form	Site Sheet no: 1 of 1

		Survey Name	Zone ID	Recorders			
Date	31 / 5 / 2018	17228	1	RS			
Zone: __	Datum	Plot ID	RS05 1216	Plot dimensions		Photo #	6605 6606
Easting: ______	Northing: _______	IBRA region	In m	Midline bearing from 0 m	SW	Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type	1216 Spotted Gum 1588			EEC: No		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	9
	Grasses etc.	6
	Forbs	3
	Ferns	0
	Other	6
Sum of Cover of native vascular plants by growth form group	Trees	41.1
	Shrubs	1.7
	Grasses etc.	13.2
	Forbs	2.3
	Ferns	0
	Other	5.8
High Threat Weed cover		0

BAM Attribute (1000 m² plot)

All eucs

DBH	# Tree Stems Count (EUC + Non EUC)	# Stems with Hollows
80 + cm		(0)
50 – 79 cm	|||	(3) 1x 50cm, 1x 0-5cm, 1x tree
30 – 49 cm	[tally]	(11)
20 – 29 cm	[tally]	(18)
10 – 19 cm	[tally]	(43)
5 – 9 cm	[tally]	(74)
< 5 cm	[tally]	n/a (74)
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2, 3, 3, 4, 5, 6	Tally space (23)

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c 82	d	e	a	b	(c)	d	e	a	b	c 1.4	d	e	a	b	(c)	d	e
Average of the 5 subplots	80	85	80	85	80	0	0	0	0	0	1	1	1	1	3	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	upper ridge	Landform Pattern		Microrelief	20 cm
Lithology		Soil Surface Texture	Med Sandy	Soil Colour	Light Grey/brown	Soil Depth	<0.5m
Slope	2%	Aspect	NE	Site Drainage	overland	Distance to nearest water and type	?

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	Lots of small regrowth trees – a few widely scattered lge trees
Cultivation (inc. pasture)	0		
Soil erosion	1	R	Very minor – associated w motorbike trk
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	0		
Other	–		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date __/__/__	171228	RS05 1216	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 C mac	N	25	150	t	
T	2 Epil	N	4	3	t	
T	3 E siderophloia	N	2	1	t	
T	4 E acmenoides	N	3	2	t	
T	5 Allo torulosa	N	6	10	t	
G	6 Themeda australis	N	20	60	G	
L	7 Hardenbergia violacea	N	2	4	V	
S	8 Daviesia ulicifolia	N	5	10	S	
G	9 Entolasia stricta	N	2	10	G	
S	10 Citriobatus pacifloras = P. thorpeanum multiflora	N	3	20	S	
S	11 Persoonia linearis	N	2	5	S	
F	12 Dianella caerulea	N	2	10	G	
L	13 Glycine clandestina	N	0.1	2	V	
F	14 Pratia purpurascens	N	0.1	1	G	
F	15 Pomax umbellata	N	0.2	5	G	
V	16 Lepidosperma laterale	N	0.1	1	G	
R	17 Lomandra longifolia	N	1	3	G	
L	18 Geitonoplesium cymosum	N	1	1	V	
L	19 Parsonsia straminea	N	2	2	V	
G	20 Microlaena stipoides	N	3	5	G	
S	21 Persoonia linearis	N	1	1	S	
Z	22 Leucopogon lanceolatus	N	0.5	1	S	
S	23 Native Holly = Podolobium ilicifolium	N	0.5	2	S	
Z	24 Leucopogon juniperinus	N	0.5	1	S	
S	25 Acacia elongata	N	0.5	1	S	
L	26 Clematis aristata	N	0.2	1	V	
R	27 Lomandra filiformis	N	0.1	1	G	
L	28 Desmodium varians	N	0.5	3	V	
S	29 Maytenus silvestris = Denhamia silvestris	N	0.2	1	S	
T	30 Notolaea longifolia very leathery leaf od thing Same as RS04	N	0.1	1	S	
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Zone ID	Recorders
17228		RS

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
__/__/__	__		RS06 1230	20×50	

Easting	Northing	IBRA region	In m	Midline bearing from 0 m	
_____	_____			NNE	Magnetic °

Vegetation Class			Confidence: H M L
Plant Community Type	1250 Swamp Mahog 1718	EEC: Y	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	4
	Grasses etc.	7
	Forbs	4
	Ferns	1
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	21.4
	Shrubs	64
	Grasses etc.	51.7
	Forbs	4.1
	Ferns	0.5
	Other	4.7
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	0
50 – 79 cm	5	5 0
30 – 49 cm	26	26 0
20 – 29 cm	72	72 0
10 – 19 cm	42	42 0
5 – 9 cm	49	49 0
< 5 cm	n/a	n/a 10 0
Length of logs (m) (≥10 cm diameter, >50 cm in length)	6, 2, 3, 2	Tally space 13

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
	50	40	80	95	30	1	0	0	0	0	2	1	1	0	1	0	0	0	0	0
Average of the 5 subplots	59					0.2					1					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Floodplain	Landform Pattern	Floodplain	Microrelief	30cm (mostly 20cm)
Lithology		Soil Surface Texture	Fine moist	Soil Colour	Dark Grey	Soil Depth	? deep
Slope	1%	Aspect	NE	Site Drainage	Overland	Distance to nearest water and type	?

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	1	R	Scattered Small Lantana
Other	–	–	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

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400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	31 / 5 / 2018	17228	RS06 1230	RS

No E tereticornis
No E salign

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
T	1	E robusta	N	20%	30	+	
S	2	Mel linerifolius	N	60%	170	+	
S	3	Mel nodosa	N	3	4	S	
T	4	Glochidion ferd	N	0.5	1	st	
L	5	Pandorea pandorana	N	2	2	V	
L	6	Smilax glyciphylla	N	1	4	V	
G	7	Entolasia Marginata	N	20	2000	G	
G	8	Entolasia stricta	N	20	2000	G	
S	9	Lepto polygalifolium (Juv)	N	0.5	1	S	
D	10	Oplismenus aemulus	N	10	500	G	
V	11	Carex longibrachiata	N	4	20	G	
S	12	Breynia Oblongif (Juv)	N	0.5	1	S	
F	13	Dichondra repens	N	2	50	G	
F	14	Dianella caerulea	N	1	6	G	
L	15	Geitonoplesium cymosum	N	0.4	10	V	
T	16	Allo torulosa (Juv)	N	0.4	1	st	
L	17	Morinda jasminoides	N	0.2	1	V	
L	18	Stephania japonica	N	0.4	3	V	
L	19	Parsonsia straminea	N	0.5	4	V	
F	20	Centella asiatica	N	0.1	3	G	
T	21	Notelaea longifolia	N	0.5	2	St	
G	22	Echinopogon caespitosus	N	0.2	4	G	
V	23	Gahnia clarkei	N	0.5	3	G	
E	24	Pteridium esculentum	N	0.5	4	G	
F	25	Pratia purpurascens	N	1	100	G	
L	26	Cassytha glabella	N	0.5	5	V	
R	27	Lomandra longif	N	1	6	G	
/	28	Solanum (nigrum?)	E	0.2	2	G	
L	29	Cayratia clematidea	N	0.1	1	V	
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of 1

Survey Name	Zone ID	Recorders
17229		RS

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
31/5/2018	__		QS07 1230	20x50	6009 6610

Easting	Northing	IBRA region	Midline bearing from 0 m	
_____	_____	In m	NW	Magnetic °

		Confidence: H M L
Vegetation Class		
Plant Community Type	1230 Swamp Mahog 1718 EEC:	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	9
	Grasses etc.	10
	Forbs	4
	Ferns	1
	Other	3
Sum of Cover of native vascular plants by growth form group	Trees	29
	Shrubs	36.1
	Grasses etc.	112.1
	Forbs	4.5
	Ferns	0.2
	Other	2.5
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	II	(1) 1x 10-20? Branch Hollow
50 – 79 cm		
30 – 49 cm	𝍸 𝍸 III	(18)
20 – 29 cm	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III	(59)
10 – 19 cm	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III	(49)
5 – 9 cm	𝍸 𝍸 𝍸 𝍸 𝍸 II	(32)
< 5 cm	𝍸 𝍸 𝍸 III	(18) n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	7	Tally space (7)

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	16.4	d	e	a	b	5%	d	e	a	b	1.6	d	e	a	b	0	d	e
Average of the 5 subplots	20	10	25	12	15	5	2	3	12	6	1	4	1	1	1	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Floodplain	Landform Pattern		Microrelief	35cm — Hummocky
Lithology		Soil Surface Texture	Fine	Soil Colour	V. Dark Grey	Soil Depth	Deep
Slope	10	Aspect	Hard to tell :o	Site Drainage	overland	Distance to nearest water and type	watercourse 300m S.

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	1	R	small 1x lantana plant approx 100m from transect to E.
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 1 of 1		Survey Name	Plot Identifier	Recorders
Date	31/5/2018	17228	RS07 1230	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E robusta	N	12	25	T	
T	2	Ang floribunda	N	4	8	T	
T	3	E resinifera	N	4	15	T	
S	4	Acacia irrorata	N	1	1	st	
S	5	Mel styphelioides	N	5	20 small	T	
S	6	Mel linariifolius	N	20	10	T	
T	7	Glochidion ferdinandi	N	5	20 small	st	
S	8	Callistemon salignus	N	3	5	st	
V	9	Gahnia clarkei	N	~~[illegible]~~ 10	20	G	
V	10	Gahnia sieberiana	N	60	250+	G	
R	11	Lomandra longifolia	N	2	30	G	
G	12	Entolasia stricta	N	5	100+	G	
G	13	Entolasia marginata	N	20	300+	G	
G	14	Microlaena stipoides	N	3	10	G	
L	15	Glycine clandestina	N	0.5	10	V	
F	16	Dichondra repens	N	0.5	50	G	
F	17	Gonocarpus sp. (margin: Parsonsia straminea)	N	1	100+	G	
V	18	Lepidosperma laterale	N	2	8	G	
S	19	Melaleuca decora	N	5	2	T	
T	20	E tereticornis	N	4	2	T	
F	21	Centella asiatica	N	1	200	G	
~~L~~	~~22~~	stem dk brown Small Prostrate creeper 1.5cm long Purple Under; Not Pratia (margin: photo 6612)	N	1	2	V	
G	23	Imperata cylindrica	N	6	50	G	
L	24	Hibbertia scandens	N	1	1	V	
S	25	Persoonia linearis v. small seedling	N	0.1	1	S	
D	26	Oplismenus aemulus (margin: photo 6611)	N	4	20	G	
Z	27	Small epacrid Leucopogon juniperinus	N	1	5	G	
E	28	Pteridium esc	N	0.2	3	G	
F	29	Dianella caerulea	N	2	5	G	
S	30	Breynia oblongifolia	N	0.5	1	S	
S	31	Exocarpos cupressiformis	N	0.5	1	st	
G	32	Eragrostis brownii					
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
17228	R908 1216	RS

Date	Zone	Datum	IBRA region		Photo #	Zone ID
7/6/2018	--				6613 6614	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
		20 x 50	SSW Magnetic ?

Vegetation Class		Confidence: H M L
Plant Community Type	1216 Spotted Gum 1588 — EEC: N	Confidence: (H) M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
TM	Trees	8
SCZY	Shrubs	13
Count of Native Richness	Grasses etc. RVGDH	7
	Forbs F	3
	Ferns E	2
	Other PLK AXQ	5
Sum of Cover of native vascular plants by growth form group	Trees	32.5
	Shrubs	18.5
	Grasses etc.	30
	Forbs	5
	Ferns	16.5
	Other	3
High Threat Weed cover		0

BAM Attribute (20 x 50 m plot) dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	1 (1)	Non Euc	Hollows
50 – 79 cm	(5)		
30 – 49 cm	(9)		
20 – 29 cm	(20)	(3)	
10 – 19 cm	(21)	(15)	
5 – 9 cm	(16)	(20)	n/a
< 5 cm	1 (1)	(16)	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	4,7,1,4,18,1,10,2,4,3,3,2		total (59)

Tree Stems Count

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

2x lge fallen trees + other Branches

Photo 6615
Photo 6616

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	80	70	75	65	75	3	5	2	3	1	1	1	0	1	2	0	0	0	0	0

Some (3) Surface rocks 50cm in Quadrat

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Mid Slope	Landform Pattern		Microrelief	20cm
Lithology		Soil Surface Texture	Med Sandy	Soil Colour	Light brown	Soil Depth	< 30cm
Slope	10°	Aspect	E	Site Drainage	Overland	Distance to nearest water and type	?

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	0	One V. lge tree felled See photo 6615 & 6616
Cultivation (inc. pasture)	0		
Soil erosion	1	0	Natural erosion + Vehicle track channelling runoff
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	2	0	
Weediness	0		
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 7_6_2018	L7228	RS08 1216	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	C mac	N	10	35		
T	2	E acmen	N	2	35		
T	3	Syn glom	N	2	2		
T	4	Allo torulosa	N	10	30		
S	5	Persoonia linearis	N	4	15		
S	6	Daviesia ulicifolia	N	3	15		
T	7	E Paniculata	N	2	2		
S	8	Bossiaea obcordata	N	1	2		
Z	9	Leucopogon lanceolatus	N	1	3		
L	10	Clematis aristata	N	1	1		
F	11	Dianella caerulea	N	3	20		
G	12	Microlaena stipoides	N	8	30		
R	13	Lomandra longifolia	N	5	15		
S	14	Podolobium ilicifolium	N	3	7		
E	15	Lacy wedge Fern = Lindsaea microphylla	N	0.5	10		
L	16	Cissus Hypoglauca	N	0.2	2		
T	17	Glochidion Ferdinandi (Small juv)	N	0.5	1		
G	18	Imperata cylindrica	N	2	20		
G	19	Bats wing Grass	N	5	30		
G	20	Entolasia stricta	N	3	30		
L	21	Geitonoplesium cymosum	N	0.4	1		
G	22	Themeda ~~australis~~ triandra	N	6	50		
S	23	Banksia ~~Monotoca~~ Silvestris	N	0.5	1		
T	24	Large Shrub 3m stiff leaves Photo 6617 (Trochocarpa laurina?)	N	5	10		
S	25	Hakea = Hakea salicifolia	N	0.8	2		
S	26	Photo 6618 6619 Pomaderris ~~elachophylla~~ P. ferruginium	N	2	3		
L	27	Vine Purple under = Parsonsia straminea	N	0.4	2		
S	28	Breynia oblongifolia	N	0.5	2		
Z	29	Leucopogon juniperinus	N	0.5	2		
S	30	Acacia elongata	N	0.2	1		
E	31	Pteridium esculentum	N	1	2		
S	32	Polyscias Sambucifolia	N	1	3		
V	33	Lepidosperma laterale	N	1	2		
F	34	Pratia purpurascens	N	1	20		
F	35	Gonocarpus teucrioides	N	1	8		
L	36	Hardenbergia violacea	N	1	1		
T	37	Notelaea longifolia	N	1	1		
Z	38	Acrotriche divaricata	N	1	3		
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

S-10
C-0
Z-3
Y-

R-5 D-0
V-1 H-0
G-24

P-0 X-0
L-3 Q-0
K-0
A-0

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Zone ID	Recorders
17228		RS

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
__/__/__	__		RS09 942	20 x 50	6623 6624 6625

Easting	Northing	IBRA region	Midline bearing from 0 m
_____	_____	In m	NW Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	PCT 942 1572 EEC:	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
T, M	Trees	10
SCZY	Shrubs	9
RVGDH	Grasses etc.	4
Count of Native Richness	Forbs F	2
	Ferns F	2
PLK AXQ	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	53
	Shrubs	13
	Grasses etc.	9.5
	Forbs	6.5
	Ferns	4
	Other	9.2
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	5	—
50 – 79 cm	7	—
30 – 49 cm	17	—
20 – 29 cm	23	—
10 – 19 cm	39	—
5 – 9 cm	23	—
< 5 cm	30+	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	4, 6, 3, 5, 9 Tally space	27

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	40	60	70	80	75	10	5	2	2	12	1	1	1	1	3	50	35	25	15	10

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that can help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Lower slope	Landform Pattern		Microrelief	1.5 m
Lithology		Soil Surface Texture	Sandy	Soil Colour	Mid brown	Soil Depth	shallow
Slope	25°	Aspect	S	Site Drainage	overland	Distance to nearest water and type	60 m S creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		- Natural
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	1	0	Natural
Weediness	0		
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 1 of 1	Survey Name	Plot Identifier	Recorders
Date 7/6/2018	17228	RS09 942	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 C mac	N	30	20		
T	2 E pil	N	8	5		
T	3 E saligna	N	14	8		
T	4 E deanei ?	N	3?	2		
T	5 Allo torulosa	N	20	3		
T	6 Syncarpia glomulifera	N	3	3		
T	7 E (acmenoides?)	N	2	2		
S	8 Porsoonia linearis	N	5	2		
T	9 Trochocarpa laurina	N	8	6		
T	10 Glochidion ferd	N	2	2		
S	11 Elaeocarpus reticulatus	N	1	1		
S	12 Breynia oblongif	N	5	1		
S	13 Podolobium ilicifolium	N	3	1		
L	14 Cissus hypoglauca	N	4	1		
S	15 Callicoma salignus	N	1	1		
S	16 Pitto undulatum	N	1	2		
L	17 Smilax australis	N	12	1		
L	18 Parsonsia straminea	N	5	1		
R	19 Lomandra longifolia	N	10	6		
F	20 Digrella caerulea	N	20	6		
L	21 Geitonoplesium cymosum	N	3	1		
E	22 Doodia aspera	N	100	2		
F	23 Gymnostachys anceps	N	2	0.5		
Q	24 Calochlaena dubia	N	~~20~~ 20	2		
L	25 Pandorea pandorana	N	3	1		
V	26 Carex appressa	N	4	0.5		
L	27 Hibbertia dentata	N	2	0.2		
D	28 Oplismenus aemulus	N	20	2		
E	29 Adiantum aethiopicum	N	20	2		
T	30 Notelaea longifolia	N	3	2		
L	31 Glycine clandestina	N	5	1		
L	32 Cassytha glabella	N	3	1		
S	33 Callicoma serratifolia	N	2	3		
S	34 Photo 6626 (Lge shrub) ?	N	2	1		
S	35 Photo 6627 (Med shrub)	N	1	1		
G	36 Entolasia stricta	N	6	1		
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

S-13
C-0
Z
Y

R-6 D-2
V-0.5 H-0
G-1

P-0 A-0
L-0.2 X-0
K-0 Q-2

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BAM Site – Field Survey Form

Site Sheet no: 1 of ____

		Survey Name	Zone ID	Recorders			
Date	7/6/2018	17228		RS			
Zone	Datum	Plot ID	RS10 942	Plot dimensions	20×50	Photo #	6628 – 6630
Easting	Northing	IBRA region	In m	Midline bearing from 0 m	WSW	Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type		PCT 942 1572		EEC:		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees TM	11
	Shrubs SCZY	8
	Grasses etc. RVGDH	3
	Forbs F	3
	Ferns E	4
	Other PLKAXQ	10
Sum of Cover of native vascular plants by growth form group	Trees	40
	Shrubs	11.5
	Grasses etc.	6
	Forbs	0.8
	Ferns	53.5
	Other	35.4
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1 (1)	
50 – 79 cm	8 (8)	1 (1)
30 – 49 cm	17 (17)	
20 – 29 cm	35 (35)	
10 – 19 cm	30 (30)	
5 – 9 cm	31 (31)	
< 5 cm	26 (26)	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	3, 2, 2, 5	Tally space (12)

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	60	40	50	65	45	0	0	0	0	0	1	1	1	3	1	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Lower slope	Landform Pattern		Microrelief	20 cm
Lithology		Soil Surface Texture	Sandy	Soil Colour	Med Brown	Soil Depth	> 30 cm
Slope	7/10°	Aspect	SE	Site Drainage	Overland	Distance to nearest water and type	80m – creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		Natural
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		Natural
Weediness	0		
Other	–	–	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

RVDGH SCZY PLKAXQ

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	7 / 6 / 2018	17228	RS10 942	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	E saligna	N	12	20		
T	2	E deanei?	N	2	3?		
T	3	C mac	N	6	8		
T	4	Allo torulosa	N	5	30		
T	5	E pil	N	2	2		
T	6	E propinqua	N	2	3		
S	7	Callistemon salignus (tall)	N	2	3		
T	8	Syncarpia glomulifera	N	3	4		
T	9	Glochidion ferdinandi	N	2	2		
T	10	Acmena smithii	N	3	4		
S	11	Breynia oblongif	N	1	2		
T	12	Trochocarpa laurina	N	2	6		
E	13	Pteridium esculentum	N	25	200		
S	14	Pitto undulatum	N	2	2		
E	15	Blechnum cartilagineum	N	25	400		
Q	16	Calochlaena dubia	N	25	300		
L	17	Pandorea pandorana	N	1	10		
L	18	Geitonoplesium cymosum	N	1	10		
E	19	Doodia aspera	N	3	300+		
J	20	Oplismenus aemulus	N	2	50		
P	21	Juv - Livistona australis	N	0.1	2		
E	22	Adiantum aethiopicum	N	0.5	20		
L	23	Cissus hypoglauca	N	0.2	2		
F	24	Gymnostachys anceps	N	0.1	1		
L	25	♡ vine = Sarcopetalum harveyanum	N	0.1	1		
F	26	Dianella caerulea	N	0.5	5		
R	27	Lomandra longifolia	N	2	5		
L	28	Hibbertia dentata	N	2	5		
F	29	Dichondra repens	N	0.2	50		
V	30	Carex appressa	N	1	8		
S	31	Denhamia ~~Maytenus~~ silvestris	N	0.5	2		
S	32	Rubus ~~parvif~~ moluccanus	N	0.2	1		
S	33	Persoonia linearis	N	0.8	2		
L	34	Clematis aristata	N	1	10		
L	35	Smilax glyciphylla	N	3	30		
L	36	Photo 6631 Calystegia sepium? vine	N	1	1		
S	37	Photo 6632 Lge shrub/small tree	N	2	1		
S	38	Photo 6633-34 Wilkeia huegeliana small tree	N	2	2		
T	39	Photo 6635 top - 6636 underside	N	1	2	Cryptocarya microneura	
X	40	Xanthorroea [illegible] med size spreading tree section leaf	N	1	1		
S		Rhodamnia rubescens	N	1	2		

GF Code: see Growth Form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); *Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

S - 8
C
Z
Y

R - 1
V - 1
G - 0
D - 1
H - 0

P - 0
L - 8
K - 0

A - 0
X - 0
Q - 1

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Zone ID	Recorders
17228		RS

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
7/6/2018	__		RS11 942	20×50	

Easting	Northing	IBRA region	Midline bearing from 0 m
_____	_____	In m	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	PCT 942 1572 EEC: tick	Confidence: H (M) L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

RS only – few E.sativum E.deanei

BAM Attribute (400 m² plot)		Sum values
T, M	Trees 8#	8
S,C,Z,Y	Shrubs 6	6
Count of Native Richness	Grasses etc. R V G D H	6
	Forbs F	5
	Ferns E	4
	Other P L K A X Q	8
Sum of Cover of native vascular plants by growth form group	Trees T=45	45
	Shrubs	10
	Grasses etc.	7.5
	Forbs	5.7
	Ferns	16
	Other	27.7
High Threat Weed cover		12

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	5	
50 – 79 cm	6	1
30 – 49 cm	11	
20 – 29 cm	28	
10 – 19 cm	41	
5 – 9 cm	40	
< 5 cm	17	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2,5,3,2,6 Tally space 18	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	70	75	75	80	50	2	0	0	1	0	1	1	3	1	1	0	0	0	0	0

Some sandstone rocks to 1m Ø on surface

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Mid Slope	Landform Pattern		Microrelief	25cm
Lithology		Soil Surface Texture	Sandy loam	Soil Colour	Mid Brown	Soil Depth	20cm+
Slope	10°	Aspect	E	Site Drainage	Overland	Distance to nearest water and type	~200m E - Creek

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	2	R	Lantana coverage ~ 10-15%.
Other	–	–	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 1 of 1	Survey Name	Plot Identifier	Recorders
Date 7/6/2018	17228	RS11 942	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Epil	N	10	6		
T	2 C mac	N	6	8		
T	3 Allo torulosa	N	6	30		
T	4 Syn glom	N	3	5		
T	5 Glochidion ferd	N	5	3		
	6 Lantana camara	E	12	35		
T	7 Trochocarpa laurina	N	8	20		
T	8 Acmena smithii	N	3	5		
E	9 Pteridium esculentum	N	10	100's		
E	10 Blechnum cartilagineum	N	4	30		
Q	11 Calochlaena dubia	N	8	100		
S	12 Breynia oblongif	N	1	3		
T	13 E saligna	N	4	4		
L	14 Hibbertia dentata	N	2	6		
D	15 Oplismenus aemulus	N	3	200		
L	16 Geitonoplesium cymosum	N	2	15		
L	17 Pandorea pandorana	N	2	8		
L	18 Cissus hypoglauca	N	2	4		
F	19 Diaella caerulea	N	1	18		
V	20 Carex appressa	N	1	2		
R	21 Lomandra longifolia	N	1	4		
S	22 Denhamia ~~Maytenus~~ silvestris	N	2	3		
F	23 Dichondra repens	N	2	200		
L	24 Clematis aristata	N	2	5		
S	25 Wilkea hygrica? Same as photo 6633	N	2	2		
F	26 Pratia purpurascens	N	2	200		
S	27 Poroonia linearis	N	1	3		
E	28 Doodia aspera	N	1	60		
E	29 Adiantum aethiopicum	N	1	4		
L	30 Smilax glyciphylla	N	2	6		
F	31 Gymnostachys anceps	N	0.5	1		
F	32 Centella asiatica	N	0.2	20		
D	33 Oplismenus imbecilis	N	1	50		
L	34 Sarcopetalum harveyanum	N	0.2	1		
G	35 Imperata cylindrica	N	0.5	20		
G	36 Entolasia stricta	N	2	50		
S	37 Mel stypheloides	N	1	1		
S	38 Same as Photo 6632 4 species	N	3	1		
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

R 1
V 1
D 2
G 2
N

P
L – 7
K
A
X
Q – 1

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

		Survey Name	Zone ID	Recorders			
Date	13/06/2018	17228 18SH003V		RS			
Zone	Datum	Plot ID	RS12 1230	Plot dimensions	20 × 50	Photo #	6640–6642
Easting	Northing	IBRA region	In m	Midline bearing from 0 m	SW	Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type		PCT ~~1230~~ 1718		EEC:		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

Freaking HEAPS!

BAM Attribute (400 m² plot)		Sum values
TM	Trees	5
SCZY	Shrubs	11
Count of Native Richness	Grasses etc. (BVGDH)	8 8
	Forbs F	9
	Ferns E	1
	Other PLKAXQ	3 37 ✓
Sum of Cover of native vascular plants by growth form group	Trees	9
	Shrubs	42
	Grasses etc.	53.5
	Forbs	14.04
	Ferns	0.1
	Other	6.1
High Threat Weed cover		6

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	0
50 – 79 cm	0	0
30 – 49 cm	4	in 20×50m 0
20 – 29 cm	~185 ~74 in	20×20m = 2·5×74 = 185 0
10 – 19 cm	~150	0
5 – 9 cm	~74	0
< 5 cm	52 in 20×20 ∴ 52×2·5 = ~130	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	4, Tally space = 4	

TL 4 trees ~ 540

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	12	20	15 (17)	5	25	5	8	6	2	8	1	3	2	1	3	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Flood plain	Landform Pattern		Microrelief	35cm — Hummocky
Lithology		Soil Surface Texture	fine clay loam	Soil Colour	Dark Grey	Soil Depth	> 50 cm
Slope	<1%	Aspect	~~E~~ NE?	Site Drainage	overland	Distance to nearest water and type	100m — Watercourse NE

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	0		
Fire damage	0		
Storm damage	0		
Weediness	1	R	- Juv Lantana present.
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 13/6/2018	1841003V/17228	RS12 1230	RS

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	1	Mel lin	N	10	200		
S	2	Mel biconvexa	N	25	350		
S	3	Mel nodosa	N	2	3		
S	4	Acacia longifolia	N	1	1		
L	5	Pensousia Straminea	N	3	12		
T	6	Glochidion ferdinandii (mostly Juv seedlings)	N	2	30		
	7	Lantana camara Not yet large	HTE?	2	6		
V	8	Gahnia clarkei	N	1	3		
D	9	oplismenus aemulus	N	15	300		
V	10	Carex ~~appressa~~ longibrachiata?	N	15	300		
	11	Paspalum dilatatum	E	0.1	1		
G	12	Imperata cylindrica	N	0.3	5		
G	13	Entolasia marginata	N	15	300		
F	14	Pratia purpurascens	N	3	200		
F	15	Dichondra repens	N	5	600		
F	16	Gonocarpus teucroides	N	1	30		
F	17	Centella asiatica	N	2	30		
F	18	Oxalis, sp	N	1	3		
F	19	Dianella caerulea var prod.	N	2	8		
T	20	E. robusta	N	2	4		
L	21	Desmodium varians	N	0.1	1		
R	22	Juncus usitatus	N	1	8		
L	23	Pandorea pandorana	N	3	25		
T	24	Trochocarpa laurina Juv	N	1	1		
S	25	Rubus ~~sp~~ R. parvifolius	N	1	1		
G	26	Entolasia marginata	N	6	150		
T	27	Tree Acacia A. binervata slightly Platy Grey Bark	N	2	1		
S	28	Wilkea huegeliana Juv shrub Photo 6643	N	0.1	1		
S	29	Rubus = Rubus moluccanus	N	0.3	1		
T	30	E resinifera	N	2	1		
S	31	Acacia irrorata	N	2	2		
S	32	Breynia oblongif	N	0.3	1		
G	33	Echinopogon ovatus	N	0.2	3		
F	34	Hydrocotyle ~~pedunculoris~~ SH. Now sibthorpioides	N	0.1	6		
F	35	Decussate Seedling Photo 6644	N	0.1	1		
S	36	Myrsine variabilis Small (Juv?) shrub Photos 6645-6	N	0.1	2		
S	37	Pitto ~~Pauciflorus~~ Citriobatus spinescens	N	0.2	1		
F	38	Geranium homeanum	N	0.2	10		
E	39	Adiantum aethiopicum	N	0.1	2		
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

S-11-42 R-1-1 P-0 A-0
C-0 V-2-16 L-3 X-0
Z-0 G-4-215
Y-0 D-1-15 K-0 Q-0
H-0

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

		Survey Name	Zone ID	Recorders			
Date	13 / 6 / 2018	17228 18SH003V		RS			
Zone	Datum	Plot ID	RS13 942	Plot dimensions	20 x 50	Photo #	6647 6648
Easting	Northing	IBRA region	In m	Midline bearing from 0 m	NNE	Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type	PCT 942 1572			EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
T, M	Trees	8
SCZY	Shrubs	10
Count of Native Richness	Grasses etc. RVGDH	5
	Forbs F	5
	Ferns E	2
	Other PLKAXQ	9 (39)
Sum of Cover of native vascular plants by growth form group	Trees	49
	Shrubs	27.2
	Grasses etc.	17
	Forbs	3
	Ferns	4
	Other	10.4
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	3	0
50 – 79 cm	9	0
30 – 49 cm	17	0
20 – 29 cm	36	0
10 – 19 cm	71	0
5 – 9 cm	92	0
< 5 cm	36	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	3, 2, 2, 4, 7, 2 Tally space	20

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	80	45	75	85	60	0	1	0	0	0	1	3	5	0	1	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Lower slope	Landform Pattern		Microrelief	30cm
Lithology		Soil Surface Texture	Fine Sandy loam	Soil Colour	Mid grey	Soil Depth	> 30cm
Slope	3°	Aspect	North	Site Drainage	Overland	Distance to nearest water and type	100m NW – watercourse

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	NR	Some stumps, regrowth to 35cm DBH
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	1	R	Cattle
Fire damage	0		
Storm damage	0		
Weediness	0		
Other	—		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

S-10 R-1-1 D-1-8 P-1-2 A-0-8

C-0 V-2-6 H-0-0 L-7-64 X-0-0

Z-0 G-1-2 K-0-0 Q-1-2

Y-0

400 m² plot: Sheet 1 of 1	Survey Name	Plot Identifier	Recorders
Date 13/6/2018		RS 13 942	RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Epil	N	5	3		
T	2 E saligna	N	10	30		
T	3 E robusta	N	2	1		
T	4 Syn glom	N	20	55		
P	5 Livistona australis	N	2	3		
S	6 Brachychiton rupestris	N	3	5		
S	7 Pittosporum rovidutum	N	4	88		
S	8 Mel linariifolia	N	~~50~~ 15	200		
S	9 Acacia elongata	N	2	1		
S	10 Citriobatus (Pittosporum ~~flavifloris~~ spinescens)	N	1	3		
V	11 Gahnia clarkei	N	2	10		
V	12 ~~Gahnia sieberiana~~ Carex appressa	N	4	20		
T	13 Exc acmenoides	N	5	1		
T	14 Glochidion ferdinandii	N	5	2		
L	15 Cissus hypoglauca	N	1	1		
L	16 Parsonsia straminea	N	2	2		
F	17 Dianella caerulea	N	1	6		
R	18 Lomandra longifolia	N	1	3		
Q	19 Calochlaena dubia	N	2	8		
S	20 Rubus moluccana	N	1	1		
D	21 Oplismenus aemulus	N	68	300		
L	22 Pandorea Pandorana	N	2	20		
G	23 Entolasia stricta	N	2	25		
T	24 Acmena smithii	N	6	6		
E	25 Pteridium esculentum	N	2	5		
L	26 Hibbertia dentata	N	0.5	1		
L	27 Geitonoplesium cymosum	N	0.5	6		
T	28 ~~Pandorea pod~~ Cryptocarya micranura	N	1	3		
S	29 Delamia silvestris (WAS Maytenus)	N	0.3	10		
L	30 Clematis aristata	N	0.2	1		
S	31 Wilkiea huegliana	N	0.2	2		
S	32 Wilkiea huegliana Shrub Juv Photo 6649	N	0.5	3		
F	33 Dichondra repens	N	0.5	100		
F	34 Pratia purpurascens	N	0.2	60		
F	35 Gonocarpus teucrioides	N	0.3	30		
L	36 Ripogonum fawcettianum Shrub Photo 6650	N	0.2	4		
S	37 ? Shrub Photo 6651	N	0.2	6		
F	38 Gymnostachys anceps	N	1	2		
E	39 Adiantum aethiopicum	N	2	10		
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Plot Identifier	Recorders
17228 18SH003V	RS14 836	RS

Date	Zone	Datum	IBRA region	Photo #	Zone ID
13/6/2018	—	—		6653 – 6355	

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
—	—	20 x 50	NE Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	PCT 836 1720	EEC: / Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	6
	Grasses etc.	8
	Forbs	12
	Ferns	0
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	33.1
	Shrubs	34.5
	Grasses etc.	27.6
	Forbs	3.3
	Ferns	0
	Other	1.2
High Threat Weed cover		1.1

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	Hollows†
dbh	# Tree Stems Count		
large trees for Euc* & Non Euc 80 + cm	1		/
50 – 79 cm	2	III	/
30 – 49 cm		IIII II	/
20 – 29 cm		I	/
10 – 19 cm		I	/
5 – 9 cm		IIII IIII IIII IIII IIII III	n/a
< 5 cm		28, 40, 55, 30, 18, 44	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2 Tally space (2)		total (2)

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	25	8	6 (15)	15	20	5	2	0	0	3	0	1	1	1	1	0	0	0	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Flood plain	Landform Pattern		Microrelief	35-40 cm
Lithology		Soil Surface Texture	Fine Loam	Soil Colour	Dark Grey	Soil Depth	> 50 cm
Slope	< 1%	Aspect	?	Site Drainage	overland	Distance to nearest water and type	120 m — watercourse

Hummocks

Plot Disturbance

	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	R	¼ of Transect Cleared.
Cultivation (inc. pasture)	2	R	Cattle
Soil erosion	0		
Firewood / CWD removal	0		
Grazing (identify native/stock)	2		Cattle
Fire damage	0		
Storm damage	0		
Weediness	2	R	Lantana, Privet, Asparagus Fern – all Juvenile
Other	—	—	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 13/6/18	Nard	NSW pa836	GP/RS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 E. amplifolia	N	3	10		
S	2 Melaleuca styphelioides	N	30	5		
T	3 Glochidion ferdl.	N	30	150		
V	4 Carex longibrac.	N	20	500		
/	5 Paspalum sp. ~~dilatatum~~	HTE	0.1	10		
L	6 Parsonsia str.	N	0.5	5		
F	7 Diovella caer.	N	0.1	5		
F	8 Dichondra repens	N	2	50		
D	9 Oplismenus aemulus	N	2	200		
G	10 Entolasia marginata	N	2	200		
G	11 Microlaena stipl.	N	4	300		
F	12 Centella asiatica	N	0.2	50		
F	13 Prostia purpurescens	N	0.2	50		
F	14 Goodenia paniculata	N	0.1	10		
S	15 Rubus moluccanus	N	0.1	5		
L	16 Desmodium varians	N	0.1	3		
F	17 Hydrocotyle pedunculoris	N	0.1	15		
F	18 " tripartita	N	0.1	10		
F	19 Veronica plebeia	N	0.1	10		
F	20 Galium propinquum	N	0.1	5		
F	21 Ranunculus pleibeus	N	0.1	3		
L	22 Glycine clandestina	N	0.1	8		
/	23 Cinnamomum camphora	HTE	0.1	3		
/	24 Ligustrum sinense	HTE	0.1	3		
F	25 Pseuderanthemum variable	N	0.1	10		
/	26 Asparagus aeth.	HTE	0.1	5		
L	27 Dioscorea transversa	N	0.1	5		
V	28 Carex appressa	N	1	20		
L	29 Morinda jasminoides	N	0.1	3		
/	30 Lantana	HTE	0.5	3		
G	31 grass indet	N	0.1	5		
S	32 Acacia ~~indet~~ irrorata	N	2	10		
T	33 Alphitonia excelsa	N	0.1	3		
F	34 Vernonia cinerea	N	0.1	5		
L	35 Pandorea pandorana	N	0.1	3		
/	36 Plantago lanc.	E	0.1	10		
/	37 Axonopus fissifolius	HTE	0.2	20		
S	38 Breynia obl.	N	0.1	3		
V	39 Gahnia clarkei	N	0.2	10		
G	40 Imperata cylind	N	0.5	20		
S	Callistemon sal.	N	2	5		
L	Geitonoplesium cym.	N	0.1	3		
S	Mel. linearifolia	N	0.3	1		

Cynodon aust. N 0.1 1

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Appendix C – Management Plan

Attachment 4: Management Plan

Instructions for completing the Biodiversity Stewardship Site Management Plan template

This Biodiversity Stewardship Site Management Plan template is to be filled in by the assessor, reviewed by the Owner and included in the Biodiversity Stewardship Site Assessment Report submitted to the BCT as part of an application to establish a Biodiversity Stewardship Site. The standard words and format provided in this template must be used for the management actions.

The BCT will review the management plan and make any necessary amendments in consultation with the Owner. The management plan will be incorporated into the Biodiversity Stewardship Agreement.

There are seven sections to this template:

- Section 1: Management Actions
- Section 2: Fire for Conservation Management Plan
- Section 3: Native Vegetation Management Plan
- Section 4: Threatened Species Habitat Management Plan
- Section 5: Integrated Feral Pest Management Plan
- Section 6: Integrated Weed Management Plan
- Section 7: Monitoring Plan

Orange boxes like this one provide instructions and examples and will be deleted by the BCT before the Biodiversity Stewardship Agreement is processed.

Yellow highlighted fields need to be customised by the Owner. Usually the Owner needs to provide the information required; sometimes the Owner will need to delete or retain provided options. It is important to ensure that, especially where fields are customised, that the management actions are certain, clear and specific so that it is clear what the requirements of the actions are.

The format and wording of standard and additional management actions must not be changed. Enter site specific information into the yellow highlighted fields as required.

Management actions are divided into 'required management actions' and 'active restoration management actions' in accordance with Subsections 13.3.2 and 13.3.3 of the BAM. Required management actions are those management actions that must be implemented on the biodiversity stewardship site to achieve the predicted management gain. Active restoration management actions are those management actions in addition to the required management actions that may be used to create biodiversity credits at a biodiversity stewardship site in addition to the biodiversity credits created for the required management actions.

Both required management actions and active restoration management actions, when included in this management plan for a biodiversity stewardship site, must be undertaken in accordance with the management plan.

Definitions

In this Management Plan, unless a contrary intention appears, a capitalised word or words has the meaning given in the corresponding row in the table below.

Other terms are defined in the Dictionary.

Word/s	Meaning
Biodiversity Stewardship Site Assessment Report	The document described in **Error! Reference source not found.**
Biodiversity Stewardship Site Management Actions Map	The map showing Management Zones, management features (e.g. firetrails) and the location of Management Actions in the Biodiversity Stewardship Site
Ecological Burn	Burning of Native Vegetation undertaken to help stimulate Native Plant regeneration, control weeds and enhance Biodiversity
Ecological Burn Map	The map included in the Fire for Conservation Management Plan identifying the areas of the Biodiversity Stewardship Site to be burnt, based on broad habitat zones, during each Ecological Burn
Ecological Burn Unit	An area within the Biodiversity Stewardship Site comprised of one or more Management Zones over which the same regime of ecological burning is applied
Ecosystem Credit	The meaning given in the Biodiversity Assessment Method Note: This definition may change from time to time, with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was: "a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur within a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site"
Feral Pest	Pest animal species not native to Australia including fox, cat, pig, goat, horse, avian pests and other miscellaneous species
Fertiliser	The meaning given in the *Biosecurity Act 2015* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was: "(a) a substance that consists of or contains nitrogen, phosphorus or potassium (or any combination of nitrogen, phosphorus or potassium) and is manufactured, represented, sold or used as a means for directly or indirectly supplying nutriment for the purpose of enhancing the development, productivity, quality or reproductive capacity of vegetation, other than a substance excluded from this definition by the regulations, or (b) any other substance prescribed by the regulations to be a fertiliser"
Fire for Conservation Management Plan	The plan titled "Fire for Conservation Management Plan" included in Section 2 of this Management Plan
High Threat Exotic Plant Cover	The meaning given to it in the Biodiversity Assessment Method Note: The definition may change from time to time, with changes in the Biodiversity Assessment Method, but on the Agreement Date this meaning was "plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species"

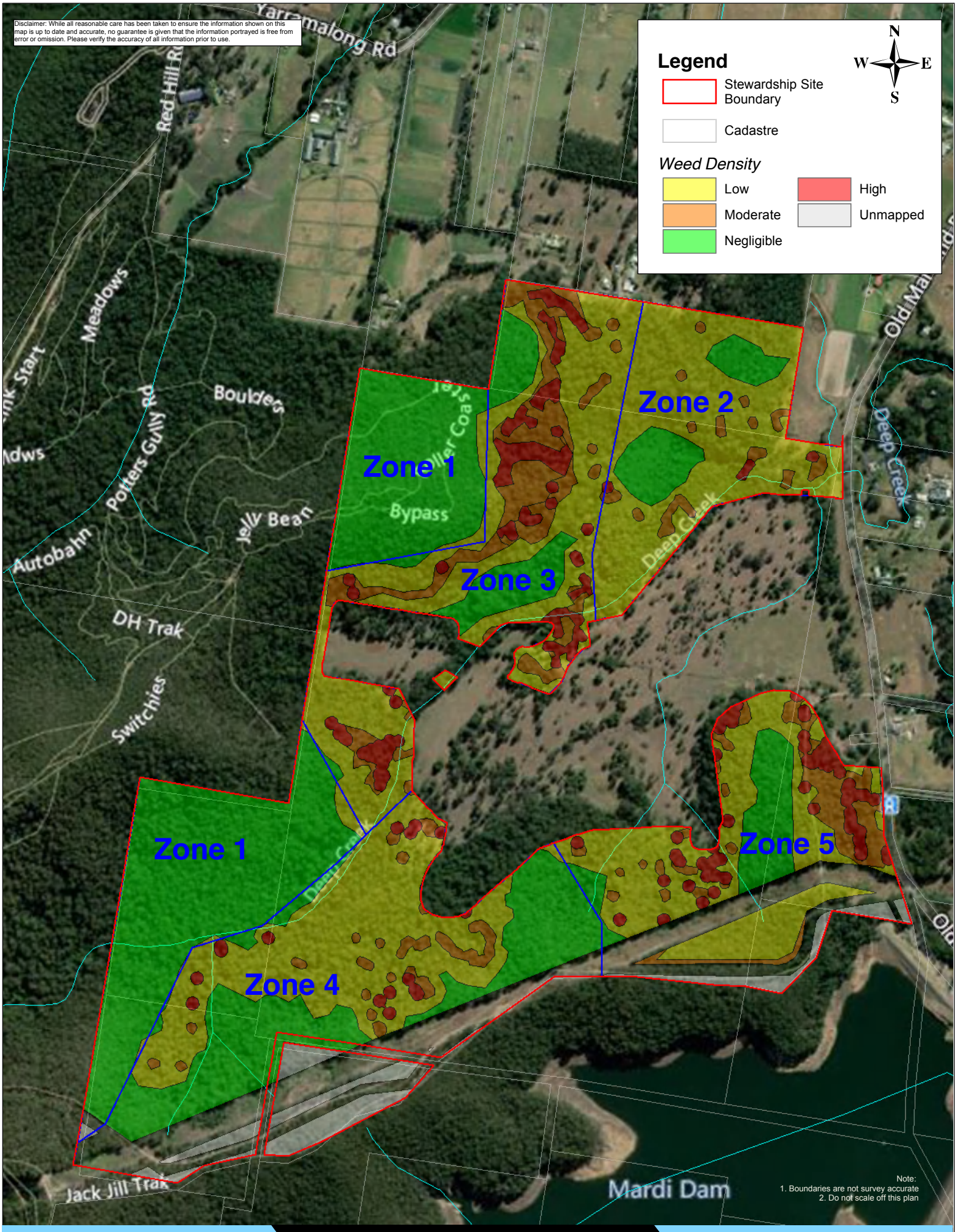
Word/s	Meaning
High Threat Exotic Species	A vascular plant not native to Australia that if not controlled will invade and outcompete Native Plant species. Also referred to in this Attachment as High Threat Weed Species
Hollow-dependent Threatened Species	Threatened Species for which tree hollows (sometimes of a particular size or with particular characteristics) are a key component of their habitat and are critical for the persistence of that species in the landscape
Integrated Feral Pest Management Plan	The plan titled "Integrated Feral Pest Management Plan" included in Section 5 of this Management Plan
Integrated Weed Management Plan	The plan titled "Integrated Weed Management Plan" included in Section 6 of this Management Plan
Large Woody Debris	Large, fallen dead tree branches and trunks
Living Ground Cover	All living vegetation below 1m in height including native and non-native ground cover species
Local Land Services	The statutory corporation established under the *Local Land Services Act 2013* (NSW).
Monitoring Plan	The plan titled "Monitoring Plan" included in Section 7 of this Management Plan
Native Vegetation Management Plan	The plan titled "Native Vegetation Management Plan" included in Section 3 of this Management Plan
Other Weed Species	A plant not native to Australia and not otherwise identified as a High Threat Weed Species
PCT	Plant Community Type
Pesticide	The meaning given in Section 5 of the *Pesticides Act 1999* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was: "(a) an agricultural chemical product (within the meaning of the Agvet Code), or (b) a veterinary chemical product (within the meaning of the Agvet Code) that: (i) is represented as being suitable for, or is manufactured, supplied or used for, the external control of ectoparasites of animals, and (ii) is concentrated and requires dilution or mixing in water before use, and (iii) is not prescribed under the Stock Medicines Act 1989 as a low-risk veterinary chemical product. …a pesticide continues to be regarded as a pesticide even when it is mixed with some other substance (whether or not the other substance is a pesticide). However, a pesticide does not include a prescribed mixture or a mixture of a prescribed class or description"
Photo Point	A location within the Biodiversity Stewardship Site and identified in Part 9.2 of Section 1 of this Management Plan at which a series of photographs is taken in all directions (360°) for the purpose of monitoring change in vegetation condition over time
Rubbish	Any anthropogenic waste material other than that identified in this Management Plan as being used to achieve a specific biodiversity management purpose

Word/s	Meaning
Sediment Trap	A temporary or permanent structure used to collect, trap and store sediment to prevent entry of sediment to a waterway
Species Credits	The meaning given in the Biodiversity Assessment Method. Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection"
Species Polygon	An identification of the area or count and location of the suitable habitat for a Species Credit species on the Biodiversity Stewardship Site, prepared as part of the Biodiversity Stewardship Site Assessment Report
Stock	The meaning given in the *Local Land Services Act 2013* (NSW), and including any animal declared to be stock under the *Local Land Services Regulation 2014* (NSW) Note: This definition may change from time to time with changes in Law, but on the Agreement Date the meaning was: "cattle, horses, sheep, goats, camels, alpacas, llamas, pigs, deer, ostriches, emus or, in relation to any specified provision or provisions of this Act, any other kind of animal declared by the regulations to be stock for the purposes of that provision or those provisions"
Targeted Supplementary Planting	Planting of locally indigenous native plants in one or more areas of the Biodiversity Stewardship Site to: a) increase Native Plant species richness and foliage cover of a vegetation zone above the level determined for management gain, and/or b) restore or enhance the native plant species composition and structure of recognisable PCTs, and/or c) improve habitat suitability for specific Threatened Species
Threatened Biodiversity Data Collection	The meaning given to it in the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method but on the Agreement Date the meaning was "part of the BioNet database, published by DPIE (previously the Office of Environment and Heritage) and accessible from the BioNet website at www.bionet.nsw.gov.au"
Threatened Species Habitat Management Plan	The plan titled "Threatened Species Habitat Management Plan" included in Section 4 of this Management Plan
Threatened Species Habitat map	The map of Threatened Species locations and Species Polygons within the Biodiversity Stewardship Site
Vegetation Integrity Survey Plot	The meaning given to 'plot' in the Biodiversity Assessment Method and described in Section 5.3.4 of the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "an area within a vegetation zone in which site attributes are assessed"
Vegetation Zone	The meaning given in the Biodiversity Assessment Method Note: This definition may change from time to time with changes in the Biodiversity Assessment Method, but on the Agreement Date the meaning was "a relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state"

Section 1: Management Actions

Management Actions
Biodiversity Stewardship Site Management Actions Map Figure 1 – Weed Density Map Figure 2 – Boundary Management Map Figure 3 – Threatened Species Management Areas
The Biodiversity Stewardship Site Management Actions Map is to be produced so that the following features can be clearly identified: (a) Vegetation Zones (b) Management Zones (c) Management features (e.g. artificial structures on waterways, erosion, rubbish, fencing, gates, firetrails, access tracks, infrastructure and built assets to be retained). (d) Location of Management Actions in the Biodiversity Stewardship Site.

Part 1	**Fire management**	**Timing**
1.1 (Required management action)	The Owner must implement and comply with the Fire for Conservation Management Plan.	Ongoing from Agreement Date.
Part 2	**Grazing management**	**Timing**
2.1	(a) The Owner must not graze Stock on the Biodiversity Stewardship Site.	



AEP

Title: Weed Density Map

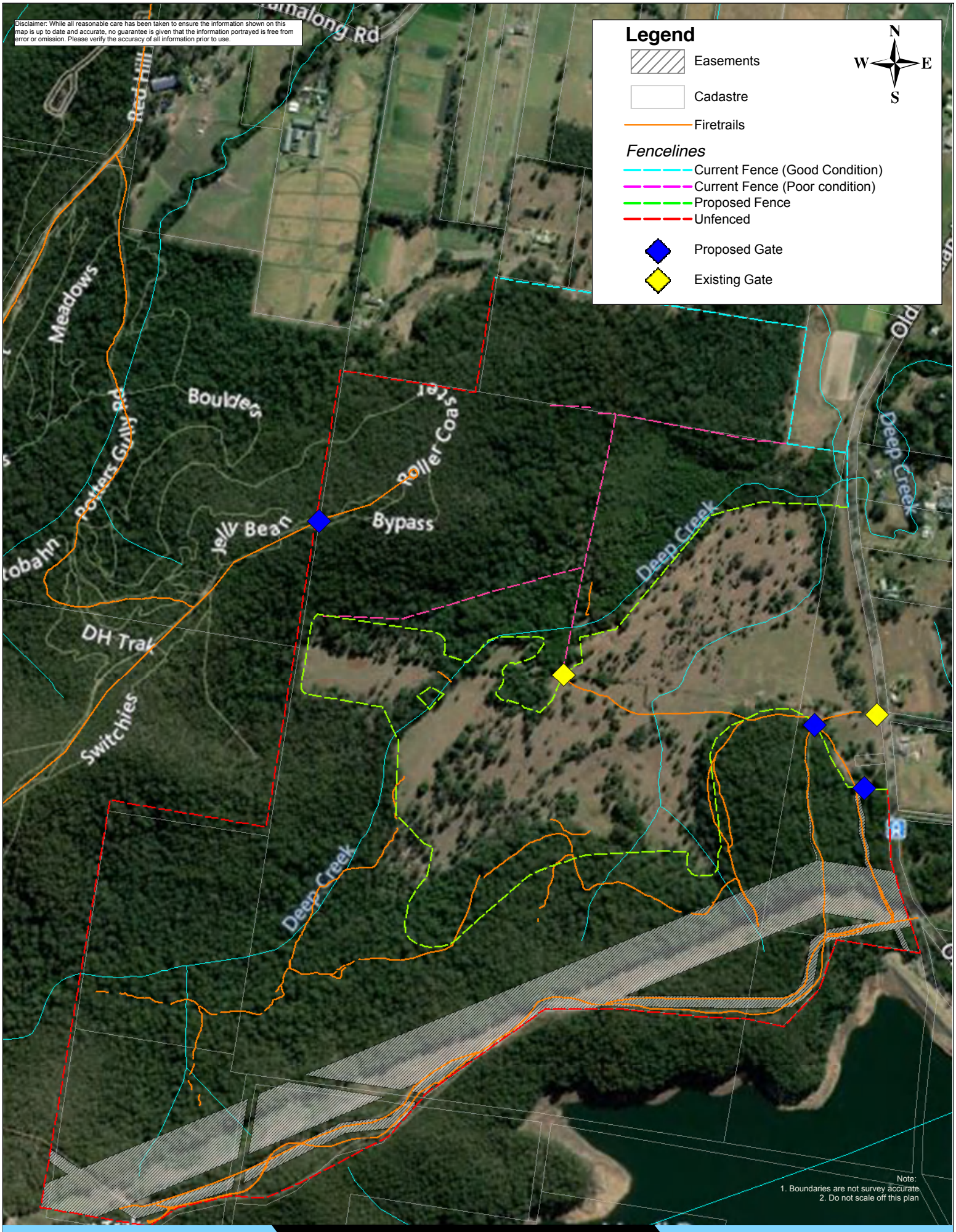
Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06



AEP

Title: Boundary Management

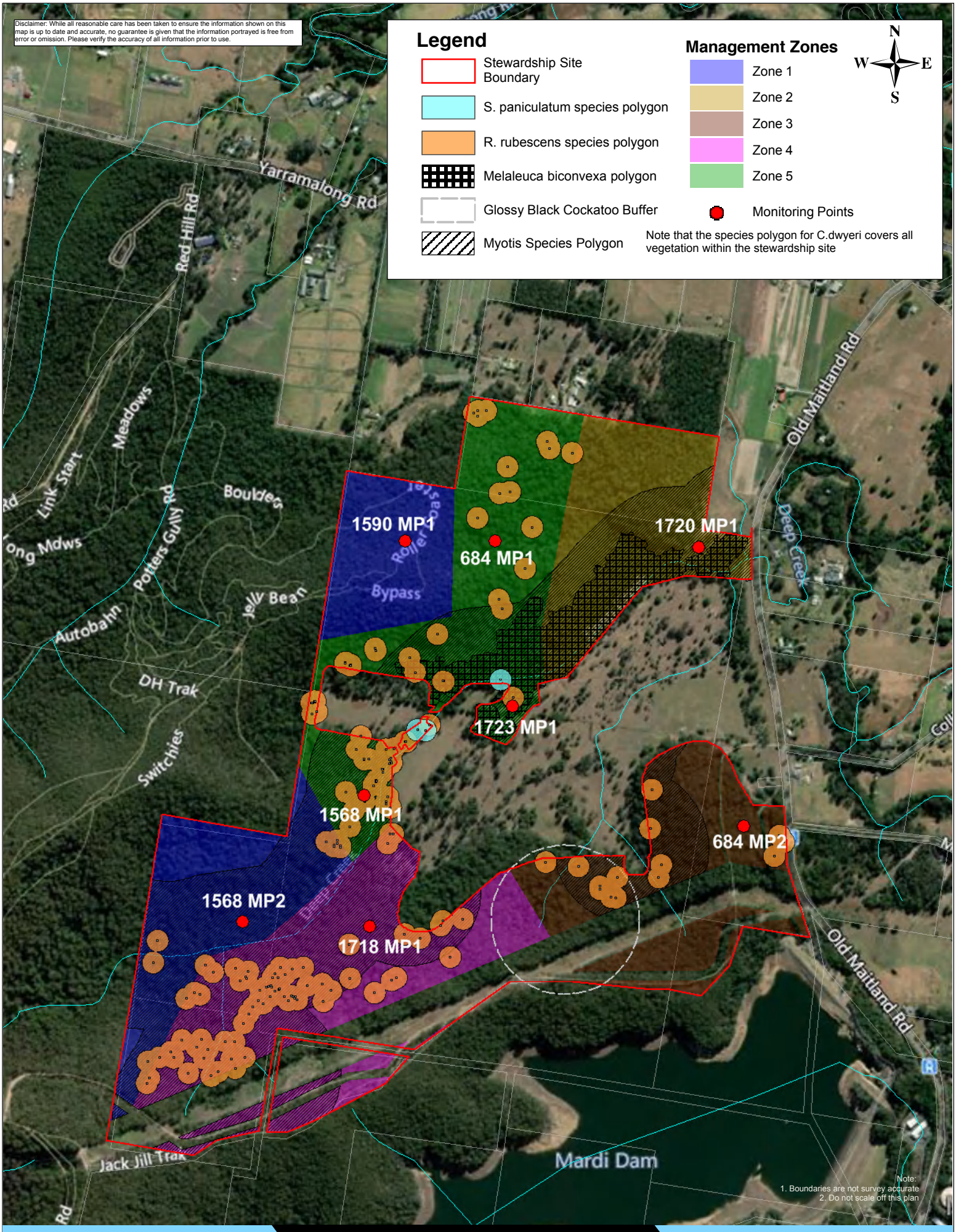
Location: Old Maitland Road, Mardi

Client: Transnatiional Pastoral Pty Ltd and Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06



AEP

Title: Threatened Species Management

Location: Old Maitland Road, Mardi

Client: Transnational Pastoral Pty Ltd and Stevens Group

Date: May 2021

BOAMS Ref: 14546

AEP Ref: 1910.06

Management Actions		
(Required management action)	If no grazing is to be allowed, replace the above part with: "The Owner must not graze Stock on the Biodiversity Stewardship Site." Then delete the words in part 2.2 (but keep the numbering) and replace with: "This part is not applicable."	Ongoing from Agreement Date.
2.2 (Required management action)	(a) This part is not applicable. (b) This part is not applicable. (c) This part is not applicable. (d) This part is not applicable.	
	Delete (b) and/or (c) if not relevant. Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.	
2.3 (Required management action)	If, at any time, the Owner observes Stock in any area of the Biodiversity Stewardship Site, other than an area where grazing is permitted, the Owner must take necessary measures to remove the Stock from the area immediately.	Ongoing from Agreement Date
Part 3	**Native Vegetation management**	**Timing**
3.1 (Required management action)	Native Vegetation on the Biodiversity Stewardship Site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except: (a) in accordance with Part 3.6.4 of this section; (b) it is specifically permitted or required as part of a Management Action; or **(c)** it is essential to a carry out an action permitted under clause 6 of this Deed.	Ongoing from Agreement Date
3.2 (Required management action)	Where Part 3.1 of this section permits Native Vegetation on the Biodiversity Stewardship Site to be burnt, it may only occur in accordance with the Fire for Conservation Management Plan.	Ongoing from Agreement Date
3.3 (Required management action)	Native Vegetation must be managed on the Biodiversity Stewardship Site to improve Threatened Species habitat if required as part of a Management Action for Threatened Species on the Biodiversity Stewardship Site under this Deed.	Ongoing from First Payment Date.

Management Actions		
3.4 (Required management action)	(a) Except as permitted by Part 3.4(b), and to as far an extent practicable, the Owner must prevent nutrients from Fertilisers and other sources (other than those that would occur as a result of natural ecosystem function) from entering the Biodiversity Stewardship Site, including waterways within the Biodiversity Stewardship Site. (b) Fertilisers and Pesticides must not be applied on the Biodiversity Stewardship Site, except where permitted or required as part of a Management Action specified in the Native Vegetation Management Plan. Use of Fertilisers for establishing Native Vegetation through planting or seeding, use of herbicides for controlling weeds or use of Pesticides for controlling feral pests may be undertaken in accordance with best practice management when required to undertake Management Actions specified in the Native Vegetation Management Plan.	Ongoing from Agreement Date
3.5 (Active restoration action)	Native Vegetation and habitat management and augmentation must be implemented as set out in Part 3.6 (including sub-parts 3.6.1 to 3.6.5) and in Part 3.7 in accordance with Management Actions specified in the Native Vegetation Management Plan. If no native vegetation and habitat management and augmentation active restoration activities are proposed, replace the above part with: "This Part 3.5 is not applicable." and delete Part 3.6 (including sub-parts 3.6.1 to 3.6.5) and Part 3.7.	Ongoing from First Payment Date.
3.6 (Active restoration action)	This Part 3.6 is not applicable. If no Targeted Supplementary Planting is proposed, replace the above part with: "This Part 3.6 is not applicable." and delete Parts 3.6.1 to 3.6.5.	Ongoing from First Payment Date.
3.6.1 (Active restoration action)		Ongoing from First Payment Date
3.6.2 (Active restoration action)	Different years or heights for specific types of plants can be listed in the Native Vegetation Management Plan.	Ongoing from First Payment Date
3.6.3 (Active restoration action)		Ongoing from First Payment Date.
3.6.4 (Active restoration action)		Ongoing from Agreement Date
3.6.5 (Active restoration action)		Ongoing from Agreement Date

Management Actions		
3.7 (Active restoration action)	Hydrology management must be implemented in accordance with the Native Vegetation Management Plan to aid the restoration of Native Vegetation in instances where the hydrology of the Biodiversity Stewardship Site has been disrupted or altered. If no changes to hydrology are proposed as an active restoration action, replace the above part with: "This Part is not applicable."	Ongoing from First Payment Date.
Part 4	**Threatened Species habitat management and enhancement**	**Timing**
4.1 (Required management action)	The Owner must protect breeding habitat features and sites for all Threatened Species for which Species Credits or Ecosystem Credits have been created. Known breeding sites of Threatened Species on the Biodiversity Stewardship Site are shown on the Threatened Species Habitat map.	Ongoing from Agreement Date
4.2 (Required management action)	The Owner must undertake all Management Actions described in the Threatened Species Habitat Management Plan. The Threatened Species Management Plan is to include all practical and relevant management actions identified in the Threatened Biodiversity Data Collection for a Threatened Species for which Species Credits or Ecosystem Credits have been created. TBDC actions; Glossy Black-Cockatoo – Application of ecological fire management Large-eared Pied Bat – none listed in TBDC Southern Myotis - Application of ecological fire management Green-thighed Frog – none listed in TBDC *Melaleuca biconvexa* - none listed in TBDC *Syzygium paniculatum* – none listed in TBDC *Rhodamnia rubescens* - none listed in TBDC	Ongoing from First Payment Date
4.3 (Active restoration action)	Habitat enhancement must be implemented as set out in Part 4.3.1 to 4.3.4 in this Part and in accordance with Management Actions specified in the Threatened Species Habitat Management Plan. If no habitat enhancement active restoration activities are proposed, replace the above part with: "This Part is not applicable." and delete Parts 4.3.1 – 4.3.4.	Ongoing from First Payment Date
4.3.1	The Owner must include artificial nest boxes on the Biodiversity Stewardship Site to provide roosting and breeding habitat for Hollow-dependent Threatened Species in accordance with the Threatened Species Habitat Management Plan.	Ongoing from First Payment Date

Management Actions		
(Active restoration action)	~~If no artificial nest boxes are proposed as active restoration management action to improve habitat suitable for specific threatened species, replace the above Part with~~ ~~"This Part is not applicable".~~ While not specifically required for Hollow-dependant Threatened Species, as an impact minimisation measure as a result of clearing on the adjacent development site, it is proposed to install a number of the artificial nest boxes within the Stewardship Site. The cost of installation will be borne by the proponent, rather than from funds within the TFD, however on-going maintenance and monitoring will be funded within the TFD. A total of 104 nest boxes are to be installed. While some of these nest boxes will be installed within riparian areas within development area, the majority will be installed within the Stewardship Site.	
4.3.2 (Active restoration action)	The Owner must relocate fallen logs from appropriate sources onto the Biodiversity Stewardship Site to improve habitat for Threatened Species in accordance with the Threatened Species Habitat Management Plan. In this Part 4.3.2, 'appropriate sources' means fallen logs that would not provide any habitat value if they remained in their current place. The amount (lineal metres) of fallen logs relocated to the site must be greater than any amount used for firewood or fencing in accordance with Part 8.1 such that there is a net increase in the amount of fallen logs within the Biodiversity Stewardship Site. The Owner must document in writing any timber brought from outside the Biodiversity Stewardship Site and keep such records in accordance with the record keeping and monitoring requirements set out in Part 1 of Attachment 3 of this Deed and the Monitoring Plan. The Owner must record the approximate amount of timber brought from outside the Biodiversity Stewardship Site (in lineal metres), the location where the timber was placed on the site and the date on which it was placed (month, year). Any timber brought onto the Biodiversity Stewardship Site is then subject to the requirements of Part 8.1.	Ongoing from First Payment Date
	If relocation of fallen logs is not proposed as an active restoration management action to improve habitat suitable for specific threatened species, replace the above Part with: "This Part is not applicable."	
4.3.3 (Active restoration action)	This Part is not applicable.	Ongoing from First Payment Date
	If relocation of dead hollow-bearing tree stags is not proposed as an active restoration management action to improve habitat suitable for specific threatened species, replace the above Part with: "This Part is not applicable."	
4.3.4 (Active restoration action)	This Part is not applicable.	Ongoing from First Payment Date
	If relocation of rocks is not proposed as an active restoration management action to improve habitat suitable for specific threatened species, replace the above Part with: "This Part is not applicable."	

Management Actions		
Part 5	**Hydrology Management**	
5.1 (Active restoration action)	Hydrology management activities must be implemented as set out in the *Threatened Species Habitat Management Plan and/or Native Vegetation Management Plan* to aid the protection and restoration of Threatened Species habitat and/or PCTs in instances where the hydrology of the Biodiversity Stewardship Site has been disrupted or altered.	Ongoing from First Payment Date.
	If hydrology management activities will only be set out in either the Threatened Species Habitat Management Plan or Native Vegetation Management Plan, delete reference to the other plan in the highlighted section of the above part. If hydrology management activities are to be set out in both plans, replace 'and/or' with 'and' in the highlighted section of the above part. If no hydrology management is proposed as an active restoration action, replace the above part with "This part is not applicable" and delete Parts 5.2 – 5.5.	
5.2 (Active Restoration Action)	This Part is not applicable.	Ongoing from First Payment Date
	If management activities related to artificial structures on waterways will only be set out in either the Threatened Species Habitat Management Plan or Native Vegetation Management Plan, delete reference to the other plan in the highlighted section of the above part. If activities are to be set out in both plans, replace 'and/or' with 'and' in the highlighted section of the above part. If management of artificial structures on waterways is not proposed as an active restoration action, replace the above Part with "This Part is not applicable".	
5.3 (Active restoration action)	Sediment traps must be installed on the Biodiversity Stewardship Site to manage sediment entering waterways in accordance with the Threatened Species Management Plan or Native Vegetation Management Plan.	Ongoing from First Payment Date
5.4 (Active restoration action)	Large Woody Debris (≥10 cm width) along stream banks and within stream channels must be managed on the Biodiversity Stewardship Site to improve Biodiversity Values in accordance with the Threatened Species Management Plan or Native Vegetation Management Plan.	Ongoing from First Payment Date
5.5 (Active restoration action)	The Owner must undertake measures to reduce nutrient levels along waterways within the Biodiversity Stewardship Site to improve Biodiversity Values in accordance with the Threatened Species Management Plan or Native Vegetation Management Plan.	Ongoing from First Payment Date
Part 6	**Integrated Feral Pest Control**	**Timing**
6.1 (Required management action)	The Owner must implement and comply with the Integrated Feral Pest Management Plan.	Ongoing from First Payment Date

Management Actions		
Part 7	**Integrated weed management and control of High Threat Exotic Plants**	**Timing**
7.1 (Required management action)	The Owner must implement the Integrated Weed Management Plan. The Integrated Weed Management Plan must include measures to: (a) control the spread of High Threat Exotic Species and other weed species within the Biodiversity Stewardship Site. (b) undertake fine-scale intensive removal of High Threat Exotic and other exotic vegetation.	Ongoing from First Payment Date
7.2 (Active restoration action)	(a) The Owner must remove and reduce High Threat Exotic Plant Cover through methods described in the Integrated Weed Management Plan. (b) High Threat Exotic Plant Cover must be replaced by Native Vegetation in accordance with Targeted Supplementary Planting described in Part 3.6 of this Section. The Owner may undertake other actions specified in the Integrated Weed Management Plan to reduce High Threat Exotic Plant Cover.	Ongoing from First Payment Date
	If removal or reduction in cover of high threat weeds is not proposed as an active restoration management action within the Biodiversity Stewardship Site, replace the above part with: "This Part is not applicable."	
Part 8	**Management of human disturbance**	**Timing**
8.1 (Required management action)	(a) Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the Biodiversity Stewardship Site except for the personal (non-commercial) use by the Owner for firewood for one dwelling only or for repair of fencing (not for construction of fencing). (b) The Owner must document in writing any dead timber used for firewood or for fencing repair and keep such records in accordance with the record keeping requirements described in Part 1 Attachment 3 of the Deed and the Monitoring Plan. The Owner must record the approximate amount of dead timber collected from the Biodiversity Stewardship Site for use as firewood or for fencing (in lineal metres), the location from which the dead timber was collected and the date it was collected (month, year).	Ongoing from Agreement Date
8.2 (Required management action)	(a) The Owner must take all reasonable steps to prevent, control and remedy erosion on the Biodiversity Stewardship Site. (b) Soil management for preventing and controlling erosion must be undertaken using best practice soil management techniques applied as relevant for the Biodiversity Stewardship Site.	Ongoing from First Payment Date
	If there is no existing erosion, delete the last paragraph.	
8.3 (Required management action)	The Owner must not: (a) remove, or cause or permit to be removed, rocks from the Biodiversity Stewardship Site; or (b) move, or cause or permit to be moved, rocks within the Biodiversity Stewardship Site.	Ongoing from Agreement Date
8.4	*(a)* This part is not applicable. *(b)* This part is not applicable.	

Management Actions		
(Required management action)	If there is no rubbish within the Biodiversity Stewardship Site delete the words of this part (but retain the numbering) and replace with: 'This part is not applicable.'	Ongoing from First Payment Date
8.5 (Required management action)	The Owner must take all reasonable steps to remove Rubbish deposited by others on the Biodiversity Stewardship Site, or which is otherwise present on the Biodiversity Stewardship Site.	Ongoing from First Payment Date
8.6 (Required management action)	The Owner must not store, dispose of, or cause or permit to be disposed of, any Rubbish on the Biodiversity Stewardship Site.	Ongoing from Agreement Date
8.7 (Required management action)	(a) The Owner must install and maintain *fencing and signage* to deter human disturbance including Rubbish dumping. Signage must be obtained from the NSW BCT. (b) When installing and maintaining *fencing and signage*, the Owner must meet the following requirements: Permanent fencing will be installed and maintained along the development / stewardship site boundary interface as part of the adjacent development (shown in green on the Biodiversity Stewardship Site Map), This fencing will be suitable to exclude incursion from vehicles/stock. Signage identifying the site as a conservation area will be installed at regular intervals along this fence line. This fencing will be installed and maintained by the development and on-going will be the responsibility of the estate which is being held under community title. Existing intact boundary fencing will be maintained as part of the Stewardship Agreement (as shown in Blue). The boundary of the Stewardship site adjoining Ourimbah State Forest and Mardi Dam, is not currently fenced (as shown in red), and is not proposed to be fenced given the remote location of this boundary. However illegal access will be managed by installing bollards and gates as required on entrances to existing easements/tracks adjoining the powerline easement along the south eastern boundary. A heavy-duty gate will also be installed where the Potters Gully fire trail enters the Stewardship site along the western boundary.	Signage must be installed within 2 months of the First Payment Date All other requirements in Part 8.7 are ongoing from First Payment Date
	If only fencing or signage are to be installed and maintained delete reference to the other in the highlighted section of the above part. If both fencing and signage are to be installed and maintained, replace 'and/or' with 'and' in the highlighted section of the above part. Signage should be located at points of access and other practical locations interfacing with adjoining properties. For Biodiversity Stewardship Sites that may be located fully within private landholdings, there should be at least one Biodiversity Stewardship Site sign to be placed at the main access gate to the site.	
8.8 (Required management action)	The locations of existing and proposed man-made structures (where permitted or required by a Management Action) on the Biodiversity Stewardship Site, including fencing, gates, firetrails and access tracks are identified on the Biodiversity Stewardship Site Management Actions Map.	On Agreement Date

Management Actions		
8.9 (Required management action)	(a) Existing firetrails and access tracks within the Biodiversity Stewardship Site (identified on the Biodiversity Stewardship Site Management Actions Map), where retained, must be maintained to permit the carrying out of Management Actions. (b) All existing firetrails and access tracks within the Biodiversity Stewardship Site must be maintained to control and minimise erosion.	Ongoing from Agreement Date
Part 9	**Monitoring**	**Timing**
9.1 (Required Management action)	The Owner must undertake monitoring in accordance with the Monitoring Plan.	Ongoing as specified in Section 7 – Monitoring Plan
9.2 (Required management action)	The Owner must establish permanent Photo Points at locations within the Biodiversity Stewardship Site as described in the Monitoring Plan	Ongoing from Agreement Date
9.3 (Required management action)	The Owner must conduct, or arrange for the conduct of, an inspection of the Biodiversity Stewardship Site at the times, and having regard to the purpose, set out in the Monitoring Plan.	Ongoing as specified in Section 7 – Monitoring Plan
9.4 (Required management action)	(a) The Owner must establish permanent Vegetation Integrity Survey Plots within 12 months after the Agreement Date with the purpose of providing a baseline for assessing Biodiversity outcomes in the future. (b) The Vegetation Integrity Survey Plots must be permanently marked and labelled using steel posts (i.e. star picket or equivalent durable post). (c) The Owner must record the location and label of each of the Vegetation Integrity Survey Plots in the Monitoring Plan using the format described therein.	Within 12 months of the Agreement Date and ongoing thereafter
9.5 (Required management action)	(a) The Owner must monitor the Biodiversity Stewardship Site for evidence of plant disease or dieback within the Native Vegetation present on the site. (b) The Owner must report any evidence of plant or animal disease on the site to the NSW BCT as soon as practicable.	Ongoing as specified in Section 7 – Monitoring Plan
9.6 (Active restoration action)	The monitoring plan must contain measurable performance targets related to the active restoration management actions such as: • Evidence of occupation of and condition of artificial hollows or relocated logs and stags. Target of 10% occupancy for artificial hollows installed. If active restoration management actions are not proposed within the Biodiversity Stewardship Site, replace the above part with: "This part is not applicable."	Ongoing as specified in Section 7 – Monitoring Plan

Section 2: Fire for Conservation Management Plan

Completing the fire for conservation management plan

A table is provided below for the fire conservation management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a map identifying the areas to be burnt during each Ecological Burn (the Ecological Burn Map). Areas to be burnt are to be based on broad habitat zones across the Biodiversity Stewardship Site.
- the year the last fire went through, the type of fire and the extent of the fire and location, where known
- frequency of natural fires in the area of the Biodiversity Stewardship Site, where known
- a description of locations and Management Zones where Ecological Burns will be conducted and areas that will not be burnt
- the methods that will be used for Ecological Burns
- the fire frequency intervals recommended for the vegetation types and Threatened Species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the Rural Fires Act 1997 (NSW) to ensure minimum frequency between Ecological Burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for Ecological Burns
- clear, measurable objectives and performance indicators to demonstrate how the management action will achieve gain on the Biodiversity Stewardship Site.

Requirements for monitoring the performance of the Fire for Conservation Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Ecological Burns
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Fire for Conservation Management Plan

1. Previous known fire events affecting the land that is the Biodiversity Stewardship Site are described in the table in this plan titled 'Fire history for previous 20 years (or longer if known)' to provide an indication of local fire conditions including intensity and frequency.
2. The Owner must carry out Ecological Burns for each Management Zone according to the following:
   (a) the method and frequency described in the table in this plan titled 'Ecological Burning actions';

   (b) the areas to be burnt identified in the Ecological Burn Map;

   (c) the requirements for each vegetation type or Threatened Species as described in the table in this plan titled 'Fire requirements for vegetation types and threatened species'.

   (d) the following NSW Rural Fire Service publications:

      (i) 'Rules and Notes for implementation of the Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code';

      (ii) 'Threatened Species Hazard Reduction List – Part 1 – Plants';

      (iii) 'Threatened Species Hazard Reduction List – Part 2 – Animals'; and

      (iv) Threatened Species Hazard Reduction List – Part 3 – Threatened Ecological Communities'; and

   (e) establish a mosaic-pattern of different burn ages (i.e. time since fire) across Ecological Burn Units (as displayed on the Ecological Burn Map) to ensure the Biodiversity Stewardship Site retains refuge areas for native fauna at all times.

3. The Owner must take the fire frequencies recommended in BioNet or other published sources of any Threatened Species on the Biodiversity Stewardship Site into consideration when determining the frequency of Ecological Burns.
4. The Owner must avoid areas containing Threatened Species when constructing fire containment lines.

5. The Owner must implement the activities (if any) described in the table in this plan titled 'Other fire management activities'.
6. The Owner must meet the performance measures described in the table in this plan titled 'Fire Management Performance Measures'.
7. The Owner must implement the monitoring and inspections of fires as described in the Monitoring Plan.

Where Species Credits are generated on the Biodiversity Stewardship Site the Species Polygon must be displayed on the Map of areas to be burnt during each Ecological Burn. Where the fire regime of the species credit species differs from that of the surrounding vegetation the management plan must demonstrate how the species polygon will be treated or excluded to ensure inappropriate fire regimes do not adversely impact the species;

Fire history for previous 20 years (or longer if known)

Year of fire	**Hazard reduction, wildfire burn or Ecological Burn and extent of fire**	**Management Zone/s**
2013	Treetops Adventure Prescribed burn – 1km NW of site	Not in site
2013	Mardi Grass fire – Wildfire – 200m east of site	Not in site
2016	Red Hill Road – Wildfire - 1km west of site	Not in site
2017	Old Maitland Road – Wildfire - SW boundary of lot	Not in site
2020	Mardi Dam – Prescribed burn – southern boundary	Not in site

Fire requirements for vegetation types and Threatened Species

Vegetation type and/or Threatened Species	**Fire frequency required**	**Time of year for burning**	**Fire intensity required**	**Adjustment required due to wildfires or activities undertaken under the *Rural Fires Act 1997* (NSW)**
PCT 1590 - Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll (shrub/grass subformation) 5-50yrs	Preference for Autumn burning, although consideration of known threatened species within burn block is required. Occasional early spring low intensity burn may be desirable.	Various intensities required. Occasional high intensity for Eucalyptus regeneration Occasional intervals greater than 25 years may be desirable	Wildfire resets the fire frequency period. No slashing, trittering or tree removal.
PCT 1720 - River-flat Eucalypt Forest on Coastal Floodplains	Forested Wetlands Avoid high frequency fire 11-50years	Preference for Autumn burning, although consideration of known threatened species within burn block is required.	Occasional low intensity fire on a more frequent basis may be necessary for the maintenance of understorey diversity Occasional intervals greater than 25 years may be desirable	Wildfire resets the fire frequency period. No slashing, trittering or tree removal.
PCT 1718 and 1723– Swamp Sclerophyll Forest on Coastal Floodplains	Forested Wetlands Avoid high frequency fire No fire more than once every 11-50years	Preference for Autumn burning, although consideration of known threatened species within burn block is required.	Occasional low intensity fire on a more frequent basis may be necessary for the maintenance of understorey diversity Occasional intervals greater than 25 years may be desirable	Wildfire resets the fire frequency period. No slashing, trittering or tree removal.
PCT 1071 – Freshwater Wetlands on Coastal Floodplains	Freshwater Wetlands Exclude Fire	Exclude Fire	Exclude Fire	Exclude Fire

Scrub turpentine *(Rhodamnia rubescens)*	Unknown	Avoid flowering period between early to mid-spring.	Avoid high intensity fires	Extremely susceptible to infection by Myrtle Rust.
Magenta Lilly Pilly *(Syzygium paniculatum)*	Exclude Fire	Exclude Fire	Exclude Fire	Exclude Fire No slashing, trittering or tree removal at known locations.
Biconvex Paperbark *(Melaleuca biconvexa)*	No fire more than once every 10 years	Avoid flowering period between September and October	Avoid high intensity fires	No slashing, trittering or tree removal at known locations.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Unknown	Breeding Season April to August	Low to moderate intensity not impacting on tree hollows	No burning around known nesting sites at any time. No slashing, trittering or tree removal of or around known nesting sites
Yellow-bellied Glider *(Petaurus australis)*	Unknown	Avoid breeding period between August to December	Low to moderate intensity not impacting on tree hollows	Highly mobile species.
Green thighed Frog *(Litoria brevipalmata)*	Unknown	No burning of moist grassy habitats in Spring and Summer	Unknown	No slashing, trittering or tree removal of known habitat
Southern Myotis *(Myotis Macropus)*	Unknown	Avoid breeding season of November to December	Low to moderate intensity not impacting on tree hollows	No fire around known roost sites No removal of trees Protect tree hollows
Large-eared Pied Bat *(Chalinolobus dwyer)*	Unknown	Avoid breeding season of November through to January	Exclude fire near known cave-roosting or sandstone bluff sites	No slashing, trittering or tree removal around known roosting sites. No burning around known roost sites

Ecological Burning actions				
Management Zone/s	**Actions**	**Supervision & extinguishing techniques**	**Time of year for Ecological Burn**	**Frequency (years)**
Burn Block (BB) A	Confirm containment lines and water supplies are accessible and adequate Minimise smoke emission near power lines Prepare Prescribed burn plan Traffic management along Old Maitland Rd	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2038 then every 15-50 years

BB B	Confirm containment lines and water supplies are accessible and adequate Minimise smoke emission near power lines Prepare Prescribed burn plan Traffic management along Old Maitland Rd	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2026 then every 15-50 years
BB C	Confirm containment lines and water supplies are accessible and adequate Minimise smoke emission near power lines Prepare Prescribed burn plan Maintain low intensity for to mitigate erosion and water quality impacts Traffic management along Old Maitland Rd	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2047 then every 15-50 years
BB D	Confirm containment lines and water supplies are accessible and adequate Prepare Prescribed burn plan Traffic management along Old Maitland Rd	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2032 then every 15-50 years
BB E	Confirm containment lines and water supplies are accessible and adequate Minimise smoke emission near power lines Prepare Prescribed burn plan	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2044 then every 15-50 years
BB F	Confirm containment lines and water supplies are accessible and adequate Prepare Prescribed burn plan Traffic management along Old Maitland Rd	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2023 then every 15-50 years

BB G	Establish consent with neighbour to include area into burn program Confirm containment lines and water supplies are accessible and adequate Minimise smoke emission near power lines Prepare Prescribed burn plan Establish temporary containment lines Ignition from top of ridge downslope Include aviation resources as required Implement intensities to self-extinguish along creek lines	Undertake in conjunction with NSW State Forest Corp. Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2041 then every 15-50 years
BB H	Establish consent with neighbour to include area into burn program Confirm containment lines and water supplies are accessible and adequate Prepare Prescribed burn plan Establish temporary containment lines Ignition from top of ridge downslope Include aviation resources as required	Undertake in conjunction with NSW State Forest Corp. Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn	First burn in 2029 then every 15-50 years
BB I	Principle aim to support the life cycle of *Melaleuca biconvexa,* with low intensity fires Establish consent with neighbour to include are into burn program Confirm containment lines and water supplies are accessible and adequate Prepare Prescribed burn plan Establish temporary containment lines Ignition from top of ridge downslope Include aviation resources as required	Contract burning or RFS supervision Mop-up containment lines to 20m Undertake risk assessment and make fire ground safe	Autumn fire only	First burn in 2035 then no more than every 10 years
Fire Exclusion Zone (FEZ) 1	Small patch of riparian vegetation to be protected to mitigate disturbance levels	Direct attack and ignition	N/A	Exclude all fire
Other fire management activities (where required)				
Fire trail maintenance: Maintain all identified trails to category 7 capacity. Annual maintenance prior to summer to ensure wildfire suppress access is provided. **Water provisions:** Confirm vehicle access to water sources on neighbouring properties and authority to access water. **Temporary containment lines:** Temporary containment lines to be rehabilitated following application of prescribed burn.				

Post Burning assessments:

Post burning assessment to be completed and reported to NSW RFS for data capture and records.

Asset Protection Zones:

Ensure all asset protection zones adjacent to burn blocks within development area are sign posted and delineated with non-combustible bollards to reduce vegetation creep over time.

Ecological Burn Map

Error! Reference source not found.

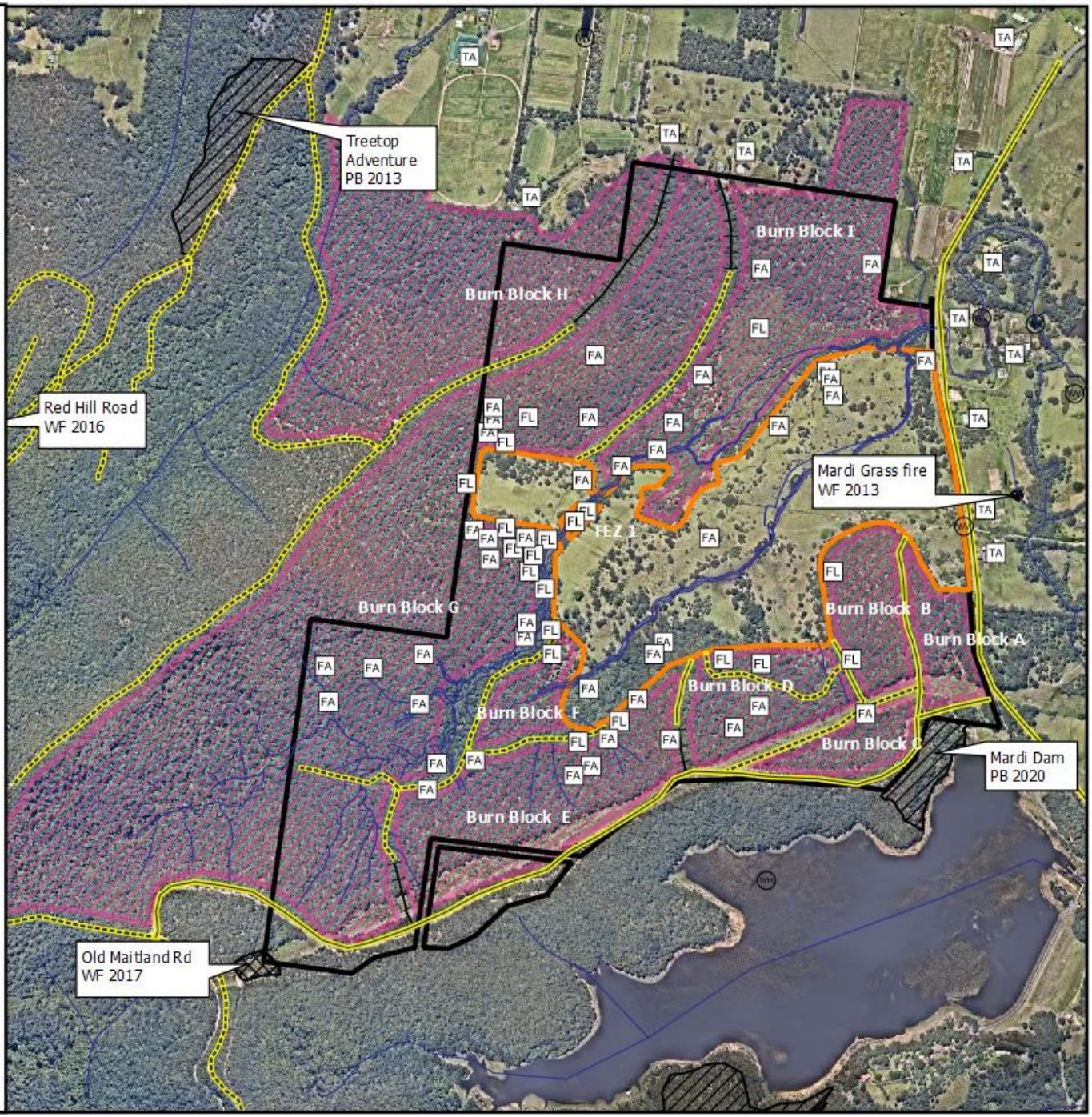
Ecological Burn Map

- Heli Water
- Vehicle Water
- Threatened Fauna
- Threatened Flora
- Threatened Assets
- Creekline
- Category 7 Fire vehicle
- Category 1 Fire vehicle
- Temporary Containment lines
- Development__boundary
- Site_boundary
- Fire Exclusion Zone
- Burn Blocks
- HazardReduction
- Wildfires

Nearmap

0 250 500 750 1,000 m

BEMC Bushfire Environmental Management Consultancy



Fire Management Performance Measures	
Management Zone/s	**Performance indicator (e.g. % Management Zone burnt)**
BB A	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High Overall Fuel Hazard (OFH)' to 'Low OFH' through the application of ground ignition.
BB B	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground ignition.
BB C	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground ignition.
BB D	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground ignition. Exclude fire from Glossy Black-Cockatoo nest site.
BB E	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground ignition.
BB F	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground ignition.
BB G	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground and aerial ignition. Manage ignition sequence and fire intensity to self-extinguish on approach to riparian areas. Exclude fire from riparian areas supporting *Syzygium paniculatum*.
BB H	Reduce the fire fuel loads throughout 60-90% of the burn block burnt from 'High OFH' to 'Low OFH' through the application of ground and aerial ignition.
BB I	Implement fire only when required to support *Melaleuca biconvexa* population. Exclude fire from riparian areas supporting *Syzygium paniculatum*.
FEZ 1	Exclude fire by direct attack.

Section 3: Native Vegetation Management Plan

Completing the Native Vegetation Management Plan

A table is provided below for completing the Native Vegetation Management Plan. Add additional fields to the table as required.

The description and location (Management Zones) of native vegetation management actions to be undertaken by the Owner are listed in the Native Vegetation Management Plan.

This plan includes some management actions listed as required Native Vegetation Management actions in Section 13.3.2 of the BAM (2016) ("Required management actions"). It may also include actions to manage and augment threatened Native Vegetation and Threatened Species habitat where approved as active restoration management actions (Section 13.3.3 of the BAM). Active restoration management actions may be approved where it can be demonstrated that management and/or augmentation is feasible for the target Plant Community Type or Threatened Species of the proposed active restoration activity.

The Native Vegetation Management Plan must:

(i) identify the target PCTs for which management and augmentation will be undertaken and Management Zones where actions will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant PCTs and include measures of success and contingencies in the event of failure.

Where hydrology management activities are proposed, the Native Vegetation Management Plan must:

(i) identify the PCT for which hydrology management will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance of hydrology within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant PCT and include measures of success and contingencies in the event of failure.

The locations and extent of areas proposed for Native Vegetation Management must be clearly identified and mapped.

Where Targeted Supplementary Planting is proposed as an active restoration management action to manage and/or augment Native Vegetation or Threatened Species habitat, the Native Vegetation Management Plan must include detailed prescriptions for planting schedules, including:

- species list per Management Zone
- planting method – specify whether plants are to be tubestock, direct seeding or another method
- number of plants per area – for tubestock, the number of plants should be rounded to the nearest 100 if there are more than 1,000 plants or to the nearest 10 if there are 1,000 plants or fewer;
- timing – described as the number of months (or Year if relevant) for completion of planting after First Payment Date.
- Management of supplementary planting includes watering, slashing, scalping, spraying of weeds, and plant replacement.

Appropriate site treatment (e.g. weed control) of each area of planting or seeding identified in the planting schedule must be identified in the Native Vegetation Management Plan and undertaken prior to such planting.

The Native Vegetation Management Plan must set out the period following planting or seeding over which grazing must be excluded from areas of Targeted Supplementary Planting. The period may be expressed as a date following planting or seeding, or as a minimum height that must be obtained by all planted or seeded plants before grazing is permitted.

The Native Vegetation Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the Management Action will achieve gain on the Biodiversity Stewardship site.

Requirements for monitoring the performance of the Native Vegetation Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Native Vegetation Management
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Fire for Conservation Management Plan

1. The Owner must carry out Native Vegetation Management for each Management Zone according to the method and frequency described in the table in this plan titled 'Native Vegetation Management Actions';
2. The Owner must undertake Targeted Supplementary Planting in accordance with the table in this plan titled 'Targeted Supplementary Planting Schedule at the Biodiversity Stewardship Site'.
3. The Owner must meet the performance measures described in the table in this plan titled 'Native Vegetation Management Performance Measures'.
4. The Owner must implement the monitoring of Native Vegetation management as described in the Monitoring Plan.

Native Vegetation Management Actions

Management Zone	**Description of Vegetation Management action**	**Frequency and timing**	**Management Action Type** (Required or Active)
1, 2, 3, 4, 5	Primary Weeding Undertake primary removal of HTE and other priority weeds (in particular Lantana & Camphor Laurel) from all management zones within areas mapped as moderate to high density. Undertake follow up weeding of HTE weeds from previously treated areas. 80% reduction in cover of HTEs.	Year 1 Year 2 Year 3	Required
1, 2, 3, 4, 5	Maintenance Weeding Undertake ongoing maintenance of HTE and other priority weeds in all management zones, including previous primary treatments, and areas mapped as low density. Increase in species abundance from natural regeneration following primary treatment.	Year 3 - ongoing	Required
1, 2, 3, 4, 5	Implement prescribed burning in accordance with Fire for Conservation Management Plan.	2023 - ongoing	Required
1, 2, 3, 4, 5	Undertake vegetation monitoring in accordance with the Monitoring Plan	Year 1 - ongoing	Required

Targeted Supplementary Planting Schedule at the Biodiversity Stewardship Site					
Species' common name	**Species scientific name**	**Management Zone/s of planting**	**Number of plants per area**	**Planting method**	**Timing** (months or Year)
	NA				

Native Vegetation Management Performance Measures			
Manage-ment Zone/s	**Management Action**	**Performance indicator (e.g. % of Management Zone treated per year, % survival rate of plantings, species abundance).**	**Timing**
1, 2, 3, 4, 5	Primary Weeding	80% reduction in cover of HTEs Observed increase in species abundance from natural regeneration following primary treatment.	Year 1 Year 3
1, 2, 3, 4, 5	Maintenance Weeding	Community composition, structure, and function continues to improve in line with predicted VI under management.	Year 2 ongoing

Section 4: Threatened Species Habitat Management Plan

Completing the Threatened Species Habitat Management Plan

A table is provided below for completing the Threatened Species Habitat Management Plan. Add additional fields to the table as required.

The description and location (Management Zones) of threatened species habitat management actions to be undertaken by the Owner are listed in the Threatened Species Habitat Management Plan.

This plan includes some management actions listed as required management actions in Section 13.3.2 of the BAM (2016) ("Required management actions"). It may also include actions to enhance and augment threatened species habitat where approved as active restoration management actions (Section 13.3.3 of the BAM).

Active restoration management actions relating to Threatened Species Habitat Management may be approved where it can be demonstrated that restoration of habitat is feasible for the target species of the proposed active restoration activity.

The Threatened Species Habitat Management Plan must:

(i) identify the target Threatened Species for which habitat enhancement will be undertaken and the species polygon in which habitat enhancement actions will be implemented;
(ii) specify the requirements for the ongoing management and maintenance of habitat enhancement within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant species and include measures of success and contingencies in the event of failure.

Where hydrology management activities are proposed, the Threatened Species Habitat Management Plan must:

(i) identify the Threatened Species and their species polygon for which hydrology management will be undertaken;
(ii) specify the requirements for the ongoing management and maintenance of hydrology within the Biodiversity Stewardship Site; and
(iii) detail ongoing monitoring requirements for the relevant species and include measures of success and contingencies in the event of failure.

The locations and extent of areas proposed for threatened species habitat management must be clearly identified and mapped on the Threatened Species Habitat Map. Breeding sites identified on the Biodiversity Stewardship Site must also be mapped on the Threatened Species Habitat Map and protected from disturbance.

Where Targeted Supplementary Planting is proposed as an active restoration management action to improve habitat suitability for specific Threatened Species, this should be identified in the Threatened Species Management Plan with reference made to relevant activities in the Native Vegetation Management Plan.

Habitat enhancement measures may include the installation of artificial nesting boxes, breeding ponds, relocation of fallen logs, relocation and securing of dead hollow bearing stags and/or the relocation of rocks. The Threatened Species Habitat Management Plan must include detailed prescriptions for the ongoing management, replacement and maintenance of installed habitat structures.

Where habitat enhancement measures include the installation of habitat structures, the Threatened Species Habitat Management Plan must:

(i) specify the target Threatened Species, and type of habitat structures to be installed.

(ii) Specify the number and location of each type of habitat structure to be installed.

(iii) provide for ongoing management, replacement and maintenance of the installed habitat structures.

(iv) detail the ongoing monitoring requirements for the installed habitat structures and include measures of success and contingency actions in the event of failure of the habitat structures to improve roosting and breeding habitat for target Threatened Species; and

(v) provides reference material to support evidence of the target Threatened Species' use of the habitat structures.

The Threatened Species Habitat Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the Management Action will achieve gain on the Biodiversity Stewardship site.

Requirements for monitoring the performance of the Threatened Species Habitat Management Plan are set out in Section 7 – Monitoring Plan and include:

- methods for monitoring the outcomes of Threatened Species Habitat Management
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the Threatened Species Habitat Management Plan

1. The Owner must carry out the Management Actions for each Management Zone according to the method and frequency described in the table in this plan titled 'Threatened Species Habitat Management Actions';
2. The Owner must meet the performance measures described in the table in this plan titled 'Threatened Species Habitat Management Performance Measures'.
3. The Owner must implement the monitoring of Threatened Species habitat management as described in the Monitoring Plan.

Threatened Species Habitat map

Threatened Species Habitat Management Actions				
Name of Threatened Species	**Description of habitat management action**	**Manage-ment Zone/s**	**Frequency and timing**	**Management Action Type** (Required or Active)
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Monitor nest site for breeding activity. Ensure protection of nest site during ecological burns via adequate burn planning. Ensure fire regime/frequency is adequate to maintain stands of Forest Oak (SOS Action). Vehicle movements only on identified access tracks.	5 All	Annual As required	Required Required Required
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Implement appropriate fire regime, do not burn at too-frequent intervals.	All	As required	Required
Southern Myotis (*Myotis Macropus*)	Protect water quality of foraging habitat. Manage exotic vegetation species or overabundant native species (such as Typha) where appropriate to provide open water for foraging. Monitor annually. Vehicle movements only on identified access tracks.	2, 3, 4	Ongoing As required	Active Required
Green-thighed Frog (*Litoria brevipalmata*)	Protect water quality of breeding habitat. Develop appropriate fire regime management strategies for the species in non-breeding habitat. Vehicle movements only on identified access tracks.	2, 3, 4	Ongoing As required	Active Required
Biconvex Paperbark (*Melaleuca biconvexa*)	Protect from slashing/maintenance and other edge effects along tracks Protect from damage during subdivision construction and property boundary maintenance by neighbours. Reduce and maintain weed densities at low levels (SOS Action), as per Native Vegetation Management Plan. Only manual weeding to be undertaken within species polygon areas (no foliar spraying). Large exotic canopy trees to be eradicated to remain in-situ. Vehicle movements only on identified access tracks.	1, 2, 5	Ongoing	Required
Scrub Turpentine (*Rhodamnia rubescens*)	Protect from slashing/maintenance and other edge effects along tracks Protect from damage during subdivision construction and property boundary maintenance by neighbours. Reduce and maintain weed densities at low levels, as per Native Vegetation Management Plan. Only manual weeding to be undertaken within species polygon areas (no foliar spraying). Large exotic canopy trees to be eradicated to remain in-situ. Undertake monthly primary fungicide treatment over six months for the first 5 years of management, then treatments every following 5 years. Details of suitable fungicide to control myrtle rust are contained in references within Attachment 6.	All	Ongoing	Required

	Vehicle movements only on identified access tracks.			
Magenta Lilly Pilly (*Syzygium paniculatum*)	Protect from slashing/maintenance and other edge effects along tracks Protect from damage during subdivision construction and property boundary maintenance by neighbours. Maintain appropriate fire regime for the species/community. Reduce and maintain weed densities at low levels (SOS Action), as per Native Vegetation Management Plan. Only manual weeding to be undertaken within species polygon areas (no foliar spraying). Large exotic canopy trees to be eradicated to remain in-situ. Vehicle movements only on identified access tracks.	2, 3	Ongoing	Required

Threatened Species Habitat Management Performance Measures			
Manage-ment Zone/s	**Manage-ment Action**	**Performance indicator (e.g. % of Management Zone treated per year, % survival rate of plantings, species abundance, number of nestboxes occupied).**	**Timing**
All	Required	Species resources increase in line with predicted VIS improvement	Ongoing
All	Nest Boxes	While not specifically required for Threatened Species Habitat Management, nest boxes will be installed within the stewardship site. The performance indicator is for 95% of the boxes to be serviceable and for occupancy or signs of occupancy of 10% or greater. It is proposed for the nest boxes to be maintained for a period of 20 years, after which time they will remain in place and be subject to attrition	Yearly up to year 20.

Section 5: Integrated Feral Pest Management Plan

Completing the compulsory Integrated Feral Pest Management Plan

A table is provided below for the integrated feral pest management plan. Add additional fields to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g foxes, cats, pigs, goats, avian pests, horses, other miscellaneous species as relevant
- consideration of relevant current DPIE and other pest management programs
- the methods of feral pest control in each Management Zone determined in accordance with best management practice
- the frequency and timing of pest control actions in each Management Zone
- clear, measurable objectives and performance indicators to demonstrate how the management action will achieve gain on the Biodiversity Stewardship site.

All pest species identified as requiring management on a Biodiversity Stewardship site must be included in the integrated feral pest management plan.

Separate management plans may be developed for each pest species.

When the management plan is reviewed, control activities may be amended, deleted or added to take into account pest species found on the site at that time.

Details of monitoring to assess the effectiveness of Integrated Feral Pest Management activities are to be described in Section 7 – Monitoring Plan and are to include:

- methods for monitoring the success of pest animal control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new pest species that may negatively impact on Threatened Species on the Biodiversity Stewardship site
- a diary for recording actions taken in accordance with the integrated feral pest management plan

1. Feral Pests existing on the Biodiversity Stewardship Site, and their extent or severity of impact, as at the Agreement Date are listed in the table below titled “Feral pests”.
2. The table below titled “Methods considered” lists possible methods of control of Feral Pests and the suitability of such methods to the Biodiversity Stewardship Site.
3. The Owner must control Feral Pests for each Management Zone according to the method and frequency described in the table below titled “Methods of control”. The methods of control will apply to the Feral Pests listed in the ‘Feral pests’ table.
4. The Owner should seek advice from Local Land Services on how to effectively and legally implement Feral Pest control prior to commencing any control methods on the Biodiversity Stewardship Site. If any methods advised or recommended by Local Land Services differ from those identified in this Integrated Feral Pest Management Plan, the Owner must advise the NSW BCT in writing prior to commencing control activities.
5. The Owner must carry out such activities as are specified (if any) in the table below titled “Other Management Activities”.
6. The Owner must implement monitoring of existing and new Feral Pests on the Biodiversity Stewardship Site, as described in the Monitoring Plan and with reference to the performance measures specified in the table below titled “Integrated Feral Pest Management Performance Measures”.
7. The Owner must complete the templates in the Monitoring Plan titled “Diary template for Feral Pest management” and “Template for reporting of monitoring activities – Feral Pest management” to record implementation of this Integrated Feral Pest Management Plan and monitoring activities.

Feral Pests

Pest	Name of Feral Pest (e.g. foxes, cats, pigs, goats, avian pests, horses, other miscellaneous species)	Description of extent/severity of impact	Management Zone/s

A	Hare / Rabbits	None observed, assumed intermittent presence	All
B	Cat	None observed, assumed intermittent presence	All
C	Dog / Fox	Fox observed. No active den sites observed, very low instances of scats observed. Assumed low density.	All
D	Feral Deer / Goats / Pigs	None observed, no evidence of activity/herbivory observed, assumed not present	All
E	Misc., Horses, wandering livestock etc.	Livestock currently present (cattle and horses) in paddocks within the adjacent proposed development site. Currently fencing does not restrict movement into the stewardship site. Livestock will be removed prior to commencement of the Stewardship Agreement.	All

Methods considered

Pest type	Name and description of program or method	Describe suitability
A	Monitor for presence. If required bait with pindone poison in line with Local Land Services (LLS) guidelines; or, Shoot on sight during night time sweeps along tracks or where previously observed or in accordance with local directives from LLS.	Shooting poses lower off target threat to native herbivores and secondary poisoning of higher order predators
B	Monitor for presence. Trap with fresh meat baits free of poison; or, shoot on sight during night time sweeps along tracks or where previously observed.	Cage trapping is simple and effective over small areas. Shooting is highly specialised and labour intensive.
C	Bait with 1080 poison in line with Local Land Services (LLS) guidelines; or, shoot on sight during night time sweeps along tracks or where previously observed or in accordance with local directives from LLS.	Baiting most likely to be successful, trapping and shooting pose lower off target threat to native carnivores
E	Ensure all stock are removed from the site prior to commencement of the Stewardship Agreement. Ensure boundary fencing is suitable to exclude stock and maintained accordingly. Contact local landholders for retrieval of wandering livestock if required.	None have been observed on the site, a flexible approach is necessary to tailor responses to different species

Methods of control

Management Zone/s	Feral Pest type	Method of control	Frequency and timing
All	C	Bait with 1080 poison in line with Local Land Services (LLS) guidelines;	As needed or in conjunction with control programs by neighbouring landholders (State Forests, Central Coast Council)

Other management activities

Ensure all stock are removed from the site prior to commencement of the Stewardship Agreement.

Ensure boundary fencing is suitable to exclude stock and maintained accordingly.

Contact local landholders for retrieval of wandering livestock if required.

Integrated Feral Pest Performance Measures

Feral Pest species	Performance indicator (e.g. numbers treated/year, level of threat abatement to be achieved, total area to be treated (in hectares)).
Dog / Fox	Level of activity/sign kept to current standards or better, ie intermittent usage.

Section 6 - Integrated Weed Management Plan

Completing the compulsory Integrated Weed Management Plan

A table is provided below for the Integrated Weed Management Plan. Add additional sections to the table if required.

The plan must include, but is not limited to:

- a description of the high threat weeds and other weeds present on the Biodiversity Stewardship Site and their locations, linked to each Management Zone where weeds are present
- the method/s of weed control in each Management Zone
- the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species
- the timing of any planting of native plant species required in each Management Zone to provide alternative habitat for native species affected by weed control activities

When the management plan is reviewed, weed control activities may be amended, deleted or added to take into account the weed species on the site at the time of the review.

The Integrated Weed Management Plan must contain clear, measurable objectives and performance indicators to demonstrate how the weed management actions will achieve gain on the Biodiversity Stewardship Site.

Details of monitoring to assess the effectiveness of Integrated Weed Management activities are to be described in Section 7 – Monitoring Plan and are to include:

- methods for monitoring the success of integrated weed management
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species
- a diary for recording actions taken in accordance with the Integrated Weed Management Plan

1. The weeds present, and their locations, on the Biodiversity Stewardship Site as at the Agreement Date are listed in the table below titled “Weed Species present”.
2. The permitted methods of control of weeds on the Biodiversity Stewardship Site for each weed type are listed in the table below titled “Methods of Weed control”.
3. Other Management Actions to control weeds (if any) are specified in the table below titled “Other Weed management activities”.
4. The Owner must implement the monitoring and inspection of existing and new weeds on the Biodiversity Stewardship Site as described in the Monitoring Plan and with reference to the performance measures listed in the table below titled “Integrated Weed Management Performance Measures”.

Weed species present

	Common name of Weed	**Scientific name of Weed**	**High Threat Weed Species (Y/N)**	**Description of infestation (e.g. intensity [% Projected Foliage Cover (PFC)] & location within zone)**	**Management Zone/s**
A	Lantana	*Lantana camara*	Y	Low to high density infestations occur throughout all management zones. Highest densities occur within Zone 3, 4, and 5, predominantly within wet sclerophyll/gullies, requiring significant primary control. Higher slopes grading to	All

				dry sclerophyll contain low to negligible infestations.	
B	Camphor Laurel	*Cinnamomum camphora*	Y	Low to high density infestations occur throughout the majority of management zones. Highest densities (mature individuals) occur within Zone 2, 3, and 5, predominantly within wet sclerophyll/gullies, requiring significant primary control. Higher slopes grading to dry sclerophyll contain low to negligible infestations.	All
C	Coral Tree	*Erythrina x sykesii*	Y	Scattered occurrences at low to moderate densities, predominantly within Zone 5 along disturbed edges. Target during primary works.	1, 6
D	Ground Asparagus	*Asparagus aethiopicus*	Y	Scattered occurrences at low densities, predominantly within Zone 5. Target during maintenance works.	1, 5, 6
E	Small-leaved Privet	*Ligustrum sinense*	Y	Scattered occurrences at low densities. Target during maintenance works.	1, 2, 3
F	Large-leaved Privet	*Ligustrum lucidum*	Y	Scattered occurrences at low densities. Target during maintenance works.	1, 2, 3
G	Ochna	*Ochna serrulata*	Y	Scattered occurrences at low densities. Target during maintenance works.	1, 4, 5, 6
H	Cats Claw Creeper	*Dolichandra unguis-cati*	Y	Scattered occurrences at low densities. Target during primary works.	6
I	Blackberry	*Rubus anglocandicans*	Y	Scattered occurrences at low to moderate densities, predominantly within Zone 3 within floodplain areas. Target during primary works.	2, 6
J	Japanese Honeysuckle	*Lonicera japonica*	Y	Scattered occurrences at low densities. Target during maintenance works.	2

Methods of Weed control

Management Zone/s	Weeds	Method of Weed control	Frequency and timing
All	Lantana	Manual removal of smaller plants which can be hand pulled and left to dry off the ground Cut and paint application of Glyphosate of larger plants Large patches can be controlled via foliar application of herbicide. Chemical selection to be fit for purpose, i.e. selective where possible to limit off target damage to native grasses and sedges.	Primary works within the first 2 years Avoid excessively hot days or prolonged dry conditions
All	Camphor Laurel Coral Tree	Manual removal of small plants where they can be pulled from the soil with roots intact.	Coral Tree - Spring to Autumn when actively growing

	Small-leaved Privet Large-leaved Privet	Larger individual plants to be treated with cut-stump or 'drill and frill' application of Glyphosate. For large, dense infestations cut trees into manageable pieces and pile in such a manner to prevent regrowth from cuttings. Where possible, pile in the open away from desirable native canopy trees to facilitate a pile burn reduction of biomass if suitable conditions occur in the following 6 to 18 months.	
2, 6	Blackberry	Manually remove small and isolated plants. Scrape and paint application of herbicide of small to medium isolated plants Foliar application of herbicide to control established plants and large patches. Chemical selection to be fit for purpose, ie. selective where possible to limit off target damage to native grasses and sedges.	Primary works within the first 2 years
1, 4, 5, 6	Ochna	Stem scrape and paint with Glyphosate.	Ongoing maintenance
1, 5, 6	Ground Asparagus	Manual removal and destruction of whole plant (small plants) or removal of crown and fruit on large plants.	Ongoing maintenance
6	Cat's Claw Creeper	Foliar spray and/or painting of cut stumps with appropriate herbicide. Skirt if climbing into canopy.	Primary works within the first 2 years Spring to Autumn when actively growing
2	Japanese Honeysuckle	Given the low density of infestation, manual scrape and paint with appropriate herbicide is recommended. Skirt if climbing into canopy.	Ongoing maintenance

Other Weed Management Actions

Management Zone/s	Weeds	Management Action	Frequency and timing

Integrated Weed Management Performance Measures

Management Zone/s	Weeds	Performance indicator (e.g. % of Management Zone treated per year, weed PFC/abundance remaining per Management Zone).
All	Lantana Camphor Laurel	80% reduction in HTE cover within moderate to high infestations within the first 3 years.
All	All	Continual suppression (maintenance weeding) to be undertaken to ensure weeds to remain absent/supressed within the Stewardship site, following primary removal.

All	Lantana Camphor Laurel	Moderate to high HTE infestations replaced with resilient native vegetation community currently displaced by the infestation.

Section 7 - Monitoring Plan

1. The Owner must implement monitoring as described in Section 7A.
2. The Owner must complete the diary templates and reports of monitoring activities contained in the more recent of:
   a) the templates contained in section 7B or;
   b) the templates published from time to time on the BCT website.

   The completed diary templates and reports of monitoring activities relating to a Reporting Period must be submitted with the Annual Report.

Section 7A – Monitoring methods and frequency

7A.1- Photo Points	(a) The Owner must establish permanent Photo Points at locations specified below within the Biodiversity Stewardship Site and ensure that photographs are taken from each point within 12 months of the Agreement Date and then at least every 12 months thereafter. (b) The Owner must take photographs according to the specifications below and at the locations listed below.			
	Locations of Photo Points Projected coordinate system: [GDA 94 Zone 56]			
	Photo Point reference number	**Easting**	**Northing**	
	1568 MP1	349386.2	6315592	
	1568 MP2	349064.8	6315250	
	1590 MP1	349487	6316275	
	1718 MP1	349406.3	6315242	
	1720 MP1	350276.3	6316272	
	1723 MP1	349781.8	6315837	
	684 MP1	349729.1	6316280	
	684 MP2	350408	6315526	
	The photographs must: (i) be taken in all directions (360°) from the Photo Point. (ii) be taken at the same location, with the same starting direction for the commencement and direction of the sweep, with the camera held at the same location, height and angle; (iii) show exactly the same field of view each monitoring event, to enable comparison across years; (iv) be clear and of suitable resolution to show detail, and taken at appropriate light conditions to display optimal contrast. (v) be dated, and labelled with the corresponding Photo Point reference number. (vi) retained by the Owner for the duration of the Deed.			
7A.2 - Biodiversity Stewardship Site inspections	Inspection of the Biodiversity Stewardship Site must be undertaken by a suitably qualified person at the times, and having regard to the purpose, set out below:			

	Site inspection		
	A. Purpose	**B. Interval (starting from the Agreement Date)**	
	To determine the percentage of Living Ground Cover present on the Biodiversity Stewardship Site for the purposes of grazing Stock in accordance with part 2.1 of section 1 of the Management Plan (if applicable).	Every 12 months	
	To determine the number of Stock and date/s when Stock have entered the Management Zones on the Biodiversity Stewardship Site	Every 3 months	
	To determine the physical condition of fencing and gates and whether they are maintained to a standard that can: – control the movement of Stock if required under Part 2.2 of Section 1 of the Management Plan – control human disturbance if required under Part 8 in Section 1 of the Management Plan – control the movement of Feral Pests if required under Part 6.1 of Section 1 of the Management Plan	Every 12 months	
	To determine any human disturbance on the Biodiversity Stewardship Site Note: Part 8 of section 1 of the Management Plan and clause 4 of this Deed place restrictions on human activities on the Biodiversity Stewardship Site	Every 6 months	
	To determine the physical condition of existing firetrails and access tracks within the Biodiversity Stewardship Site, their navigability and evidence of erosion. The Owner must also document any evidence of erosion within other areas of the Biodiversity Stewardship Site. Note: Parts 8.2 and 8.9 of Section 1 of the Management Plan contain requirements for erosion control	Every 6 months	
	To determine the presence of Rubbish on the Biodiversity Stewardship Site Note: Part 8.3 and 8.6 of Section 1 of the Management Plan contains requirements for storing and disposing of Rubbish on the Biodiversity Stewardship Site	Every 6 months	
	Baseline Biodiversity monitoring	Every 5 years	
	To assess the effectiveness of Threatened Species habitat management actions	Every 12 months or as specified in the Threatened Species Habitat Management Plan	

7A.3 - Baseline biodiversity monitoring – Vegetation Integrity Survey Plots	Vegetation Integrity Survey Plots must be established with the purpose of providing a baseline for assessing Biodiversity outcomes in the future at the locations specified below.			
	Locations of Vegetation Integrity Survey Plots Projected coordinate system: [GDA 94 Zone 56]			
	Plot reference	**Easting**	**Northing**	**Direction of plot (magnetic degrees)**
	1568 MP1	349386.2	6315592	*180*
	1568 MP2	349064.8	6315250	*310*
	1590 MP1	349487	6316275	*220*
	1718 MP1	349406.3	6315242	*90*
	1720 MP1	350276.3	6316272	*280*
	1723 MP1	349781.8	6315837	*40*
	684 MP1	349729.1	6316280	*100*
	684 MP2	350408	6315526	*90*
7A.4 - Monitoring	The Owner must carry out monitoring against the performance measures using the methods and frequency specified below.			

Monitoring Fire for conservation management

Performance Measure	**Management Zone/s**	**Method of monitoring**	**Timing**
Exclude fire from Glossy Black-Cockatoo nest site	*Zone 5*	*Walkthrough of nest site species polygon*	*Annual*
Exclude fire from riparian areas supporting *Syzygium paniculatum*.	*Zone 3*	*Walkthrough of riparian zone associated with species polygon*	*Annual*
Recruitment of species increasing PCT species closer to benchmark. Removal of any weed regrowth	*All*	*Vegetation Integrity Monitoring Plots*	*5 -yearly*

Monitoring Native Vegetation Management

Performance indicator	Management zone(s)	Method of monitoring	Timing
PCTs VI increasing to reflect benchmark levels	*All*	*Vegetation Integrity Monitoring Plots*	*5 -yearly*
Weeds to remain absent / supressed	*All*	*Weed surveys (rapid point)* *Vegetation Integrity Monitoring Plots*	*Annual* *5 -yearly*

Monitoring Threatened Species Habitat Management

Performance indicator	Management Zone/s	Threatened species	Method of monitoring	Timing
Habitat is preserved or improved	*5*	*Glossy Black-Cockatoo*	*Walkthrough of nest site species polygon, record nest condition and evidence of activity (chewed cones)*	*Annual*
Habitat is preserved or improved	*3*	*Syzygium paniculatum*	*Transect of riparian zone associated with species polygon, record species health, weed levels, threatening processes*	*Annual*
Habitat is preserved or improved	*All*	*Rhodamnia rubescens*	*Sample abundance plots/transects, condition assessment - record species health, weed levels, threatening processes & crown transparency to measure effectiveness of fungicide treatments.* *Opportunistic random meander in conjunction with annual surveys to assess general health.*	*5-yearly* *Annual*
Habitat is preserved or improved	*2, 3*	*Melaleuca biconvexa*	*Area of occupancy transect, condition assessment (record species health, weed levels, threatening processes)*	*5-yearly*
Habitat is preserved or improved	*1, 2, 3, 4, 5*	Large-eared Pied Bat	*Deploy anabat recorders within species polygon.*	*5-yearly*
Habitat is preserved or improved	*1, 2, 3, 4, 5*	Southern Myotis	*Deploy anabat recorders within species polygon.*	*5-yearly*
Habitat is preserved or improved	*1, 2, 3, 4, 5*	Green-thighed Frog	*Aural survey 500m transect through species polygon after significant rain*	*5-yearly*

Monitoring Integrated Feral Pests Management

Performance indicator	Management Zone/s	Pest species	Method of monitoring	Timing
Level of feral animal signs is not increasing	*All*	*All*	*Scat / activity search (random meander) in conjunction with annual weed surveys and accessing monitoring plots.* *Installation of camera traps in suitable areas as identified during annual surveys.*	*Annually* *5-yearly*
Level of feral animal signs is not increasing	*All*	*Fox/Wild Dog*	*Utilise camera traps as part of baiting program to observe night time activity along tracks or edges.*	*As required*

Monitoring Integrated Weed Management

Performance indicator	Management Zone/s	Weed species	Method of monitoring	Timing
HTE's replaced with resilient native vegetation community currently displaced by the infestation *Exotic weeds remain absent / supressed in stewardship site.*	*All*	*All*	*Rapid point assessment of weed densities at fixed monitoring plots and other areas of identified weed infestations.* *Vegetation Integrity Monitoring Plots*	*Annually* *5 Yearly*

Section 7B - Templates for reporting monitoring activities

Diary template for fire management
The Owner must complete this template following any fire event (including prescribed ecological burns, wildfire and arson) within the Biodiversity Stewardship Site. Completed templates must be submitted with the next Annual Report.
Completed by:
Date of fire:
Cause of fire:
Management Zone/s affected:
Area burnt (hectares) (attach map):
Canopy scorched (%):
Leaf litter remaining (%):
Intensity of fire:
Other comments/observations:

Template for the reporting of monitoring activities – Integrated Fire management	
The Owner must complete this template for each Management Zone. The template must be completed each year and submitted with the Annual Report. It is required to be completed by a suitably qualified ecologist or bush regenerator.	
Completed by:	
Date:	

Management Zone/s:	
Date of fires on the Biodiversity Stewardship Site:	
General description of the vegetation structure and species composition at time of reporting	
Observations of the health of threatened flora and its response to previous fires	
Interpretation of other ecological outcomes of previous fires	
Assessment of results of management actions (refer to performance measures)	
Recommendation on the timing and location for future planned fires within the Management Zone(s)	

Diary template for Native Vegetation management

The Owner must complete this template to record the details of any Native Vegetation Management Actions implemented on the Biodiversity Stewardship site.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management Zone/s:

Description and type of action undertaken Include details of the Targeted Supplementary Planting, site treatment and other actions.

Assessment of results of management actions (refer to performance measures). Include details of the results of the action and how it could be improved in future

Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Native Vegetation management		
The Owner must complete this template to record the outcomes of Native Vegetation Management Actions implemented on the Biodiversity Stewardship site. The template must be completed each year and submitted with the Annual Report.		
Manage-ment Zone/s	**Date**	**Observations and assessment of monitoring against performance measures**

Diary Template for the reporting of monitoring activities - threatened species habitat management
The Owner must complete this template to record the details of any Threatened Species Habitat Management Actions implemented on the Biodiversity Stewardship site. Completed templates are to be submitted with the next Annual Report.
Completed by:
Date of activity:
Management zone/s:
Description and type of management undertaken Include details of the target species and the management activity used.
Assessment of effectiveness of threatened species habitat management action (refer to performance measures). Include details of the results of the management activity implemented and how it could be improved in future
Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Threatened Species Habitat Management		
The Owner must complete this template to record the outcomes of Threatened Species Habitat Management Actions implemented on the Biodiversity Stewardship site. The template must be completed each year and submitted with the Annual Report.		
Manage-ment Zone/s	**Date**	**Observations and assessment of monitoring against performance measures**

Diary template for Feral Pest management

The Owner must complete this template to record the details of any Feral Pest management control actions implemented on the Biodiversity Stewardship site.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management zone/s:

Description and type of control undertaken Include details of the target species and the control technique used.

Assessment of results of control technique action (refer to performance measures). Include details of the results of the control technique and how it could be improved in future

Minor variations from management plan (if any) (Include details and reasons)

Template for reporting of monitoring activities – Feral Pest management

The Owner must complete this template to record the outcomes of Feral Pest management control actions implemented on the Biodiversity Stewardship site.

The completed template must be submitted with the next Annual Report.

Manage-ment Zone/s	Date	Current level of impact on vegetation or threatened fauna species This column must record impact as Negligible, Minimal, Moderate or High	Observations and assessment of monitoring against performance measures

Diary Template Integrated Weed management

This template must be completed to record the details of any Integrated Weed Management actions implemented on the Biodiversity Stewardship site. The template must be completed by a suitably qualified bush regenerator or ecologist on behalf of the Owner.

Completed templates are to be submitted with the next Annual Report.

Completed by:

Date of activity:

Management Zone:

Description and type of control undertaken

Provide a summary of all weed control activities undertaken within the previous 12 months. As a minimum, this should include number of person hours worked, methods used, type and quantity of chemical used, approximate area (ha) of primary weed treatment and follow-up weed treatment, and the main weeds that were treated. Attach a map of locations worked.

Assessment of results of control technique action (refer to performance measures). Include details of the results of weed control activities and how they could be improved in future. Assess effectiveness through evaluation against the relevant performance measures for the management zone.
Minor variations from management plan (if any) (Include details and reasons)

Template for the reporting of monitoring activities – integrated weed management	
This template must be completed annually for each Management Zone by a suitably qualified bush regenerator or ecologist. The completed template must be submitted with the next Annual Report.	
Management Zone:	
Completed by:	**Date:**
Weed control summary	
Provide a summary and review of all weed control activities undertaken within the previous 12 months and their effectiveness through evaluation against the relevant performance measures for the management zone. As a minimum, this should include number of person hours worked, methods used, type and quantity of chemical used, approximate area (ha) of primary weed treatment and follow-up weed treatment, and the main weeds that were treated. Attach a map of locations worked.	

Description and recommendations for remaining weed infestations

Provide a summary of the type and density of the main weeds that remain in the Management Zone, their location (mark on a map if necessary), and describe the recommended techniques for controlling these weeds.

Condition

Record each of the following condition measures as either absent, occasional, moderate or frequent when assessed across the part of the management zone where active integrated weed management has commenced

	Absent	Occasional	Moderate	Frequent
Regeneration of native canopy species				
Regeneration of native shrubs				
Regeneration of native groundcovers				
Dieback of native species				
Erosion				

Comments on condition

Provide any additional comments on the condition of the Management Zone, including reference to areas where supplementary planting or erosion control is required or has occurred (mark on a map where necessary).

Annual Reporting Template

Biodiversity Stewardship Site Annual Report					
Location details Biodiversity Stewardship Agreement ID: Reporting period:			Name of Owner/s: Property address:		
Management action	**Required completion time and frequency**	**Action completed (Yes/No)**	**Actual completion date/s**	**Description of actions undertaken** (including where undertaken (including reference to Management Zones), any variations and the reasons for variation)	**Visual observations and other comments** (including reasons for non-completion)
1 Management of fire for conservation					
2 Management of grazing for conservation					
3 Native vegetation management					
4 Threatened species habitat management					
5 Hydrology management					
6 Integrated feral pest management					
7 Integrated weed management					
8 Management of human disturbance					
9 Monitoring					

Records submitted with this report	
☐ Photographs taken at the Photo Point locations specified in the Management Plan in the Biodiversity Stewardship Agreement	
☐ Results of any monitoring, inspections or surveys required to be conducted under the Biodiversity Stewardship Agreement. This should include all completed diary templates and completed templates for the reporting of monitoring activities.	
Signature and certification	
I hereby declare that the information supplied in this report is accurate and complies with the reporting requirements under the Biodiversity Stewardship Agreement Note: If the land that forms the Biodiversity Stewardship Site is owned by multiple persons, each Owner must sign this Annual Report	
Signed:	Signed:
Date:	Date:

Attachment 5: Dictionary

In this Deed, unless a contrary intention appears, a capitalised word or words has the meaning given in the corresponding row in the table below:

Note: Definitions used only within the Management Plan are defined within the Management Plan and are not defined in this Dictionary

Word/s	Meaning
Aboriginal Objects	The same meaning that "Aboriginal objects" has in the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains"*
Aboriginal Places	The same meaning that "Aboriginal places" has in the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "Aboriginal place means any place declared to be an Aboriginal place under section 84" of the NPW Act*
Accredited Person	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant a person accredited to prepare biodiversity assessment reports in accordance with the Biodiversity Assessment Method, under the scheme for the accreditation that is prepared in draft by the Environment Agency Head and published by the Minister on the NSW legislation website*
Agreement Date	The date on which the last party executes the Deed, being the date set out in **Error! Reference source not found.**
Annual Contribution	The annual contribution payable in relation to the Biodiversity Stewardship Site, determined in accordance with clause 6.27 of the Biodiversity Conservation Regulations
Annual Report	An annual report for each Reporting Period in the form of, and attaching the information and documents required by, the Annual Reporting Template
Annual Reporting Template	The form entitled "Annual Reporting Template" which has been available to the Owner by whichever is the most recent of the following: – as attached to this Deed in Attachment 4 – on the NSW BCT website – as supplied to the Owner by the Minister's Representative from time to time
Assessment Date	The date on which the assessment for the preparation of the Site Assessment Report commenced
Attachment	A numbered attachment at the end of this Deed
Authorised Entrant	Any one or more of the following: – the Minister – the Minister's Representative – the Environment Agency Head – an officer of DPIE or the NSW BCT – any other person that the Minister, the Environment Agency Head or an officer of DPIE or the NSW BCT requests the Owner to allow onto the Land to carry out Research and/or Monitoring where the Owner has consented to such request (such consent not to be unreasonably withheld or delayed)
Authorised Officer	A person who is appointed as an authorised officer under Part 12 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date, the Environment Agency Head may appoint any person (including a class of persons) as an authorised officer*
Authority	Any federal, state or local government authority, body or department having jurisdiction in relation to the Premises or this Deed and includes any governmental or semi-governmental or local governmental authority, administrative or judicial body or tribunal, department, commission, public authority, agency, minister, statutory corporation or instrumentality

Word/s	Meaning
Biodiversity	The meaning given to it in section 1.5 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "the variety of living animal and plant life from all sources, and includes diversity within and between species and diversity of ecosystems"*
Biodiversity Assessment Method	The method established under section 6.7 of the Biodiversity Conservation Act
Biodiversity Conservation Act	The *Biodiversity Conservation Act 2016* (NSW) and any regulations from time to time in force under that Act
Biodiversity Conservation Regulations	The *Biodiversity Conservation Regulation 2017* (NSW)
Biodiversity Credit	A biodiversity credit created under this Deed
Biodiversity Stewardship Payments Fund	The fund established under Part 6 of the Biodiversity Conservation Act to hold funds from the transfer or retirement of Biodiversity Credits, and other funds
Biodiversity Stewardship Site	The area described in **Error! Reference source not found.** beside the words "Biodiversity Stewardship Site"

Word/s	Meaning
Biodiversity Values	The meaning given to it in section 1.5 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was:* *"- vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,* *- habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site,* *- threatened species abundance—being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,* *- vegetation abundance—being the occurrence and abundance of vegetation at a particular site,* *- habitat connectivity—being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,* *- threatened species movement—being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,* *- flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,* *- water sustainability—being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site"*
Business Day	A day that is not: – a Saturday, Sunday, public holiday or bank holiday in Sydney, Australia; or – 24, 27, 28, 29, 30 or 31 of December
Claim	Any claim, damage, demand, liability, Cost, loss, suit, proceeding (whether actual or potential), right of action and claim for compensation
Cost	Any cost, expense, charge, payment, outgoing, loss or other expenditure of any nature whether direct, indirect or consequential and whether accrued or paid and includes legal costs and expenses on whichever is the higher of a full indemnity basis or solicitor and own client basis

Word/s	Meaning
CPI	The Consumer Price Index All Groups number relating to Sydney published from time to time by the Australian Bureau of Statistics (or if that index ceases to be published then such other index which is, in the reasonable opinion of the Minister, a similar index which reflects changes in the cost of living in Sydney at the relevant time)
Deed	This deed and includes any attachments, annexures or schedules attached to this deed
Development	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was:* *"(a) the use of land, and* *(b) the subdivision of land, and* *(c) the erection of a building, and* *(d) the carrying out of a work, and* *(e) the demolition of a building or work, and* *(f) any other act, matter or thing referred to in section 26 of the Environmental Planning and Assessment Act 1979 (NSW) that is controlled by an environmental planning instrument,* *but does not include the demolition of a temporary structure"*
Dictionary	This Attachment 5 and includes any replacement or updated component of such Attachment from time to time
Disclosure Information	The information contained in this Deed, including a copy of the Deed and details of the location of the Land and Management Actions and Management Payments under this Deed
Dispute	A dispute, difference or claim in connection with this Deed (but excluding any dispute, difference or claim in connection with clause 29).
Dispute Notice	A notice setting out: – the nature, or subject matter, of the Dispute, including a summary of any efforts made to resolve other than in accordance with the Dispute Resolution Process; – the identity of any other person centrally involved in the Dispute; – the intent to invoke the Dispute Resolution Process; and – (if practicable) the outcomes which the notifying party wishes to achieve
Dispute Resolution Process	The process set out in clauses **Error! Reference source not found.** and **Error! Reference source not found.**.
DPIE	The Department of Planning, Industry and Environment

Word/s	Meaning
Environment Agency Head	The meaning given to it in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "the Secretary of the Department of Planning, Industry and Environment"*
First Payment Date	The date of the first occasion when the balance in the Relevant Account is equal to or greater than 100% of the Total Fund Deposit
Force Majeure Event	An event that is beyond the reasonable control of the Owner, including any natural disaster, fire, flood, accident, war, riot, act of terrorism, biohazard, a serious epidemic, or a change in legislation, but only to the extent that such events were beyond the Owner's reasonable control. A force majeure event does not however include any obligation to pay money, a labour dispute or shortage of materials or labour
Formal Review	A review conducted by an Accredited Person or by an appropriately qualified person to consider the efficacy of the Management Plan, including the Management Actions, and any amendments to the Management Plan that the reviewer considers appropriate to ensure the conservation of Biodiversity and of Biodiversity Values on the Biodiversity Stewardship Site and a written report summarising the findings of that review
Fund Manager	The person appointed from time to time under Part 6 of the Biodiversity Conservation Act as the "fund manager" in respect of the Biodiversity Stewardship Payments Fund, and who, as at the Agreement Date, is the person listed in **Error! Reference source not found.**.
Funding Acknowledgement Guidelines	The Funding Acknowledgement Guidelines for recipients of NSW Government infrastructure grants published by the NSW Government and as updated from time to time
GST Act	*A New Tax System (Goods and Services Tax) Act 1999 (Cth).* The expressions "GST", "Input Tax Credit", "Recipient", "Supply", "Tax Invoice" and "Taxable Supply" have the meanings given to those expressions in the GST Act and "Supplier" means the party who made the Taxable Supply

Word/s	Meaning
Identified Legal Requirements	Any one or more of the requirements listed below: – under the *Biosecurity Act 2015* (NSW): + an emergency order under section 44; + a control order under section 62; + a requirement to assist an authorised officer under section 103; or + a biosecurity direction under section 128; + a weed control notice issued under and prior to the repeal of the *Noxious Weeds Act 1993* (NSW)*;* – under the *Local Land Services Act 2013* (NSW): + a pest control order under section 130, + an eradication order under section 144, + a requirement for destruction of pests under section 152, or + a requirement to assist an authorised officer under section 179 + a direction under section 37A of the *State Emergency and Rescue Management Act 198*9 (NSW) in relation to a state of emergency or a direction under section 22A of that Act, – under the Rural Fires Act 1997 (NSW): + any notified steps under section 63, + a direction under section 45 for the prevention, control or suppression of any bush fire, + a bush fire hazard reduction notice under section 66, + an emergency fire fighting act within the meaning of that Act, + emergency bush fire hazard reduction work within the meaning of that Act, + otherwise as part of any managed bushfire hazard reduction work that is carried out in accordance with a current bushfire hazard reduction certificate that applies to the work or the provisions of any bushfire code applying to the land specified in the certificate
Item	A numbered item in the terms schedule at the beginning of this Deed
Land	The land described in **Error! Reference source not found.** beside the word "Land"
Law	The common law, any requirement of any rule, statute, proclamation, regulation, ordinance or by-law, present or future, and whether state, federal or otherwise and the requirements of any Authority

Word/s	Meaning
Management Action	An obligation to act or an obligation to refrain from doing something set out in section 1-7 of the Management Plan
Management Payments	A payment to be made to the Owner in accordance with clause **Error! Reference source not found.**.
Management Plan	The management plan attached to this Deed in Attachment 4 and includes any replacement or updated component of such Attachment from time to time
Management Zone	An area of a given vegetation zone within the Biodiversity Stewardship Site subject to the same regime of management identified as a management zone on the map immediately below the words "Property Management Actions" included in the Management Plan
Minister's Representative	The person nominated by the Minister to be his or her representative from time to time and who, as at the Agreement Date, is the person set out in **Error! Reference source not found.**.
Monitoring	Observing and making records (in any form) of any one or more of the following: – the status of and changes to Biodiversity and Biodiversity Values – the success of the Management Plan in improving Biodiversity – compliance by the Owner with this Deed and the Biodiversity Conservation Act
Native Plant	The meaning given to it in section 5 of the NPW Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "native plant means any tree, shrub, fern, creeper, vine, palm or plant that is native to Australia, and includes the flower and any other part thereof"*
Native Vegetation	The meaning given to it in section 1.6 of the Biodiversity Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant any plants (including trees, saplings, shrubs, scrub, groundcover) native to New South Wales (ie established in New South Wales before European settlement)*
New Owner	Any transferee, assignee or novatee of part or all of the Owner's interest under this Deed, including by way of a sale of the Land, or any part of the Land

Word/s	Meaning
Nominated Bank Account	The bank account nominated by the Owner in accordance with clause **Error! Reference source not found.** or as updated from time to time in accordance with clause **Error! Reference source not found.**
Note	Any indented or italicised text in this point 8 font and prefaced by the word "Note:"
Notice Address	The address set out in **Error! Reference source not found.**, **Error! Reference source not found.**, **Error! Reference source not found.** or **Error! Reference source not found.** beside the words "Address for service of notices" for the party to whom the notice is to be given
Notified Occupant	Any Occupant that the Minister is aware of because the Owner has provided the notification required under clause **Error! Reference source not found.**
NPW Act	The *National Parks and Wildlife Act 1974* (NSW) and any regulations from time to time in force under that Act
NSW BCT	The Biodiversity Conservation Trust of New South Wales established under the Biodiversity Conservation Act
Occupancy Agreement	Any lease or licence or other agreement which permits entry to or occupancy of any part of the Land (including the Biodiversity Stewardship Site)
Occupant	Any person who occupies any part of the Land pursuant to an Occupancy Agreement (but does not include an Owner)
Ongoing	In relation to the timing of carrying out a Management Action means commencing on the Agreement Date or First Payment Date (as indicated) and continuing in perpetuity, unless specified otherwise
Operational Deficit	The meaning given to it in the Biodiversity Conservation Regulations *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant the balance of the biodiversity stewardship site account is less than the total present value of all scheduled management payments in respect of the biodiversity stewardship site for the period starting from the most recent anniversary of the date on which the biodiversity stewardship agreement was entered into and extending to perpetuity.*
Operational Deficit Threshold	The meaning given to it in the Biodiversity Conservation Regulations *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant:* *(a) 20% of the total present value of all scheduled management payments in respect of the biodiversity stewardship site for the period starting from the most recent anniversary of the date on which the biodiversity stewardship agreement was entered into and extending to perpetuity, or* *(b) such other amount as the Minister determines, having regard to the advice of the Fund Manager*
Owner	The person described as "Owner" at Part A at the beginning of this Deed, any successor or assign under clause **Error! Reference source not found.** and any person who is an "owner" within the meaning given to that term in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was that owner of land includes:* *(a) every person who, either at law or in equity:* *(i) is entitled to the land for any estate of freehold in possession, or* *(ii) is a person to whom the Crown has lawfully contracted to sell the land under the Crown Lands Act 1989 (NSW) or any other Act relating to the alienation of lands of the Crown, or* *(iii) is entitled to receive, or is in receipt of, or if the land were let to a tenant would be entitled to receive, the rents and profits in respect of the land, whether as beneficial owner, trustee, mortgagee in possession or otherwise, and* *(b) a person who leases land under the Crown Lands Act 1989, the Crown Lands (Continued Tenures) Act 1989 (NSW) or the Western Lands Act 1901 (NSW), and* *(c) any other person who, under the regulations, is taken to be the owner of the land,* *but (unless the regulations otherwise provide) does not include a beneficiary of a trust relating to the land*

Word/s	Meaning
Owner Associate	Any representative, servant, contractor, consultant, agent, lessee, licensee or invitee of the Owner
Ownership Change Date	The date that the Minister's Representative is notified of a change in Owner of the Land
Payment Amount	Each amount set out in, or calculated in accordance with, the Payment Tables for a Payment Year, increased in accordance with the method set out in clause **Error! Reference source not found.**
Payment Tables	The tables in **Error! Reference source not found.** and **Error! Reference source not found.**
Payment Year	Each 12 month period: – commencing on the First Payment Date; and – each yearly anniversary of the First Payment Date
Permitted Exception	An activity specified in the table in **Error! Reference source not found.**, provided it is carried out in accordance with the requirements within that table, and only in the Management Zones for which the activity is permitted
Protected Animal	The same meaning that it has in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning was "an animal of a species listed or referred to in Schedule 5 of the Biodiversity Conservation Act" and "animal means any animal, whether vertebrate or invertebrate and in any stage of biological development, but does not include:* *(a) humans, or* *(b) fish within the meaning of the Fisheries Management Act 1994 (NSW)"*
Protected Person	Each and all of the following: – the Minister – the Minister's Representative – the Environment Agency Head – the employees or officers of DPIE – the NSW BCT – the members and committees of the Board of the NSW BCT – the employees and officers of the NSW BCT – any other person acting under the delegation, direction or control of the Minister, the Minister's Representative, the Environment Agency Head or the NSW BCT for any purpose – the Crown in right of the State of New South Wales

Word/s	Meaning
Registration	Registration of this Deed, or the variation or termination of this Deed, in the Register kept under the *Real Property Act 1900* (NSW) and includes, where the context allows, an application to register this Deed and "Register" has a corresponding meaning
Registration Date	The date on which the Minister receives notification from the Registrar-General that this Deed has been registered under Section 5.12 of the Biodiversity Conservation Act
Relevant Account	The biodiversity stewardship site account within the Biodiversity Stewardship Payments Fund kept by the Fund Manager in accordance with the Biodiversity Conservation Regulations
Reporting Obligations	The reporting and record keeping requirements as set out in Attachment **Error! Reference source not found.**
Reporting Period	Each of the following: – prior to the First Payment Date: + the 12 month period commencing on the Agreement Date; and + each subsequent 12 month period commencing on each anniversary of the Agreement Date – on and from the First Payment Date: + the 12 month period commencing on such First Payment Date; and + each subsequent 12 month period commencing on each anniversary of the First Payment Date
Research	The investigation into and study of facts relating to Biodiversity and Biodiversity Values, and the conservation of Biodiversity and Biodiversity Values
Review Date	– Until the first Ownership Change Date, each 5th anniversary of the Agreement Date – On and after the Ownership Change Date, on the Ownership Change Date and each 5th anniversary of the Ownership Change Date
Sell	To sell, transfer, gift, assign or otherwise dispose of and "Sale" has a corresponding meaning
Site Assessment Report	The report described in **Error! Reference source not found.**
Site Sketch Plan	A plan in registrable form which is part of this Deed showing the boundaries of the Biodiversity Stewardship Site, but not a deposited plan or subdivision plan which is separate to this Deed

Word/s	Meaning
Site Splitting	A gifting or transfer of part only of the Land, including a Subdivision in preparation for such a gift or transfer *Note: For example, if the Owner wanted the Owner's children to each own part of the Land*
Special Conditions	The terms and conditions set out in **Error! Reference source not found.**
Standard Provisions	Clauses **Error! Reference source not found.** to **Error! Reference source not found.** of this Deed, and this Dictionary
Subdivide	To physically or legally (or both) split or separate the Land into portions or to make any application to an Authority for such a split or separation
Templates	The Templates available on the NSW BCT website
Threatened Ecological Community	Vegetation communities that are: – known to occur within the Conservation Area and specified as a threatened ecological community in the Site Values Report; or – listed in Schedule 2 to the Biodiversity Conservation Act; or – listed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
Threatened Species	The same meaning as in section 1.6 of the Biodiversity Conservation Act *Note: This definition may change from time to time with changes in Law, but on the Agreement Date a list of threatened species was available at https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch1*

Word/s	Meaning
Total Fund Deposit	The meaning given to it in section 6.21(7) of the Biodiversity Conservation Act and for this Biodiversity Stewardship Site is the amount specified in **Error! Reference source not found.** *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meant, for a site, an amount determined (subject to the regulations) by the Environment Agency Head as the present value of the total of all scheduled management payments in respect of the site (under the biodiversity stewardship agreement) during the life of the agreement. The present value is to be determined by applying the discount rate determined and published by the Environment Agency Head from time to time.*
Waste	The meaning given to it in the *Protection of the Environment Operations Act 1997* (NSW) *Note: This definition may change from time to time with changes in Law, but on the Agreement Date this meaning included:* *(a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or* *(b) any discarded, rejected, unwanted, surplus or abandoned substance, or* *(c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or* *(d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or* *(e) any substance prescribed by the regulations to be waste.* *A substance is not precluded from being waste merely because it is or may be processed, recycled, re-used or recovered*

x
NSW BCT delegate

x
Owner

Attachment 6: Reference Papers

Carnegie (2016) Impact of the invasive rust *puccinia psidii* (myrtle rust) on native Myrtaceae. Bio Invasions 18:127-144

Gallagher (2018) Conservation Assessment of *Rhodamnia rubescens*. NSW Threatened Species Scientific Committee.

x
NSW BCT delegate

x
Owner

Biol Invasions (2016) 18:127–144
DOI 10.1007/s10530-015-0996-y

ORIGINAL PAPER

Impact of the invasive rust *Puccinia psidii* (myrtle rust) on native Myrtaceae in natural ecosystems in Australia

Angus J. Carnegie · Amrit Kathuria · Geoff S. Pegg · Peter Entwistle · Matthew Nagel · Fiona R. Giblin

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Abstract The invasive rust *Puccinia psidii* (myrtle rust) was detected in Australia in 2010 and is now established along the east coast from southern New South Wales to far north Queensland. Prior to reaching Australia, severe damage from *P. psidii* was mainly restricted to exotic eucalypt plantations in South America, guava plantations in Brazil, allspice plantations in Jamaica, and exotic Myrtaceous tree species in the USA; the only previous record of widespread damage in native environments is of endangered *Eugenia koolauensis* in Hawai'i. Using two rainforest tree species as indicators of the impact of *P. psidii*, we report for the first time severe damage to endemic Myrtaceae in native forests in Australia, after only 4 years' exposure to *P. psidii.* A 3-year disease exclusion trial in a natural stand of *Rhodamnia rubescens* unequivocally showed that repeated, severe infection leads to gradual crown loss and ultimately tree mortality; trees were killed in less than 4 years. Significant ($p < 0.001$) correlations were found between both incidence ($r = 0.36$) and severity ($r = 0.38$) of *P. psidii* and subsequent crown loss (crown transparency). This provided supporting evidence to conclude a causal association between *P. psidii* and crown loss and tree mortality in our field assessments of *R. rubescens* and *Rhodomyrtus psidioides* across their native range. Assessments revealed high levels of damage by *P. psidii* to immature leaves, shoots and tree crowns—averaging 76 % (*R. rubescens*) and 95 % (*R. psidioides*) crown transparency—as well as tree mortality. For *R. psidioides*, we saw exceptionally high levels of tree mortality, with over half the trees surveyed dead and 40 % of stands with greater than 50 % tree mortality, including two stands where all trees were dead. Tree mortality was less prevalent for *R. rubescens,* with only 12 % of trees

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surveyed dead and two sites with greater than 50 % mortality. Any alternative causal agents for this tree mortality have been discounted. The ecological implications of this are unclear, but our work clearly illustrates the potential for *P. psidii* to negatively affect Australia's biodiversity.

Keywords Invasive fungi · Guava rust · Eucalyptus rust · Biodiversity · Environmental monitoring · Ecological impacts · Extinction risk · Environmental change

Introduction

Puccinia psidii Winter is an invasive pathogen of global significance that has rapidly expanded its international range over the past decade. It infects and kills newly expanding leaves and stems, as well as fruit and flowers (Ferreira 1983; Coutinho et al. 1998), and has a wide host range within Myrtaceae (Carnegie and Lidbetter 2012; Giblin and Carnegie 2014). Described from common guava (*Psidium guajava*) in Brazil (Winter 1884), and believed to be native to South and Central America, it gained notoriety in its country of origin in the 1970s following severe damage in nurseries and plantations of exotic *Eucalyptus* species (Ferreira 1983). *Puccinia psidii* has also significantly affected guava production in Brazil (Ferrari et al. 1997; Lim and Manicom 2003). While not known to cause severe damage in undisturbed natural environments in Brazil, probably due to co-evolution of hosts and pathogen, the invasive potential of *P. psidii* was realized when it established on new continents. Although known for many years in Jamaica on exotic *Syzygium jambos* (Dale 1955), a new strain detected in 1934 caused extensive damage to *Pimento dioica* (allspice) plantations, resulting in the collapse of the allspice industry in certain regions within two years (MacLachlan 1938). In Florida, USA, *P. psidii* was first identified on *P. dioica* in 1977 (Marlatt and Kimbrough 1980), but it was not until new strains invaded that severe epiphytotics occurred; firstly on *Melaleuca quinquenervia* in the late 1990s (Rayachhetry et al. 1997) and more recently on *Rhodomyrtus tomentosa* (Rayamajhi et al. 2013)—both exotic invasive weeds in Florida. When *P. psidii* reached Hawai'i in 2005 (Uchida et al. 2006), it spread quickly and within several years was causing extensive damage to exotic *S. jambos* (Uchida and Loope 2009) and threatening native endangered Myrtaceae (Loope 2010). In the past decade, *P. psidii* has also invaded Japan (Kawanishi et al. 2009), China (Zhuang and Wei 2011), Australia (Carnegie et al. 2010), South Africa (Roux et al. 2013) and New Caledonia (Giblin 2013). The disease it causes is variably known as guava rust, eucalyptus rust or myrtle rust.

Prior to reaching Australia, the known host range for *P. psidii* was 129 species in 33 genera of Myrtaceae, including important Australian genera such as *Eucalyptus, Melaleuca* and *Leptospermum* (Carnegie and Lidbetter 2012). Australia is floristically dominated by Myrtaceae, which is widespread and abundant across the continent and thus important in many ecological processes (Myerscough 1998). Many industries are reliant on Myrtaceae, including forestry, nursery, essential oils and cut flower, and the conservation and biodiversity reliance on Myrtaceae cannot be overstated. As such, *P. psidii* had been recognized as a serious biosecurity threat in Australia for some time (Commonwealth Department of Primary Industry 1985; Grgurinovic et al. 2006; Glen et al. 2007). In April 2010, *P. psidii* was detected in New South Wales (NSW), Australia; an eradication attempt ensued, but ultimately failed (Carnegie et al. 2010; Carnegie and Cooper 2011). Once established outside of nurseries, it spread rapidly, becoming established in the natural ecosystem throughout coastal NSW and south-east Queensland by mid-2011 and in far north Queensland by mid-2012 (Carnegie and Lidbetter 2012; Pegg et al. 2014). *Puccinia psidii* has now established, albeit with limited distribution, in Victoria (http://agriculture.vic.gov.au), Tasmania (http://dpipwe.tas.gov.au) and the Northern Territory (http://www.nt.gov.au/). A large number of naïve hosts have thus been exposed to this pathogen and as a result the host range has rapidly expanded. There are now 232 species known as hosts due to natural infection in Australia (all but 18 native to Australia) and another 115 hosts recorded from artificial inoculation only, bringing the total hosts for *P. psidii* globally to over 450 species and 73 genera (Carnegie and Lidbetter 2012; Morin et al. 2012; Pegg et al. 2014; Giblin and Carnegie 2014).

The perceived threat to Australian biodiversity and industry is now being realized. Severe damage to key species has been observed in native environments,

including rainforest understorey species such as *Rhodamnia rubescens* and *Rhodomyrtus psidioides* and the keystone wetland species *M. quinquenervia* (Carnegie and Cooper 2011; Carnegie and Lidbetter 2012; Pegg et al. 2014). The essential oil industry is being significantly affected, particularly lemon myrtle (*Backhousia citriodora*), and although *P. psidii* has been found in eucalypt plantations, the forest industry has not yet been severely affected (Carnegie 2015). *Puccinia psidii* has been listed as a key threatening process to the natural environment in NSW (http://www.environment.nsw.gov.au/determinations/exoticrustfungiFD.htm), and was recently nominated (unsuccessfully) as a key threatening process at the federal level (Makinson 2014). However, limited studies on the effects of *P. psidii* in the native environment have been initiated. This is surprising considering the heightened publicity *P. psidii* received prior to introduction and during the emergency response, and the anticipated threat to native Myrtaceae and biodiversity. Thus our objective was to gather critical data on the potential threat of *P. psidii* in natural ecosystems in eastern Australia using two rainforest species—*R. rubescens* and *R. psidioides*—as indicators of the impact of *P. psidii*. We conducted a manipulative field experiment (disease exclusion trial) in a natural stand of *R. rubescens* over 3 years to gather rigorous quantitative data on the progression of disease and its subsequent effects on crown health and tree survival. Extensive field assessments of *P. psidii* damage and tree health were conducted across the native range of our two indicator species to obtain an understanding of the extent and severity of the impact of *P. psidii* in natural ecosystems in Australia.

Methods

Selected study species

We selected two rainforest species to quantify the impact of *P. psidii* in natural ecosystems in Australia and to illustrate the potential for *P. psidii* to affect similarly susceptible Myrtaceae. The two species, *R. rubescens* and *R. psidioides,* are listed as highly to extremely susceptible to *P. psidii*, including fruit infection, based on field observations in Australia (Carnegie and Cooper 2011; Carnegie and Lidbetter 2012; Pegg et al. 2014). *Rhodamnia rubescens* (brush turpentine) is a common pioneer species in subtropical, cool and warm temperate rainforests, with a coastal distribution from Batemans Bay in southern NSW to Gympie in southern Queensland (Floyd 1989) (Fig. 1). It is an understorey shrub to small tree with dense foliage, and although reported to reach heights of 25 m (Floyd 1989), we rarely observed trees over 15 m. *Rhodomyrtus psidioides* (native guava) is an understorey shrub to small tree (to 12 m) found in littoral rainforests and wet sclerophyll forests with a coastal distribution from Gosford on the Central Coast of NSW to Gympie in southern Queensland (Floyd 1989) (Fig. 2). It is known as a pioneer species in disturbed environments (Williams and Adam 2010). *Puccinia psidii* is known to have been established across the range of these species since mid-2011 (www.bionet.nsw.gov.au/; Carnegie and Lidbetter 2012; Pegg et al. 2014). There is a paucity of botanical or ecological research on these two species: both are known to be susceptible to drought and frost, but have few natural enemies, and are often described as good "screen" trees for their dense foliage (Floyd 1989; Shaw 2015; www.noosanativeplants.com.au). Neither species was considered as either rare or of conservation concern prior to 2010 and are still currently listed as 'Least Concern' under state and federal legislation (http://www.environment.nsw.gov.au/threatenedspecies/; http://www.ehp.qld.gov.au/wildlife/threatened-species/; http://www.environment.gov.au/biodiversity/threatened/species).

Effect of repeated damage by *Puccinia psidii* on *Rhodamnia rubescens*: Olney State Forest disease exclusion trial

Trial design

A disease exclusion trial was established in Olney State Forest (SF) (33°07′53″S, 151°15″30″E) on the Central Coast of NSW to quantify the effect of repeated damage from *P. psidii* on *R. rubescens* and examine the progress of disease symptoms over time. The site selected was a wet sclerophyll forest in a moist gully with an abundance of *R. rubescens* ranging in size from newly emerging seedlings to 12 + m trees. Overstorey trees included *Syncarpia glomulifera* and *Eucalyptus* spp., with the understorey dominated by *R. rubescens* and *Allocasuarina* sp. *Puccinia psidii* was first detected in Olney SF in October 2010

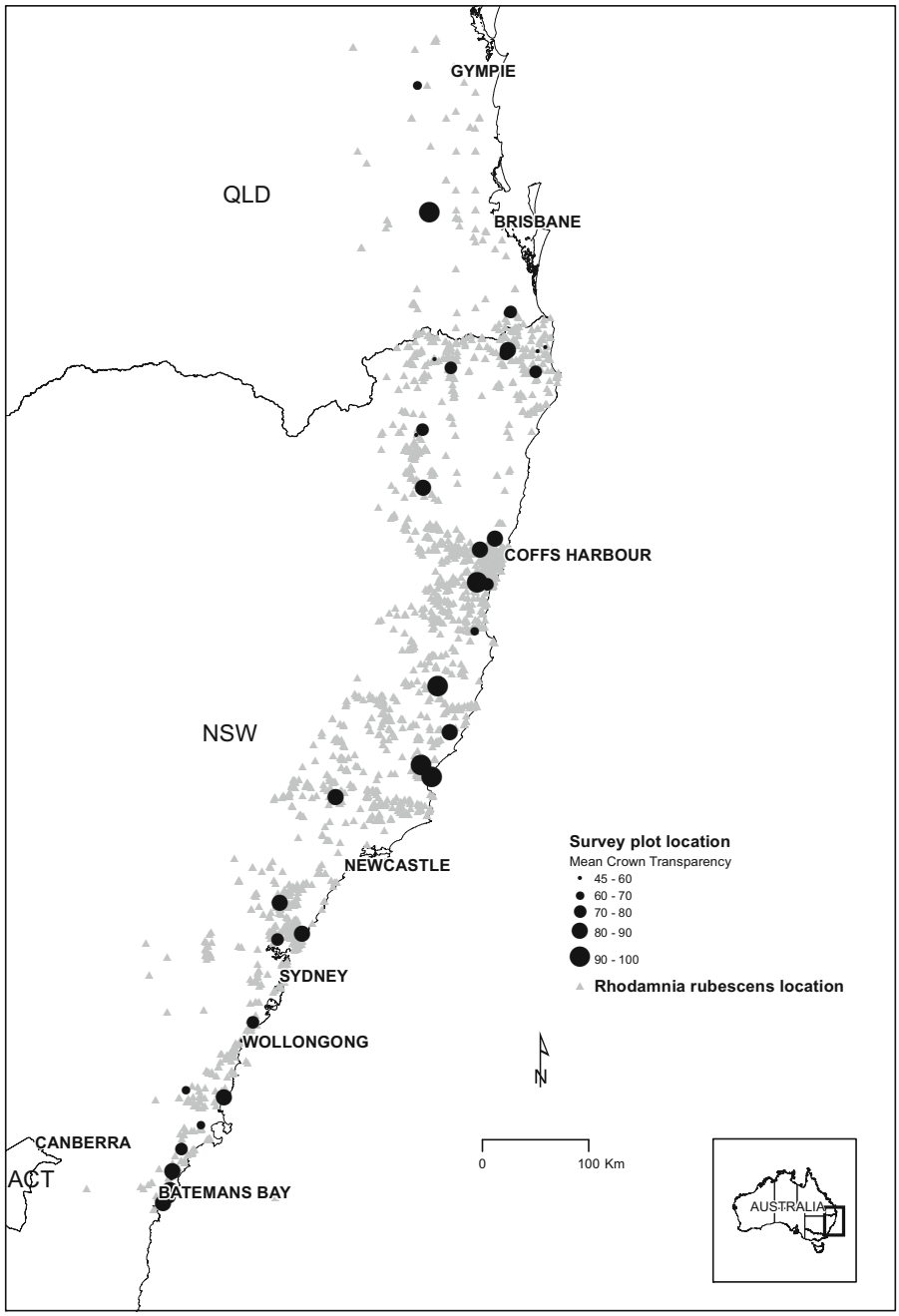

Fig. 1 Map of *Rhodamnia rubescens* survey sites. Native distribution of *R. rubescens* (*grey triangles*) obtained from Atlas of Living Australia (www.ala.org.au) and mean crown transparency of survey plots (*graduated circles*)

(Carnegie and Cooper 2011), 6 months after *P. psidii* was detected in Australia; Olney SF is less than 10 km north of the first known infected location in Australia. It is likely that *P. psidii* had been present for several months prior to being detected.

Twenty trees were selected by walking a line-transect through the forest and every 5 m selecting the nearest *R. rubescens* tree ~0.5 to ~4.0 m in height (trees above this height would be too difficult to spray). Ten trees were then randomly assigned as

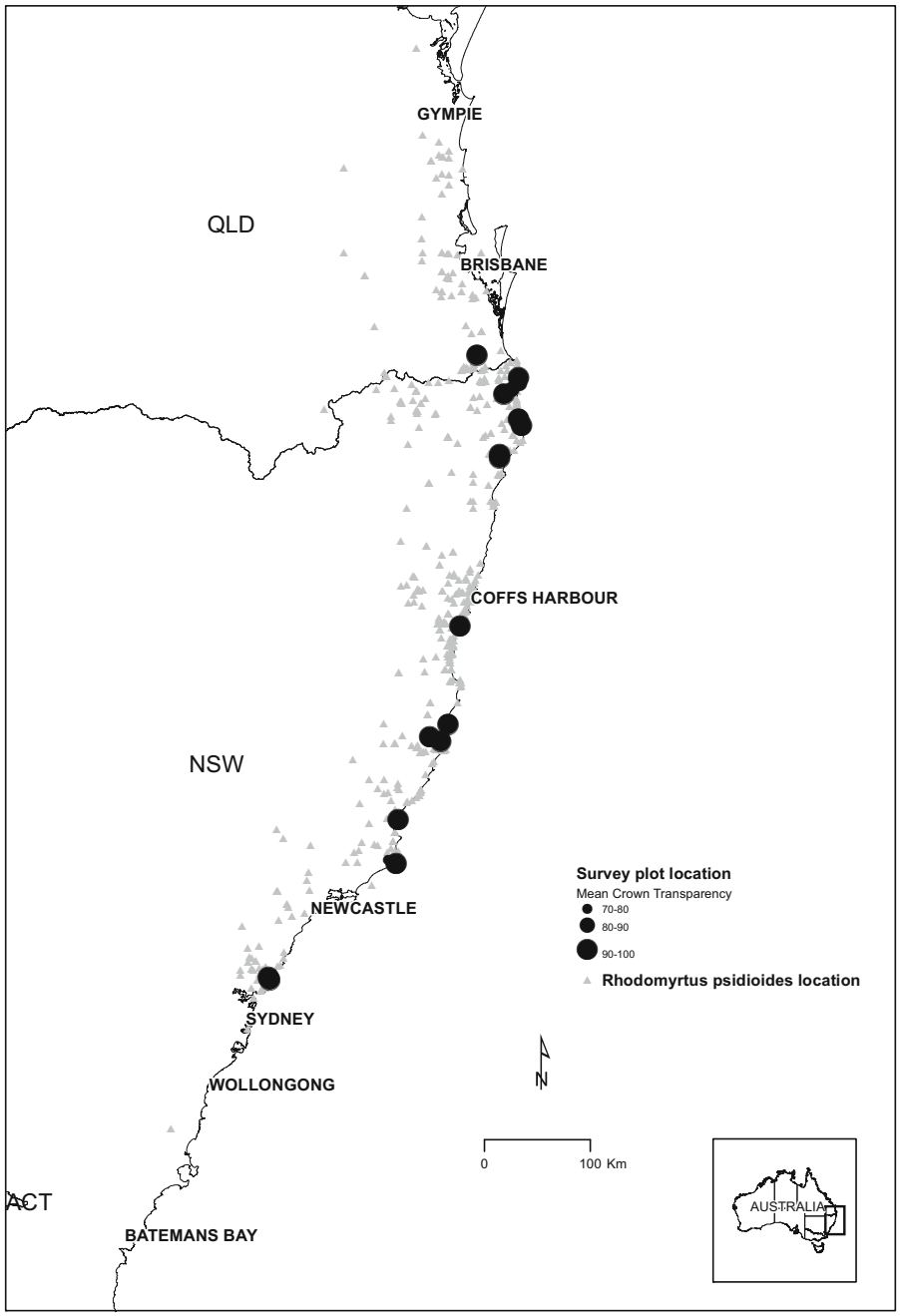

Fig. 2 Map of *Rhodomyrtus psidioides* survey sites. Native distribution of *R. psidioides* (*grey triangles*) obtained from Atlas of Living Australia (www.ala.org.au), and mean crown transparency of survey plots (*graduated circles*)

treated (sprayed) and 10 as untreated (not sprayed). All foliage on treated trees was sprayed to run-off with the fungicide triadimenol (50 mL/100 L)—which is registered in Australia for control of *P. psidii* (http://permits.apvma.gov.au/PER12319.PDF)—with a manual pressurized back-pack spray unit. Fungicide application generally occurred monthly from August 2011 to October 2014. From June 2013, the ten treated trees were split into two groups with five individuals randomly selected for ongoing fungicide treatment while the other five were no

longer treated with fungicide (hereafter termed "partially treated"). This was carried out so that trees could recover from infection for a period, so that we could then follow disease progression from initial infection onwards, similar to original disease establishment in the forest.

Tree assessments

The whole crown of each tree was assessed for crown transparency (Schomaker et al. 2007) monthly from August 2011 to October 2014 to provide an indication of the impact on tree health due to repeated damage from *P. psidii*: low transparency (e.g. 25 %) indicated many leaves in the crown and limited impact from *P. psidii* infection; high transparency (e.g. 75 %) indicated few leaves and a high level of impact. No other causal agent of defoliation (e.g. herbivores or drought) was observed during the course of the study. Incidence and severity of *P. psidii* was assessed on leaves to gain an understanding of the relationship between leaf damage and crown transparency and to follow progression of damage over time. Incidence (% infected) and severity (% leaf area affected on diseased leaves) of *P. psidii* was assessed on leaves on individual branches from August 2011 to December 2012 and thereafter on leaves in the whole crown up to October 2014 as follows. Three branches per tree were randomly selected and tagged 30 cm from the tip and each month from August 2011 to December 2012 the number of leaves (immature and mature leaves combined) on each branch counted and the incidence and severity of *P. psidii* on these leaves assessed. "Immature" leaves had recently been produced and were still susceptible; "mature" leaves, representing several leaf cohorts, had previously been susceptible, but had since matured and were no longer susceptible to new infection. From March 2013 to October 2014, individual branches were no longer assessed and the incidence and severity of *P. psidii* on the immature leaves only, across the whole crown, was assessed at monthly intervals. The methodology was modified as many of the tagged branches on the untreated trees had died by March 2013, hence further data was collected by assessing *P. psidii* in the whole crown. Only these later assessments (March 2013–October 2014) were used to conduct comparative analysis with crown transparency and leaf flush. An estimate of the proportion of immature leaves in the whole crown, providing an indication of leaf flush events, was also assessed monthly from March 2013 to October 2014. Development of flowers and fruit, and incidence of rust on each, was to be assessed, however neither flower nor fruit production was observed during this study.

Quantification of infected leaf area and leaf size on Rhodamnia rubescens at Olney SF

Within 6 months of initiation of the Olney SF disease exclusion trial we observed a difference in disease severity and an apparent difference in the size of newly developed (immature) leaves between treated and untreated trees. We hypothesized that this difference in leaf size was due to repeated severe leaf damage and subsequent defoliation on untreated trees resulting in reduced carbon assimilation, thus affecting ongoing leaf development. To further examine this, leaves were collected and the leaf area damaged by *P. psidii* (severity) and the total leaf area (size) of both treated and untreated trees were assessed. Three branches per tree from each of the 20 trees were randomly selected (but avoiding tagged branches above) and two leaves per leaf category (old, mature and immature) were sampled six months after treatment began (i.e. 2 leaves $\times$ 3 leaf categories $\times$ 3 branches $=$ 18 leaves/tree). For this experiment we designated three categories of leaf age to try to differentiate the effect of treatment on leaf production (=leaf size): "old" leaves had matured prior to commencement of the trial and so any rust on these was from previous episodes of infection; "mature" leaves, representing several leaf cohorts, would have been produced after the trial commenced and so would have been susceptible, but had matured and were no longer susceptible at the time they were sampled; "immature" leaves had recently emerged and were susceptible. Whole leaves were removed, placed in paper bags, pressed in a herbarium press while still fresh and scanned using an HP Color LaserJet CM3530fs MFP. The image processing software QUANT (Vale et al. 2003) was used to quantify leaf area (mm^2) and the percentage of leaf area damaged by *P. psidii* (*P. psidii* severity).

The impact of *Puccinia psidii* on indicator species across their native range

To gain an understanding of the impact of *P. psidii* on our indicator species, and ascertain whether there was

any variation in susceptibility, we assessed native stands of each species across the range of their natural distribution. Stands were selected via feedback of local ecologists (e.g. Forestry Corporation of NSW; National Parks and Wildlife Service) and from species location data obtained from the Atlas of Living Australia (www.ala.org.au/). While some stands were already known to have a history of *P. psidii* related dieback, such as those listed in the Atlas of NSW Wildlife (www.bionet.nsw.gov.au/), many sites were selected without any prior knowledge of *P. psidii* presence to remove bias from site selection. Stands were selected if they were in native forests and ideally contained at least 20 individuals. At each site (GPS coordinates obtained), a central point was located within the stand and the nearest 20 individuals marked for assessment. Individuals smaller than ~0.5 m in height were not included.

For each tree, assessments were made of *P. psidii* infection and damage: (1) crown transparency (Schomaker et al. 2007), (2) incidence of *P. psidii* (% infected) on (a) immature leaves, (b) mature leaves and (c) flowers and fruits (if present), and (3) a disease rating score (Pegg et al. 2012). Dead trees were classed as 100 % crown transparency; results from the Olney SF exclusion trial, and our extensive field observations, indicated that such trees might produce epicormic growth or re-shoot, but that this foliage subsequently became infected and died. No other causal agent of defoliation (e.g. herbivores or drought) was observed during our assessments. For disease incidence assessments, immature leaves were those that had not fully expanded and were thus still susceptible to *P. psidii;* mature leaves were no longer susceptible, but may have previously been infected when immature and were still retained on trees. Disease rating (0–4 scale) was based on the scale developed by Pegg et al. (2012), where 0 = no evidence of *P. psidii* symptoms, up to 4 = rust pustules present on the majority of immature leaves and shoots and evidence of stem and shoot dieback. Based on results from the Olney SF disease exclusion trial, a posteriori knowledge of our indicator species, and typical foliage and stem and branch dieback symptoms associated with repeated infection (Pegg et al. 2014), we were confident that damage and crown loss observed at sites assessed was caused by *P. psidii*. Both our indicator species are evergreen.

Binoculars were used to assess tall trees where necessary. Tree height (m) was measured with either a height pole or laser rangefinder/height meter. Sites were assessed between January and October 2014, roughly 3–3.5 years after *P. psidii* had established in natural ecosystems across the natural range of these two species.

At each site we examined trees for typical symptoms of *P. psidii* infection and damage (Carnegie and Lidbetter 2012; Pegg et al. 2014) to confirm presence of the disease. This included yellow sori on immature leaves and stems, old grey sori on mature leaves which had been infected when immature, and branch and stem dieback. No other disease established in Australia presents similar symptoms (Walker 1983). At a selection of sites, samples were collected for further examination in the laboratory and molecular confirmation of *P. psidii* (results presented in Pegg et al. 2014; Machado et al. 2015).

Statistical analyses

Effect of repeated damage by Puccinia psidii on Rhodamnia rubescens: Olney State Forest disease exclusion trial

Crown transparency data were measured at regular intervals so the data are a time series and the observations over time on the same experimental unit (tree) cannot be assumed to be independent. A mixed effect model was used to model the auto-correlation structure. An auto-correlation between the residuals of different time points was modeled by introducing a stationary auto-correlation function of order 1 (Chatfield 2003; Diggle 1990). This error structure models the residuals at time t (u_t) as a function of residuals at time t − 1 (u_{t-1}) along with the noise (ε_t):

$$u_t = \rho u_{t-1} + \varepsilon_t \quad (1)$$

The parameter ρ is unknown, and needs to be estimated from the data. This error structure results in the following correlation structure:

$$cor(u_t, u_s) = \begin{cases} 1 & if\ t = s \\ \rho^{|s-t|} & else \end{cases} \quad (2)$$

Treatment and time were used as fixed effects. Initial plotting indicated a non-linear trend with time, so a smoothing spline was fitted with time. The fitted model is:

$$Response\ variable = intercept + Treatment + f_1(time) : Treatment + \varepsilon \quad (3)$$

where crown transparency is the response variable, treatment (=treated, untreated and partially treated), and time is the number of days since the start of the study period. A separate spline function (f_1) is fitted for each treatment over time rather than assuming a linear relationship.

Maximum likelihood was used when comparing nested models where the fixed effects differed (Zuur et al. 2009). Likelihood ratio tests and t statistics were used to identify the significant fixed effect terms in the model. Model was validated by inspecting the residual plots to check for homogeneity, independence and normality.

Quantification of infected leaf area and leaf size at Olney SF

Observations were made within trees for the leaf area data, so the observations are not independent and hence a mixed effects model was fitted to the data. Fixed effects that were included in the model were treatment, crown transparency and leaf class (old, mature, immature). Crown transparency was included in the model as we had hypothesized that high crown transparency would result in a reduction in photosynthetic area and thus a reduction in size of newly produced leaves due to depletion of reserves. For the analysis, we included crown transparency assessment dates that we believed would have had some effect on foliage production for each leaf class (i.e. crown transparency prior to or at the time of foliage production): for immature leaves, we used mean crown transparency from the two preceding assessments (February 2012 and December 2011); for mature leaves we used mean crown transparency for the December 2011 and November 2011 assessments (these leaves had matured by the February 2012 assessment); for old leaves we used crown transparency from August 2011 only.

The full model fitted is:

$$Response\ variable = intercept + Treat + LC + Trans + Treat : LC + \alpha + \varepsilon \quad (4)$$

where response variable is the leaf area or the severity of *P. psidii* on leaves (*P. psidii* severity), Treat, LC, Trans, Treat:LC, are the terms for fixed effects for treatment, leaf class, crown transparency and the interaction of treatment and leaf class, and α, ε are the random effects for the tree and the error terms. The variances for the treated and the untreated for severity data were different. The heteroscedasticity structure was specified by weights argument in the model. The model was fitted using likelihood ratio tests for significance testing.

The impact of Puccinia psidii on indicator species across their native range

The crown transparency data has an inherent nested structure as the trees are nested within locations and cannot be assumed to be independent as is required for linear regression. The data were therefore analyzed using mixed models (Pinheiro and Bates 2000). Restricted maximum likelihood (Zuur et al. 2009) was used to compare nested models in which only the random effects differed. Following the final random effect structure the model was tested for fixed effects. Likelihood ratio tests and t statistics were used to identify the significant fixed effect terms in the model.

Previous rust (site with a known history of *P. psidii*), disease rating, disease incidence on immature leaves, disease incidence on mature leaves, and height were used as the fixed variables. Location was used as the random variable. The full model that was fitted was:

$$Response\ variable = intercept + DR + PR + ML + Ht + IL + \alpha + \varepsilon \quad (5)$$

where crown transparency is the response variable, DR, PR, ML, IL, Ht, are the fixed effect terms for disease rating, previous rust, disease incidence on mature leaves, disease incidence on immature leaves and height, and α, ε are the random effects for the location and the error terms. We included previous rust in the analysis to determine whether there was any bias in our selection of sites we already knew had disease compared to those with an unknown disease history.

We also tested whether region—using Köppen climate classification and seasonal rainfall data (www.bom.gov.au)—had an effect on disease of *R. rubescens* and *R. psidioides* across the survey sites. However, there was no effect so we did not report on this

further. Pearson correlation coefficient was calculated between crown transparency, severity on immature and mature leaves and disease scores.

All analyses were conducted using R (R Core Team 2014), nlme (Pinheiro et al. 2014) and plotting was done using ggplot2 (Wickham 2009) and lattice (Sarkar 2008).

Results

Effect of repeated damage by *Puccinia psidii* on *Rhodamnia rubescens*: Olney State Forest disease exclusion trial

Monthly application of the fungicide triadimenol was effective in controlling *P. psidii* on *R. rubescens* in the native environment (Figs. 3, 4, Supplementary Fig. 1). If fungicide application extended beyond this time-frame, control was not effective (Supplementary Fig. 1, arrows). Active *P. psidii* infection (sori producing yellow urediniospores) was observed at every assessment date on untreated trees. There was a significant difference ($p < 0.001$) in crown transparency between treated, untreated and partially treated trees (Fig. 3). There was a significant autocorrelation (ρ) between values over time for each tree ($\rho = 0.2$, $p = 0.01$). The smoother terms were all significant ($p < 0.001$) and had 5, 3 and 5 degrees freedom for untreated, treated and partially treated trees, respectively, indicating that the trends in crown transparency over time are non-linear. Based on data from March 2013 to October 2014, crown transparency was moderately correlated with incidence ($r = 0.36$, $p < 0.001$) and severity ($r = 0.38$, $p < 0.001$) of disease on immature leaves and with percentage new flush ($r = 0.51, p < 0.001$); incidence and severity were highly correlated ($r = 0.86$, $p < 0.001$); and percentage new flush was moderately correlated with incidence ($r = 0.34$, $p < 0.001$) and severity ($r = 0.31, p < 0.001$) of disease on immature leaves.

This trial allowed observations of disease progression, and the subsequent impact of this on trees, over time. At the beginning of the trial, all trees had similar crown transparency (Fig. 3) as well as incidence and severity on mature and immature leaves (data not shown). As the trial progressed, incidence and severity of *P. psidii* infection on treated trees effectively became zero while disease on untreated trees fluctuated, but was significantly greater than on treated trees (Supplementary Fig. 1). This corresponded with an increase in crown transparency on untreated trees and a decrease on treated trees (Fig. 3). Significant periods of leaf production (leaf flush) generally followed a trend of increasing during warm wet periods of the

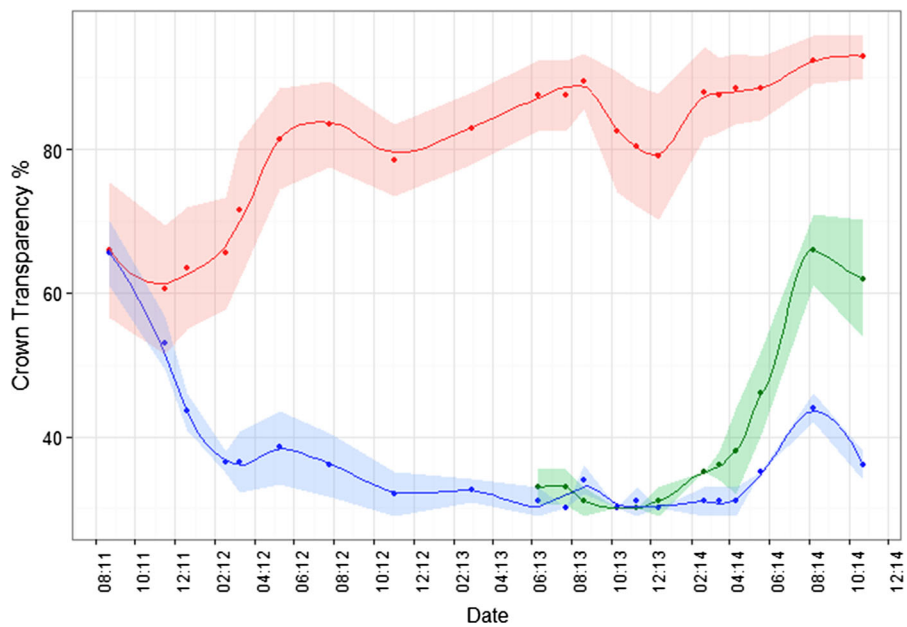

Fig. 3 Time series plot of mean crown transparency of all *Rhodamnia rubescens* trees for the disease exclusion trial at Olney State Forest. The *lines* are locally weighted *scatterplot smoothing curves* (loess) and the *shaded areas* are the 95 % confidence interval. *Red* untreated, *Blue* treated, *Green* partially treated (treatment ceased in June 2013)

Fig. 4 Comparison of untreated tree (**a**) and treated tree (**b**) of *Rhodamnia rubescens* in the disease exclusion trial at Olney State Forest 24 months after commencement of the trial and approx. 3 years after *Puccinia psidii* established in the forest

year (i.e. spring to summer), but this was not always consistent (Supplementary Fig. 1). Untreated trees had a greater proportion of the crown as new flush, compared to treated trees, as the majority of matured leaves had fallen on untreated trees. Incidence and severity of *P. psidii* generally followed a trend of increasing during periods of high rainfall and reducing during dry periods over winter (Supplementary Fig. 1), but again this was not always consistent. A similar trend, with a slight time lag, was observed for crown transparency (Fig. 3). Generally, peaks in incidence and severity occurred a month or so following peaks in leaf flush (Supplementary Fig. 1). A more detailed epidemiological study will be carried out on this data.

Time-series observations of untreated trees revealed that immature leaves became infected and often distorted and died. This resulted in a proliferation of new shoots and immature leaves that subsequently became infected and distorted with many dying. Within 6 months of the trial commencing, any new (immature) leaves on untreated trees were noticeably smaller than those on treated trees. Over time, mature leaves that had been retained on untreated trees prior to the trial beginning were shed, with little replacement (thus increasing crown transparency). Occasionally, a new flush of leaves did not coincide with conditions optimal for disease, resulting in little infection and a cohort of leaves surviving to maturity (and a subsequent decrease in crown transparency). In contrast, on treated trees, immature leaves were able to fully expand and were retained on trees, thus resulting in a decrease in crown transparency.

When we divided the treated trees into two groups in June 2013, we saw no noticeable change in disease incidence and severity or crown transparency in the now untreated (partially treated) trees for 6 months, then a sharp increase in incidence and severity in early 2014 (Supplementary Fig. 1) followed by an increase in crown transparency (Fig. 3), significantly different ($p < 0.001$) from the treated trees.

In December 2013 we began to observe some untreated trees almost completely defoliated and with any retained immature leaves distorted and dead (Fig. 4a). These trees subsequently produced a small amount of new flush, which was again severely infected, and by August 2014 these trees ceased to produce new flush and had died. A separate assessment of 100 trees in this stand (see section below "The impact of Puccinia psidii on selected species across

their native range"), revealed that 53 % of trees had died by October 2014. Thus, tree mortality had occurred in this native ecosystem less than four years after *P. psidii* had established in this forest.

Quantification of infected leaf area and leaf size

Severity of *P. psidii* on leaves collected from the disease exclusion trial at Olney SF was significantly ($p < 0.001$) higher on the untreated compared to the treated trees for all three leaf classes, but more so for the mature and immature leaves. The size of leaves (leaf area) was not significantly different between treated and untreated trees for the old and mature leaf class, but was significantly different between treatments for the immature leaf class ($p = 0.004$). Mean and standard errors (SE) for severity of *P. psidii* and leaf area are presented in Table 1. Immature leaves assessed using QUANT were produced generally 4–5 months after initiation of the trial, and so we expected some influence of reducing crown transparency of untreated trees on leaf production. However, previous crown transparency on trees from which leaves were collected was not a significant factor in determining leaf area or disease severity.

The impact of *Puccinia psidii* on indicator species across their native range

For *R. rubescens*, we assessed 43 sites across the native range from Murramarang National Park (35°40′45″S, 150°16′55″E) near Batemans Bay, NSW, to Traveston Crossing (26°11′43″S, 152°25′30″E) near Gympie, Queensland (Fig. 1), with *P. psidii* present at all sites. The mean crown transparency was 76.29 % (SE 0.81 %), with the majority (79 %) of trees having greater than 60 % transparency (Fig. 5a). Based on the disease exclusion trial, and a posteriori knowledge of the species, we surmise the normal crown transparency of *R. rubescens* in an understorey is approx. 30–35 %. We observed tree mortality at 18 sites, mostly only a few trees, but five sites with between 20 and 40 % of trees dead, one site with half the trees dead and another with three-quarters of the trees dead (Table 2). Overall, 12 % of trees surveyed were classed as dead (Fig. 5a). There was no evidence of any other primary causal agent that could have been responsible for this tree mortality. Mean disease incidence was greater on immature leaves [56.37 % (SE 2.08 %)] than on mature leaves [29.76 % (SE 1.16 %)], with a mean disease rating (score) of 2.40 (SE 0.08). Crown transparency was significantly ($p < 0.001$) negatively correlated with tree height, and positively correlated with disease rating and incidence of disease on mature leaves (Table 3), but not with incidence of disease on immature leaves or previous presence of rust at the location. The disease rating score was highly correlated with incidence on immature leaves ($r = 0.89$, $p < 0.001$).

For *R. psidioides,* we assessed 18 sites from Wambina Nature Reserve (33°24′60″S, 151°20′34″E) near Gosford, NSW, to Tallebudgera Valley (28°7′15″S, 153°12′48″E) near Beechmont, Queensland (Fig. 2), with *P. psidii* present at all sites. The mean crown transparency was 94.88 % (SE 0.53 %), with the majority of trees (82 %) having greater than 90 % transparency (Fig. 5b). Based on a posteriori knowledge of the species, we surmise the normal crown transparency of *R. psidioides* in an understorey

Table 1 Mean and standard error (SE) of percentage severity of *Puccinia psidii* and leaf area of old, mature and immature leaves from treated and untreated trees analyzed with the image processing software QUANT from the Olney SF disease exclusion trial

Treatment	Leaf class	*P. psidii* severity (%)		Leaf area (mm^2)	
		Mean	SE	Mean	SE
0	Old	16.81	3.70	71.32	8.51
1	Old	6.40	0.78	68.83	8.27
0	Mature	11.06	2.54	58.03	11.43
1	Mature	0.36	0.08	69.12	8.50
0	Immature	19.13	5.81	14.03	3.21
1	Immature	0.97	0.50	49.44	5.61

0 = untreated; 1 = treated

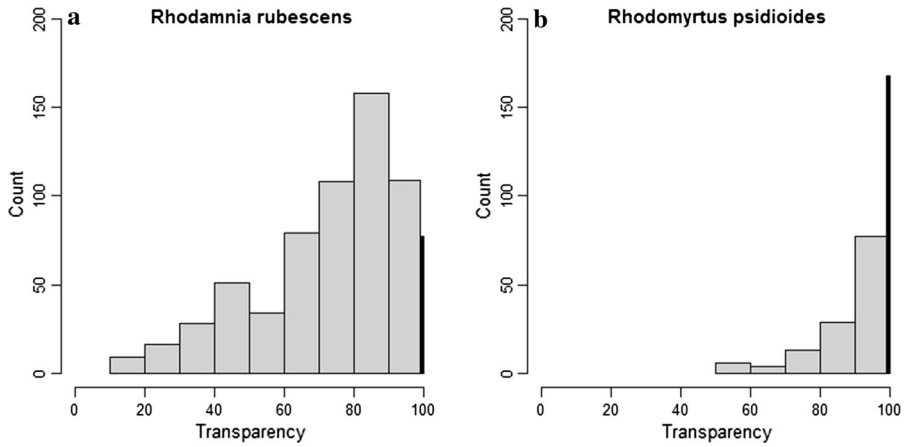

Fig. 5 Total tree counts (across all sites) for crown transparency (*grey bars*)—in 10 % classes—and tree mortality (*black bar*) associated with *Puccinia psidii* for **a** *Rhodamnia rubescens* and **b** *Rhodomyrtus psidioides* from field assessments across the species' native ranges

is approx. 25–35 %. All but 3 sites had exceptional levels of tree mortality (Table 4), with four sites having 50–75 % dead trees, two sites with 95 % dead trees, and two sites with all trees (100 %) dead. Overall, 57 % of trees surveyed were dead (Fig. 5b). Trees of all sizes were killed, including trees as tall as 12 m in height (Fig. 6), with the stage of decline indicating some had been dead for at least 1 year (i.e. 2 years after *P. psidii* established in the region). There was no evidence of any other primary causal agent that could have been responsible for this tree mortality. Mean disease incidence was greater on immature leaves [94.46 % (SE 2.12 %)] than on mature leaves [38.44 % (SE 3.18 %)], with a mean disease rating (score) of 3.87 (SE 0.05). Crown transparency was not significantly correlated with any other variable assessed (data not shown).

For both these species, we observed severely damaged trees with epicormic shoots infected and killed by *P. psidii.* Ad hoc observations during surveys revealed few regenerating seedlings and/or suckers, and all with *P. psidii* infection and associated dieback.

Discussion

The disease exclusion trial at Olney SF unequivocally showed that repeated, severe infection by *P. psidii* results in a reduction in foliage production, severely affects crown health and can lead to tree death. It also revealed that myrtle rust is capable of killing mature trees in a native forest ecosystem in fewer than four years. This trial provided strong supporting evidence for our conclusions that the severe crown loss, dieback and tree mortality we observed in *R. rubescens* and *R. psidioides* across their native range was a result of repeated infection by *P. psidii.* Any alternative causal agents have been discounted. This is supported by previous studies (Pegg et al. 2014; Shaw 2015).

Puccinia psidii has caused significant damage in commercial plantations and orchards in South and Central America (to both exotic and endemic species), to invasive weed species in Florida and Hawai'i, and to endangered endemic species in Hawai'i. This disease is now causing significant damage to endemic Myrtaceae in natural ecosystems in Australia. Severe infection and crown loss, dieback and tree mortality were observed in our indicator species—*R. rubescens* and *R. psidioides*—across their entire native range. *Rhodomyrtus psidioides* has been particularly affected, with deaths of over half the trees in many stands within 2–3 years of *P. psidii* establishing, including mature trees up to 12 m tall. This species is now undergoing a process of rapid decline across its range as a result of *P. psidii* invasion: of the 297 trees across 18 stands that we assessed, 57 % are dead, with all but three sites having exceptional levels of tree mortality. We know from observations of botanists and seed collectors that stands of *R. psidioides* were healthy prior to *P. psidii* establishing (Shaw 2015). Thus, based on our data, *R. psidioides* has undergone a population decline of greater than 50 % in less than five years. Similar impact has been observed in Hawai'i to endangered *Eugenia koolauensis* and mature trees of the exotic *S. jambos* (Uchida and Loope 2009; Loope 2010), but not previously to an

Table 2 Percentage of *Rhodamnia rubescens* trees assessed as dead at each survey site

Location	Percent dead
Austinmer, NSW	0.0
Bagawa SF, NSW	15.0
Bongil Bongil NP, NSW	10.0
Brill Brill SF, NSW	30.0
Brisbane Water NP, NSW	0.0
Chichester SF, NSW	8.3
Conglomerate SF, NSW	0.0
Cunninghams Gap, QLD	0.0
Ewingar SF 1, NSW	0.0
Ewingar SF 2, NSW	0.0
Flat Rock SF, NSW	0.0
Gibraltar Range NP, NSW	0.0
Gold Creek Reservoir, QLD	73.3
Goongery, NSW	15.4
Kiwarrak SF, NSW	26.3
McDonald SF, NSW	4.8
Mebbin NP 2, NSW	0.0
Mebbin NP 4, NSW	0.0
Middle Brother SF, NSW	0.0
Morton NP, NSW	0.0
Murramarang NP 1, NSW	4.5
Murramarang NP 2, NSW	8.3
Murramarang NP 3, NSW	16.7
Olney SF 1, NSW	53.3
Olney SF 2, NSW	0.0
Pine Creek SF, NSW	0.0
Red Head, NSW	40.0
Richmond Range NP, NSW	0.0
Royal NP, NSW	23.3
Seven Mile Beach NP, NSW	16.7
Tallebudgera Valley 1, QLD	25.0
Tallebudgera Valley 2, QLD	0.0
Termeil SF 1, NSW	0.0
Termeil SF 2, NSW	0.0
Tomerong SF, NSW	0.0
Tomerong, NSW	0.0
Traveston Crossing 1, QLD	0.0
Traveston Crossing 2, QLD	13.3
Upper Burringbar, NSW	0.0
Upper Sleepy Hollow, NSW	0.0
Wambina NR, NSW	11.1
Way Way SF, NSW	0.0
Yabbra SF, NSW	0.0

SF State Forest, *NP* National Park, *NR* Nature Reserve

abundant endemic species. The damage to *R. rubescens* is just as extensive but less severe, with 12 % of trees assessed as dead in our study, and tree mortality observed in fewer than half the stands. It appears, however, that *R. rubescens* can cope better with the disease because it can manage to produce some flush even after substantial defoliation. Still, based on our surveys, *R. rubescens* numbers have declined by over 10 % in less than five years; this abundant species is also undergoing significant decline across its range.

Our quantitative findings for both species are supported by field botanists who have conducted extensive surveys of these species during routine botanical surveys and seed collecting over many years: "…all sites of *R. rubescens* visited since 2010 are in serious decline…with no flowering or seed observed" (Doug Beckers, Senior Botanist, National Parks and Wildlife Service, pers. comm., May 2014); "*R. rubescens* and *R. psidioides* are seriously threatened, with significant decline in all stands visited…the worst area in the Bellinger Valley [NSW] where hundreds of plants have died…" (Richard Johnstone, Seed Bank Officer/Botanist, The Australian Botanic Garden Mount Annan, pers. comm., July 2014); "Neither *R. rubescens* or *R. psidioides* have flowered since 2010, with at least half of *R. rubescens* dead and all known *R. psidioides* dead at monitoring sites" (Deb Holloman, Bush Regeneration Coordinator, National Parks and Wildlife Service, May 2015). Monitoring of *R. rubescens* and *R. psidioides* stands in northern NSW—which prior to 2011 appeared to be vigorous and in robust health—revealed devastating effects, with 75 % tree mortality in some areas (Smith, M., National Parks and Wildlife Service, 2014, unpublished). The impact of *P. psidii* on these hitherto widespread species, neither of which is legislatively 'listed' under state or federal legislation, is likely to be sufficient to justify a change in their status to 'threatened' (IUCN 2001). While further investigations are required to determine the impacts on a range of host species, those considered threatened prior to *P. psidii* being detected in Australia and identified as being susceptible may be at greater risk of becoming extinct. Preliminary studies have already identified that the currently threatened species *Rhodamnia angustifolia*, a species with only 12 trees remaining in the wild, has been further threatened, with repeat infection resulting in loss of fecundity and rapid dieback (Pegg et al. 2014).

Table 3 ANOVA table for fixed effects of field assessments of *Rhodamnia rubescens*

Variables	Value	SE	t-value	*p* value
Intercept	70.13	3.57	19.66	<0.001
Disease rating	3.17	0.66	4.77	<0.001
Height (m)	−2.15	0.44	−4.90	<0.001
Disease incidence on mature leaves	0.20	0.03	6.04	<0.001

Table 4 Percentage of *Rhodomyrtus psidioides* trees assessed as dead at each survey site

Location	Percent dead
Baggotville 1, NSW	69.2
Baggotville 2, NSW	60.0
Bongil Bongil NP, NSW	72.5
Broken Ridge, NSW	100.0
Cudgen NR, NSW	0.0
Ewingsdale, NSW	100.0
Goolawah RP, NSW	24.0
Myall Lakes NP, NSW	23.1
Port Macquarie 1, NSW	11.8
Port Macquarie 2, NSW	0.0
Red Head, NSW	0.0
Seal Rocks RP, NSW	20.0
Tallebudgera Valley, Qld	96.7
Tweed Coast, NSW	15.0
Upper Burringbar, NSW	95.7
Upper Sleepy Hollow, NSW	12.5
Wamberal Lagoon NR, NSW	50.0
Wambina NR, NSW	33.3

NP National Park, *NR* Nature Reserve, *RP* Regional Park

Fig. 6 Native stand of mature *Rhodomyrtus psidioides* in north coastal NSW where the majority of trees have been killed within 2–3 years of *Puccinia psidii* establishing. Photo P. Entwistle

The assessments of *R. rubescens* in Olney SF provided information not only on the effects of the disease on *R. rubescens* but on the progression of disease and rate of decline in the plant population. This revealed not only how quickly the tree crown declines (within 6 months) following repeated infection of immature leaves and subsequent defoliation, but also fluctuations in incidence and severity of disease over time. The study using the image processing software QUANT (Vale et al. 2003) provided more rigorous data on the effects of *P. psidii* on *R. rubescens* at Olney SF. For the immature leaf class, we saw a significant difference in both disease severity and leaf area between treatments, indicating a causal relationship between disease and reduced leaf area. We had hypothesized that reduced leaf size would be associated with increased crown transparency on trees: fewer leaves resulting in less photosynthesis leading to a gradual decline in carbohydrates for ongoing leaf production. However, we did not see a significant correlation between these traits. This may be an artifact of the trial design, as there were only three assessments (August, November, December 2011) of crown transparency prior to sampling leaves (February 2012). The data did, however, show that untreated trees had more disease, smaller leaves (when they did reach maturity) and higher crown transparency compared to treated trees. We surmise that the gradual decline in foliage retention on diseased trees resulted in a decrease in photosynthetic capability of these trees leading to a reduction in the size of newly produced

leaves. Over time this likely resulted in the depletion of stored carbohydrates, affecting further leaf development and foliage replacement. Like *P. dioica* in Jamaica (MacLachlan 1938) and *S. jambos* in Hawai'i (Uchida and Loope 2009), *R. rubescens* and *R. psidioides* are severely defoliated by *P. psidii,* resulting in the production of highly susceptible new growth, which in-turn becomes severely infected and defoliated. Repeated defoliation leads to reduced foliage re-growth, affects reproduction, and ultimately causes tree morality, likely due to carbohydrate depletion (McPherson and Williams 1998).

The time-series observations of disease progression at Olney SF provide some corroboration of the published environmental factors that influence disease development. Periods of rainfall were generally followed by an increase in leaf production, even during winter. This abundant susceptible foliage, with continued high humidity and rainfall, provided ideal conditions for infection by *P. psidii*, and a subsequent increase in incidence and severity of disease generally within a month. Duration of leaf wetness and high relative humidity combined with nocturnal temperatures ranging from 18 to 22 °C have been recognized in previous studies as being triggers for disease outbreaks (Tessmann et al. 2001). The frequency and quantity of rainfall is also a likely factor of significance influencing rate and quantity of new leaf growth.

Our work showed that *P. psidii* has expanded across the entire natural range of our two study species, was found on every plant surveyed, and the damage to individual plants was generally high to extreme. The overall impact of an invasive species can be measured by the total area occupied (range), the abundance across that range, and the damage on individual plants (Parker et al. 1999). Thus, based on the metrics proposed by Parker et al. (1999), the impact of *P. psidii* on these two endemic species in natural ecosystems in Australia is severe. Our study, however, only investigated damage to individuals within populations, and as such more research is required to gain an understanding of the effects on plant communities and ecosystem processes (Parker et al. 1999). The short-term ecosystem-level impacts of *P. psidii* are likely to include a reduction in photosynthesis and productivity, stimulation of decomposition and changes in microclimate and light condition in the forest due to crown loss and mortality of highly susceptible species (Lovett et al. 2006). Longer term effects are likely to be related to a change in species composition, due to local extirpation of highly susceptible species, and subsequent changes of forest structure, productivity, and nutrient cycling. Already we are observing changes in plant community structure, with native grasses and exotic weeds (e.g. *Lantana camara*) colonizing gaps provided by mortality of *R. psidioides* stands (authors, pers. obs.).

Our selected species have proven useful in illustrating the potentially severe impact of *P. psidii* on other highly or extremely susceptible species in an ecologically critical family (Myrtaceae) that constitutes about 10 % of the Australian flora by species—about half of which occur in climatic zones identified as conducive to *P. psidii* naturalisation (Kriticos et al. 2013). Pegg et al. (2014) considered 48 species in Queensland alone to be highly or extremely susceptible to *P. psidii*. We recommend a greater range of species with a broader variation in susceptibility be monitored, including both currently 'listed' threatened species and 'non-listed' species. Understanding the variability in species susceptibility is critical in order to optimize scarce resources for potential species recovery plans. Such monitoring will also assist in detecting changes in disease severity due to local and regional variation in climate and potentially herald the incursion of new strains of *P. psidii* (e.g. Loope 2010). The introduction of new strains of *P. psidii* into Jamaica (MacLachlan 1938) and Florida (Rayachhetry et al. 1997) resulted in devastating epidemics not previously seen in those counties. Furthermore, it is imperative that monitoring of plant communities and ecosystems are initiated to fully understand the long-term impact of this devastating invasive pathogen.

In just the short time that *P. psidii* has been established in Australian natural ecosystems we have observed significant damage and tree mortality. There are few exotic diseases in Australia that threaten a wide range of Australian flora. The most significant of these is *Phytophthora cinnamomi,* which is associated with mortality of a wide range of overstorey and understorey species in multiple families including Myrtaceae, Proteaceae, Epacridaceae and Papilionaceae (Wills 1992; Weste 1994). *Phytophthora cinnamomi* is associated with significant ecological impact in plant communities in south-eastern and south-western Australia, with declines in species richness, plant abundance and percentage cover

(Wills 1992; Weste 1994). Fauna dependent on these plant communities are also affected. While *P. psidii*-associated mortality of dominant overstorey trees has not yet been recorded (although effects on vegetative and seedling recruitment of these remain unknown), over time we are likely to see significant alterations to understorey plant communities due to *P. psidii*.

There are numerous examples of invasive forest pathogens causing landscape-level ecological impacts (Ellison et al. 2005; Loo 2009), including chestnut blight (*Cryphonectria parasitica*) in North America (Anagnostakis 1987), Dutch elm disease (*Ophiostoma ulmi* and *O. nova-ulmi*) in Europe and North America (Gibbs 1978) and phytophthora dieback (*Phytophthora cinnamomi*) in Australia (Wills 1992; Weste 1994). The greatest impacts occur when invasive pathogens cause mortality of foundation species (Ellison et al. 2005; Loo 2009). Death of foundation species are also often very dramatic, garnering government and public attention, e.g. phytophthora dieback, Dutch elm disease and chestnut blight. Although receiving government and public attention prior to reaching Australia (e.g., O'Neill 2000; Grgurinovic et al. 2006), and during the emergency response following detection (e.g., Carnegie and Cooper 2011; Makinson 2012), interest in *P. psidii* in Australia has waned, partly because the "mycological firestorm" that "environmentalists predicted" does not appear to have eventuated (according to McRae 2013); there has been no large scale tree mortality and minimal affects to industries so far. Our studies, while currently limited, have shown that *P. psidii* is severely affecting key species in natural ecosystems, and likely to be significantly affecting a wider range of species. Local extirpation of highly susceptible species is likely, potentially leading to species extinction. This work clearly illustrates the potential for *P. psidii* to negatively affect Australia's biodiversity.

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Conservation Assessment of Rhodamnia rubescens (Benth.) Miq. (Myrtaceae)
Rachael Gallagher, April 2018
NSW Threatened Species Scientific Committee

(revised with advice from CTSSC and Qld, October 2018)

***Rhodamnia rubescens* (Benth.) Miq. (Myrtaceae)**
Distribution: NSW, Qld
Current EPBC Act Status: Not listed
Current NSW BC Act Status: Not listed (Preliminary Determination to list as Critically Endangered made under BC Act)

Summary of Conservation Assessment
Rhodamnia rubescens was found to be eligible for listing as Critically Endangered under the BC Act 2016 under Clause 4.2 (equivalent to IUCN Criteria A3(e)). To be listed as threatened under Clause 4.2 the species must have experienced a population reduction of 80% (CR threshold) over three generations or 10 years (whichever is longer). The effect of *Austropuccinia psidii* (Myrtle Rust) infection on *R. rubescens* is severe across the species entire range based on quantitative evidence from field surveys. An > 80% reduction in the population of *R. rubescens* across Australia over the three generations is projected given documented levels of mortality due to *A. psidii* infection and high susceptibility to *A. psidii* in both mature individuals and seedlings.

Description and Taxonomy
Rhodamnia rubescens (Benth.) Miq. (family Myrtaceae) is described by PlantNET as:
"Shrub or small tree to 25 m high, bark reddish brown, fissured; young stems densely tomentose. Leaves with lamina ovate to elliptic, 5–10 cm long, 2–4.5 cm wide, shortly acuminate, base cuneate to rounded, upper surface green and sparsely hairy, lower surface paler and sparsely to densely hairy with erect hairs; strongly 3-veined from base, lateral veins transverse; oil glands distinct, moderately dense; petiole 4–9 mm long. Inflorescences 1–3 per axil, each usually 3-flowered; peduncle 5–22 mm long. Hypanthium sparsely pubescent. Sepals 2–3 mm long, caducous. Petals 4–6 mm diam., white. Stamens 3–5 mm long. Style 4–5 mm long. Fruit globose, 5–8 mm diam., red turning black."

Synonyms: *Rhodamnia trinervia* (Sm.) Blume, *Monoxora rubescens* Benth.

Common name: Scrub Turpentine, Brown Malletwood

NOTE: Myrtle rust was previously known as *Puccinia psidii* (see Beenken 2017).

Distribution and abundance

Rhodamnia rubescens is known to occur from coastal districts of NSW north from Batemans Bay (35.71° S, 150.18° E) to Bundaberg in Queensland (24.86° S, 152.35° E). The distribution of *R. rubescens* occasionally extends inland onto the escarpment up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm (Benson & McDougall 1998).

There are 2,740 records associated with the name *R. rubescens* in Australia in the Atlas of Living Australia (http://www.ala.org.au accessed 4/4/2018). Of these records, 329 are associated with

vouchered herbarium specimens and 2,266 with the NSW Office of Environment & Heritage Atlas of NSW Wildlife (BioNet). All records for *R. rubescens* from Herbarium and Atlas databases were accessed and cleaned to remove duplicates and erroneous records. Note that two records from the Wet Tropics region of Queensland were assumed to be incorrectly identified as this species is not known to occur north of Gympie (Floyd 2008).

Populations

The number of distinct populations of *Rhodamnia rubescens* is unknown but is expected to be large given the wide distribution of the species. Occurrences of *R. rubescens* are contiguous along the entire range of the species with no significant disjunctions.

No formal estimates of total abundance of *Rhodamnia rubescens* across the range of the species, or of extinction-risk status prior to 2010, have been located (Australian Network for Plant Conservation, *in litt*. April 2016). It is reasonably suspected that given the large geographic range size of *R. rubescens* and its characterisation as a 'common' species (Benson and McDougall 1998; Floyd 2008) that the number of mature individuals may be large (i.e., not < 10,000, the IUCN threshold for Vulnerable). However, there is clear evidence of *R. rubescens* mortality and a lack of successful seedling recruitment due to infection by *Austropuccinia psidii* documented at multiple sites across the species entire range (Carnegie *et al.* 2016; Pegg *et al.* 2017; J. Neldner *in litt*. March 2018).

AOO and EOO estimates

Rhodamnia rubescens has a large geographic distribution.

The extent of occurrence (EOO) was estimated to be 147,340 km2. The EOO is estimated based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2017).

The area of occupancy (AOO) was estimated to be 3,360 km2. This calculation was based on the species occupying 840 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2017).

Evidence of population decline

The 'Introduction and establishment of Exotic Rust Fungi of the order Austropucciniales pathogenic on plants of the family Myrtaceae' is listed as a Key Threatening Process under the NSW BC Act (gazetted 15/4/2011). In 2014-2015, the Commonwealth Threatened Species Scientific Committee considered a public nomination to list 'exotic rust fungi of the order Pucciniales that are pathogenic on plants of the family Myrtaceae' as a Key Threatening Process under the Environment Protection and Biodiversity Conservation Act 1999. The Committee decided that such pathogens are encompassed within the existing 'Novel biota and their impact on biodiversity' Key Threatening Process and did not prioritise the assessment.

Austropuccinia psidii was first detected in Australia on the NSW Central Coast in April 2010 and has since established in natural ecosystems throughout coastal NSW, south-east Queensland and

far north Queensland and has a limited distribution in Victoria, Tasmania and the Northern Territory (Carnegie and Lidbetter 2012; Pegg *et al.* 2014).

Rhodamnia rubescens is a known host of *A. psidii* (Zauza *et al.* 2010) and is characterised as 'Highly to Extremely Susceptible' to infection (Pegg *et al.* 2014). All plant parts have been documented as being affected by *A. psidii* infection, including leaves, stems, flowers and fruits (Pegg *et al.* 2014; Carnegie *et al.* 2016). A disease rating system documents species susceptibility to *A. psidii* infection from Relatively Tolerant to Extremely Susceptible (Pegg *et al.* 2014). Highly susceptible species exhibit "rust sori…on 50–80% of expanding leaves and shoots, evidence of rust on juvenile stems and older leaves, leaf and stem blighting and distortion, multiple sori per leaf/stem" whereas Extremely Susceptible species exhibit "rust sori…on all expanding leaves, shoots and juvenile stems; foliage dieback; evidence of stem and shoot dieback" (Pegg *et al.* 2014). A susceptibility study of wild-collected seed of *R. rubescens* to *A. psidii* inoculation documented 60.5% of *R. rubescens* seedlings as being resistant to infection (Zauza *et al.* 2010). The fungal isolate used in this glasshouse trial (UFV-02 (Race 1; Junghans *et al.* 2003) has not been confirmed as the strain of *A. psidii* that is currently present in Australia. No significant variation in susceptibility of populations of *R. rubescens* has been noted in field surveys (Carnegie *et al.* 2016). However, field surveys have detected relatively healthy individual *R. rubescens* plants in some locations which could be targeted for additional research (J. Willis *in litt.* April 2018).

Extensive field assessments of *A. psidii* damage on *R. rubescens* across its entire range have been, and continue to be, conducted (Carnegie *et al.* 2016; Pegg *et al.* 2017; J. Neldner *in litt*. March 2018; J. Ferris *in litt*. Jan 2018; J. Willis *in litt*. April 2018). Carnegie *et al.* (2016) surveyed forty-three sites to assess for the impact of *A. psidii* on *R. rubescens* between January and October 2014 which was approximately 3-3.5 years after *A. psidii* had established across the range of this host species (Carnegie and Lidbetter 2012; Pegg *et al.* 2014). Sites were distributed between Murramarang National Park near Batemans Bay, NSW in the south, to Traveston Crossing near Gympie, Queensland, in the north and are representative of *A. psidii* impacts across the population. Sites were selected for assessment if they contained predominantly native vegetation and approximately 20 individuals of *R. rubescens*. *A. psidii* was detected as present at all sites, and no other plant disease established in Australia presents similar symptoms (Walker 1983). At all sites, approximately 20 individuals of *R. rubescens* were assessed for crown transparency (Schomaker *et al.* 2007) and the incidence of *A. psidii* (% infected) on mature leaves, immature leaves, flowers and fruit and a disease rating score of 0-4 (Pegg *et al.* 2012) was allocated. Dead trees were classed as 100% crown transparency.

The comprehensive assessments conducted by Carnegie *et al.* (2016) across the range of *R. rubescens* document large levels of tree mortality across sites. Mortality of *R. rubescens* was recorded across 18 of the 43 sites. Most sites contained only a few dead trees with the following exceptions: five sites had between 20 and 40% mortality, one site with 50% mortality and one site with 75% mortality (Carnegie *et al.* 2016). Across all sites mean crown transparency was 76.3% (standard error 0.8%), with the majority (79%) of trees having greater than 60% transparency. Based on prior knowledge of the species the normal crown transparency in an understorey is approximately 30-35% (Carnegie *et al.* 2016).

Of the 669 trees assessed across the range of *R. rubescens* by Carnegie *et al.* (2016), 12% were dead (77 individuals) equating to an annualised rate of decline (r) of -0.03 across the 3.5-year study period. The generation length of *R. rubescens* is suspected to be at least 30-40 years given the

height (> 25 m) which the species can attain (Floyd 2008). Using a generation time of 30-40 years, *R. rubescens* is projected to decline by 96-99% over 3 generations.

All age classes of trees and plant parts were affected by *A. psidii* infection (Carnegie *et al.* 2016). Disease incidence was greater on immature leaves (average incidence of 56.4% (standard error 2.1%) than on mature leaves (average incidence of 29.8% (standard error 1.2%) and an average disease rating score of 2.4 (0-4 scale; standard error 0.08) was documented. Further observations of *R. rubescens* infection with *A. psidii* since the publication of Carnegie *et al.* (2016) indicate that at two surveyed sites (Bongil Bongil National Park and Royal National Park) mortality has increased from 10% and 23% respectively to > 50% (ANPC *in litt*. April 2016). A new monitoring site in Pine Creek State Forest also has >50% mortality (ANPC *in litt.* April 2016).

Information held by the National Environmental Science Program (NESP) database further confirms the findings of Carnegie *et al.* (2016) that *R. rubescens* is highly impacted by *A. psidii*, with an average damage assessment of c. 4 (4 = 50-90% branch death or branches with 50-90% dieback or >80% crown transparency). The NESP database indicates that the majority of populations where damage has been assessed have disease rating scores of 4 or above (48 of 90 populations), with an additional 24 populations of a disease rating of 3.

In parallel with the whole-of-range field surveys, a three-year disease exclusion trial was performed in a natural stand of *Rhodamnia rubescens* in Olney State Forest on the Central Coast of NSW. This trial "unequivocally showed that repeated, severe infection leads to gradual crown loss and ultimately tree mortality" (Carnegie *et al.* 2016). Significant correlations were found between both incidence ($r = 0.36$; $p > 0.001$) and severity ($r = 0.38$ $p > 0.001$) of *A. psidii* infection and subsequent crown loss (crown transparency). This trial documents the relationship between severe crown loss, dieback and tree mortality observed in *R. rubescens* across its native range and repeated infection by *A. psidii*. Any alternative causal agents have been discounted. This is supported by previous studies (Pegg *et al.* 2014).

Ongoing observations in 2016 of a smaller sub-sample of observed populations from Carnegie *et al.* (2016) since the end of the documented study period (2011-2014) estimate mortality has increased to over 50% (A. Carnegie *in litt.* July 2016). Ongoing observations also indicate that there has been no evidence of regenerating populations surviving, with no seedlings observed (A. Carnegie *in litt.* July 2016). Mortality in mature *R. rubescens* individuals is continuing to increase in a sub-sample of survey plots and this effect is consistent across much of the native range (A. Carnegie *in litt*. July 2016). At one monitoring site the average canopy transparency rating, indicating dieback levels has increased to 88% (June 2016) from 72% in (2014) in >50 trees assessed (G. Pegg *in litt*. July 2016). A small trial was established at Tucki Tucki Nature Reserve in northern NSW to examine the impact of *A. psidii* infection on flower and fruit production and survival. Branches with flowers were sprayed with fungicide monthly and survival compared to untreated branches. While fruit were produced on the untreated branches, all became infected and none survived until maturity (G. Pegg *in litt*. July 2016).

An obvious change in species composition following mortality of *R. rubescens* has been detected in a sub-sample of surveyed plots. The tree *Cupaniopsis anacardioides* has replaced *R. rubescens* in some of the coastal areas as have a mix of species in inland areas including weeds (including *Lantana camara*) (G. Pegg *in litt*. July 2016).

Monitoring has also documented declines in the population of *Rhodamnia rubescens* in the north western corner of Bongil Bongil National Park in East Boambee, 10 km south of Coffs Harbour, NSW (M. Smith *in litt*. Aug 2016). This monitoring survey assessed the impact of *A. psidii* infection on 30 *R. rubescens* plants between 2011-2014 and documented mortality of > 80% over this time period (25 of the 30 plants dead, all with severe levels of infection). Return surveys in Aug 2016 document mortality in the five remaining plants (i.e. 100% mortality between 2012-2016). A nearby population of 11 plants was monitored for infection with *A. psidii* between 2014-2016. Three of the 11 plants have died in the last two years, three have severely declined (foliage loss over two years of between 80-95% of 2014 levels), two have suffered decline in foliage coverage of around 50% from 2012 levels. All these three plants displayed active and abundant *A. psidii* spores during this recent inspection. The remaining three plants have stabilised their foliage loss (M. Smith *in litt.* Aug 2016). Resurveys of many of these sites and popualtions have documented continuing decline and mortality (J. Willis *in litt.* April 2018).

Quantitative findings of large declines in *Rhodamnia rubescens* populations are supported by field botanists who have conducted extensive surveys during routine botanical surveys and seed collecting over many years. Specific comments reported about the rapid and widespread decline of the in Carnegie *et al.* (2016) include:

"... all sites of *R. rubescens* visited since 2010 are in serious decline ... with no flowering or seed observed"

" ... *R. rubescens* [is] seriously threatened, with significant decline in all stands visited ... the worst area in the Bellinger Valley [NSW] where hundreds of plants have died ... "

"*R. rubescens* [has not] flowered since 2010, with at least half of *R. rubescens* dead…at monitoring sites"

Large reductions in population size across the range of *R. rubescens* since infection with of *A. psidii* have been documented over a short period of time (10% mortality over a period of 3-3.5 years (2011 -2014)) relative to the generation length of the species. The generation length of *R. rubescens* is suspected to be at least 30-40 years given the height (> 25 m) which the species can attain (Floyd 2008). Soil-stored seed banks are unlikely to be extensive for this species given its affinity for rainforest environments with high litter decomposition rates. The inferred median time to germination of seed is 1.5 months being described as “1-2 months” in Benson and McDougall (1998).

Based on tree mortality data from extensive field surveys (Carnegie *et al.* 2016), *ad hoc* observations of infection and mortality in regenerating shoots and seedlings (various pers. comm) and expert opinion about the apparent health of populations prior to the spread of *A. psidii* and recent declines it is estimated that *R. rubescens* has already undergone a population reduction of approximately 10% in less than five years. However, given the relatively long, suspected generation length of the species and high susceptibility to *A. psidii* infection across all age-classes of the species it is reasonably suspected that declines of greater than 80% of individuals may occur within three generations.

Multiple factors indicate that the rapid decline of *R. rubescens* is likely to continue into the future. These factors include:

Lack of effective or practical control

No effective or practical chemical, biological or management control is currently available for protecting populations of *Rhodamnia rubescens* in natural ecosystems from *A. psidii* infection. Repeated monthly application of registered fungicides (e.g. triadimenol) for extremely high value assets concentrated in small local areas may be feasible but is impractical for widespread control. Where triadimenol has been used in experimental trials of *A. pisdii* control in natural populations of *R. rubescens* applications repeated at longer than a monthly interval did not control infection (Carnegie *et al.* 2016). In the absence of an effective control strategy for *A. psidii* further rapid reductions of *R. rubescens* populations and individuals are highly likely.

The ubiquity of susceptible species in the family Myrtaceae in the Australian landscape makes broad-scale eradication or containment of *A. psidii* unlikely (Glen *et al.* 2007). Surviving plants and populations of *R. rubescens* will continue to be subject to spore load (whether as wind-borne spores or by other vectors) from other species which severely reduces the likelihood of population recovery (ANPC *in litt.* April 2016). Whilst some biological control agents have been trialled in other countries to control *A. psidii* in *Eucalyptus* plantations the likelihood that these controls will become viable options for eradication in Australia in the time frame relevant to the regeneration capacity of *R. rubescen*s are negligible (Glen *et al.* 2007). Manipulation of the environment via management actions (e.g. fire management) to control *A. psidii* on established trees would likely lead to high infection rates on highly susceptible resprouting leaf material (Carnegie *et al.* 2016).

Inadequate ex-situ collections

No adequate ex-situ collections of *R. rubescens* material exist (G. Errington *in litt*. October 2016). For example, current holdings of wild-collected seed at the NSW Seedbank number < two hundred seeds from two accessions. Tests on these holdings have shown extremely variable rates of seed fill (ranging from less than 1% to about 70%) (ANPC *in litt.* April 2016). Soft-fruited Myrtaceae from rainforest environments are characterised by seeds which are desiccation-intolerant and, therefore, not suited to long-term conservation storage (Sommerville and Offord 2014). The Australian Seed Bank partnership reports that the conservation seed bank at Mt Coot-tha, Brisbane, has one batch of *R. rubescens* seed of unknown quantity (ANPC *in litt*. April 2016). Tissue culture collections are currently held within the NSW PlantBank at the Australian Botanic Garden, Mount Annan NSW.

On the basis field observations of fruit production decline since 2012, NSW Seedbank collectors only expect to be able to find significant collectable quantities of fruit or seed of R. rubescens at some locations for another couple of years (ANPC *in litt*. April 2016).

Ecology

Rhodamnia rubescens commonly occurs in all rain forest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is a common pioneer species in eucalypt forests (Floyd 2008). Populations and individuals of *R. rubescens* are often found in wet sclerophyll associations in rainforest transition zones (including open forest of *Eucalyptus tereticornis* and *E. bosistoana* in the Sydney region) and creekside riparian associations (Benson and McDougall 1998).

R. rubescens flowers from late winter through spring, with a peak in October and fruits appear in December in the Sydney region. The species is able to resprout from rootstock after fire and produce suckers which may develop into thickets (Benson and McDougall 1998). The species is characterised as a common understory tree (M. Smith *in litt.* Aug 2016).

The habitat of *R. rubescens* is likely to include the following vegetation classes: Subtropical Rainforests, Northern Warm Temperate Rainforests, Littoral Rainforest, North Coast Wet Sclerophyll Forests, Northern Hinterland WSF, Northern Escarpment WSF, Southern Lowland WSF, and probably the northern patches of South Coast WSF and Southern Escarpment WSF, and perhaps easterly patches of Northern Tableland WSF. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations (Keith 2004; Floyd 2008).

Under the BC Act, *R. rubescens* is listed as a characteristic species in the Final Determination for the Endangered Ecological Community (EEC) 'Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Comer Bioregions'. *Rhodamnia spp*. are listed as characteristic species for the in the Final Determination EEC 'Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions' and the distribution of *R. rubescens* coincides with the spatial currently documented spatial extent of this EEC.

The species is also highly likely to occur in the followings EECs listed under the BC Act (though is not listed as a characteristic species): 'Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion', 'Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion' and 'Illawarra Subtropical Rainforest in the Sydney Basin Bioregion'. The species may possibly occur in the following EECs listed under the Act (though is not listed as a characteristic species): 'Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions', 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', 'Kurnell Dune Forest in the Sutherland Shire and City of Rockdale', 'Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion' and 'Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion'.

Threats

Mortality caused by infection by *Austropuccinia psidii* (see ***'Evidence of population decline'***).

It is reasonably suspected that some populations of *R. rubescens* may also have undergone decline as a result of threatening processes in the past, such as land-clearing (particularly in rainforest clearing efforts in northern NSW for agriculture), fragmentation of populations, and weed invasion. These threats have been documented as causes of decline in the EEC 'Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' where R. rubescens is a named as a characteristic species (Adam 1987, 1992; Floyd 1990; Mills 1996).

Assessment against BC Act/ IUCN Red List criteria

For this assessment is it considered that the survey of *Rhodamnia rubescens* has been adequate and there is sufficient scientific evidence to support the assessment outcome.

Clause 4.2 – Reduction in population size of species (Equivalent to IUCN criterion A)

Assessment Outcome: Clause/Criterion met at Critically Endangered threshold.
Justification: To be listed as threatened under Clause 4.2/IUCN Criteria A the species must have experienced a population reduction of 80% (CR threshold) over three generations or 10 years (whichever is longer). The effect of *Austropuccinia psidii* (Myrtle Rust) infection on *Rhodamnia rubescens* is severe across the species entire range based on quantitative evidence from field surveys. All age classes of *R. rubescens* have been documented to be affected by *A. psidii* (Carnegie *et al.* 2016) which severely reduces the capacity of infected populations to recover through time. Populations of *R. rubescens* are projected to continue to decline rapidly as a consequence of infection by *A. psidii*. Within three generations, assuming a generation time of 30-40 years, a quantitative estimate of decline of 96-99% has been made based on documented rates of mortality across the range.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a) ~~(b)~~ ~~(c)~~	for critically endangered species ~~endangered species~~ ~~vulnerable species~~	a very large reduction in population size. ~~a large reduction in population size~~ ~~a moderate reduction in population size~~
(2) - The determination of that criteria is to be based on any of the following:			
	~~(a)~~	~~direct observation,~~	
	~~(b)~~	~~an index of abundance appropriate to the taxon,~~	
	~~(c)~~	~~a decline in the geographic distribution or habitat quality,~~	
	~~(d)~~	~~the actual or potential levels of exploitation of the species,~~	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)
Assessment Outcome: Clause/Criterion not met.
Justification: *Rhodamnia rubescens* has a large geographic range.

Extent of Occurrence: The extent of occurrence (EOO) for *Rhodamnia rubescens* is estimated to be 147,340 km^2.

Area of Occupancy: The area of occupancy (AOO) for *Rhodamnia rubescens* is estimated to be 3,360 km^2 (based on the species occupying 840 (2 x 2 km) cells, the scale of measurement recommended by IUCN 2017).

The geographic distribution of the species is:			
	~~(a)~~ ~~(b)~~ ~~(c)~~	~~for~~ ~~critically endangered~~ ~~endangered species~~ ~~vulnerable species~~	~~very highly restricted~~ ~~highly restricted~~ ~~moderately restricted~~
and at least 2 of the following 3 conditions apply:			
	~~(d)~~	~~the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,~~	
	~~(e)~~	~~there is a projected or continuing decline in any of the following:~~	
		~~(i)~~	~~an index of abundance appropriate to the taxon,~~
		~~(ii)~~	~~the geographic distribution of the species,~~
		~~(iii)~~	~~habitat area, extent or quality,~~
		~~(iv)~~	~~the number of locations in which the species occurs or of populations of the species.~~
	~~(f)~~	~~extreme fluctuations occur in any of the following:~~	
		~~(i)~~	~~an index of abundance appropriate to the taxon,~~
		~~(ii)~~	~~the geographic distribution of the species,~~
		~~(iii)~~	~~the number of locations in which the species occur or of populations of the species.~~

IUCN sub clauses
In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU)locations.
b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals
c) Extreme fluctuations.

Clause 4.4 - Low numbers of mature individuals of species and other conditions (Equivalent to IUCN criterion C)

Assessment Outcome: Clause/Criterion not met.

Justification: Although the total population of *Rhodamnia rubescens* is unknown, it is reasonably suspected that given the large geographic range size of the species and its characterisation as a 'common' species (Benson and McDougall 1998; Floyd 2008) that the number of mature individuals may be large (i.e. exceeding the threshold for VU (≥ 10,000 mature individuals).

The estimated total number of mature individuals of the species is:						
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~vulnerable species~~		~~very low~~ ~~low~~ ~~moderately low~~		
and either of the following 2 conditions apply:						
	~~(d)~~	~~a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):~~				
		~~(ii)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Very large~~ ~~Large~~ ~~moderate, or~~		
	~~(e)~~	~~both of the following apply:~~				
		~~(i)~~	~~a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and~~			
		~~(ii)~~	~~at least one of the following applies:~~			
			~~(A)~~	~~the number of individuals in each population of the species is:~~		
				~~(II)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Extremely low~~ ~~very low~~ ~~low, or~~
			~~(B)~~	~~all or nearly all mature individuals of the species occur within one population,~~		
			~~(C)~~	~~extreme fluctuations occur in an index of abundance appropriate to the species.~~		

IUCN sub clauses

At least one of two additional conditions must be met. These are:

C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future).

C2. An observed, estimated, projected or inferred continuing decline

In addition, at least 1 of the following 3 conditions:

a (i). Number of mature individuals in each subpopulation ≤50 (CR) ; ≤250 (EN) or ≤1000 (VU).

a (ii). % of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

b. Extreme fluctuations in the number of mature individuals

Clause 4.5 - Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)

Assessment Outcome: Clause/Criterion not met.

Justification: The total number of mature individuals of *Rhodamnia rubescens* is unknown but is estimated to be more than 100,000. To be listed under Criterion D1 a species must have <1000 mature individuals.

The total number of mature individuals of the species is:			
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Extremely low~~ ~~very low~~ ~~low.~~

IUCN sub clauses

To be listed as Vulnerable, a species must meet at least one of the two following conditions:

D1. Population size estimated to number fewer than 1,000 mature individuals

D2. Restricted area of occupancy (typically <20 km^2) or number of locations (typically <5) with a plausible future threat that could drive the taxon to CR or EX in a very short time.

Clause 4.6 - Quantitative analysis of extinction probability

Assessment Outcome: Data Deficient.

Justification: Currently there is not enough data to undertake a quantitative analysis to determine the extinction probability of *Rhodamnia rubescens.*

The probability of extinction of the species is estimated to be:			
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Extremely high~~ ~~very high.~~ ~~High~~

Conservation and Management Actions

There is no currently NSW Saving Our Species site-managed program for *Rhodamnia rubescens*. The following actions are derived from threat information.

Habitat loss, disturbance and modification

- Develop hygiene protocols to minimise spread of Myrtle Rust.

Invasive species

- Weed control measures at known sites must ensure adequate hygiene protocols to minimise spread of Myrtle Rust.

Ex situ conservation

- Support continued seed storage enablement study in train at NSW PlantBank.
- Secure germplasm (high quantity, geographically and genetically representative).
- Secure germplasm of any detected or suspected resistant individuals.

Stakeholder Management

- Inform land owners and managers of sites, particularly private land holders, mining and State Forests, where there are known populations and consult with these groups regarding options for conservation management and protection of the species and identification of occurrence of myrtle rust.
- Provide up to date information on best phytosanitory practices for reducing risk of spread of myrtle rust.

Survey and Monitoring priorities

- Establish permanent monitoring sites to track decline (utilising Carnegie *et al.* (2016) sites and permanent plot/transect sites).
- Conduct field survey for, and monitoring of, populations exhibiting low levels of Myrtle Rust infection or resistance (especially inland occurrences near and on the Great Escarpment)

Information and Research priorities

- Seek resources for genetic and physiological research into the resistance and susceptibility of *Rhodamnia rubescens to Austropuccinia psidii*.
- Understand the best techniques for long term seed and tissue storage. Investigate and implement options for tissue culture and/or inter-situ live collections (in sites amenable to fungicidal management), as alternatives to seed banking if the species proves storage-intolerant, and/or as resources for seed production and resistance studies.

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http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Rhodamnia~rubescens (accessed 23/3/2017)

Expert Communications

Angus Carnegie, July 2016

Graeme Errington, October 2016

Geoffrey Pegg, July 2016

M. Smith, August 2016

John Neldner, March 2018

Jason Ferris, January 2018

Jarrah Wills, April 2018

David Keith, August 2018

Exhibition period: 01/02/19 – 29/03/19 Proposed Listing date: 01/02/19

Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the tree *Rhodamnia rubescens* (Benth.) Miq. as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Rhodamnia rubescens is eligible for listing as Critically endangered under Clause 4.2 (a) (e) because: i) the species is projected to experience a population reduction of > 80% (CR threshold) over three generations or 10 years due to the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

The NSW Threatened Species Scientific Committee has found that:

1. *Rhodamnia rubescens* (Benth.) Miq. (family Myrtaceae) is described as a "Shrub or small tree to 25 m high, bark reddish brown, fissured; young stems densely tomentose. Leaves with lamina ovate to elliptic, 5–10 cm long, 2–4.5 cm wide, shortly acuminate, base cuneate to rounded, upper surface green and sparsely hairy, lower surface paler and sparsely to densely hairy with erect hairs; strongly 3-veined from base, lateral veins transverse; oil glands distinct, moderately dense; petiole 4–9 mm long. Inflorescences 1–3 per axil, each usually 3-flowered; peduncle 5–22 mm long. Hypanthium sparsely pubescent. Sepals 2–3 mm long, caducous. Petals 4–6 mm diam., white. Stamens 3–5 mm long. Style 4–5 mm long. Fruit globose, 5–8 mm diam., red turning black." (PlantNET 2018).

2. *Rhodamnia rubescens* is currently known to occur in coastal districts north from Batemans Bay in New South Wales (NSW), approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm (Benson and McDougall 1998).

3. *Rhodamnia rubescens* flowers in late winter through to spring, with a peak in October, and fruits typically begin to appear in December (PlantNET 2018). Populations and individuals of *R. rubescens* are often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation (Benson and McDougall 1998). *Rhodamnia rubescens* commonly occurs in all rainforest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is also a common pioneer species in eucalypt forests (Floyd 2008). Suitable habitat for *R. rubescens* is likely to occur in the following vegetation types: Subtropical Rainforests, Warm Temperate Rainforests, Littoral Rainforests, and Wet Sclerophyll Forests. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations (Keith 2004; Floyd 2008;). *Rhodamnia rubescens* has been documented occurring in association with *Acacia melanoxylon*, *Acmena smithii*, *Breynia oblongifolia*, *Corymbia intermedia*, *Endiandra discolor*, *Eucalyptus bosistoana*, *E. tereticornis*, *Glochidion sumatranum, Guioa semiglauca, Lophostemon suaveolens* and *Mallotus philippensis.*

4. In NSW, *Rhodamnia rubescens* is listed as a characteristic species in the Final Determination for the Endangered Ecological Community (EEC) 'Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Comer Bioregions'. *Rhodamnia* spp. are listed as characteristic species for the Final Determination of the EEC 'Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions' and the distribution of *R. rubescens* coincides with the documented spatial extent of this EEC. The species is also highly likely to occur in the followings EECs listed under the Act (although is not listed as a characteristic species): 'Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion', 'Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion' and 'Illawarra Subtropical Rainforest in the Sydney Basin Bioregion'. *Rhodamnia rubescens* may possibly occur in the following EECs listed under the Act (although is not listed as a characteristic species): 'Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions', 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', 'Kurnell Dune Forest in the Sutherland Shire and City of Rockdale', 'Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion' and 'Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion'.

5. *Rhodamnia rubescens* has a large geographic range. The estimated extent of occurrence (EOO) of *R. rubescens* across Australia is 147,340 km^2. The EOO is based on a minimum convex polygon enclosing all occurrences of the species, the method of assessment recommended by IUCN (2016). The area of occupancy (AOO) is estimated as 3,360 km^2 based on 2 km x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2016).

6. The number of mature individuals of *Rhodamnia rubescens* is currently unknown. No formal estimates of total abundance of the species across its range prior to 2010 has been located (B. Makinson *in litt*. April 2016). However, it is reasonably suspected that given the large geographic range size of *R. rubescens* and its characterisation as a common species (Benson and McDougall 1998; Floyd 2008) that a large number of mature individuals may have existed prior to 2010.

7. The survival of *Rhodamnia rubescens* is severely threatened by infection from the exotic rust fungus *Austropuccinia psidii* (myrtle rust). *Austropuccinia psidii* was first detected in Australia on the NSW Central Coast in April 2010 and has since established in natural ecosystems throughout coastal NSW, south-east Queensland and far north Queensland (Carnegie and Lidbetter 2012; Pegg *et al*. 2014). *Austropuccinia psidii* also has a limited distribution in Victoria, Tasmania and the Northern Territory (Carnegie *et al*. 2016). The 'Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is listed as a Key Threatening Process under the Act.

8. *Rhodamnia rubescens* is a known host of *Austropuccinia psidii* (Zauza *et al*. 2010) and is characterised as 'Highly to Extremely Susceptible' to infection (Pegg *et al*. 2014). All plant parts have been documented as being affected by *A. psidii* infection, including leaves, stems, flowers and fruits (Pegg *et al*. 2014; Carnegie *et al.* 2016). The disease rating system of Pegg *et al*. (2014) documents species susceptibility to *A. psidii* infection along a continuum from 'Relatively Tolerant' to 'Extremely Susceptible'. 'Highly Susceptible' species exhibit "rust sori…on 50–80% of expanding leaves and shoots, evidence of rust on juvenile stems and older leaves, leaf and stem blighting and distortion, multiple sori per leaf/stem" whereas 'Extremely Susceptible' species exhibit "rust sori…on all expanding leaves, shoots and juvenile stems; foliage dieback;

evidence of stem and shoot dieback" (Pegg *et al*. 2014). Results of field trials designed to actively prevent infection of *R. rubescens* by *A. psidii* establish a clear relationship between the incidence/severity of *A. psidii* infection and subsequent crown loss (% crown transparency) in this species (Carnegie *et al*. 2016). Any alternative causal agents of crown loss have been discounted. A similar, but smaller, trial was established at Tucki Tucki Nature Reserve in northern NSW to examine the impact of *A. psidii* infection on flower and fruit production and survival in *R. rubescens*. Branches with flowers were sprayed with fungicide monthly and survival compared to untreated branches. While fruit were produced on the untreated branches, all became infected and none survived until maturity (G. Pegg *in litt.* July 2016). Approximately 17 populations of *R. rubescens* have been identified as having lower incidence of damage from *A. psidii* and these may be useful targets for germplasm collection (J. Willis *in litt*. April 2018).

9. Extensive field assessments of *Austropuccinia psidii* infection on *Rhodamnia rubescens* across its entire range show infection is widespread and severe (Carnegie *et al*. 2016; J. Willis *in litt*. April 2018). Carnegie *et al*. (2016) assessed 43 sites for the impact of *A. psidii* on *R. rubescens* between January and October 2014, approximately 3–3.5 years after *A. psidii* had established across the range of this host species. Sites were distributed between Murramarang National Park, near Batemans Bay in NSW, to Traveston Crossing, near Gympie, Queensland. Sites were a mixture of locations where *A. psidii* infection on *R. rubescens* was already known to occur, and where no known infection had been documented (A. Carnegie *in litt*. July 2016). *Austropuccinia psidii* was detected as present on *R. rubescens* plants in a range of age classes at all sites, and no other plant disease established in Australia presents similar symptoms (Walker 1983). At all sites, approximately 20 individuals of *R. rubescens* were assessed for crown transparency using the scheme of Schomaker *et al*. (2007), the incidence of *A. psidii* (% infected) on mature leaves, immature leaves, flowers and fruit and rated for disease prevalence using the scheme from Pegg *et al.* (2012). Individuals were considered dead when crown transparency reached 100%. These comprehensive assessments of populations document mortality in *R. rubescens* across 18 of the 43 sites surveyed, where 12% of all the 669 surveyed trees were dead. Most sites contained only a few dead trees with the following exceptions: five sites had between 20 and 40% mortality, one site with 50% mortality and one site with 75% mortality (Carnegie *et al.* 2016). Across all sites mean crown transparency was 76.3% (standard error 0.8%), with the majority (79%) of trees having greater than 60% transparency. Based on prior knowledge of the species the normal crown transparency in an understorey is approximately 30-35% (Carnegie *et al*. 2016). All age classes of trees, as assessed by tree height, were similarly affected by *A. psidii* infection (Carnegie *et al*. 2016). Across all sites surveyed, disease incidence was greater on immature leaves (average incidence of 56.4%; standard error 2.1%) than on mature leaves (average incidence of 29.8%; standard error 1.2%) and an average disease rating score of 2.4 (0-4 scale; standard error 0.08) was documented.

10. Ongoing observations in 2016 of a smaller sub-sample of populations from Carnegie *et al*. (2016) since the end of the documented study period (2011–2014) estimate mortality has increased to over 50% at Bongil Bongil National Park and Royal National Park (A. Carnegie *in litt.,* July 2016). Greater than 50% mortality has also been observed at a new monitoring site in Pine Creek State Forest on the mid-north coast of NSW (B. Makinson *in litt*. April 2016). Ongoing observations also indicate that there has been no evidence of regenerating populations surviving, with all seedlings/suckers observed being killed by *A. psidii* (A. Carnegie *in litt*. July 2016). The continued decline of mature plants and lack of successful regeneration threaten the long-term viability of *R. rubescens* in the wild.

11. Populations of *Rhodamnia rubescens* are projected to continue to rapidly decline due to infection by *Austropuccinia psidii*. Reductions in population size across the range of *R. rubescens* since infection from *A. psidii* have been documented over a short period of time (12% mortality over a period of 3–3.5 years (2011–2014)) relative to the inferred generation length of at least 30–40 years (Floyd 2008). Soil-stored seed banks are unlikely to be extensive for this species given its affinity for rainforest environments with high litter decomposition rates. Under documented rates of decline due to infection by *A. psidii*, *R. rubescens* is projected to undergo a 96–99% reduction in population size across its range within three generations. All age classes of *R. rubescens* have been documented to be affected by *A. psidii* (Carnegie *et al*. 2016) which severely reduces the capacity of infected populations to recover through time.

12. Quantitative findings of very large declines in *Rhodamnia rubescens* populations due to *Austropuccinia psidii* infection reported in Carnegie *et al*. (2016) are supported by field botanists who have encountered the species during routine botanical surveys and seed collecting over multiple years (B. Makinson *in litt*. April 2016; J. Willis *in litt*. April 2018).

13. There has been no confirmed evidence of resistance to *Austropuccinia psidii* infection in field populations of *Rhodamnia rubescens* to date (Pegg *et al*. 2014). Approximately 17 populations assessed across the range of *R. rubescens* have relatively low damage following infection by *A. psidii* (J. Willis *in litt*. April 2018). These populations may be important sources of naturally resistant germplasm. However, the prospect for naturally selected resistance emerging before the collapse of populations is currently considered small.

14. No effective or practical chemical, biological or management control is currently available for protecting populations of *Rhodamnia rubescens* in natural ecosystems from *Austropuccinia psidii* infection. Repeated monthly application of registered fungicides (e.g. triadimenol) for extremely high value assets concentrated in small local areas may be feasible but is impractical for widespread control. Where triadimenol has been used in experimental trials of *A. pisdii* control in natural populations of *R. rubescens*, applications repeated at longer than a monthly interval did not control infection (Carnegie *et al*. 2016). Whilst some biological control agents have been trialled to control *A. psidii* in *Eucalyptus* plantations overseas the likelihood that these controls will become viable options for eradication in Australia in the time frame relevant to the regeneration capacity of *R. rubescens* is negligible (Glen *et al*. 2007). Manipulation of the environment via management actions (e.g. fire management) to control *A. psidii* on *R. rubescens* would likely lead to high infection rates on resprouting leaf material which is known to be highly susceptible to infection (Carnegie *et al*. 2016). In the absence of an effective control strategy for *A. psidii* further rapid declines of *R. rubescens* populations are highly likely.

15. The ubiquity of susceptible species in the family Myrtaceae in the Australian landscape makes broad-scale eradication or containment of *Austropuccinia psidii* unlikely (Glen *et al*. 2007). The predominantly airborne nature of the rust spores and inadvertent dispersal by human activity (Carnegie and Cooper 2011) infers that *Rhodamnia rubescens* populations and individuals in conservation reserves may be no more secure than any other land tenure. It is expected that surviving plants and populations of *R. rubescens* will continue to be subject to a significant spore load, whether as wind-borne spores or by other vectors. This continued exposure severely reduces the likelihood of population recovery in *R. rubescens* (B. Makinson *in litt*. April 2016).

16. No adequate *ex-situ* collections of *Rhodamnia rubescens* material exist (G. Errington *in litt*. October 2016). Current holdings of wild-collected seed at the NSW Seedbank number < 20

seeds from two accessions. Tests on these seed-lots have shown extremely variable rates of seed fill (ranging from less than 1% to about 70%) (B Makinson *in litt*. April 2016). Soft-fruited Myrtaceae from rainforest environments are characterised by seeds which are desiccation-intolerant and, therefore, not suited to long-term conservation storage (Sommerville and Offord 2014). The Australian Seed Bank partnership reports that the conservation seed bank at Mt Coot-tha, Brisbane, has one batch of *R. rubescens* seed (B. Makinson *in litt.* April 2016). On the basis that field observations have shown a severe decline in fruit production since 2012, NSW Seedbank collectors do not expect to be able to find significant collectable quantities of fruit or seed of *R. rubescens* now or in the future (R. Johnstone *in litt*. October 2014). Some tissue culture collections are currently held within the NSW PlantBank at the Australian Botanic Garden, Mount Annan NSW.

17. It is reasonably suspected that some populations of *Rhodamnia rubescens* may also have undergone significant decline because of other past and current threats, such as land-clearing (particularly in rainforest clearing efforts in northern NSW for agriculture), fragmentation of populations, and weed invasion. These threats have been documented as causes of decline in the EEC 'Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Comer Bioregions' where *R. rubescens* is named as a characteristic species (Adam 1987; 1992; Floyd 1990; Mills 1996).

18. *Rhodamnia rubescens* (Benth.) Miq. is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the *Biodiversity Regulation 2017*:

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Critically Endangered under Clause 4.2 1 (a), 2 (e).

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size
	~~(b)~~	~~endangered species~~	~~a large reduction in population size~~
	~~(c)~~	~~vulnerable species~~	~~a moderate reduction in population size~~
(2) - The determination of that criteria is to be based on any of the following:			
	~~(a)~~	~~direct observation,~~	
	~~(b)~~	~~an index of abundance appropriate to the taxon,~~	
	~~(c)~~	~~a decline in the geographic distribution or habitat quality,~~	
	~~(d)~~	~~the actual or potential levels of exploitation of the species,~~	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)
Assessment Outcome: Clause/Criterion not met.

The geographic distribution of the species is:					
	~~(a)~~	~~for critically endangered~~		~~very highly restricted~~	
	~~(b)~~	~~endangered species~~		~~highly restricted~~	
	~~(c)~~	~~vulnerable species~~		~~moderately restricted~~	
and at least 2 of the following 3 conditions apply:					
	~~(d)~~	~~the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,~~			
	~~(e)~~	~~there is a projected or continuing decline in any of the following:~~			
		~~(i)~~	~~an index of abundance appropriate to the taxon,~~		
		~~(ii)~~	~~the geographic distribution of the species,~~		
		~~(iii)~~	~~habitat area, extent or quality,~~		
		~~(iv)~~	~~the number of locations in which the species occurs or of populations of the species.~~		
	~~(f)~~	~~extreme fluctuations occur in any of the following:~~			
		~~(i)~~	~~an index of abundance appropriate to the taxon,~~		
		~~(ii)~~	~~the geographic distribution of the species,~~		
		~~(iii)~~	~~the number of locations in which the species occur or of populations of the species.~~		

Clause 4.4 - Low numbers of mature individuals of species and other conditions (Equivalent to IUCN criterion C)
Assessment Outcome: not met.

The estimated total number of mature individuals of the species is:						
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~vulnerable species~~		~~very low~~ ~~low~~ ~~moderately low~~		
and either of the following 2 conditions apply:						
	~~(d)~~	~~a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):~~				
		~~(ii)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Very large~~ ~~Large~~ ~~moderate, or~~		
	~~(e)~~	~~both of the following apply:~~				
		~~(i)~~	~~a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and~~			
		~~(ii)~~	~~at least one of the following applies:~~			
			~~(A)~~	~~the number of individuals in each population of the species is:~~		
				~~(II)~~	~~for~~ ~~critically endangered species~~	~~Extremely low~~

					~~endangered species~~ ~~Vulnerable species~~	~~very low~~ ~~low, or~~
			~~(B)~~	~~all or nearly all mature individuals of the species occur within one population,~~		
			~~(C)~~	~~extreme fluctuations occur in an index of abundance appropriate to the species.~~		

Clause 4.5 - Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)
Assessment Outcome: not met.

The total number of mature individuals of the species is:			
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Extremely low~~ ~~very low~~ ~~low.~~

Clause 4.6 - Quantitative analysis of extinction probability
(Equivalent to IUCN criterion E)
Assessment Outcome: Data Deficient.

The probability of extinction of the species is estimated to be:			
	~~(b)~~	~~for~~ ~~critically endangered species~~ ~~endangered species~~ ~~Vulnerable species~~	~~Extremely high~~ ~~very high.~~ ~~High~~

Clause 4.7 - Very highly restricted geographic distribution of species–vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: not met

For vulnerable species,	<u>the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.</u>

Dr Marco Duretto
Chairperson
NSW Threatened Species Scientific Committee

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Appendix D – Biodiversity Credit Report

BAM Biodiversity Credit Report - Stewardship Agreement

Proposal Details

Assessment Id
00025868/BAAS18147/21/00025873

Proposal Name
Mardi Stewardship Old Maitland Rd

BAM data last updated *
29/03/2021

Assessor Name

Assessor Number

BAM Data version *
38

Proponent Names

Report Created
28/05/2021

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Stewardship (for offset sites)

Date Finalised
28/05/2021

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Additional Information for Approval

Vegetation Zones With Customized Rate of Decline
No Changes

PCTs With Customized Benchmarks
No Changes

BAM Biodiversity Credit Report - Stewardship Agreement

Predicted Threatened Species Not On Site

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be created)

Name of Plant Community Type/ID	Name of threatened ecological community	Area	HBT Cr	No HBT Cr	Total credits to be created
684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Not a TEC	51.1	288	0	288
1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast	Not a TEC	30.7	162	0	162
1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	29.4	184	0	184
1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	11.9	45	0	45
1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	3.4	0	16	16

1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	15.1	0	80	80

684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Class	Trading group	Zone	HBT	Credits	IBRA region
	North Coast Wet Sclerophyll Forests	North Coast Wet Sclerophyll Forests <50%	684_Good	Yes	288	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)
	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forests	684_Good	Yes (including artificial)	288	Tier 4 <50%
1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast	Class	Trading group	Zone	HBT	Credits	IBRA region
	North Coast Wet Sclerophyll Forests	North Coast Wet Sclerophyll Forests <50%	1568_Good	Yes	162	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)
	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forests	1568_Good	Yes (including artificial)	162	Tier 4 <50%

1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Name of offset trading group (like for like)	Trading group	Zone	HBT	Credits	IBRA region
	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	-	1590_Good	Yes	184	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)
	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	1590_Good	Yes (including artificial)	184	Tier 3 - Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Name of offset trading group (like for like)	Trading group	Zone	HBT	Credits	IBRA region
	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	-	1718_Good	Yes	45	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)

	Forested Wetlands	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1718_Good	Yes (including artificial)	45	Tier 3 - Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	Name of offset trading group (like for like)	Trading group	Zone	HBT	Credits	IBRA region
	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	-	1720_Good	No	16	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)
	Forested Wetlands	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1720_Good	No	16	#Error

BAM Biodiversity Credit Report - Stewardship Agreement

1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast	Name of offset trading group (like for like)	Trading group	Zone	HBT	Credits	IBRA region
	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	-	1723_Good	No	80	Wyong
	Vegetation Formation (offset variation rules)	Vegetation Class	Zone	HBT	Credits	Offset trading group tier (non TEC's)
	Forested Wetlands	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1723_Good	No	80	#Error

Species Credit Summary

Species (Class of species credits)	Listing Status	Kingdom	Area/Count	Number of credits created
Calyptorhynchus lathami / Glossy Black-Cockatoo	Vulnerable	Fauna	7.3	43
Chalinolobus dwyeri / Large-eared Pied Bat	Vulnerable	Fauna	141.6	775
Litoria brevipalmata / Green-thighed Frog	Vulnerable	Fauna	59.3	297
Melaleuca biconvexa / Biconvex Paperbark	Vulnerable	Flora	12.2	63
Myotis macropus / Southern Myotis	Vulnerable	Fauna	80.8	431

Rhodamnia rubescens / Scrub Turpentine	Critically Endangered	Flora	319.0	265
Syzygium paniculatum / Magenta Lilly Pilly	Endangered	Flora	3.0	3

BAM Candidate Species Report - Stewardship Agreement

Proposal Details

Assessment Id 00025868/BAAS18147/21/00025873	Proposal Name Mardi Stewardship Old Maitland Rd	BAM data last updated * 29/03/2021
Assessor Name	Report Created 28/05/2021	BAM Data version * 38
Assessor Number	Assessment Type Stewardship (for offset sites)	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 28/05/2021	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Calyptorhynchus lathami Glossy Black-Cockatoo	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria brevipalmata Green-thighed Frog	Yes (surveyed)	☐ Jan ☑ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Melaleuca biconvexa Biconvex Paperbark	Yes (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	Yes (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Refer to BAR
Black-eyed Susan	Tetratheca juncea	Refer to BAR
Broad-headed Snake	Hoplocephalus bungaroides	Refer to BAR
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Brush-tailed Rock-wallaby	Petrogale penicillata	Refer to BAR
Bush Stone-curlew	Burhinus grallarius	Refer to BAR
Charmhaven Apple	Angophora inopina	Refer to BAR

Common Planigale	Planigale maculata	Refer to BAR
Eastern Australian Underground Orchid	Rhizanthella slateri	Refer to BAR
Eastern Cave Bat	Vespadelus troughtoni	Refer to BAR
Eastern Osprey	Pandion cristatus	Habitat constraints
Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas	Eucalyptus parramattensis subsp. parramattensis - endangered population	Geographic limitations
Eucalyptus parramattensis subsp. decadens	Eucalyptus parramattensis subsp. decadens	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Giant Barred Frog	Mixophyes iteratus	Refer to BAR
Giant Burrowing Frog	Heleioporus australiacus	Refer to BAR
Giant Dragonfly	Petalura gigantea	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Grove's Paperbark	Melaleuca groveana	Refer to BAR
Heath Wrinklewort	Rutidosis heterogama	Refer to BAR
Koala	Phascolarctos cinereus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Refer to BAR
Leafless Tongue Orchid	Cryptostylis hunteriana	Refer to BAR
Little Bent-winged Bat	Miniopterus australis	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Long-nosed Potoroo	Potorous tridactylus	Refer to BAR
Mahony's Toadlet	Uperoleia mahonyi	Refer to BAR
Masked Owl	Tyto novaehollandiae	Refer to BAR
Maundia triglochinoides	Maundia triglochinoides	Refer to BAR
Native Guava	Rhodomyrtus psidioides	Refer to BAR

Netted Bottle Brush	Callistemon linearifolius	Refer to BAR
Pale-headed Snake	Hoplocephalus bitorquatus	Refer to BAR
Parma Wallaby	Macropus parma	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Red Helmet Orchid	Corybas dowlingii	Refer to BAR
Red-backed Button-quail	Turnix maculosus	Refer to BAR
Red-crowned Toadlet	Pseudophryne australis	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Rough Doubletail	Diuris praecox	Geographic limitations
Slaty Red Gum	Eucalyptus glaucina	Refer to BAR
Small-flower Grevillea	Grevillea parviflora subsp. parviflora	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Squirrel Glider	Petaurus norfolcensis	Refer to BAR
Stephens' Banded Snake	Hoplocephalus stephensii	Refer to BAR
Stuttering Frog	Mixophyes balbus	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints
Tall Knotweed	Persicaria elatior	Refer to BAR
Tetratheca glandulosa	Tetratheca glandulosa	Refer to BAR
Wallum Froglet	Crinia tinnula	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR
White-flowered Wax Plant	Cynanchum elegans	Refer to BAR
Wyong Sun Orchid	Thelymitra adorata	Refer to BAR

BAM Credit Summary Report - Stewardship Agreement

Proposal Details

Assessment Id
00025868/BAAS18147/21/00025873

Proposal Name
Mardi Stewardship Old Maitland Rd

BAM data last updated *
29/03/2021

Assessor Name

Report Created
28/05/2021

BAM Data version *
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Assessor Number

BAM Case Status
Finalised

Date Finalised
28/05/2021

Assessment Revision
0

Assessment Type
Stewardship (for offset sites)

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Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Percent Cleared Value	Area (ha)	Current Vegetation integrity score	Future Vegetation integrity score without management	Future Vegetation integrity score with management	Security benefit score	Total gain in Vegetation integrity	BC Act listing status	EPBC Act listing status	Total number of ecosystem credits
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion												
5	684_Good	Not a TEC	42	51.1	69.3	68	87.4	3.1	22.5			288
											Subtotal	**288**

BAM Credit Summary Report - Stewardship Agreement

Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast												
1	1568_Good	Not a TEC	40	30.7	77.2	75.3	92.9	3.5	21.1			162
											Subtotal	**162**
Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast												
3	1720_Good	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	90	3.4	83.1	80	95.4	3.7	19.1	Endangered Ecological Community	Not Listed	16
											Subtotal	**16**
Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast												
4	1723_Good	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	92	15.1	62.5	60.1	78.8	2.5	21.2	Endangered Ecological Community	Not Listed	80
											Subtotal	**80**

Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest												
2	1590_Good	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	48	29.4	75.3	71.8	93.4	3.4	25.1	Endangered Ecological Community	Not Listed	184
											Subtotal	**184**
Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast												
6	1718_Good	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	74	11.9	83.3	81.2	92.6	3.7	15.1	Endangered Ecological Community	Not Listed	45
											Subtotal	**45**
											Total	**775**

Species credits for threatened species

Vegetation zone name	Total gain in Habitat condition (HC)	Area (ha) / Count (no. individuals)	Constant	BC Act listing status	EPBC Act listing status	Total number of species credits
Calyptorhynchus lathami / Glossy Black-Cockatoo (Fauna)						
1590_Good	25.1	0.58	0.25	Vulnerable	Not Listed	4
1723_Good	21.2	0.01	0.25	Vulnerable	Not Listed	1
684_Good	22.5	6.8	0.25	Vulnerable	Not Listed	38

					Subtotal	**43**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)						
1568_Good	21.1	30.7	0.25	Vulnerable	Vulnerable	162
1590_Good	25.1	29.4	0.25	Vulnerable	Vulnerable	184
1720_Good	19.1	3.4	0.25	Vulnerable	Vulnerable	16
1723_Good	21.2	15.1	0.25	Vulnerable	Vulnerable	80
684_Good	22.5	51.1	0.25	Vulnerable	Vulnerable	288
1718_Good	15.1	11.9	0.25	Vulnerable	Vulnerable	45
					Subtotal	**775**
Litoria brevipalmata / Green-thighed Frog (Fauna)						
1568_Good	21.1	19.5	0.25	Vulnerable	Not Listed	103
1590_Good	25.1	0.85	0.25	Vulnerable	Not Listed	5
1720_Good	19.1	3.3	0.25	Vulnerable	Not Listed	16
1723_Good	21.2	15	0.25	Vulnerable	Not Listed	80
684_Good	22.5	8.8	0.25	Vulnerable	Not Listed	49
1718_Good	15.1	11.8	0.25	Vulnerable	Not Listed	44
					Subtotal	**297**
Melaleuca biconvexa / Biconvex Paperbark (Flora)						
1568_Good	21.1	0.43	0.25	Vulnerable	Vulnerable	2
1720_Good	19.1	0.65	0.25	Vulnerable	Vulnerable	3
1723_Good	21.2	9.9	0.25	Vulnerable	Vulnerable	53
684_Good	22.5	0.04	0.25	Vulnerable	Vulnerable	1
1718_Good	15.1	1.2	0.25	Vulnerable	Vulnerable	4
					Subtotal	**63**

Myotis macropus / Southern Myotis (Fauna)						
1568_Good	21.1	28.7	0.25	Vulnerable	Not Listed	151
1590_Good	25.1	7.3	0.25	Vulnerable	Not Listed	46
1720_Good	19.1	3.4	0.25	Vulnerable	Not Listed	16
1723_Good	21.2	13.8	0.25	Vulnerable	Not Listed	73
684_Good	22.5	22.2	0.25	Vulnerable	Not Listed	125
1718_Good	15.1	5.4	0.25	Vulnerable	Not Listed	20
					Subtotal	**431**
Rhodamnia rubescens / Scrub Turpentine (Flora)						
1568_Good	N/A	139	0.25	Critically Endangered	Not Listed	115
1590_Good	N/A	1	0.25	Critically Endangered	Not Listed	1
1723_Good	N/A	6	0.25	Critically Endangered	Not Listed	5
684_Good	N/A	171	0.25	Critically Endangered	Not Listed	142
1718_Good	N/A	2	0.25	Critically Endangered	Not Listed	2
					Subtotal	**265**
Syzygium paniculatum / Magenta Lilly Pilly (Flora)						
1568_Good	N/A	2	0.25	Endangered	Vulnerable	2
1723_Good	N/A	1	0.25	Endangered	Vulnerable	1
					Subtotal	**3**

BAM Predicted Species Report - Stewardship Agreement

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00025868/BAAS18147/21/00025873	Mardi Stewardship Old Maitland Rd	29/03/2021
Assessor Name	**Report Created**	**BAM Data version ***
	28/05/2021	38
Assessor Number	**Assessment Type**	**BAM Case Status**
	Stewardship (for offset sites)	Finalised
Assessment Revision		**Date Finalised**
0		28/05/2021

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Black Bittern	Ixobrychus flavicollis	1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

Broad-headed Snake	Hoplocephalus bungaroides	684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Diamond Firetail	Stagonopleura guttata	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Eastern Osprey	Pandion cristatus	1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

Gang-gang Cockatoo	Callocephalon fimbriatum	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Golden-tipped Bat	Phoniscus papuensis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Greater Broad-nosed Bat	Scoteanax rueppellii	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Grey-headed Flying-fox	Pteropus poliocephalus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

Grey-headed Flying-fox	Pteropus poliocephalus	684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Koala	Phascolarctos cinereus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Little Bent-winged Bat	Miniopterus australis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Little Eagle	Hieraaetus morphnoides	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

Little Lorikeet	Glossopsitta pusilla	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Masked Owl	Tyto novaehollandiae	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Painted Honeyeater	Grantiella picta	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Powerful Owl	Ninox strenua	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Regent Honeyeater	Anthochaera phrygia	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Rose-crowned Fruit-Dove	Ptilinopus regina	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast

Rosenberg's Goanna	Varanus rosenbergi	684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Scarlet Robin	Petroica boodang	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Speckled Warbler	Chthonicola sagittata	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
Spotted-tailed Quoll	Dasyurus maculatus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Square-tailed Kite	Lophoictinia isura	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Superb Fruit-Dove	Ptilinopus superbus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
Swift Parrot	Lathamus discolor	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Turquoise Parrot	Neophema pulchella	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

Varied Sittella	Daphoenositta chrysoptera	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
White-bellied Sea-Eagle	Haliaeetus leucogaster	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
		1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast
		1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
Wompoo Fruit-Dove	Ptilinopus magnificus	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
Yellow-bellied Glider	Petaurus australis	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast
		1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
		684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion

Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Vegetation Zones Report - Stewardship Agreement

Proposal Details

Assessment Id
00025868/BAAS18147/21/00025873

Assessment name
Mardi Stewardship Old Maitland Rd

BAM data last updated *
29/03/2021

Assessor Name

Report Created
28/05/2021

BAM Data version *
38

Assessor Number

Assessment Type
Stewardship (for offset sites)

BAM Case Status
Finalised

Assessment Revision
0

Date Finalised
28/05/2021

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	1568_Good	1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast	Good	30.66	4	

2	1590_Good	1590-Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Good	29.37	4	
3	1720_Good	1720-Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	Good	3.37	2	
4	1723_Good	1723-Melaleuca biconvexa - Swamp Mahogany - Cabbage Palm swamp forest of the Central Coast	Good	15.12	3	
5	684_Good	684-Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Good	51.1	5	
6	1718_Good	1718-Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Good	11.93	3	

Appendix E – Field Survey Effort

Date	Time	Field Activity	No. of Persons on Site	Company
--/04/2014 – --/07/2014	NS	• Vegetation communities – field verification and aerial photography interpretation.	NS	Biosis
--/04/2014 – --/07/2014	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Biosis
11/09/2014	NS	• Parallel transects targeting *Melaleuca biconvexa*, *Syzygium paniculatum, Diuris praecox*, *Diuris, bracteate*, *Caladenia tessellate*, *Caladenia porphyria*, *Thelymitra adorate, Thelymitra branwhiteii*.	NS	Biosis
08/10/2014	NS	• Parallel transects targeting *Melaleuca biconvexa*, *Syzygium paniculatum, Diuris praecox*, *Diuris, bracteate*, *Caladenia tessellate*, *Caladenia porphyria*, *Thelymitra adorate, Thelymitra branwhiteii*.	NS	Biosis
--/05/2018 – --/06/2018	NS	• Vegetation communities – field verification and aerial photography interpretation.	NS	Travers
30/05/2018	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
31/05/2018	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
07/06/2018	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
08/06/2018	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
13/06/2018	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
25/06/2018	NS	• Deployment of Songmeters (x4) targeting diurnal birds, nocturnal birds, arboreal mammals.	NS	Travers
14/07/2018	NS	• Collection of Songmeters (x4) targeting diurnal birds, nocturnal birds, arboreal mammals.	NS	Travers
07/09/2018	NS	• Parallel transects targeting *Diuris praecox, Prostanthera askania.*	NS	Travers
--/02/2019	NS	• Targeted search for *Maundia triglochinoides, Persicaria elatior.*	NS	Travers
08/02/2019	20:00 – 01:40	• Spotlighting targeting terrestrial mammals.	NS	Travers
13/02/2019	NS	• Vegetation transects; and	NS	Travers

Date	Time	Field Activity	No. of Persons on Site	Company
		• BioBanking plots; and • BAM plots.		
21/02/2019	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
22/02/2019	NS	• Vegetation transects; and • BioBanking plots; and • BAM plots.	NS	Travers
--/05/2019 – --/06/2018	NS	• Vegetation communities – field verification and aerial photography interpretation.	NS	Travers
25/06/2019	09:15 – 16:00 18:00 – 24:00	• Deployment of surveillance cameras (x10) targeting *Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus*; and • Diurnal census (x5) targeting diurnal birds; and • Spotlighting targeting *Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus, Pteropus poliocephalus, Tyto novaehollandiae, Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius*, bats, amphibians; and • Call playback targeting *Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Tyto novaehollandiae, Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius*; and • Call identification targeting amphibians; and • Tadpole searches targeting amphibians.	NS	Travers
26/06/2019	09:15 – 16: 00 18:00 – 24:00	• Diurnal opportunistic targeting reptiles; and • Habitat searches targeting reptiles; and • Amphibian searches targeting amphibians; and • Spotlighting targeting *Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus, Pteropus poliocephalus, Tyto novaehollandiae, Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius*, bats; and • Call Playback targeting *Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis*.	NS	Travers
1/08/2019	10:45 – 21:50	• Diurnal census (x4) targeting diurnal birds; and • Diurnal opportunistic targeting diurnal birds; and • Habitat Tree Assessment targeting Significant Owl Hollows; and	2	Travers

Date	Time	Field Activity	No. of Persons on Site	Company
		• Spotlighting targeting *Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus, Pteropus poliocephalus, Tyto novaehollandiae, Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius*, bats, amphibians; and • Scat searches targeting arboreal mammals; and • Collection of surveillance cameras (x10) targeting *Petrogale penicillate*, *Macropus parma*, *Thylogale stigmatica*, *Potorous tridactylus*, *Dasyurus maculatus*.		
05/08/2019	10:30 – 16:20	• Diurnal opportunistic targeting diurnal birds, reptiles; and • Habitat searches targeting reptiles.	2	Travers
05/08/2019	NS	• Elliot trapping (x51) targeting *Petaurus norfolcensis*, *Phascogale tapoatafa* and (x102) targeting *Planigale maculate*, *Pseudomys gracilicaudatus*.	2	Travers
06/08/2019	07:00 – 16: 30	• Diurnal opportunistic targeting diurnal birds, reptiles; and • Habitat searches targeting reptiles.	NS	Travers
06/08/2019	NS	• Elliot trapping (x51) targeting *Petaurus norfolcensis*, *Phascogale tapoatafa* and (x102) targeting *Planigale maculate*, *Pseudomys gracilicaudatus*.	NS	Travers
07/08/2019	07:00 – 11:40	• Diurnal opportunistic targeting diurnal birds, reptiles; and • Habitat searches targeting reptiles.	NS	Travers
07/08/2019	NS	• Elliot trapping (x51) targeting *Petaurus norfolcensis*, *Phascogale tapoatafa* and (x102) targeting *Planigale maculate*, *Pseudomys gracilicaudatus*.	NS	Travers
08/08/2019	07:00 – 11:40	• Diurnal opportunistic targeting diurnal birds, reptiles; and • Habitat searches targeting reptiles.	NS	Travers
08/08/2019	NS	• Elliot trapping (x51) targeting *Petaurus norfolcensis*, *Phascogale tapoatafa* and (x102) targeting *Planigale maculate*, *Pseudomys gracilicaudatus*.	NS	Travers
09/08/2019	07:00 – 15:00	• Diurnal opportunistic targeting diurnal birds, reptiles; and • Habitat searches targeting *Hoplocephalus stephensii*, *Hoplocephalus bitorquatus*; and • Deployment of surveillance cameras (x4) targeting *Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus.*	NS	Travers
02/09/2019	17:55 – 18:45	• Spotlighting and Stagwatch targeting *Tyto novaehollandiae,Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius, Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Pteropus poliocephalus*.	NS	Travers
03/09/2019	09:30 – 18:45	• Collection of surveillance cameras (x4) targeting *Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus*; and • Frog habitat assessment; and	NS	Travers

Date	Time	Field Activity	No. of Persons on Site	Company
		• Spotlighting and Stagwatch (x2) targeting *Tyto novaehollandiae,Tyto tenebricosa, Ninox strenua, Ninox connivens, Burhinus grallarius, Phascolarctos cinereus, Petaurus australis, Petaurus norfolcensis, Pteropus poliocephalus*.		
06/09/2019	09:30 – 15:45	• Frog habitat assessment.	NS	Travers
07/09/2019	NS	• Parallel transects targeting *Syzygium paniculatum*, *Tetratheca glandulosa, Tetratheca juncea.*	NS	Travers
13/09/2019	NS	• Parallel transects targeting *Rhodamnia rubescens, Tetratheca glandulosa, Tetratheca juncea.*	NS	Travers
17/09/2019	NS	• Parallel transects targeting *Rhodamnia rubescens.*	NS	Travers
19/11/2019	09:45 – 11:15 17:30 – 21:50	• Amphibian searches; and • Spotlighting targeting *Petrogale penicillate, Macropus parma, Thylogale stigmatica, Potorous tridactylus, Dasyurus maculatus*, reptiles.	NS	Travers
27/11/2019	08:50 – 18:40	• Targeted searches for amphibians, reptiles; and • Frog habitat assessment; and • Deployment of ultrasonic microbat recorders (x3); and • Ultrasonic microbat recording (active monitoring).	NS	Travers
--/12/2019	NS	• SAT surveys (x4) targeting *Phascolarctos cinereus*.	NS	Travers
02/12/2019	NS	• Collection of ultrasonic microbat recorders (x3).	NS	Travers
08/02/2020	20:00 – 01:40	• Spotlighting targeting *Litoria aurea*, reptiles; and • Call identification targeting *Litoria aurea*.	2	Travers
10/02/2020	20:00 – 23:20	• Deployment of Songemeters (x6) targeting Mixophyes *spp*.; and • Deployment of ultrasonic microbat recorders (x3); and • Spotlighting targeting *Litoria aurea*, terrestrial mammals, reptiles; and • Call playback targeting *Phascolarctos cinereus*.	2	Travers
11/02/2020	NS	• Deployment of ultrasonic microbat recorders (x2) targeting *Myotis macropus*.	NS	Travers
19/02/2020	NS	• Collection of ultrasonic microbat recorders (x5) targeting *Myotis macropus*.	NS	Travers
26/02/2020	19:30 – 21:30	• Collection of Songmeters (x6) targeting *Mixophyes* spp.; and • Deployment of Songmeters (x3) targeting *Litoria aurea*; and • Spotlighting targeting *Litoria aurea* terrestrial mammals, reptiles; tadpoles and • Call Playback targeting *Litoria aurea*.	NS	Travers
05/03/2020	19:30 – 21:30	• Spotlighting targeting terrestrial mammals and reptiles	NS	Travers
16/03/2020	NS	• Parallel transects targeting *Melaleuca biconvexa, Syzygium paniculatum, Diuris praecox, Diuris, bracteate, Caladenia tessellate, Caladenia porphyria, Thelymitra adorate, Thelymitra branwhiteii.*	NS	Travers

Date	Time	Field Activity	No. of Persons on Site	Company
17/03/2020	NS	• Parallel transects targeting *Melaleuca biconvexa, Syzygium paniculatum, Diuris praecox, Diuris, bracteate, Caladenia tessellate, Caladenia porphyria, Thelymitra adorate, Thelymitra branwhiteii.*	NS	Travers
25/03/2020	19:00 – 01:15	• Spotlighting targeting *Mixophyes* spp., terrestrial mammals, reptiles; and • Call Playback targeting *Mixophyes* spp.	2	Travers
26/03/2020	19:50 – 22:00	• Spotlighting and Call Playback targeting *Litoria aurea*.	NS	Travers
27/03/2020	13:30 – 22:00	• Diurnal opportunistic (diurnal birds); and • Collection of Songmeters (x3) targeting *Litoria aurea*.	NS	Travers
31/03/2020	19:30 – 22:00	• Spotlighting and Call Playback targeting *Mixophyes spp.*.	NS	Travers
05/01/2021	09:00 - 15:20	• Threatened flora search (25 m transects, meander survey and radiate search from target species sightings) targeting *Rhodamnia rubescens*, *Melaleuca biconvexa*, *Syzygium paniculatum*; and • Incidentals.	3	AEP
06/01/2021	09:00 – 14:30	• Threatened flora search (25 m transects, meander survey and radiate search from target species sightings) targeting *Rhodamnia rubescens*, *Melaleuca biconvexa*, *Syzygium paniculatum*; and • Incidentals.	2	AEP
12/01/21	09:00 – 15:30	• Rapid Data Points of Vegetation; and • Weed mapping; and • Incidental Threatened Species Search targeting *Rhodamnia rubescens, Melaleuca biconvexa* and *Syzygium paniculatum*	2	AEP
13/01/21	09:00 – 15:30	• Rapid Data Points of Vegetation; and • Weed mapping; and • Incidental Threatened Species Search targeting *Rhodamnia rubescens, Melaleuca biconvexa* and *Syzygium paniculatum.*	2	AEP
25/01/2021	13:30 – 18:00	• Rapid Data Points of Vegetation; and • Weed mapping; and • Incidental Threatened Species Search targeting *Rhodamnia rubescens, Melaleuca biconvexa* and *Syzygium paniculatum.*	2	AEP
02/02/2021	10:10 – 15:30	• Threatened flora search (25 m transects, meander survey and radiate search from target species sightings) targeting *Rhodamnia rubescens*, *Melaleuca biconvexa*, *Syzygium paniculatum.*	2	AEP

NS = Not specified

Appendix F – Author CVs

Tim Mouton
Curriculum Vitae

Tim works with AEP in the role of Ecologist. Tim has over 10 years of professional experience managing projects in the fields of ecology, natural area restoration, biodiversity conservation, community education, and construction environmental management. Tim also has 5 years experience working in the field as a bush regenerator.

Qualifications

- Bachelor of Environmental Science University of Newcastle (2001)
- Conservation Land Management Certificate II Tafe (2003)
- Master of Environmental Science Southern Cross University (2008)

Further Education & Training (select summary)

- Biodiversity Assessment Methodology (BAM) Accredited Assessor (BAAS: 19083)
- NSW Class C Driver's Licence. Experienced 4WD operator.
- OH&S NSW White Card
- Erosion & Sediment Control Training (4 day Blue Book course / CPESC)
- Feral Animal Control training (1080 & Pindone baiting)
- Certificate 3 in Chemical Application (AQF3)

Fields of Special Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna
- Highly proficient at botanical surveys and establishing monitoring programs
- Project Management and auditing
- Restoration Science

Professional Affiliations / Memberships (past / present)

- Board of Management member for Worimi Conservation Lands (NPWS & Worimi LALC)
- Certified Practitioner in Erosion & Sediment Control (CPESC) (not currently active)

Relevant Employment History

2019-present **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2015-2018 **Senior Project Officer / Ecologist**
Conservation Volunteers Australia / WetlandCare Australia

- Project managing on-ground restoration works including revegetation, site stabilisation, weed control and bush regeneration.
- Facilitating community engagement events, and supervision of volunteers.
- Undertaking site assessments, ecological surveys, and preparing plans of management.
- Scoping and preparing grant applications, managing all aspects of grant delivery, budgets, and reporting.

2009-2015 **Senior Ecologist / Environmental Scientist**
Onsite Environmental Management

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Environmental site management, monitoring and compliance auditing on large scale infrastructure projects and extractive industries.

2008-2009 **Bush Regenerator / Leading Hand**
Lane Cove Council
Australian Wetlands

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and supervision and training of volunteers.
- Supervising bush regeneration and weed management teams.
- Undertaking large scale revegetation works on infrastructure projects involving mass tubestock planting, site stabilisation and maintenance weeding.

2006-2007 **Ecologist / Environmental Scientist**
GeoLINK Consulting

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Monitoring and analysis of wetland, groundwater, and domestic wastewater systems.

2002-2006 **Bush Regenerator / Leading Hand**
Gondwana Bush Restoration
Willoughby City Council

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and translocation of vegetation.
- Supervision and training of bush regeneration teams and volunteers.

2001-2002 John Holland Construction
Environmental Officer

- Environmental site management and monitoring and reporting on large scale infrastructure projects.

Relevant Volunteer Experience

2014 - Current Burwood Beach Coastcare - Facilitator (Volunteer)

Supporting and managing volunteers, on-ground works, promotion and funding opportunities on a monthly basis, to undertake conservation and restoration activities within Glenrock State Conservation Area (NPWS estate).

2013 - 2016 Humane Society International – EPBC Act Nomination Support

Preparation of Threatened Ecological Community (TEC) nominations under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act).

IAN BENSON
Curriculum Vitae

Ian works with AEP in the role of Principal Ecologist. He is an experienced field ecologist, bird watcher and a regular participant in wader surveys. Ian has previously had a successful career as a project manager with a local geotechnical engineering firm. His background in project management and soil sciences combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Graduate Diploma in Science (Ecology) University of New England (2014)
- Bachelor Engineering (Civil) University of Newcastle (2008)

Further Education & Training (select summary)

- Biobank and Biocertification Assessors Training Course
- Advanced Plant Identification (University of New South Wales)
- NSW Class C Driver's Licence. Experienced 4WD operator
- Occupational Health & Safety Training
- Rail Industry Worker
- ARTC Safety Induction for Contractors (NSW)
- ARTC Hunter Bulk Terminal Induction

Fields of Special Competence

- Biobanking & Biodiversity Offset Commissions – initial scoping and feasibility, BAM impact assessments and BDAR reporting, biobank calculations, Stewardship site creation
- Detailed knowledge of environmental legislation and approval pathways
- Ecological field survey and habitat assessment covering terrestrial and aquatic flora and fauna. Experienced in camera trap methods particularly targeting cryptic and difficult to identify mammal species.
- Highly proficient at avifauna surveys, including challenging wetland and shorebird environs
- High level of experience undertaking nocturnal survey of arboreal mammals and nocturnal birds
- Project Management
- Soil science

Professional Affiliations / Memberships (past / present)

- Hunter Bird Observers Club (HBOC)
- Australasian Seabird Group
- Graduate Member of The Institution of Engineers Australia in the Civil College

Relevant Employment History

2019-Current **Principal Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning in the role of Principal Ecologist overseeing a team of 15 professional ecology staff and all aspects of the business including training and management of field and office staff undertaking ecology and bushfire works to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2018-2019 **Senior Ecologist**
Anderson Environment & Planning, Newcastle

2016-2018 **Ecologist**
Anderson Environment & Planning, Newcastle

2012-2016 **Project Manager**
Douglas Partners, Newcastle

As a project manager with Douglas Partners I was responsible for proposal and tender preparation, planning, implementation and reporting of geotechnical and geo-environmental investigations for a broad range of projects including site classification, foundations, pavements, bridges and slope stability. I was required to liaise with clients regarding project requirements, project goals and deadlines. I was responsible for the development and implementation of Work Health and Safety Plans as well as Environmental Plans and documentation. This included the development of safe work procedures, safety inspections on site and implementing improved safety procedures with staff. I was responsible for ensuring projects were completed on time and on budget whilst meeting the clients' expectations and achieving quality assurance standards.

2008-2012 **Geotechnical Engineer**
Douglas Partners, Newcastle

As a geotechnical engineer for Douglas Partners I was involved in the planning and implementation of geotechnical investigations for a wide range of development in the Hunter Valley area. I was primarily involved in site supervision of geotechnical investigations using drilling rigs for boreholes, truck mounted cone penetration testing and test pit excavations using excavators and backhoes. My role also included site inspections involving the assessment of conditions for piles, piers and shallow footings. I also undertook site walkovers for assessment of mine subsidence and slope stability.

2007-2008 **Undergraduate Geotechnical Engineer**
Douglas Partners, Newcastle

Whilst an undergraduate engineer with Douglas Partners I experienced a broad range of practice areas and developed a diverse range of engineering skills.

Relevant Ecological Experience

2013 - Current **Bird Surveyor**
Hunter Bird Observers Club

Volunteer survey work for Hunter Bird Observers Club for regular wader and water bird counts and Tomago and Kooragang Island.

2017 – Current **Birdata Moderator**
Birdlife Australia

Volunteer moderating and vetting bird surveys from *Birdata* which is the Birdlife Australia Atlas to ensure a robust database for both the Hunter Valley and Central Coast reporting areas totalling approximately 5000 surveys per year.

Appendix G – BSSAR BAM Checklist

Appendix M: Requirements for a Biodiversity Stewardship Site Assessment Report

BAM Reference	Minimum Requirements	BSSAR Section	Completed
Information			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: • brief description of proposed biodiversity stewardship site • identification of subject land footprint, including: • - location • - lot and DP numbers • General description of the subject land	1.1	✓
	• Sources of information used in the assessment, including reports and spatial data	1.1.4	✓
	• Identification of assessment method applied (i.e. linear or site-based)	1.4.1	✓
Landscape context - Section 3.1, 3.2 and Appendix E	Identification of site context components and landscape features at the biodiversity stewardship site, including: • general description of subject land topographic and hydrological setting, geology and soils • percent native vegetation cover in the assessment area (as described in BAM Section 3.2) • IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) • NSW (Mitchell) landscape features and area (ha) (as described in BAM Section 3(2.)) • rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E) • wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) • connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.)) • areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(10.) • areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	1.3.2	✓
Native vegetation - Chapter 4, Appendix A and Appendix H	• Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	1.3.1 1.3.3 Table 1	✓

BAM Reference	Minimum Requirements	BSSAR Section	Completed
	• Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1) • Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 3.2 • Describe the use of more appropriate local data and provide reasons that support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	Appendix E (Field Survey Effort)	
	For each PCT within the subject land, describe: • vegetation class • extent (ha) within subject land • justification of evidence used to identify a PCT (BAM Section 4.2(1–3.)) • plant species relied upon for identification of the PCT and relative abundance of each species • TEC status (BAM Subsection 4.2.2(1–2.)) • estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.)) • equivalence with mapping units of previous vegetation maps reviewed as part of the assessment (i.e. equivalent mapping units)	1.4 1.5 Table 2 Table 3 Table 4	✓
	Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1) • assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.)) • list of high threat weed species present on the land	1.5.3 1.5.4 Table 4 Table 5 Figure 4 Appendix A	✓
	Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): • identify the PCT or vegetation class for which local benchmark data will be applied • identify published sources of local benchmark data (if benchmarks obtained from published sources)	n/a	-

BAM Reference	Minimum Requirements	BSSAR Section	Completed
	• describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) • provide justification for use of local data rather than BioNet Vegetation Classification benchmark values		
Threatened species (optional for biodiversity stewardship agreements) - Chapter 5	• Describe the review of existing information and any field survey undertaken to assess habitat constraints and microhabitats for threatened species within the subject land.	1.1 1.1.3 1.1.4 1.2.1 1.3.1 Appendix E (Field Survey Effort)	✓
	Identify ecosystem credit species associated with PCTs on the subject land as outlined in BAM Subsection 5.1.1, including: • list of ecosystem credit species derived from the TBDC (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification for exclusions of any ecosystem credit species based on habitat constraints (as described in BAM Subsection 5.2.2)	Table 6 Appendix E (Field Survey Effort)	✓
	Identify candidate species credit species on the subject land as outlined in BAM Subsections 5.2.1–5.2.6, including: • list of species credit species derived from the TBDC (as described in BAM Subsection 5.1.2) • justification for inclusions and exclusions based on habitat constraints (as described in BAM Subsection 5.2.2 • list of candidate species credit species with suitable habitat on the subject land (as described in BAM Subsection 5.2.3)	Table 7	✓
	From the list of candidate species credit species, identify: • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	Table 7	✓
	Where use of local data is proposed (BAM Subsection 1.4.2): • identify relevant species	n/a	-

BAM Reference	Minimum Requirements	BSSAR Section	Completed
	• identify aspect of species data • identify source of information for local data • justify use of local data in preference to database value		
	Describe targeted surveys undertaken to determine the presence of each candidate species credit species, including: • details of targeted survey effort, timing and weather (as described in BAM Section 5.3) • justification of survey method (e.g. citation of peer-reviewed literature) if approach differs from the Department's threatened species survey guidelines or where no relevant guideline has been published • survey personnel and relevant experience	1.3.1 Figure 5 Figure 6 Table 7 Appendix E (Field Survey Effort) Study Certification & Licencing section	✓
	Describe the use of expert reports where used in place of targeted survey (as described in BAM Section 5.3, Box 3), including: • justification of the use of an expert report • identify the expert and provide evidence of their expert credentials	n/a	-
	Describe the presence of each candidate species credit species within the subject land based on: • results of targeted threatened species survey (as described in BAM Section 5.3) • results of any expert reports including justification for presence of the species assessed and information considered in making this assessment (as described in BAM Section 5.3, Box 3)	Table 7 Table 10 Figure 9	✓
	For species credit species identified as present within the subject land (determined on basis of survey or expert report): • determine the species polygons identifying the extent of habitat for the species credit species within the subject land (as described in BAM Subsection 5.2.5(1–5.)) • describe the habitat features and/or habitat constraints associated with each species credit species within the subject land (as described in BAM Subsection 5.2.5(6.)) • describe the habitat condition within each species polygon (as described in BAM Subsection 5.2.6) • for flora species credit species, provide a count, or an estimation, of the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	1.4 Table 7 Table 10 Figure 9	✓
Maps			

BAM Reference	Minimum Requirements	BSSAR Section	Completed
Introduction - Chapters 2 and 3	• Map of the subject land boundary showing the final proposal BSA site	Figure 1	✓
Landscape context - Section 3.1, 3.2 and Appendix E	Site Map • Boundary of subject land • Cadastre of subject land • Landscape features identified in BAM Subsection 3.1.3 • Areas of outstanding biodiversity value within the subject land	Figure 1	✓
	Location Map • Digital aerial photography at 1:1,000 scale or finer • Boundary of subject land • 1500 m buffer area or 500 m buffer for linear site • Landscape features identified in BAM Subsection 3.1.3 • Additional detail (e.g. local government area boundaries) relevant at this scale • Areas of outstanding biodiversity value within the assessment area	Figure 2	✓
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include: • IBRA bioregions and subregions • NSW (Mitchell) landscape regions • rivers, streams and estuaries • important and local wetlands • connectivity of different areas of habitat • areas of geological significance and soil hazard features • any additional landscape features identified in any SEARs for the proposal	Figure 2	✓
Native vegetation - Chapter 4, Appendix A and Appendix H	• Map of native vegetation extent within the subject land at scale not greater than 1:10,000 (as described in BAM Section 4.1(1–3.))	Figure 3	✓
	• Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4	✓
	• Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 4	✓
	• Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4	✓
	• Map of TEC distribution on the subject land	Figure 4	✓
	• Patch size of native vegetation (as described in BAM Subsection 4.3.2)	1.6.3	✓

BAM Reference	Minimum Requirements	BSSAR Section	Completed
Threatened species (optional for biodiversity stewardship agreements) - Chapter 5	• Map of species credit species records within the subject land and species polygons for flora and fauna species (as described in BAM Subsection 5.2.5(1–5.))	Figure 7 Figure 8	✓
Tables			
Introduction - Chapters 2 and 3	N/A	-	-
Landscape context - Section 3.1, 3.2 and Appendix E	N/A	-	-
Native vegetation - Chapter 4, Appendix A and Appendix H	Table of current vegetation integrity scores for each vegetation zone within the site and including: • composition condition score • structure condition score • function condition score	Table 8	✓
Threatened species (optional for biodiversity stewardship agreements) - Chapter 5	• Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and: • identifying any ecosystem credit species removed from the list of species on the basis of further assessment in accordance with BAM Subsections 5.2.2) • identifying the sensitivity to gain class of each species	Table 6	✓
	• Table detailing species credit species in accordance with BAM Subsections 5.2.1–5.2.2 and identifying: • those species identified as candidate species credit species • presence on site as determined by targeted survey expert report or important mapped area	Table 7 Table 10 Appendix D (Biodiversity Credit Report)	✓
	• Table detailing species credit species recorded within the subject land, habitat feature/component associated with the species, its abundance (flora)/extent of habitat (flora and fauna) (as described in BAM Subsection 5.2.6)	Table 7	✓
Data			
Introduction - Chapters 2 and 3	• N/A	Contents 1.1	✓

BAM Reference	Minimum Requirements	BSSAR Section	Completed
Landscape context - Section 3.1, 3.2 and Appendix E	• All report maps as separate jpeg files Individual digital shape files of: • subject land boundary • assessment area (i.e. subject land and 1500 m buffer area) boundary • cadastral boundary of subject land • areas of native vegetation cover • areas of habitat connectivity • additional landscape features identified in any SEARs for the proposal	NA	✓
Native vegetation - Chapter 4, Appendix A and Appendix H	• All report maps as separate jpeg files • Plot field data (MS Excel format) • Plot field data sheets Digital shape files of: • PCT boundaries within subject land • TEC boundaries within subject land • vegetation zone boundaries within subject land • floristic vegetation survey and vegetation integrity plot locations	NA	✓
Threatened species (optional for biodiversity stewardship agreements) - Chapter 5	• Digital shape files of species polygons • Species polygon map in jpeg format • Expert reports and any supporting data used to support conclusions of the expert report	NA	✓

Table 30 Minimum information requirements for the Biodiversity Stewardship Site Assessment Report (application for a biodiversity stewardship agreement), Stage 3: Improving biodiversity values

BAM Reference	Minimum requirements	SBDAR Section	Completed
Information			

BAM Reference	Minimum requirements	SBDAR Section	Completed
Improving biodiversity values - Chapter 11	Ecosystem credits and species credits created at a biodiversity stewardship site, including: • description of the required management actions to improve biodiversity values (BAM Section 11.3) • description of active restoration management actions to improve biodiversity values (BAM Section 11.3) • description of active restoration management actions targeted at manageable high threat weeds • number of ecosystem credits created for the improvement in biodiversity values for each vegetation zone at a biodiversity stewardship site (BAM Section 11.6) • number of species credits created for each threatened species that occurs on the biodiversity stewardship site (BAM Section 11.7) • full disclosure of existing management obligations and management actions and the credit adjustments relating to these (BAM Section 11.9)	Appendix C – Management Plan – Sections 1-6 Table 9 Table 10 NA	✓
Appendix Chapter 11	• Credit reports for ecosystem and species credit species produced by the BAM Calculator	Appendix D	✓
	• Management plan for the biodiversity stewardship site (BAM Section 11.2)	Appendix C	✓
Maps			
Improving biodiversity values - Chapter 11	• Map of species polygon, identifying areas that will not generate credits and areas that will be restored to expand species habitat	Figure 9	✓
Tables			
Improving biodiversity values – Chapter 11	Table of vegetation zones detailing: • Future vegetation integrity score without management, including averted loss (BAM Subsection 11.4.1) • future vegetation integrity score with required and active restoration management (in accordance with BAM Section 4.4, Equation 33 and Equation 34 in Appendix H) • change in vegetation integrity score (BAM Section 11.4) • gain in vegetation integrity score (Equation 37 in Appendix H)	Table 8	✓
	• Table of required management actions, including: • future value of vegetation integrity attributes with management (BAM Subsection 11.4.2)	Appendix C – Management Plan Table 8	✓

BAM Reference	Minimum requirements	SBDAR Section	Completed
	• Table of active restoration management actions, including: • future value of vegetation integrity attributes with management (BAM Subsection 11.4.2)	Appendix C – Management Plan Table 8	✓
	• Table of PCTs at the biodiversity stewardship site and the number of ecosystem credits created	Table 9	✓
	• Table of threatened species at the biodiversity stewardship site and the number of species credits created	Table 10	✓
Data			
Improving biodiversity values – Chapter 11	• Submitted proposal in the BAM Calculator	NA	✓

Biodiversity Stewardship Site Assessment Report: (application for a biodiversity stewardship agreement), Stage 3: Improving biodiversity values

BAM Reference	Information	BSSAR Section	Completed
Report			
Improving biodiversity values - Chapter 11	Ecosystem credits and species credits created at a biodiversity stewardship site, including: • description of the required management actions to improve biodiversity values (BAM Section 11.3) • description of active restoration management actions to improve biodiversity values (BAM Section 11.3) • description of active restoration management actions targeted at manageable high threat weeds • number of ecosystem credits created for the improvement in biodiversity values for each vegetation zone at a biodiversity stewardship site (BAM Section 11.6) • number of species credits created for each threatened species that occurs on the biodiversity stewardship site (BAM Section 11.7) • full disclosure of existing management obligations and management actions and the credit adjustments relating to these (BAM Section 11.9)	Appendix C – Management Plan – Sections 1-6 Table 8 Table 9 NA	✓
Appendix Chapter 11	Credit reports for ecosystem and species credit species produced by the BAM Calculator	Appendix D	✓
	Management plan for the biodiversity stewardship site (BAM Section 11.2)	Appendix C	✓
Maps			
Improving biodiversity values - Chapter 11	Map of species polygon, identifying areas that will not generate credits and areas that will be restored to expand species habitat	Appendix C – Management Plan – Section 1, Figure 3	✓
Tables			
	Table of vegetation zones detailing:	Table 8	✓

BAM Reference	Information	BSSAR Section	Completed
Improving biodiversity values – Chapter 11	• Future vegetation integrity score without management, including averted loss (BAM Subsection 11.4.1) • future vegetation integrity score with required and active restoration management (in accordance with BAM Section 4.4, Equation 33 and Equation 34 in Appendix H) • change in vegetation integrity score (BAM Section 11.4) • gain in vegetation integrity score (Equation 37 in Appendix H)		
	Table of required management actions, including: • future value of vegetation integrity attributes with management (BAM Subsection 11.4.2)	Appendix C – Management Plan – Sections 1-6 Table 8	✓
	Table of active restoration management actions, including: • future value of vegetation integrity attributes with management (BAM Subsection 11.4.2)	Appendix C – Management Plan – Sections 1-6 Table 8	✓
	Table of PCTs at the biodiversity stewardship site and the number of ecosystem credits created	Table 9	✓
	Table of threatened species at the biodiversity stewardship site and the number of species credits created	Table 10	✓
Data			
Improving biodiversity values – Chapter 11	Submitted proposal in the BAM Calculator	NA	✓

Appendix H – Total Fund Deposit Spreadsheet

Total Fund Deposit worksheet (Part A costs)

This template should be used for estimating the Total Fund Deposit and preparation of the payment schedule

Site location	414 Old Maitland Rd, Mardi NSW
Site owner	Transitional Pastoral Pty Ltd
Are you registered for GST/do you have an ABN?	Yes
ABN	96 003 121 882
(OFFICE USE ONLY: REFERENCE NUMBER):	
(OFFICE USE ONLY: SAP WBS):	

Add row for **management action cost**

Add row for **other recurring cost**

Real discount rate
2.60%

Management action costs	Timing			Estimated annual cost ($)	Year																			Present value of payments for first 20 yrs	Present value of payments after 20 yrs	Present value of all payments
	Start year	End year	Frequency		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Weed Control - Primary	1	2		27,000	27,000	27,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53,316	0	53,316
Weed Control - Primary follow-up	2	3		18,000	0	18,000	18,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34,643	0	34,643
Weed Control - Ongoing	3		2	9,000	0	0	9,000	0	9,000	0	9,000	0	9,000	0	9,000	0	9,000	0	9,000	0	9,000	0	9,000	0	63,215	107,641	170,856
Firebreak / Track Maintenance	1		2	1,800	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	1,800	0	14,443	21,528	35,971
Ecological Fire Management	2		3	10,000	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	54,798	76,712	131,510
Barrier Installation	1	1		20,000	20,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20,000	0	20,000
Fence Installation	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fence Maintenance	1		5	3,000	3,000	0	0	0	0	3,000	0	0	0	0	3,000	0	0	0	0	3,000	0	0	0	0	10,001	14,907	24,908
Integrated Feral Pest Control	3		3	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	23,712	40,376	64,088
Nest Box Installation	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nest Box Maintenance	5	20	2	1,500	0	0	0	0	1,500	0	1,500	0	1,500	0	1,500	0	1,500	0	1,500	0	1,500	0	1,500	0	9,111	0	9,111
Rhodamnia fungicide primary treatment	1	4	1	19,200	19,200	19,200	19,200	19,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73,930	0	73,930
Rhodamnia fungicide ongoing treatment	5		5	19,200	0	0	0	0	19,200	0	0	0	0	19,200	0	0	0	0	19,200	0	0	0	0	19,200	57,760	86,095	143,855
Contingency	4		2	4,000	0	0	0	4,000	0	4,000	0	4,000	0	4,000	0	4,000	0	4,000	0	4,000	0	4,000	0	4,000	27,384	46,628	74,012
					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other recurring costs																											
Annual reporting fee	1		1	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	24,955	37,197	62,152
Compliance Reporting & Monitoring	1			7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	114,080	170,043	284,123
Intensive Monitoring	1		5	8,800	8,800	0	0	0	0	8,800	0	0	0	0	8,800	0	0	0	0	8,800	0	0	0	0	29,336	43,727	73,063
Rhodamnia monitoring	1	20	5	19,200	19,200	0	0	0	0	19,200	0	0	0	0	19,200	0	0	0	0	19,200	0	0	0	0	64,005	0	64,005
Insurance	1		1	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	23,767	35,426	59,192
Site management cost in today's value					109,275	84,475	63,275	33,475	51,775	50,275	22,575	24,275	27,575	33,475	63,575	19,275	22,575	24,275	46,775	45,275	32,575	19,275	22,575	43,475			**Total Trust Fund Deposit**
Present Value (PV) of the site management cost					109,275	82,334	60,109	30,994	46,723	44,220	19,353	20,283	22,456	26,570	49,183	14,534	16,590	17,388	32,655	30,807	21,604	12,459	14,222	26,696	698,454	680,280	**1,378,734**
Discount factors					100%	97%	95%	93%	90%	88%	86%	84%	81%	79%	77%	75%	73%	72%	70%	68%	66%	65%	63%	61%			

	Year																					Present value of payments during first 20 yrs	Present value of payments after 20 yrs	Present value of all payments
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
Annual site management costs in today's values	$109,275	$84,475	$63,275	$33,475	$51,775	$50,275	$22,575	$24,275	$27,575	$33,475	$63,575	$19,275	$22,575	$24,275	$46,775	$45,275	$32,575	$19,275	$22,575	$43,475	$698,454	$680,280	$1,378,734
Annual reporting fee	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$1,575	$24,955	$37,197	$62,152
Total amount payable to landowner (excluding GST)	$107,700	$82,900	$61,700	$31,900	$50,200	$48,700	$21,000	$22,700	$26,000	$31,900	$62,000	$17,700	$21,000	$22,700	$45,200	$43,700	$31,000	$17,700	$21,000	$41,900	$673,499	$643,083	$1,316,582
GST payable to landowner	$10,770	$8,290	$6,170	$3,190	$5,020	$4,870	$2,100	$2,270	$2,600	$3,190	$6,200	$1,770	$2,100	$2,270	$4,520	$4,370	$3,100	$1,770	$2,100	$4,190	$67,350	$64,308	$131,658
Total amount payable to landowner (including GST)	$118,470	$91,190	$67,870	$35,090	$55,220	$53,570	$23,100	$24,970	$28,600	$35,090	$68,200	$19,470	$23,100	$24,970	$49,720	$48,070	$34,100	$19,470	$23,100	$46,090	$740,849	$707,391	$1,448,240