



Biobanking Agreement Credit Assessment Report

Macarthur-Onslow Mt Gilead Biobank Site

Prepared for
Mt Gilead Pty Ltd

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Project Manager	Enhua Lee 02 8536 8633 Level 3, Suite 2 668 Princes Highway Sutherland NSW 2232
Prepared by	Enhua Lee, Joanne Daly
Reviewed by	Robert Humphries
Approved by	Robert Humphries
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Abbreviations

Abbreviation	Description
AW	Alluvial Woodland
BACAR	Biobank Agreement Credit Assessment Report
BBAM 2014	BioBanking Assessment Methodology 2014
BVT	BioMetric Vegetation Type
CEEC	Critically Endangered Ecological Community
CMA	Catchment Management Area
ELA	Eco Logical Australia Pty Ltd
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
LGA	Local Government Area
Mt Gilead	Mt Gilead Pty Ltd
NPWS	National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage
Old Mill Properties	Old Mill Properties Pty Ltd
PCT	Plant Community Types
SHW	Shale Hills Woodland
SPW	Shale Plains Woodland
SSTF	Shale Sandstone Transition Forest
TSC Act	<i>Threatened Species Conservation Act 1995</i>

Executive summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by Old Mill Properties Pty Ltd (Old Mill Properties), on behalf of Mt Gilead Pty Ltd (Mt Gilead), to prepare Biobank Agreement Credit Assessment Reports and Management Plans for the establishment of two Biobank sites within a selected portion of a property owned and referred to by Mt Gilead as the MDP lands, located in Gilead on Appin Road in the Campbelltown Local Government Area (LGA). The MDP lands are comprised of several lots (Lots 59 and 61//DP 752042, and parts of Lots 1 and 2//DP 807555) and have been subject to a proposal to rezone parts of the land holdings from rural land to residential land under the Campbelltown draft LEP 2104. A Biocertification Assessment Report and Biocertification Strategy is currently in preparation for the proposed development of the MDP lands and the land subject to this Biobank application is being treated as 'retained land' with existing conservation obligations within the Biocertification assessment.

Generally, biocertification assessments and strategies are undertaken, with commitments around conservation measures (e.g. registering biobank sites) given, prior to assessing, applying and registering biobank sites. Biobank sites are generally established after land is certified and the certification process is complete. However, registering biobank sites in advance or in parallel to the biocertification process for Mt Gilead will assist in streamlining the formal biocertification process (as the conservation areas will already be secured and available to meet the offset obligations), and generate additional value to the land holders due to the ability to retain any surplus credits generated.

The areas within the MDP lands proposed to be established as Biobank sites are referred to as the 'Noorumba-Mt Gilead Biobank Site' and the 'Macarthur-Onslow Mt Gilead Biobank Site' (this application). The Noorumba-Mt Gilead Biobank Site is comprised of two discrete areas in the north of the MDP lands, while the Macarthur-Onslow Mt Gilead Biobank Site is comprised of a single area. Separate Biobank Site Assessments and Applications are being prepared and submitted for the two proposed Biobank sites as one will be retained and managed by the current land holder whilst the other is proposed to be transferred to Campbelltown Council as an addition to the Noorumba Reserve. The proposed Biobank sites and the MDP lands are shown in **Figure 1**.

This document is the **Biobank Agreement Credit Assessment Report (BACAR)** for the Macarthur-Onslow Mt Gilead Biobank Site. It contains a detailed description of the Biobanking Assessment process, including a justification of the landscape score, and mapping of plant community types, vegetation zones, and management zones. The credits generated by the proposal, and their credit profiles, are also outlined.

This report has been prepared to meet the requirements of the BioBanking Assessment Methodology 2014 (BBAM 2014) (NSW Office of Environment and Heritage [OEH] 2014) stating that a BACAR must be prepared, with the assessment made by an accredited BioBanking assessor. The accredited BioBanking assessor who prepared the assessment is Enhua Lee (assessor number: 176). Enhua was supported by Bruce Mullins (assessor number: 0156) as assessment began prior to Enhua becoming formally accredited. Version 4.0 of the calculator was used in the assessment.

The total area of the Macarthur-Onslow Mt Gilead Biobank Site is 11.88 ha. One plant community type (PCT), which occurs as two condition classes, and exotic grassland, have been recorded for the assessment. The plant community type is mapped as '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' (PCT 1395) (OEH 2015). '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of*

the Cumberland Plain, Sydney Basin Bioregion' forms part of the Critically Endangered Ecological Community (CEEC), Shale Sandstone Transition Forest (SSTF), and was formerly recognised as the BioMetric Vegetation Type (BVT) of the same name, HN556.

There are 11.87 ha of vegetation to generate credits (there are some dams in the Macarthur-Onslow Mt Gilead Biobank Site that will not generate credits). The vegetation on site generates 118 ecosystem credits. ELA considered it likely that *Phascolarctos cinereus* (Koala) may use the site. The site currently generates 58 species credits for Koala, and restored habitat would generate a further 27 species credits. **Table 1** and **Table 2** provide a summary of ecosystem and species credits generated, with details provided in **Section 3**.

Table 1: Summary of ecosystem credits generated

Plant community type	Condition and ancillary code	Area (ha)	Credits generated	Credits/ha
<i>Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion</i>	Moderate to Good (Native)	0.35	4	11.43
	Moderate to Good (Exotic)	7.78	82	10.54
	Low (Cleared/exotic to be regenerated)	3.74	32	8.56
Total		11.87	118	9.94

Table 2: Summary of Koala species credits generated

Koala habitat	Area (ha)	Credits generated
Current	8.14	58
Restored	3.74	27
Total	11.87	84 *

* This figure does not match the sum of 58 and 27 credits as the credit calculator rounded the number of credits to 84

Management of the Macarthur-Onslow Mt Gilead Biobank Site will involve the implementation of standard management actions and will include:

- The active management and reduction of weeds;
- The erection and maintenance of 2.4 km of new fencing to a stock proof standard;
- The application of fire, where appropriate;
- Replanting or supplementary planting where natural regeneration is not sufficient;
- Active management of human disturbance, if necessary; and
- The retention of regrowth/native vegetation, dead timber, and rocks.

Management of the Macarthur-Onslow Mt Gilead Biobank Site will also involve additional management actions, including:

- Supplementary planting including in areas where natural regeneration is occurring.
- Addition of logs.

- Control of rabbits and foxes (as required).

The management required on site, and the associated costs, are provided in the accompanying Management Plan (completed management actions template) and credit pricing spreadsheet, respectively.

1 Site Description

1.1 Location

The Macarthur-Onslow Mt Gilead Biobank Site is located on parts of Lots 1 and 2//DP 807555, which comprise a selected portion of a property owned and referred to by Mt Gilead Pty Ltd (Mt Gilead) as the MDP lands (**Figure 1**). The Macarthur-Onslow Mt Gilead Biobank Site is approximately 11.88 ha in area and the lots on which it lies are located on Appin Road in the Campbelltown Local Government Area (LGA), approximately 5 km south of Campbelltown city centre (**Figure 1**). The site lies entirely within the Cumberland subregion of the Sydney Basin IBRA region (Thackway and Creswell 1994), and the majority of the site is within the Cumberland Plain Mitchell Landscape (**Figure 2**).

The Macarthur-Onslow Mt Gilead Biobank Site is bound by MDP lands, other than on its western side which is part of Lots 1 and 2//DP 807555 outside of MDP lands. Dharawal National Park lies to the south east of the Macarthur-Onslow Mt Gilead Biobank Site approximately 3.5 km away (**Figure 1**). Further, the registered Beulah Biobank Site and a number of proposed biobank sites are located within 2 km of the Macarthur-Onslow Biobank Site. This includes the second biobank site, the '*Noorumba-Mt Gilead Biobank Site*', proposed to offset impacts in the MDP lands which will be retained and managed by the current land holder.

There are no covenants or conservation funding arrangements for the Macarthur-Onslow Mt Gilead Biobank Site, and the site is to be managed for ecosystem and species credits in its entirety.

1.2 Biophysical characteristics of the site

The Macarthur-Onslow Mt Gilead Biobank Site is located on gently sloping hills to flat plains, and alluvial flats, of the Cumberland Plain in western Sydney. It is mostly covered by woody vegetation (canopy only), with remaining areas covered by grassland, and occurs at an elevation of between 150 m and 170 m above sea level (masl). Two first order and one second order streams have been mapped on the Macarthur-Onslow Mt Gilead Biobank Site (**Figure 3**).

The Macarthur-Onslow Mt Gilead Biobank Site lies on the Blacktown (Bt) soil landscape. The Blacktown soil landscape lies on gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Soils are shallow to moderately deep (<100 cm) red and brown podzolic soils on crests, upper sloped and well drained areas, and deep (150-300 cm) yellow podzolic soils and soloths on lower slopes and in areas of poor drainage (Hazelton and Tille 1990).

1.3 Land use zoning

The Macarthur-Onslow Mt Gilead Biobank Site is not currently zoned under the draft Campbelltown Local Environmental Plan 2014 (CLEP 2014), with land where it occurs being a deferred matter for future consideration. Campbelltown City Council is in the process of rezoning the land to RU2.

1.4 Site history and current uses of property

The Macarthur-Onslow Mt Gilead Biobank Site is currently used for agricultural purposes, mainly cattle grazing. The presence of remnant native vegetation, constructed dams and improved pastures reflects the current land use.

1.5 Surrounding land uses

The Macarthur-Onslow Mt Gilead Biobank Site is currently surrounded by rural grazing land. Following the rezoning of the adjacent land to the east, the BioBank site will be separated from future residential development by a perimeter road. Land to the north will remain as grazing land whilst land to the west is proposed to be registered as a Biobank site. Further to the south, land in the Beulah Biobank site is being managed in perpetuity for conservation; the Beulah Biobank site is a registered biobank site. There are also a number of other proposed biobank sites in the surrounding area, as shown in **Figure 1**. The *Noorumba-Mt Gilead Biobank Site* is the second biobank site currently being assessed to offset impacts in the MDP lands.

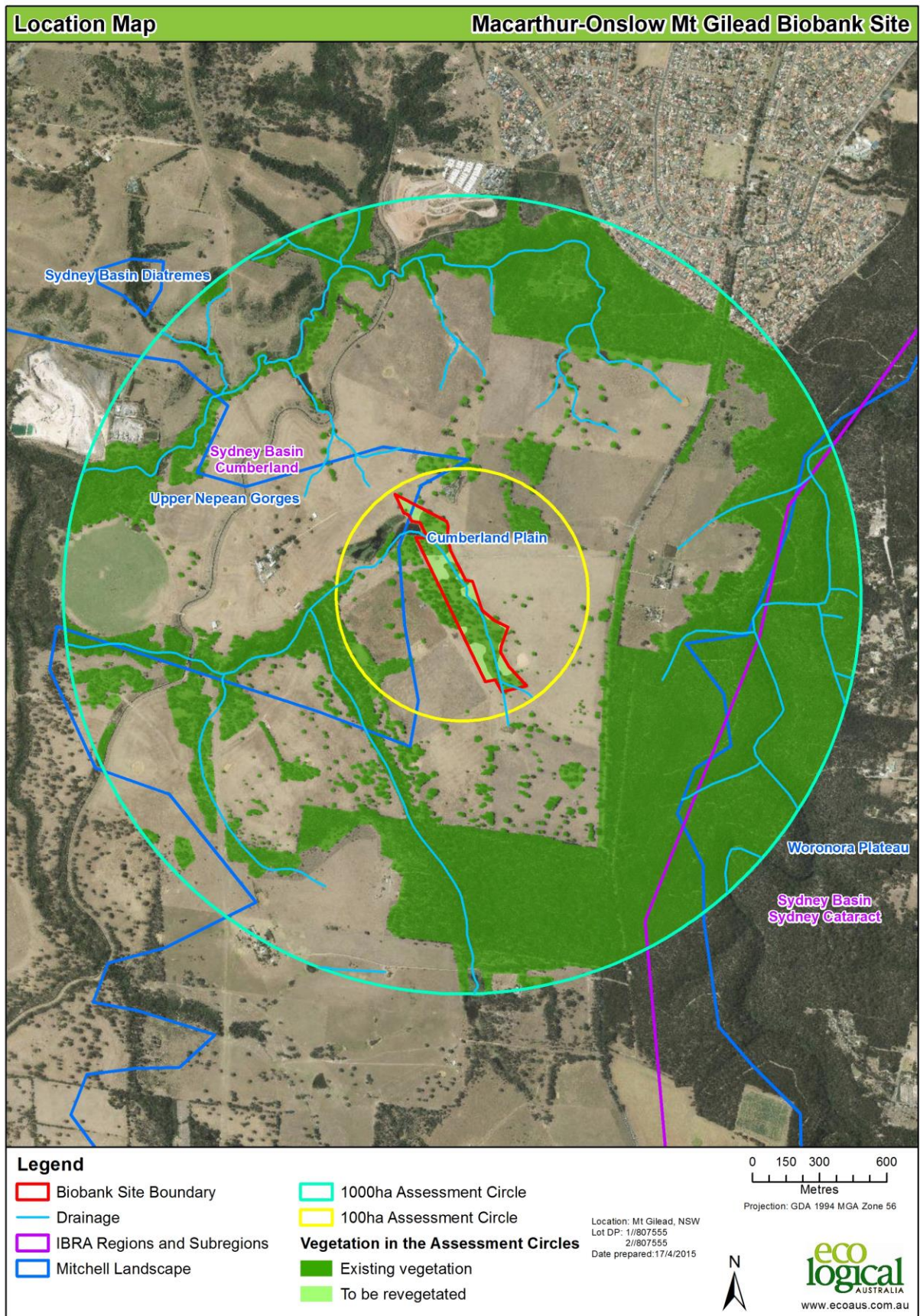


Figure 2: Location of the Macarthur-Onslow Mt Gilead Biobank Site relative to IBRA Regions/Subregions, Mitchell Landscapes, and Assessment circles (Location Map)

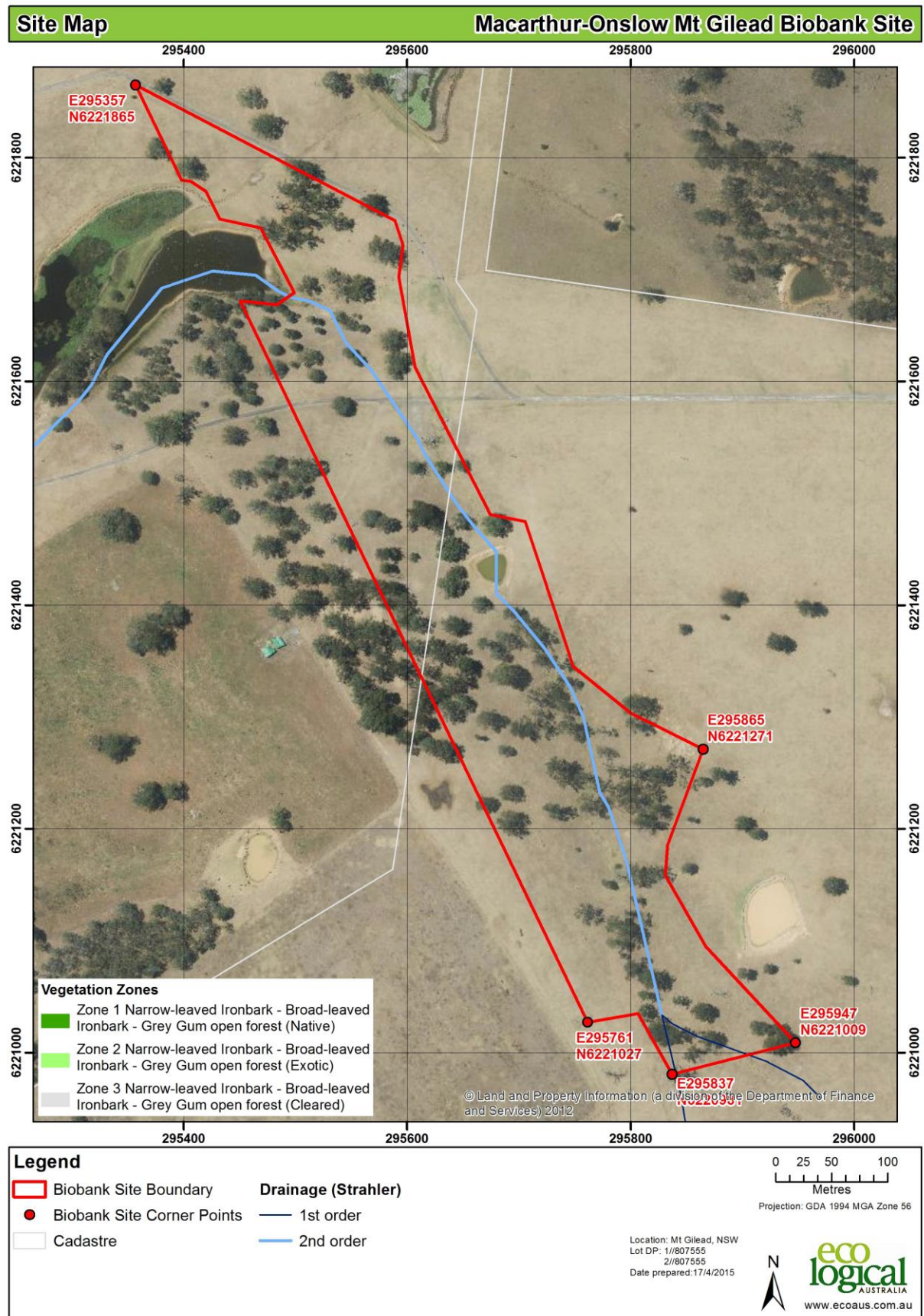


Figure 3: The Macarthur-Onslow Mt Gilead Biobank Site boundary (Site map)

2 Biobank Assessment

2.1 Biobank area

The Macarthur-Onslow Mt Gilead Biobank Site covers a total of 11.88 ha. Two first order streams start on the site, which join to form a second order stream. The site lies along this second order stream.

There are no covenants or conservation funding arrangements for the Macarthur-Onslow Mt Gilead Biobank Site, and the entire site is to be managed for ecosystem credits.

2.2 Plant Community Types

Remnant vegetation in the MDP lands was mapped primarily as Shale Sandstone Transition Forest (SSTF) by the NSW National Parks and Wildlife Service (NPWS) in its mapping of Native Vegetation of the Cumberland Plain Western Sydney (NPWS 2002). The NPWS also mapped some Shale Plains Woodland (SPW), Shale Hills Woodland (SHW), and Alluvial Woodland (AW) in the MDP lands.

Within the Macarthur-Onslow Mt Gilead Biobank Site, NPWS mapping included SSTF and a small amount of SPW (**Figure 4**). In the Cumberland Plain, SSTF occurs on soils derived from Wianamatta Shale in areas transitioning between parent geologies of Wianamatta Shale to high quartz sedimentary substrates such as Hawkesbury and Narrabeen group sandstones, while SPW occurs on gently sloping and flat topography on soils derived from Wianamatta Shale or on Holocene alluvium on well-drained areas that are infrequently inundated (NPWS 2002). The equivalent Plant Community Types (PCTs) to SSTF and SPW are '*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' and '*Grey Box - Forest Red Gum grassy woodland on flats of the southern Cumberland Plain, Sydney Basin Bioregion*' (OEH 2015).

Previous field survey of the MDP lands by ELA in 2013, undertaken for a proposed rezoning of the MDP lands (ELA 2014), found vegetation within the Macarthur-Onslow Mt Gilead Biobank Site to be slightly different to that mapped by NPWS (2002). Rather than areas of SPW within the Macarthur-Onslow Mt Gilead Biobank Site, all vegetation in the site was found to be SSTF. Assessment was based on the dominant flora species present, flora species composition, substrate, underlying geology, and landscape position.

Field survey by ELA for the current biobank assessment confirmed the previous vegetation mapping of ELA (2014) i.e. SSTF present across the Macarthur-Onslow Mt Gilead Biobank Site. Field survey for the biobank assessment was undertaken over a single day on 10 April 2015. Where multiple plots were undertaken for vegetation zones, survey sampled representative areas within these and also attempted to sample the variation across vegetation zones. **Figure 5** shows the distribution of '*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' within the Macarthur-Onslow Mt Gilead Biobank Site.

Note that quantitative analysis of plot data collected during field survey was undertaken using the OEH vegetation tool developed by Greg Steenbeeke. However, the OEH vegetation tool did not generate clear results for vegetation communities from the plot data (**Table 3**). Ratios of actual to required positive diagnostic species were mostly low, other than a few values found for Riparian Herbfeld (RHf). Generally, only ratios above 80 are considered to reflect good matches with vegetation communities. The vegetation communities did not resemble RHf. The lack of clear results is likely the result of past disturbance that has degraded the vegetation community on site.

Table 3: Summary of results (ratio of actual to required positive diagnostic species) from plot data entered into the OEH vegetation tool determining likely matches for vegetation communities. Communities with the highest ratios are highlighted per plot

Survey plot name (code) *	Ratio of actual to required positive diagnostic species in vegetation communities (after Tozer et al 2010) (%)^							
	SSTF	SHW	SPW	CRFF	GMDR	WSDR	MSW	RHf
SSTF, Native (G01)	23	45	46	69	28	32	37	100
SSTF, Exotic 01 (E01)	19	40	38	44	28	27	37	0
SSTF, Exotic 02 (E02)	23	25	38	44	6	9	16	150
SSTF, Exotic 03 (E03)	23	30	35	44	11	23	16	100

* Note that data for plots F01 and F02 are not included in the table due to these plots being located in exotic grassland.

^ Results are only shown for these eight vegetation communities. SSTF = Shale Sandstone Transition Forest, SHW = Shale Hills Woodland, SPW = Shale Plains Woodland, CRFF = Cumberland River Flat Forest, GMDR = Grey Myrtle Dry Rainforest, WSDR = Western Sydney Dry Rainforest, MSW = Moist Shale Woodland, RHf = Riparian Herbfield.

The over-storey of SSTF in the Macarthur-Onslow Mt Gilead Biobank Site was composed of *Eucalyptus creber* (Narrow-leaved Ironbark), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), and *E. moluccana* (Grey Box). The shrub layer was absent due to the grazing history of the site. The under-storey was composed of native and exotic grasses: *Microlaena stipoides* (Weeping Grass), *Eragrostis brownii* (Brown's Lovegrass), *Cynodon dactylon* (Couch), *Sporobolus creber* (Western Rat-tail Grass), *Pennisetum clandestinum* (Kikuyu), *Setaria parviflora*, and *Paspalum dilatatum* (Paspalum), although the majority was composed of the exotic grass, *Pennisetum clandestinum*. Besides grasses, there were a few herbs/low shrubs present, including *Dichondra repens* (Kidney Weed) and the introduced *Sida rhombifolia* (Paddy's Lucerne). A flora inventory is provided in **Appendix A**.

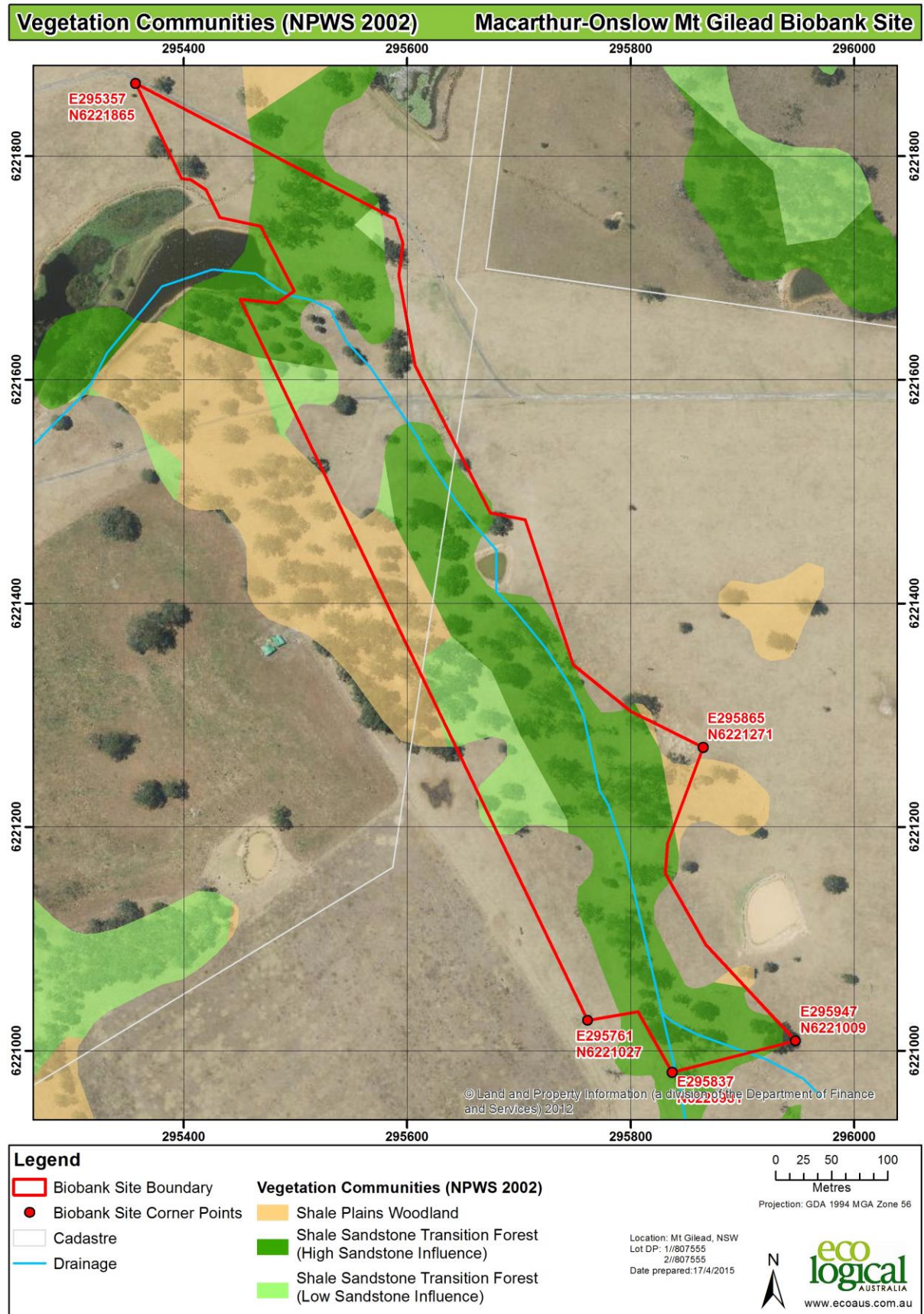


Figure 4: Vegetation communities in the Macarthur-Onslo Mt Gilead Biobank Site as mapped by NPWS (2002)

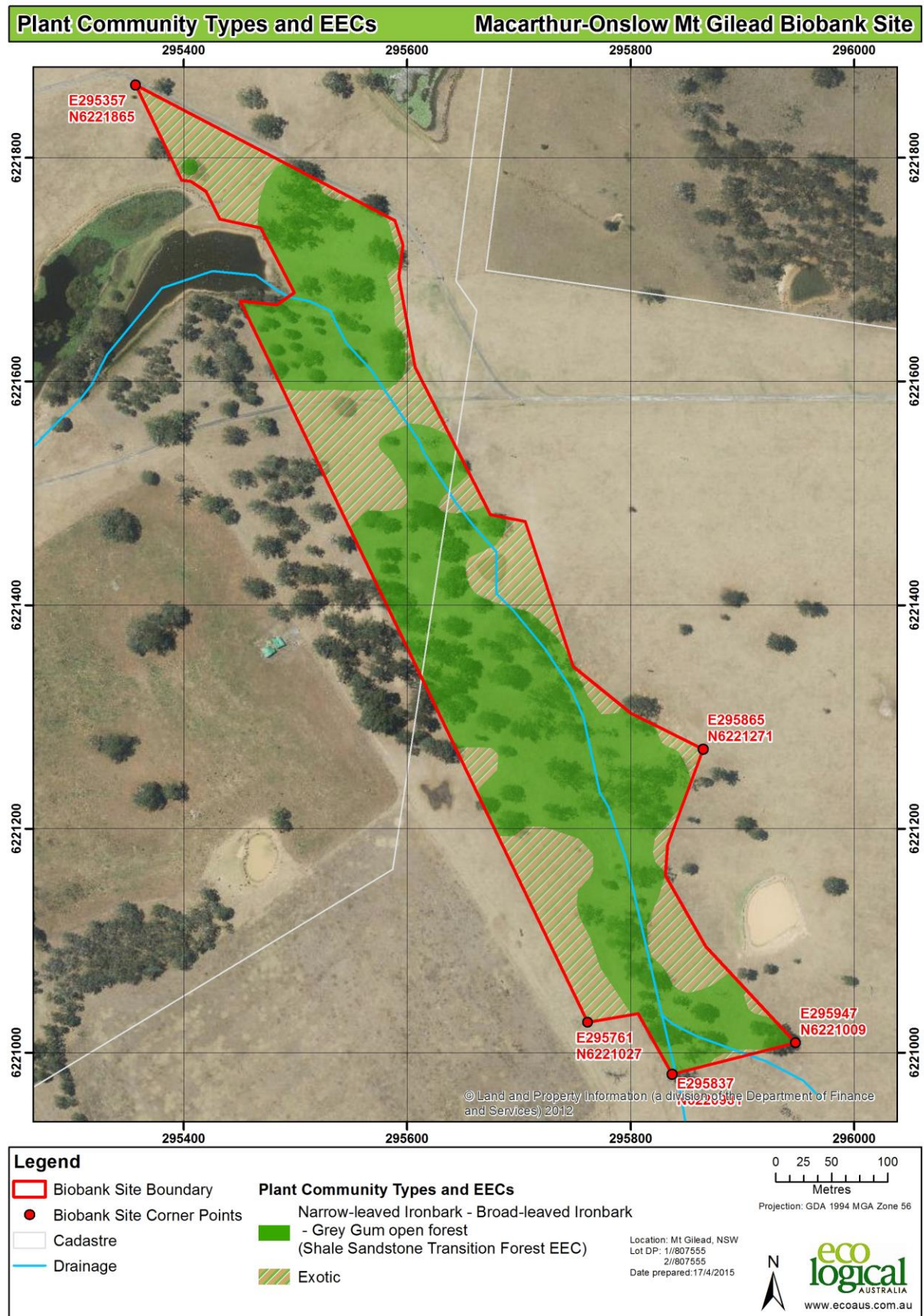


Figure 5: Plant Community Types/Endangered Ecological Communities in the Macarthur-Onslow Mt Gilead Biobank Site

2.3 Over-cleared vegetation types and Threatened Ecological Communities

2.3.1 *Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*

'Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' is likely to be a 'highly cleared' vegetation type within the Hawkesbury/Nepean Catchment Management Area (CMA). It has not been identified in the VIS classification database (OEH 2015) as a highly cleared vegetation type, and the VIS database also does not include an estimated percent cleared value for this PCT. However, the now usurped database for BioMetric Vegetation Types (BVTs) estimated the equivalent BVT of the same name (HN556) to be 80% cleared.

'Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' also forms a component of the critically endangered ecological community (CEEC), *'Shale Sandstone Transition Forest in the Sydney Basin Bioregion'* (CPW), listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Threatened Species Conservation Act 1995* (TSC Act).

The distribution of *'Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion'* within the Macarthur-Onslow Mt Gilead Biobank Site is shown on **Figure 5**.

2.4 Landscape value assessment

According to the BBAM 2014 (OEH 2014), the following steps are required in assessing the landscape value for biobank sites:

- a) Assess whether the site is in a strategic location;
- b) Assess change in connectivity value;
- c) Assess the increase in native vegetation cover; and
- d) Assess the patch size area.

A strategic location is defined in Section 4.2.6 of the BBAM 2014 as:

- part of a state or regional biodiversity link and in a plan approved by the Chief Executive of the OEH; or
- a riparian buffer area of a third order stream or higher, or an important wetland or estuarine area.

If the biobank site is in a strategic location, there is no need to further assess connectivity value i.e. step 'b' is not required.

The Macarthur-Onslow Mt Gilead Biobank Site did not meet any of the criteria for inclusion as a strategic location. As such, the following landscape value assessment follows steps a, b, c and d of the BBAM 2014 for assessing landscape value.

The following sections outline the data that were entered to the calculator.

2.4.1 Connectivity value

In accordance with the BBAM 2014, the following aspects were considered in determining the connectivity value:

- The width of the current and future connecting links; and
- The condition of woody and non-woody vegetation types before and after the biobank site is established.

Native vegetation was considered to be part of a connecting link if the patch size was >1 ha in size, in moderate to good condition, patches were separated by a distance of <100 m, and were not separated by a large water body, dual carriageway, wider highway or similar hostile link (see Appendix 6 of BBAM 2014).

The narrowest point of the current vegetated connection is identified in **Figure 6**. GIS analysis identified the minimum width of the current connection as approximately 47 m, placing it into the >30-100 m (moderate) connectivity width category. As the most limiting width occurs outside the Biobank site, improvement of the Biobank site will not increase the connectivity width. The connectivity width category after Biobank therefore remains >30-100 m.

The biobank site is connected to the large, well vegetated areas to the east through the link created by the scattered trees as they are less than 100 m apart. This vegetation had a projected foliage cover (PFC) at benchmark condition for overstorey cover and for mid-storey/ground cover. Given the overstorey and mid-storey/ground covers are already at benchmark, the average condition across the length of the connection will not increase. **Table 4** contains the results of the analysis.

The results of the width of current and future connecting links and the condition of vegetation types before and after the establishment of the biobank site combined to give a score of 0 for connectivity value (no linkage width class or condition thresholds crossed). Thus, a score of 0 for connectivity value was entered into the Credit Calculator.

Table 4: Condition classes before and after the establishment of the Biobank site

Strata	Condition Class (Before Biobank)	Condition Class (After Biobank)
Connectivity Value (Over-storey Condition)	Benchmark	Benchmark
Connectivity Value (Mid-storey/Ground Cover Condition)	Benchmark	Benchmark

2.4.2 Increase in native vegetation cover

The amount of vegetation currently within the 100 ha and 1000 ha assessment circles (inner and outer assessment circles, respectively) was calculated using ArcGIS at a scale of 1:10,000 (see **Figure 2** for circle placement). The amount of vegetation in the circles once the Macarthur-Onslow Mt Gilead Biobank Site is established, and managed into the future, was also estimated in ArcGIS.

The assessment for the inner circle recorded approximately 21 ha of overstorey vegetation before the establishment of the Biobank site, which represents 21% cover. After the establishment of the Biobank site, it has been assumed that the entire site will, at some stage, reach benchmark, which contributes 4 ha (4%) of additional vegetation to the total. The total amount of overstorey cover vegetation in the inner circle has increased from 21% (before establishment of the Biobank site) to 25% (after the establishment of the Biobank site).

The assessment for the outer circle recorded approximately 430 ha of overstorey vegetation before the establishment of the Biobank site, which represents 43% cover. After the establishment of the Biobank site, it has been assumed that the entire site will, at some stage, reach benchmark, which contributes 4 ha (0.4%) of additional vegetation to the total. The total amount of overstorey cover vegetation in the

outer circle has increased from 43% (before the establishment of the Biobank site) to 43.4% (after the establishment of the Biobank site).

Table 5 summarises the results of the assessment for each circle. The native vegetation cover class did not change for either the inner assessment circle or the outer assessment circle. As such, in accordance with Table 26 of the BBAM 2014 (OEH 2014), a score of 3.75 was entered into the Credit Calculator for the inner assessment circle for both before and after the establishment of the Biobank site. A score of 10.35 was entered into the Credit Calculator for the outer assessment circle for both before and after the establishment of the Biobank site.

Table 5: Area of over-storey cover in assessment circles before and after the establishment of the Macarthur-Onslow Mt Gilead Biobank Site

Assessment circle	Vegetated area before the establishment of the Biobank site (ha)	Native vegetation cover class (%)	Vegetated area after the establishment of the Biobank site (ha)	Native vegetation cover class (%)
Inner	21	21-25	25	21-25
Outer	430	41-45	434	41-45

2.4.3 Patch size

The area surrounding the Macarthur-Onslow Mt Gilead Biobank Site consists of native canopy cover with a predominately native understorey and is shown in **Figure 6**. These areas are therefore predominantly in moderate to good condition. Large intact remnants are positioned to the north and east of the site. Farmland in the surrounding area as a whole also retain patches of native over-storey vegetation. The maximum patch size assessable in the Cumberland Plain Mitchell landscape (89% cleared) is 100 ha according to the BBAM 2014. These linkages of moderate/good condition vegetation were measured at greater than 100 ha and therefore 101 hectares (a score of 12) was entered for patch size in the Credit Calculator.

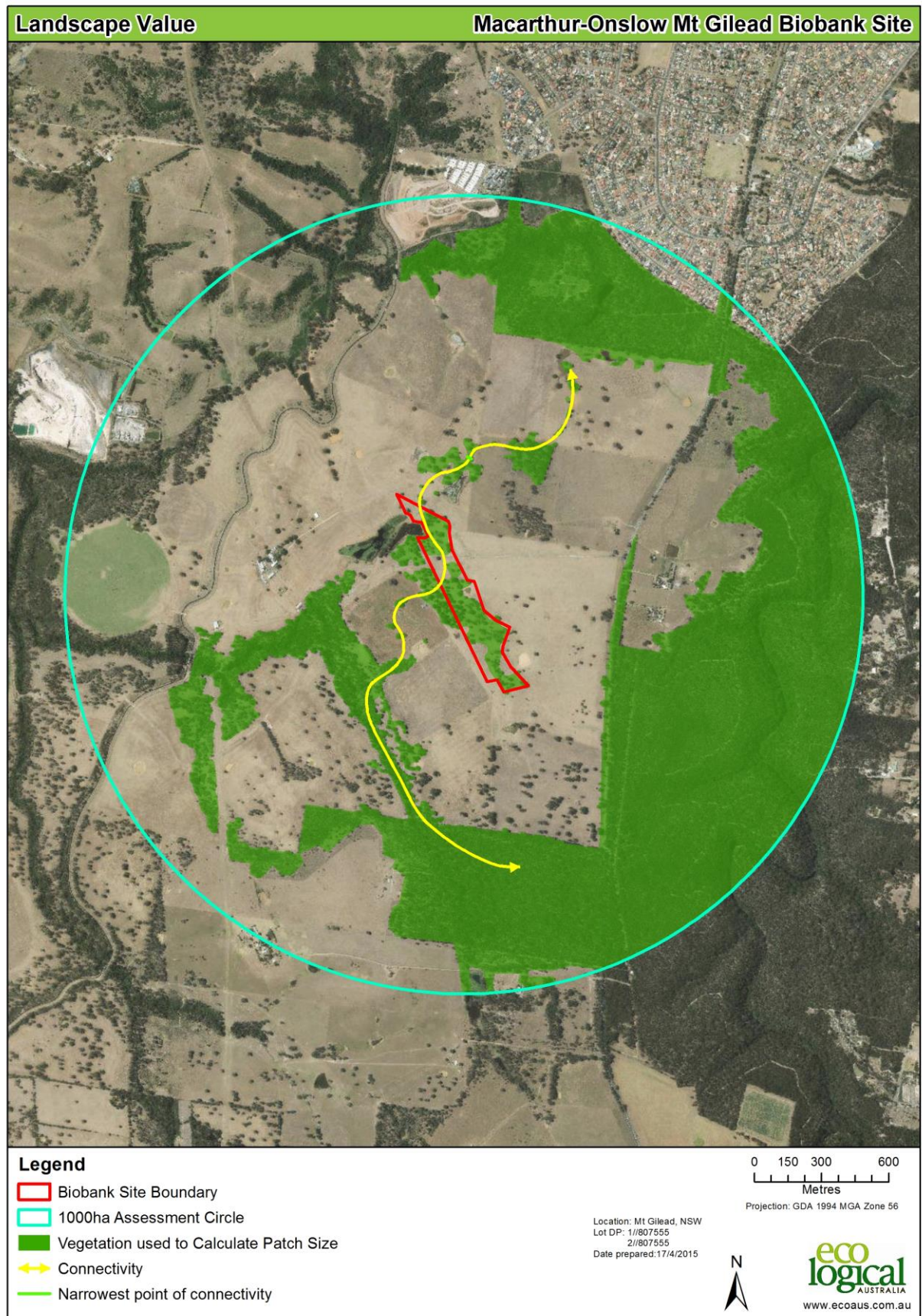


Figure 6: Vegetation to calculate the patch size and connectivity

2.5 Native vegetation assessment

2.5.1 Vegetation zones

Vegetation zones are defined as areas of native vegetation that are the same PCT which have similar broad condition states (OEH 2014).

In total, there are three vegetation zones (including cleared land to be revegetated) within the Macarthur-Onslow Mt Gilead Biobank Site. The area of each vegetation zone is provided in **Table 6**, and the spatial configuration of the vegetation zones is shown in **Figure 7**.

2.5.2 Plot and transect surveys

The BBAM 2014 (OEH 2014) requires that Biometric plots/transects are undertaken to sample vegetation zones. The number of plots/transects undertaken for each vegetation zone is outlined in **Table 6**. Information was collected from the required number of plots/transects for all vegetation zones consistent with BBAM 2014. All plots were permanently marked with two star pickets to allow for the monitoring of vegetation condition in the future. A star-picket was placed at the beginning and end of the 50 m line transect. The locations of the star-pickets were recorded using handheld GPS units with co-ordinates in GDA94 datum. Two photographs were taken along each transect: one at the beginning of the transect and in the direction of the end of the transect, and one at the end of the transect in the direction of the start of the transect.

The location of plots/transects are shown in **Figure 7**. **Appendix A** contains the flora species recorded in each plot, while **Appendix B** contains the plot/transect data entered into the credit calculator.

Table 6: Vegetation zones and number of Biometric plots/transects required and surveyed for in the Macarthur-Onslow Mt Gilead Biobank Site

Veg zone ID	Plant community type	Condition	Ancillary code	Characteristics of vegetation zone	Area (ha)	Plots required	Plots completed
1	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good	Native	Intact remnant occurring on gentle slopes within the site, with a mature native over-storey dominated by <i>Eucalyptus tereticornis</i> and <i>E. creber</i> . The shrub layer is largely absent. The under-storey is composed of a mixture of native and introduced grasses, sedges, herbs and scramblers. Native species richness is low.	0.35	1	1 (G01)
2			Exotic	Mature over-storey of <i>E. tereticornis</i> , <i>E. creber</i> , <i>E. punctata</i> and <i>E. moluccana</i> present. The shrub layer is absent. Groundcover is predominantly exotic and comprised of grasses and herbs. Native species richness is low.	7.78	3	3 (E01, E02, E03)
3		Low	Cleared/exotic (to be regenerated)	Exotic dominated herbs / grasses occurring on gentle slopes and flats within the site. The dominant grass species was <i>Pennistetum clandestinum</i> . Native species richness is very low.	3.74	1	2 (F01, F02)
Total*					11.87	5	6

* There were dams present in the Macarthur-Onslow Mt Gilead Biobank Site covering 0.01 ha, which account for the difference in the area of the Macarthur-Onslow Mt Gilead Biobank Site and the total shown here

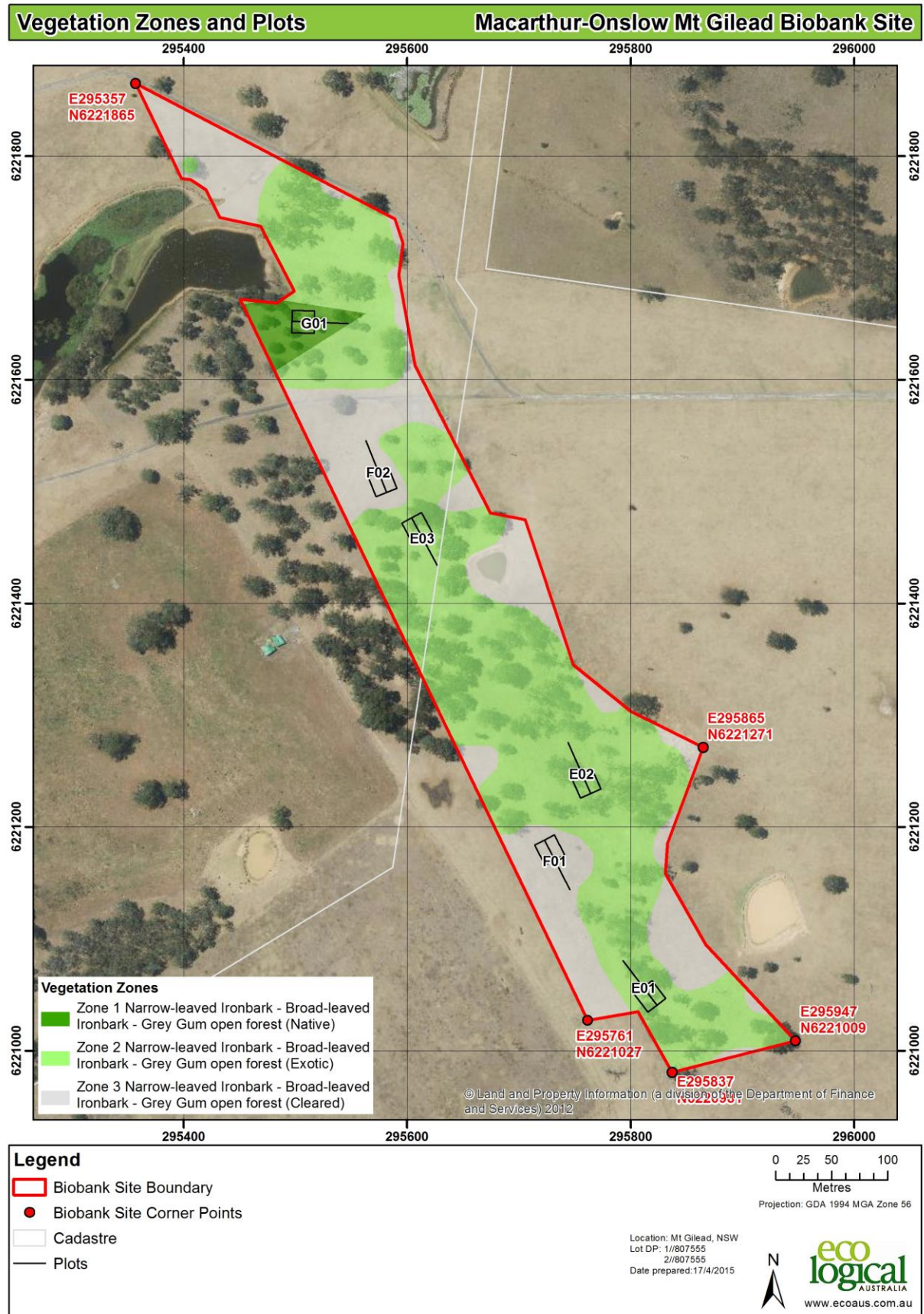


Figure 7: Vegetation zones and location of Biometric plots/transects in the Macarthur-Onslow Mt Gilead Biobank Site

2.5.3 Management zones and site value scores

Management zones combine the mapping of vegetation zones with the final management outcome on the site. They enable the assessor to increase, or decrease, the number of credits generated depending on the expected condition of the vegetation after management actions are undertaken.

The Macarthur-Onslow Mt Gilead Biobank Site contains three management zones (**Table 7** and **Figure 8**). Each management zone will be managed as an entire zone, with the management to be applied based on zone boundaries. The boundaries of the three management zones match the three vegetation zones identified.

Table 7: Area of each management zone within the Macarthur-Onslow Mt Gilead Biobank Site

Management zone ID	Plant community type	Condition	Ancillary code	Area (ha)
MZ1	<i>Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion</i>	Moderate to good	Native	0.35
MZ2			Exotic	7.78
MZ3		Low	Cleared/exotic (to be regenerated)	3.74
Total				11.87

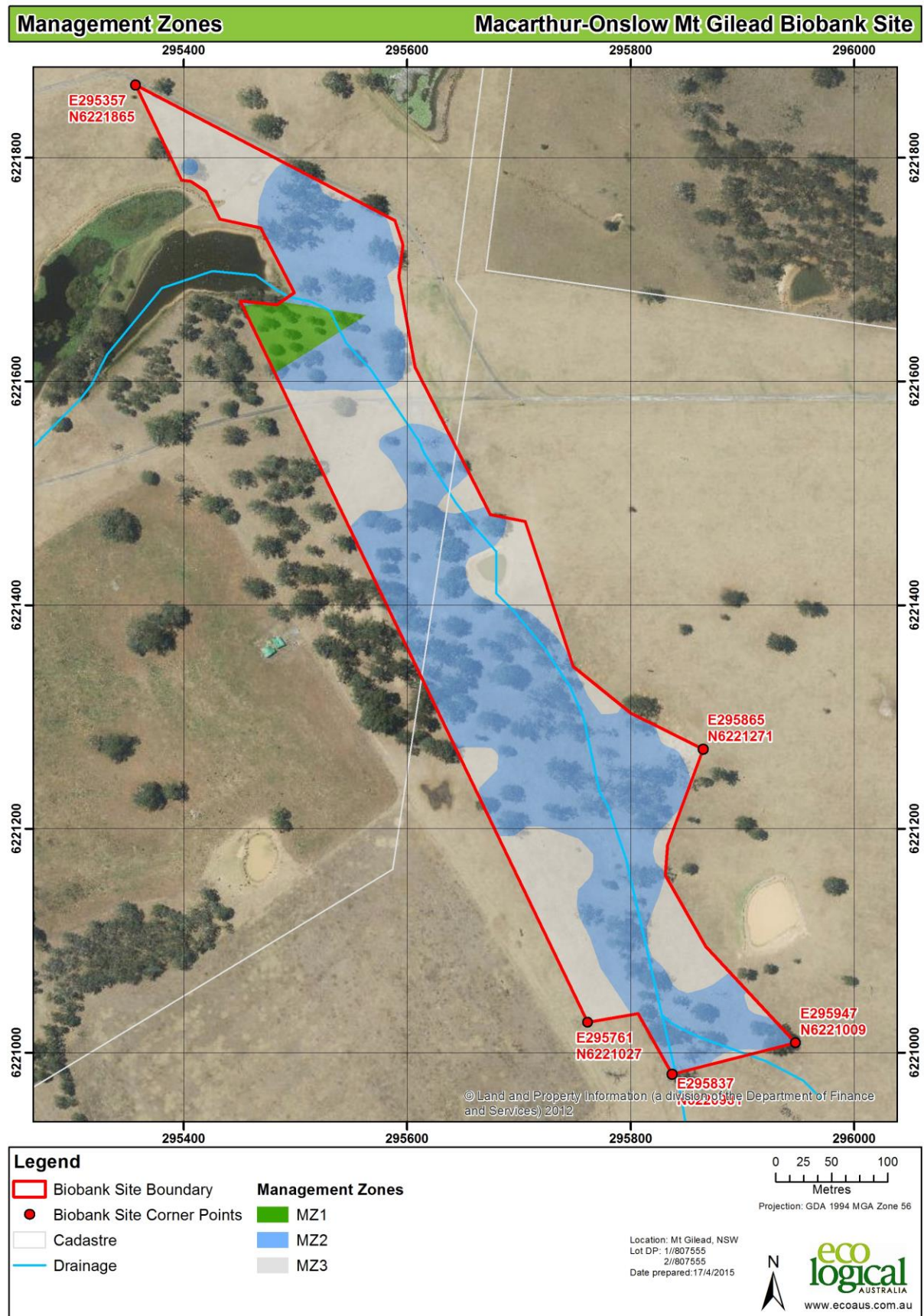


Figure 8: Management zones in the Macarthur-Onslow Mt Gilead Biobank Site

The current site value scores for each management zone, as well as the future site value scores based on the calculator's default site attribute scores after standard management actions are undertaken, are shown in **Table 8**. The current site value scores ranged between 7.29 and 31.25 for the three management zones. The site values were predicted to increase from between 13.02 and 22.22 for the three management zones based on the application of standard management actions.

Table 8: Site value scores for each management zone

Management zone ID	Current site value	Future site value	Increase in site value
MZ1	20.83	41.15	20.32
MZ2	31.25	53.47	22.22
MZ3	7.29	20.31	13.02

Additional actions (Appendix 7 of BBAM 2014) can be included to further increase site values and the number of credits generated. There were only a few site attributes where scores could be increased from their current scores with additional actions, either due to site attributes already being at the highest scores allowed, or the BBAM 2014 rules which determine the increases allowed from current scores. Generally, the site attributes that could be increased were:

- Native plant species;
- Native over-storey cover;
- Native mid-storey cover;
- Native ground cover (grasses);
- Number of trees with hollows; and/or
- Total length of fallen logs.

Despite there being potential to increase site values through increasing the scores of the number of trees with hollows, this assessment focussed on increasing site values through increasing the scores of native plant species, native over-storey cover, native mid-storey cover, native ground cover (grass), and total length of fallen logs. Through additional management to increase the number of native plant species, increase the cover of the native over-storey, mid-storey, and ground cover (grass), and increase the total length of fallen logs, as well as decrease the cover of native ground cover (grass), site values for all management zones were increased. The additional management actions that will be undertaken are:

- Supplementary planting of over-storey species characteristic of 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' (PCT 1395) in Management Zones 1 and 3 to achieve:
 - An over-storey cover attribute of >25-<50% of the percent native over-storey cover benchmark (i.e. between 4.625% and 9.25% cover using the lower benchmark value. Benchmark values are 18.5-23.5% cover) for Management Zone 3;
 - An over-storey cover attribute of >50-<75% of the percent native over-storey cover benchmark (i.e. between 9.25% and 13.875% cover using the lower benchmark value. Benchmark values are 18.5-23.5% cover) for Management Zone 1;
- Supplementary planting of mid-storey species characteristic of 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' (PCT 1395) in Management Zones 1, 2, and 3 to achieve a mid-storey cover attribute

- of >25-<50% of the percent native mid-storey cover benchmark in these zones (i.e. between 3.25% and 6.5% cover using the lower benchmark value. Benchmark values are 13-23%);
- Note that supplementary planting of mid-storey species characteristic of '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' (PCT 1395) in Management Zone 1 would also achieve a native ground cover (grass) attribute that is <175% of the percent native ground cover (grass) benchmark in this zone (i.e. <26.25% cover using the lower benchmark value. Benchmark values are 15-21%). This would be achieved through mid-storey shading. The native ground cover of grass in Management Zone 1 is currently over benchmark and shading would thin native grass cover;
 - Supplementary planting of grass species characteristic of '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' (PCT 1395) in Management Zone 3 to achieve a grass cover attribute that is at benchmark in this zone (i.e. between 15% and 21% cover);
 - Note that supplementary planting of over-storey and mid-storey species characteristic of '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' (PCT 1395) in Management Zone 1 would also achieve a species richness attribute of between 50% and 100% of the native plant species richness benchmark in Management Zone 1 (i.e. between 18 and 36. The benchmark value is 36 species).

In Management Zone 2, supplementary planting of mid-storey species characteristic of the PCT would achieve a species richness of between 50% and 100% of the native plant species richness benchmark.

In Management Zone 3, supplementary planting of over-storey, mid-storey, and grass species characteristic of the PCT would achieve a species richness of between 50% and 100% of the native plant species richness benchmark.

- Addition of logs in Management Zones 1 and 3 to achieve a length of fallen logs attribute that is >25-<50% of the length of fallen logs benchmark (i.e. between 7.5 m and 15 m. The benchmark value for the length of fallen logs in '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*' is 30 m per 0.1 ha plot i.e. 300 m/ha).

The details of the increases in values are shown in **Table 9**.

Table 9: Site value scores after additional management actions for each Management Zone within the Macarthur-Onslow Mt Gilead Biobank Site

Site attribute	Zone 1			Zone 2			Zone 3		
	Current score	Default increased score	Score with additional management	Current score	Default increased score	Score with additional management	Current score	Default increased score	Score with additional management
Native plant species	1	1.5	2	1	1.5	2	1	1.5	2
Native over-storey cover	1	2	2.5	2	3		0	1	1.5
Native mid-storey cover	0	1	1.5	0	1	1.5	0	1	1.5
Native ground cover (grasses)	0	1	1.5	3	3		1	2	3
Native ground cover (shrubs)	3	3		3	3		3	3	
Native ground cover (other)	1	2		0	1		0	1	
Exotic plant cover	2	3		1	1.5		0	0.5	
Number trees with hollows	0	0		2	2.5		0	0	
Over-storey regeneration	2	3		0	0.5		0	0.5	
Fallen logs	0	0	0.5	2	3		0	0	0.5
Site Values	20.83	41.15	51.56	31.25	53.47	59.11	7.29	20.31	28.65

2.6 Threatened species and populations assessment

There are no threatened species or populations known within the Macarthur-Onslow Mt Gilead Biobank Site, although the ecosystem credit species, *Daphoenositta chrysoptera* (Varied Sitella), has been recorded directly adjacent to the site to the west, and there are records of *Climacteris picumnus* subsp. *victoriae* (Brown Treecreeper) (ecosystem credit species) to the west and *Phascolarctos cinereus* (Koala) (species credit species) to the east and north of the site (ELA 2014).

Targeted surveys for threatened species were not undertaken. However, an expert report was prepared for the species credit species, Koala (**Appendix E**), given that ELA considered it likely that Koala would use the Macarthur-Onslow Mt Gilead Biobank Site on an occasional basis and targeted survey would be unlikely to detect the species (due to its transient and low use of the site). Also, Koala was assumed to be present in the adjacent MDP lands using scattered paddock trees in the Biocertification Assessment (currently in preparation) so Koala credits are required which could be generated in the Biobank site.

2.6.1 List of predicted threatened species

The list of threatened species (predicted to occur within ecosystem credits and those that require survey to generate species credits) is provided in **Appendix C**.

2.6.2 Threatened species habitat

ELA considered it likely that Koala would use the Macarthur-Onslow Mt Gilead Biobank Site on an occasional basis. The expert report prepared (**Appendix E**) mapped Koala habitat to be present in the Macarthur-Onslow Mt Gilead Biobank Site within areas of 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' that supported a canopy. The species polygon for Koala, zoomed in to the Macarthur-Onslow Mt Gilead Biobank Site, is reproduced in **Figure 9**. A regional-scale map of Koala habitat (current and to be restored) is provided in the expert report in **Appendix E**.

A description of Koala and the habitat features associated with the species in the Macarthur-Onslow Mt Gilead Biobank Site is provided in the expert report in **Appendix E**.

2.6.3 Geographic and habitat features

The responses in **Table 10** were provided to the geographic and habitat features questions (Step 2) in the Biobank calculator.

Table 10: Geographic and habitat questions and answers

Common name	Scientific name	Feature	Answer
Rosenberg's Goanna	<i>Varanus rosenbergi</i>	Land within 250 m of termite mounds or rock outcrops	No
Red-crowned Toadlet	<i>Pseudophryne australis</i>	Heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	Yes
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	Land containing bark or leaf litter accumulation	Yes

Common name	Scientific name	Feature	Answer
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	No
Matted Bush-pea	<i>Pultenaea pedunculata</i>	Land within 5 km of coast in South East Coastal Plains CMA subregion	Not relevant*
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	Land within 40 m of heath, woodland or forest	Yes
<i>Hibbertia superans</i>	<i>Hibbertia superans</i>	Ridgetops	No
Green and Golden Bell Frog	<i>Litoria aurea</i>	Land within 100 m of emergent aquatic or riparian vegetation	Yes

* while not relevant due to not being within the South East Coastal Plains CMA subregion, this species was targeted due to nearby records during previous survey (ELA 2014). The species was not found.

2.7 Changes to benchmark data

It is noted that the credit calculator did not include any benchmark values for the total length of fallen logs or trees with hollows for 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' (PCT 1395).

An outcome of a previous discussion between ELA and Tim Hagar of the OEH was that "local" benchmark data for the number of trees with hollows and for the length of fallen logs could be added for 'Grey Box - Forest Red Gum grassy woodland on flats of the southern Cumberland Plain, Sydney Basin Bioregion', with one (1) and 50 m added for the number of trees with hollows and the length of fallen logs, respectively. This was to be consistent with other woodland/open forest vegetation types on the Cumberland Plain, and is consistent with the assessment undertaken for the Brownlow Hill Stages 1 and 2 Biobank Sites and other assessments undertaken by OEH on the Cumberland Plain.

ELA contacted the OEH regarding the benchmark data for the number of trees with hollows and for the length of fallen logs for 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion' on 17/04/2015. Advice from the OEH was to use the benchmarks for the Sydney Metropolitan CMA for assessment i.e. one (1) and 30 m for the number of trees with hollows and the length of fallen logs, respectively.

As this is an error in the Biobanking Tool datasets, it is not considered that a formal application for the use of local benchmark data be submitted to the OEH for approval.

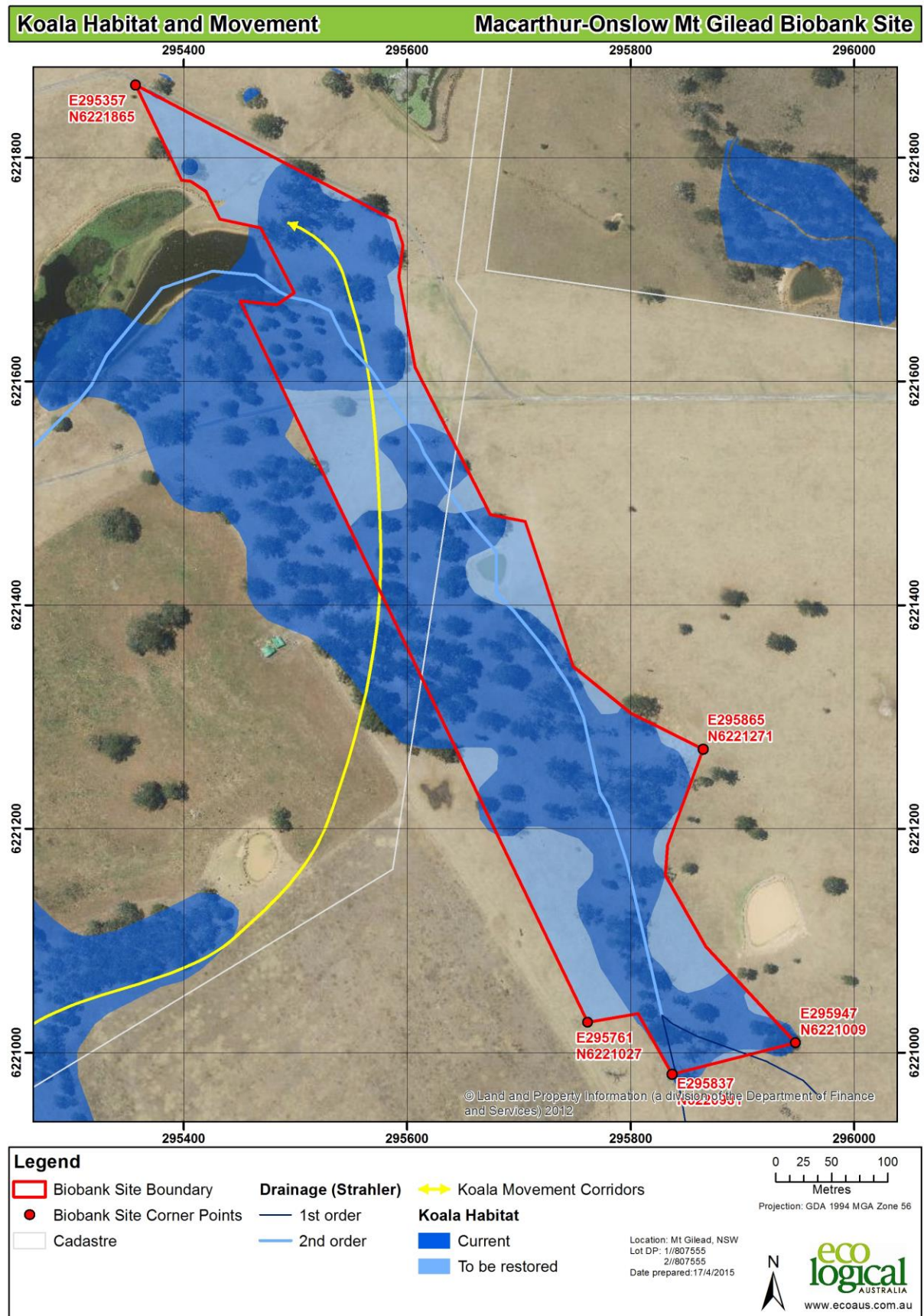


Figure 9: Species polygon of potential habitat for Koala in relation to the Macarthur-Onslow Mt Gilead Biobank Site

3 Credits generated

3.1 Ecosystem credits

Table 11 shows the results of the credit calculations. A copy of the credit report produced by the BioBanking calculator tool is provided in **Appendix D**. In total, 118 ecosystem credits are generated by the Macarthur-Onslow Mt Gilead Biobank Site.

Table 11: Ecosystem credits generated and credit profile

Vegetation zone ID	Plant community type	Condition and ancillary code	Area (ha)	Credits generated	Credits/ha
1	<i>Narrow-leaved Ironbark - Broad-leaved Ironbark -</i>	Moderate to Good (Native)	0.35	4	11.43
2	<i>Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion</i>	Moderate to Good (Exotic)	7.78	82	10.54
3		Low (Cleared/exotic to be regenerated)	3.74	32	8.56
Total			11.87	118	9.94 (average)

3.2 Species credits

Table 12 shows the results of the credit calculations. A copy of the credit report produced by the BioBanking calculator tool is provided in **Appendix D**. The Macarthur-Onslow Mt Gilead Biobank Site currently generates 58 species credits for Koala, and restored habitat would generate an additional 27 species credits.

Table 12: Species credits generated and credit profile

Koala habitat	Area (ha)	Credits generated
Current	8.14	58
Restored	3.74	27
Total	11.87	84 *

* This figure does not match the sum of 58 and 27 credits as the credit calculator rounded the number of credits to 84

4 Existing management obligations

There are no covenants or conservation funding arrangements for the Macarthur-Onslow Mt Gilead Biobank Site, and the entire Biobank site is to be managed for ecosystem credits. The proposed Biobank site has no existing management obligations.

Based on the above, ELA is of the opinion that there is no requirement to 'discount' the number of credits generated.

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Appendix A Flora species recorded

Scientific Name	Common Name	Origin	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion					
			E01	E02	E03	F01	F02	G01
<i>Alternanthera denticulata</i>	Lesser Joyweed	Native		x				x
<i>Anagallis arvensis</i>	Scarlet Pimpernel	Exotic	x	x				
<i>Asteraceae</i> weed 1		Exotic	x	x	x	x	x	
<i>Axonopus</i> sp.		Exotic	x	x	x	x		x
<i>Bidens pilosa</i>	Cobbler's Pegs	Exotic	x	x				
<i>Bothriochloa macra</i>	Red Leg Grass	Native		x				
<i>Bromus</i> sp.	Brome	Exotic	x					
<i>Carthamus</i> sp.		Exotic	x					
<i>Cayratia clematidea</i>	Native Grape	Native	x					
<i>Centella asiatica</i>	Pennywort	Native		x				
<i>Chenopodium murale</i>	Nettle-leaf Goosefoot	Exotic	x					
<i>Chloris truncata</i>	Windmill Grass	Native	x					
<i>Cirsium vulgare</i>	Spear Thistle	Exotic	x					
<i>Conyza bonariensis</i>	Fleabane	Exotic	x	x				
<i>Cynodon dactylon</i>	Couch	Native		x	x	x	x	x
<i>Cyperus eragrostis</i>	Umbrella Sedge	Exotic		x				x
<i>Cyperus gracilis</i>	Slender Flat-sedge	Native						x

Scientific Name	Common Name	Origin	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion					
			E01	E02	E03	F01	F02	G01
<i>Cyperus</i> sp.		Native			x			
<i>Desmodium varians</i>	Slender Tick-trefoil	Native						x
<i>Dichondra repens</i>	Kidney Weed	Native	x	x	x			x
<i>Echinopogon</i> sp.	Hedgehog Grass	Native		x				
<i>Ehrharta erecta</i>	Panic Veldtgrass	Exotic	x		x			
<i>Einadia nutans</i>	Climbing Saltbush	Native			x			
<i>Einadia trigonos</i>	Fishweed	Native	x		x			x
<i>Eleusine tristachya</i>	Goose Grass	Exotic				x	x	x
<i>Eragrostis brownii</i>	Brown's Lovegrass	Native	x	x	x	x	x	x
<i>Eucalyptus creber</i>	Narrow-leaved Ironbark	Native			x			
<i>Eucalyptus moluccana?</i>		Native	x					
<i>Eucalyptus punctata</i>		Native		x				
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Native	x					x
<i>Eucalyptus/Angophora</i> sp.		Native			x			
<i>Euchiton/Gnaphalium</i> sp.		Native	x	x				x
<i>Glycine clandestina</i>		Native		x				x
<i>Hibbertia</i> sp.		Native		x				
<i>Juncus usitatus</i>		Native		x	x			
<i>Lepidium</i> sp.		Exotic	x	x	x			x

Scientific Name	Common Name	Origin	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion					
			E01	E02	E03	F01	F02	G01
<i>Medicago</i> sp.		Exotic		x		x		
<i>Microlaena stipoides</i>	Weeping Grass	Native	x		x	x		x
<i>Modiola caroliniana</i>	Red-flowered Mallow	Exotic			x		x	
<i>Oxalis perennans</i>		Native	x		x			x
<i>Panicum</i> sp.		Native						x
<i>Paspalum dilatatum</i>	Paspalum	Exotic	x	x	x	x	x	x
<i>Pennisetum clandestinum</i>	Kikuyu	Exotic	x	x	x	x	x	x
<i>Plantago lanceolata</i>	Plantain	Exotic	x	x	x		x	x
<i>Portulaca oleracea</i>	Pigweed	Native			x		x	x
<i>Pratia purpurascens</i>	Whiteroot	Native	x					
<i>Richardia</i> sp.		Exotic		x				x
<i>Rytidosperma</i> sp.	Wallaby Grass	Native		x				
<i>Senecio madagascariensis</i>	Fireweed	Exotic	x	x	x		x	x
<i>Setaria parviflora</i>		Exotic	x	x		x		x
<i>Sida rhombifolia</i>	Paddy's Lucerne	Exotic	x	x	x	x	x	x
<i>Solanum</i> sp.		Exotic	x					
<i>Soliva sessilis</i>	Bindii	Exotic			x			
<i>Sporobolus creber</i>	Western Rat-tail Grass	Native	x	x		x		x
<i>Sporobolus</i> sp.		Exotic				x		

Scientific Name	Common Name	Origin	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion					
			E01	E02	E03	F01	F02	G01
<i>Stellaria</i> sp.	Chickweed	Exotic	x		x		x	x
<i>Themeda australis</i>	Kangaroo Grass	Native		x				
<i>Trifolium</i> sp.		Exotic	x	x	x			
Unidentified forb		Exotic		x				
Unknown grass (Buffalo ?)		Exotic				x		
Unknown Lilly		Native		x				
<i>Urochloa</i> sp.		Native		x				
<i>Verbena bonariensis</i>	Purpletop	Exotic	x					
<i>Veronica plebeia</i>	Trailing Speedwell	Native		x	x		x	x
<i>Vittadinia</i> sp.		Native	x					

Appendix B Biometric plot and transect data

Plot number	Native Plant Species	Native over-storey (%)	Native mid-storey cover (%)	Native ground cover – grasses (%)	Native ground cover – shrubs (%)	Native ground cover – other (%)	Exotic plant cover (%)	# Tree hollows	Over-storey regeneration	Fallen logs	Easting	Northing
<i>Zone 1: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion - Native</i>												
G01	17	6	0	46	0	6	24	0	0.5	0	295495	6221652
<i>Zone 2: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion - Exotic</i>												
E01	14	19	0.5	0	0	2	66	1	0	32	295824	6221042
E02	17	7	0	10	0	0	68	1	0	25	295767	6221229
E03	13	4	0	42	0	0	44	0	0	6	295604	6221477
<i>Zone 3: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion –Cleared/exotic</i>												
F01	4	0	0	0	0	0	92	0	0	2	295722	6221186
F02	4	0	0	4	0	0	90	0	0	1.5	295582	6221498

Appendix C Predicted threatened species and species requiring survey

Predicted species (ecosystem credits) – survey not required

Common name	Scientific name	TS offset multiplier
Barking Owl	<i>Ninox connivens</i>	3
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis subsp. gularis</i>	1.3
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus subsp. victoriae</i>	2
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	2.2
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	2.2
Flame Robin	<i>Petroica phoenicea</i>	1.3
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2
Glossy Black Cockatoo	<i>Calyptrorhynchus lathamii</i>	1.8
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	2.2
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>	1.7
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8
Masked Owl	<i>Tyto novaehollandiae</i>	3
Painted Honeyeater	<i>Grantiella picta</i>	1.3
Powerful Owl	<i>Ninox strenua</i>	3
Scarlet Robin	<i>Petroica boodang</i>	1.3
Sooty Owl	<i>Tyto tenebricosa</i>	3
Speckled Warbler	<i>Chthonicola sagittata</i>	2.6
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	2.6
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4
Swift Parrot	<i>Lathamus discolor</i>	1.3
Turquoise Parrot	<i>Neophema pulchella</i>	1.8
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2

Species requiring survey (species credits) – if application to generated species credits is submitted

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bargo Geebung	<i>Persoonia bargoensis</i>	Yes	Yes	Yes	Yes	Yes							Yes
Brown Pomaderris	<i>Pomaderris brunnea</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bynoe's Wattle	<i>Acacia bynoeana</i>	Yes	Yes	Yes						Yes	Yes	Yes	Yes
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deane's Paperbark	<i>Melaleuca deanei</i>	Yes	Yes										Yes
<i>Dillwynia tenuifolia</i>	<i>Dillwynia tenuifolia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Downy Wattle	<i>Acacia pubescens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	<i>Cercartetus nanus</i>												
<i>Epacris purpurascens</i> subsp. <i>purpurascens</i>	<i>Epacris purpurascens</i> subsp. <i>purpurascens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Green and Golden Bell Frog	<i>Litoria aurea</i>	Yes	Yes	Yes					Yes	Yes	Yes	Yes	Yes
<i>Grevillea parviflora</i> subsp. <i>supplicans</i>	<i>Grevillea parviflora</i> subsp. <i>supplicans</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Gyrostemon thesioides</i>	<i>Gyrostemon thesioides</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hairy Geebung	<i>Persoonia hirsuta</i>	Yes	Yes	Yes	Yes	Yes							Yes
Koala	<i>Phascolarctos cinereus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nodding Geebung	<i>Persoonia nutans</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Pimelea curviflora</i> subsp. <i>curviflora</i>	<i>Pimelea curviflora</i> subsp. <i>curviflora</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Red-crowned Toadlet	<i>Pseudophryne australis</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Small-flower Grevillea	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Squirrel Glider	<i>Petaurus norfolcensis</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sydney Plains Greenhood	<i>Pterostylis saxicola</i>									Yes	Yes	Yes	
<i>Tetradlea glandulosa</i>	<i>Tetradlea glandulosa</i>							Yes	Yes	Yes	Yes	Yes	

Appendix D Biobanking credit report

Provided as a separate report

Appendix E Expert report

Provided as separate report.



HEAD OFFICE

Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601
F 08 8941 1220

SYDNEY

Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

Suite 1 Level 3
471 Adelaide Street
Brisbane QLD 4000
T 07 3503 7191
F 07 3854 0310

ST GEORGES BASIN

8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

NAROOMA

5/20 Cauty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au