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## Appendix 7: Offset site BAR – RedGum Ridge (Biosis 2016b)

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Redgum Ridge Western Precinct (part Lots  
815 DP1193843 and 1801 DP1223063)

BioBank Site:

## Biodiversity Assessment Report

FINAL REPORT

Prepared for Edenvell Pty Ltd

12 December 2016

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**Biosis project no.:** 20289

**File name:** 20289.Redgum.Ridge.Biobank.Site.BAR.FIN02.20161219.docx

**Citation:** Biosis 2016. Redgum Ridge Western Precinct (part Lots 815 DP1193843 and 1801 DP1223063) BioBank Site: Biodiversity Assessment Report. Report for Edenvell Pty Ltd. Authors: N Garvey & M Misdale, Biosis Pty Ltd, Wollongong. Project 20289.

## Document control

Version	Internal reviewer	Date issued
Draft version 01	Kylie Reed	18/01/2016
Final version 01	Nathan Garvey	03/03/2016
Final version 02	Nathan Garvey	19/12/2016

## Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- Edenvell Pty Ltd: Richard Clifford
- MMJ Wollongong: Luke Rollinson
- NSW Office of Environment and Heritage: Chris Page, Daniel Robson, Jedda Lemmon, Ziggy Andersons

Biosis staff involved in this project were:

- Axton Aguiar and Mathew Misdale (assistance in the field)
- Ashleigh Pritchard (mapping)
- Kylie Reed (quality assurance)

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## Glossary

<b>APZ</b>	Asset Protection Zone
<b>CBD</b>	Central Business District
<b>DCDB</b>	Digital Cadastral Database
<b>DIWA</b>	Directory of Important Wetlands of Australia
<b>DoE</b>	Department of the Environment
<b>DTDB</b>	Digital Topographic Database
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cmwth)
<b>GIS</b>	Geographic Information System
<b>IBRA</b>	Interim Biogeographical Rationalisation of Australia
<b>LEP</b>	Local Environment Plan
<b>LGA</b>	Local Government Area
<b>NSW</b>	New South Wales
<b>NV Act</b>	<i>Native Vegetation Act 2003</i> (NSW)
<b>NW Act</b>	<i>Noxious Weed Act 1993</i> (NSW)
<b>OEH</b>	Office of Environment and Heritage (NSW)
<b>PCT</b>	Plant Community Types (as defined by the NSW OEH's Vegetation Information System Classification Database)
<b>PFC</b>	Percentage Foliage Cover
<b>SALIS</b>	Soil and Land Information System
<b>SEPP</b>	State Environmental Planning Policy
<b>TSC Act</b>	<i>Threatened Species Conservation Act 1995</i> (NSW)
<b>VIS</b>	Vegetation Information System
<b>WM Act</b>	<i>Water Management Act 2000</i> (NSW)

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# Stage 1 – Biodiversity Assessment

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# 1. Introduction

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## 1.1 BioBank site identification

The BioBank site includes part of Lots 815 DP 1193843 and 1801 DP 1223063 in Figtree, NSW which is approximately 5 kilometres south-west of the Wollongong Central Business District (CBD) (Figure 1). The site encompasses 47 hectares of private land and is currently zoned E2 Environmental Conservation under the Wollongong Local Environment Plan 2009 (LEP).

The study area is within the:

- Sydney Basin Interim Biogeographical Rationalisation of Australia (IBRA) Region.
- Illawarra IBRA Subregion.
- Dapto – Wollongong Coastal Slopes Mitchell Landscape.
- Lake Illawarra Catchment.
- Wollongong Local Government Area (LGA).

The BioBank site (Figure 2) spans the northern and southern slopes of a centralised ridge plateau that runs from the Woronora plateau, located to the west, towards the coastal plain to the east. The northern slopes of the BioBank site drain toward a fourth order section of Brandy and Water Creek. Two north-draining ephemeral first order streams join Brandy and Water Creek within the BioBank site and one eastwards draining intermittent first order stream meets the creek to the east of the site. The southern slopes drain towards a third order section of American Creek, with two southwards-draining first order ephemeral streams joining the creek within the BioBank site. Brandy and Water Creek and American Creek converge nearby to the east of the BioBank site before joining Allans Creek further to the east.

The study area is located at the western extent of the Illawarra Coastal Plain where the plain begins to rise towards the Woronora plateau. The Gwynneville Soil Landscape is the predominant soil landscape (NSW Soil and Land Information System (SALIS)) which is present in the footloose of the Illawarra Escarpment and isolated rises of the Wollongong Plain between Coledale and Dapto. This soil landscape unit overlies the Illawarra Coal Measures geologic unit. Dominant soils in the upper profile are sandy loams and sandy clay loam with pedal clay in the lower profile (Hazelton and Tille 1990).

The BioBank site supports three plant community types (PCTs) which reflect the underlying soils, landscape position and aspect of the BioBank site. *Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion* occurs on the upper margins of the northern and southern slopes, along the centralised ridge plateau. *Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion* occurs in areas of moderate slope, while *Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion* occurs on steeper slopes and shaded gullies.

The BioBank site supports significant biodiversity values, including two endangered ecological communities (EECs) (*Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* and *Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion*) and one threatened flora species (White-flowered Wax Plant *Cynanchum elegans*) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Currently, the BioBank site is subject to significant levels of weed infestation. Protection and management of the site for conservation purposes, resulting in an improvement in the condition of vegetation and habitat for

threatened species, has the potential to make a significant contribution to biodiversity conservation in the region, and would also assist in meeting targets set out under the *Illawarra Biodiversity Strategy* (WCC et al. 2011a, 2011b) and Southern Rivers Catchment Management Authority (SRCMA) *Catchment Action Plan* (CAP) 2006 to 2016 as well as the current SRCMA CAP 2013 – 2023 (SRCMA, 2013).

## 1.2 Information sources

### 1.2.1 Publications and databases

In order to provide a context for the study area, information about flora and fauna from within 5 kilometres (the 'locality') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Department of the Environment (DoE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife, Office of Environment and Heritage (OEH).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
  - Native Vegetation of the Illawarra Escarpment and Coastal Plain (NPWS 2002).
  - OEH Vegetation Information System (VIS) Mapping through the Spatial Information eXchange (SIX) Vegetation Map Viewer.
- NSW Vegetation Information System (VIS): Classification Version 2.1.
- Wollongong LGA Bioregional Assessment (Part I): Native Vegetation of the Illawarra Escarpment and Coastal Plain (NPWS 2002).

The following reports were also used in the preparation of this assessment:

- Redgum Ridge Western Precinct (part Lots 814 and 815 DP1193843) Biodiversity Certification: Biodiversity Conservation Strategy (Biosis 2015a).
- Redgum Ridge Western Precinct (part Lots 814 and 815 DP1193843) Biodiversity Certification: Biodiversity Assessment Report (Biosis 2015b).
- Redgum Ridge Estate BioBanking Assessment (Biosis 2014).
- Illawarra Biodiversity Strategy. Volume 1 Action Plan (WCC et al. 2011a).
- Illawarra Biodiversity Strategy. Volume 2 Background Information (WCC et al. 2011b).
- Catchment Action Plan 2013 – 2023 (SRCMA 2013).

### 1.2.2 Spatial data

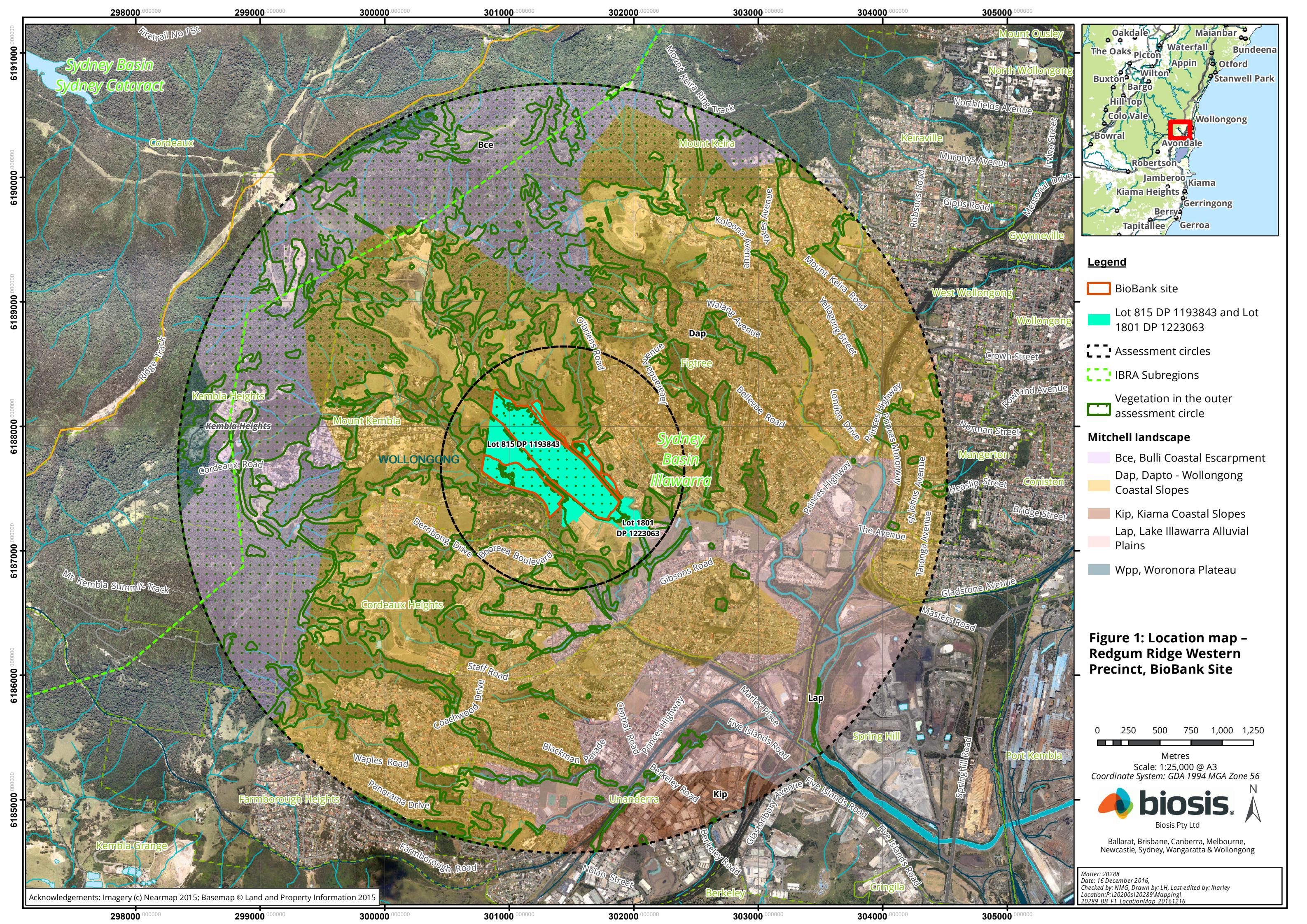
The subdivision layout was supplied by KFW Pty Ltd. Data was converted into shapefile format and imported into ArcGIS.

Basemap data was obtained from NSW Land and Property Information (LPI) 1:25000 digital topographic database (DTDB), with cadastral data obtained from LPI digital cadastral database (DCDB). Mapping of stream order was undertaken using a model using the Hydroline layer within the DTDB.

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The following spatial datasets were utilised during the development of this report:

- Catchment data was obtained from the Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DIWA).
- State Environmental Planning Policy (SEPP) No. 14 Coastal Wetlands.
- NSW Soil and Land Information System (SALIS).
- Aerial imagery for the BioBank site was obtained from KFW.
- Aerial photography for the assessment circle was obtained from the NSW public imagery database (date: 10 November 2014).



**Legend**

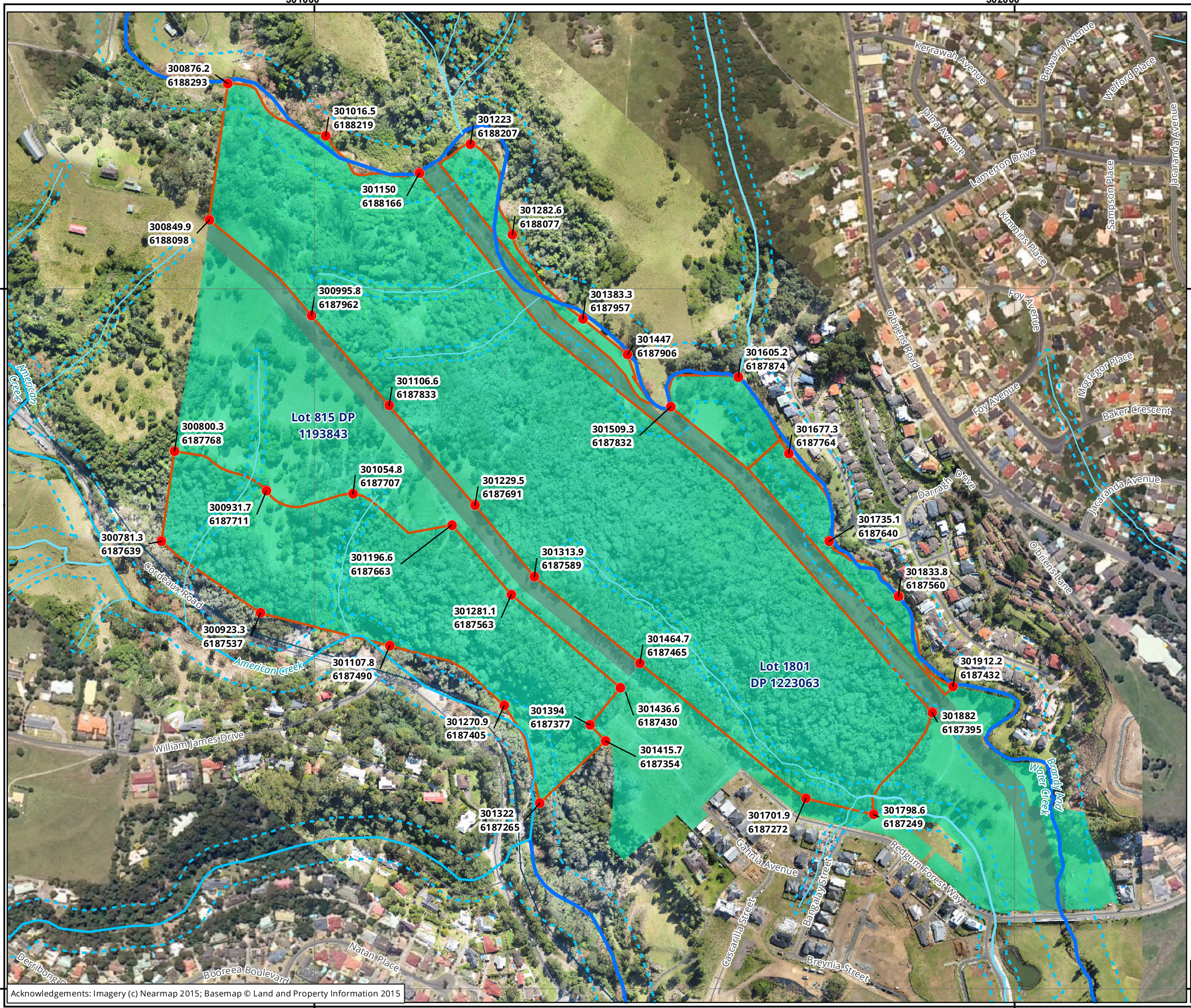
- BioBank site
  - Lot 815 DP 1193843 and Lot 1801 DP 1223063
  - Assessment circles
  - IBRA Subregions
  - Vegetation in the outer assessment circle
- Mitchell landscape**
- Bce, Bulli Coastal Escarpment
  - Dap, Dapto - Wollongong Coastal Slopes
  - Kip, Kiama Coastal Slopes
  - Lap, Lake Illawarra Alluvial Plains
  - Wpp, Woronora Plateau

**Figure 1: Location map - Redgum Ridge Western Precinct, BioBank Site**

0 250 500 750 1,000 1,250  
Metres  
Scale: 1:25,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Matter: 20288  
Date: 16 December 2016,  
Checked by: NMG, Drawn by: LH, Last edited by: lharley  
Location: P:\20200s\20289\Mapping\20289\_BB\_F1\_LocationMap\_20161216



**Legend**


- BioBank site
- Lot 815 DP 1193843 and Lot 1801 DP 1223063
- Easements
- Stream buffers

**Stream order**

- 1
- 2
- 3
- 4

**Figure 2: Site map - Redgum Ridge Western Precinct, BioBank Site**

0 50 100 150 200 250  
Metres  
Scale: 1:5,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



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## 2. Landscape

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### 2.1 Bioregions and landscapes regions

The BioBank site occurs within the Sydney Basin IBRA bioregion, and the Illawarra IBRA subregion (Figure 2). The Sydney Cataract IBRA subregion is located within the outer assessment circle, to the north-west of the study area (Figure 1).

The BioBank site occurs within the Dapto – Wollongong Coastal Slopes Mitchell Landscape (Figure 2). The Lake Illawarra Alluvial Plains Mitchell Landscape occurs within the inner assessment circle to the south-east of the site. The Bulli Coastal Escarpment and Woronora Plateau Mitchell Landscapes occur within the outer assessment circle to the west of the site, and the Kiama Coastal Slopes Mitchell Landscape occurs within the outer assessment circle to the south-east of the site (Figure 1).

### 2.2 Waterways and wetlands

The study area is located within the Lake Illawarra catchment area. Waterways within and adjacent to the BioBank site are part of the Allans Creek catchment, with both Brandy and Water Creek and American Creek flowing into Allans Creek approximately 2 kilometres south-west of the site. The Allans Creek catchment is characterised by the Illawarra escarpment which rises to a height to 400 metres to the west above the low coastal plain. Allans Creek enters the Pacific Ocean via Tom Thumbs Lagoon at Port Kembla.

Two first order ephemeral streams flow northwards into a fourth order section of Brandy and Water Creek in the northern section of the BioBank site. A first order intermittent stream is located within the north-eastern section of the BioBank site; this creek flows eastwards converging with both Brandy and Water Creek and American Creek to the east of the site. Two first order ephemeral streams flow south into a third order section of American Creek in the southern section of the BioBank site. American Creek and Brandy and Water Creek converge approximately 450 metres east of the BioBank site to form Allans Creek.

The outer assessment circle intersects a number of creeks and associated tributaries, including:

- Byaralong Creek and a number of unnamed tributaries (located to the north of the BioBank site).
- Allans Creek and a number of unnamed tributaries (located to the south of the BioBank site).

No SEPP No. 14 coastal wetlands or DIWA wetlands are located within the BioBank site or outer assessment circle.

### 2.3 Native vegetation extent

Mapping of vegetation within the outer assessment circle was undertaken using a combination of NPWS (2002) and aerial photo interpretation to remove areas where development or clearing has occurred.

NPWS (2002) maps 14 native vegetation communities within the outer assessment circle, including:

- Alluvial Swamp Mahogany Forest
- Coachwood Warm Temperate Rainforest
- Coastal Grassy Red Gum Forest
- Escarpment Blackbutt Forest

- Escarpment Edge Silvertop Ash Forest
- Escarpment Moist Blue Gum Forest
- Floodplain Wetland
- Illawarra Escarpment Subtropical Rainforest
- Lowland Dry-Subtropical Rainforest
- Moist Box-Red Gum Foothills Forest
- Moist Coastal White Box Forest
- Moist Gully Gum Forest
- Spotted Gum Open Forest

This vegetation mapping was undertaken prior to 2002. Since this time parts of the outer assessment circle have been developed or cleared for other purposes. For this reason, assessment of the NPWS (2002) was undertaken using aerial photo interpretation with obvious areas of clearing removed and areas that were interpreted to be native vegetation added to the data. This resulted in a total of 1071 hectares of native vegetation being mapped within the inner and outer assessment circles (Figure 3).

## 2.4 Assessment of landscape value

Landscape value has been calculated using the method for BioBank sites, outlined in Appendix 6 of the BioBanking Assessment Methodology 2014 (OEH 2014).

### 2.4.1 Assessment of the current extent of native vegetation cover

A 300 hectare inner assessment circle was used to calculate landscape value, as this was the smallest size required to fit the BioBank site. This resulted in a 3000 hectare outer assessment. The assessment circles were centred on the northern section of the BioBank as this was considered to represent the centroid of greatest improvement for the site (Figure 3).

Native vegetation cover within the inner and outer assessment circle was determined using the refined NPWS (2002) dataset (see above under Section 2.3). Table 1 provides a summary of the extent of native vegetation cover within the inner and outer assessments circles, before and after BioBanking based on the outcomes of Stage 3 detailed herein

**Table 1: Extent of native vegetation cover before and after development**

Assessment Circle	Before BioBanking		After BioBanking	
	Area (ha)	Per cent	Area (ha)	Per cent
Outer assessment circle	1017	34	1021	34
Inner assessment circle	118	39	122	41

### 2.4.2 Assessment of connectivity value

The BioBank site is located on the southern bank of a fourth order section of Brandy and Water Creek. Therefore, the BioBank site is located within a strategic location, being a 'Riparian buffer on one side of a fourth or fifth order stream or higher'.

No further assessment of connectivity value is required.

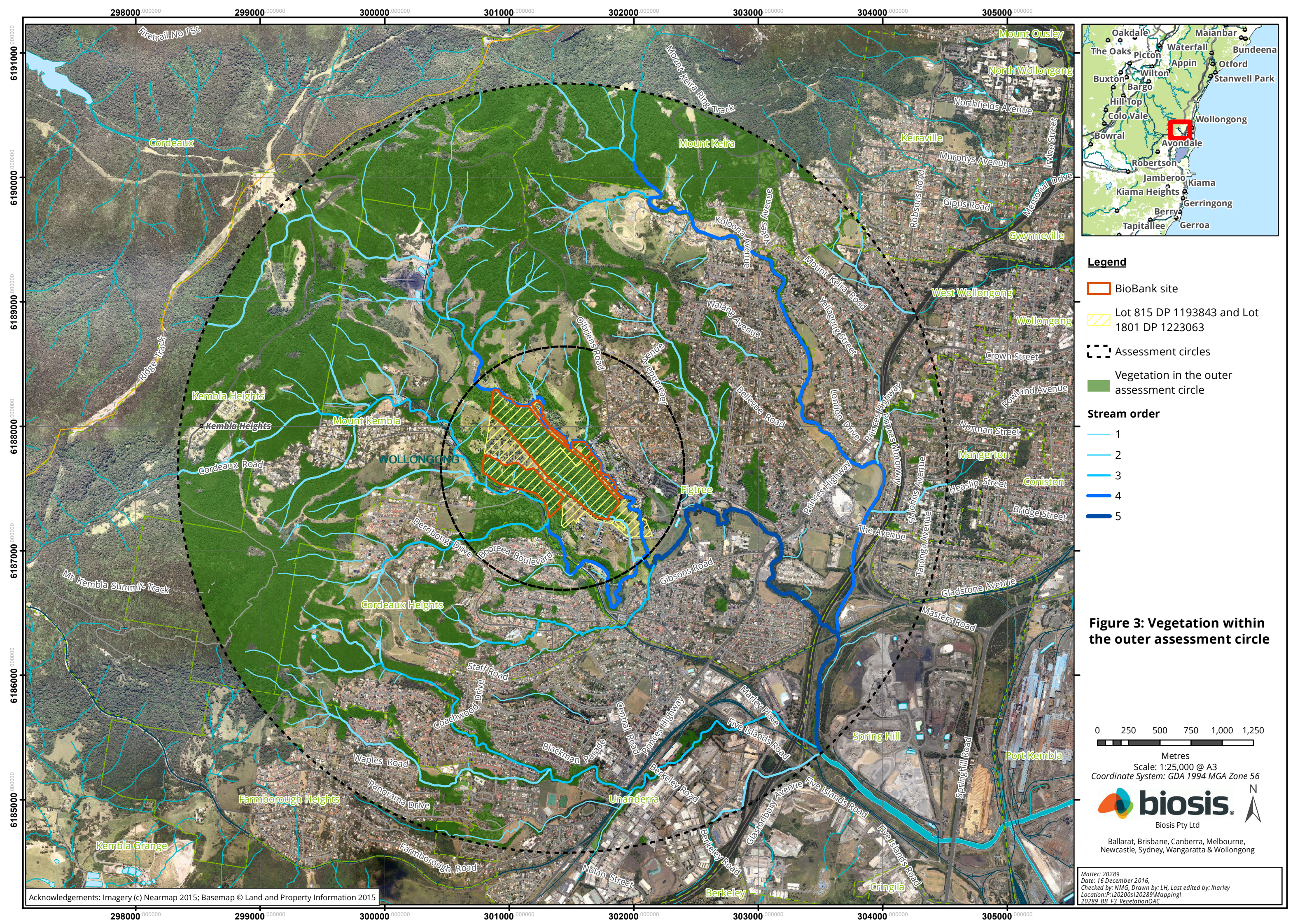
### **2.4.3 Assessment of patch size**

Patch size was assessed using a Geographic Information System (GIS). All vegetation not defined as low condition and separated by a distance of less than 100 metres was mapped sequentially using a selection process in ArcGIS. Using this method, vegetation within the study area forms part of a large patch of vegetation, extending into the Woronora plateau and land managed by Water NSW as a part of Sydney's drinking water catchment. The BioBank site was assessed as having a patch size of > 1000 hectares.

The Dapto – Wollongong Coastal Slopes Mitchell Landscape is estimated to be 71 per cent cleared. A patch size of greater than 100 hectares is deemed to be 'Extra Large' for Mitchell Landscapes with a percent native vegetation cleared of 70 – 90 per cent.

The BioBank site fits into the 'Extra Large' patch size class.





**Legend**

- BioBank site
- Lot 815 DP 1193843 and Lot 1801 DP 1223063
- Assessment circles
- Vegetation in the outer assessment circle

**Stream order**

- 1
- 2
- 3
- 4
- 5

**Figure 3: Vegetation within the outer assessment circle**

0 250 500 750 1,000 1,250  
Metres

Scale: 1:25,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 20289  
Date: 16 December 2016,  
Checked by: NMG, Drawn by: LH, Last edited by: lharley  
Location: P:\20200s\20289\mapping\20289\_BB\_F3\_VegetationOAC

## 3. Native vegetation

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The extent of native vegetation within the study area was determined using Section 5 of the BioBanking Assessment Methodology 2014 (OEH 2014).

### 3.1 Background review

A review of regional vegetation mapping by NPWS (2002) was undertaken to inform the site investigation.

NPWS (2002) maps four native vegetation communities within the BioBank site (Figure 4). Moist Box-Red Gum Foothills Forest (MU13) is mapped as the predominant vegetation community within the site, occurring across the northern and north-eastern sections. A small patch of Coastal Grassy Redgum Forest (MU23) is mapped in the north-western section of the site. Escarpment Moist Blue Gum Forest (MU8) is mapped along the northern and southern boundaries. Small patches of Lowland Dry-Subtropical Rainforest (MU4) are mapped along the southern boundary of the BioBank site.

Detailed mapping of vegetation within the BioBank site was undertaken for this assessment. Methodology is outlined in Section 3.2 and results presented in Section 3.3.

### 3.2 Methods

#### 3.2.1 Site investigation

Investigations of the BioBank site have been carried out between September 2011 and December 2015. In summary, investigations included:

- 2011 – A constraints assessment undertaken to document the flora and fauna habitats within the BioBank site and to inform concept plans for a proposed rezoning and residential development. Field work undertaken included initial mapping of the vegetation communities, random meanders for threatened flora species and assessment of fauna habitat features.
- 2013-2014 – A preliminary BioBanking assessment, including consultation with OEH and Local Land Services, to determine the feasibility of BioBanking or Biocertification of the site. Field work undertaken included confirmation of the vegetation types present and alignment with the NSW Biometric Vegetation Types (BVTs), as well as more detailed assessment of fauna habitat features within the BioBank site.
- 2015 – Additional detailed surveys, including refinement of vegetation mapping using Light Detection and Ranging (LiDAR) data to map the tree canopy, ground-truthing to provide detailed mapping of vegetation, vegetation plots/transects in accordance with the NSW BioBanking Assessment Methodology (OEH 2014) and targeted surveys for threatened flora species within the BioBank site.

The following provides the details of survey methods undertaken to inform this assessment.

#### **Constraints assessment (Biosis Research 2011)**

Flora and fauna field assessments were undertaken on 14 September 2011. The flora and fauna surveys were preliminary in nature and designed to inform key elements of concept planning for a rezoning and lot layout of the site.

Flora surveys focused on ground truthing the existing NPWS (2002) vegetation mapping and defining vegetation formations for consideration in bushfire hazard assessment and planning. Redefining the boundaries of plant communities and alignment into vegetation types (Keith 2004) was based on sampling and observations of vegetation, structure, floristic composition and physiographic features such as soils and aspect. Flora surveys were undertaken using a combination of 20 x 20 metre quadrats, spot locations and random meanders to sample each stratification unit for the purpose of identifying the community type. Flora surveys were carried out in the following landscape stratification units:

- Closed forest
- Woodland
- Open woodland
- Closed scrub
- Cleared and disturbed areas.

Flora habitat assessments focused on the potential for threatened flora species and populations to occur on within the BioBank site, and the presence or absence of threatened ecological communities (TECs). The general condition of the vegetation was assessed based on disturbance history, the degree of infestation by exotic species, structure and overall resilience. Threatened flora species previously recorded in the locality and with potential to occur on the site were targeted in surveys. An inventory of the native and exotic flora species recorded for each plant community was compiled.

Brief diurnal fauna surveys were conducted over the BioBank site to determine the values of the site for fauna. These were determined, primarily, on the basis of the types and qualities of habitat(s) present on the site. The presence of the following habitat features was noted:

- Structure and floristics of vegetation communities.
- Ground cover vegetation, leaf litter and presence of coarse woody debris.
- Size, range and abundance of hollow-bearing trees.
- Rocky outcrops, overhangs or crevices.
- Presence of specific feed trees or host plants.
- Presence of foraging, roosting or nesting resources.
- Size, number and vegetation cover of waterbodies present.
- Connectivity to off-site habitat.
- Disturbance, including weed invasion, clearing, rubbish, fire and urban development.

All species of fauna observed during the assessment were recorded and active searching for fauna was undertaken. This included direct observation during diurnal surveys, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site and were not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

### **Preliminary BioBanking assessment (Biosis 2014)**

Diurnal flora and fauna surveys were carried out over the BioBank site on 1 August 2013 to confirm vegetation types and map condition in accordance with the previous version of the BioBanking Assessment

Methodology (DECC 2008). This was followed by a general flora and fauna assessment incorporated as part of the more formal BBAM surveys on 16 October 2013. Flora surveys included:

- Random meanders over the BioBank site in the main landscape stratification units targeting threatened flora species and populations previously recorded in the locality and with potential to occur on the subject site. Species targeted included:
  - Eastern Flame Pea *Chorizema parviflorum* (threatened population)
  - White-flowered Wax Plant *Cynanchum elegans*
  - Illawarra Socketwood *Daphnandra johnsonii*
  - Rainforest Cassia *Senna acclinis*
  - *Solanum celatum*.
- Searches to locate and confirm the continued presence of threatened flora species recorded in previous surveys by UBM Consultants (2005).
- Assessment to confirm the extent of the of the TSC Act listed TECs *Illawarra lowlands grassy woodland in the Sydney Basin Bioregion* and *Illawarra subtropical rainforest in the Sydney Basin Bioregion* as previously mapped by NPWS (2002) or amended and mapped by Biosis Research (2011).

Plot and transect surveys were undertaken in accordance with DECC (2008). Plot and transect surveys included:

- A 20 metre x 50 metre quadrat and 50 m transect for assessment of site attributes.
- A 20 metre x 20 metre quadrat, nested within the quadrat outlined above, for full floristic survey to determine native plant species richness.

### **Additional survey and assessment**

Additional surveys and assessment of the BioBank site have been undertaken during the development of this Biodiversity Assessment Report to align previous surveys with the current NSW BioBanking Assessment Methodology (OEH 2014). This additional survey and assessment has focused on refining the mapping of vegetation types within the BioBank site, mapping of vegetation condition and weeds and targeted surveys for threatened species.

Mapping of the tree canopy was obtained using LiDAR data, sourced from the NSW LPI. Small gaps in the LiDAR data were manually filled to obtain a defined boundary for the tree canopy layer across the BioBank site. Data obtained using this method provides an accurate representation of the tree canopy, but does not define if this is native vegetation, and does not provide information on areas with a native understorey but no overstorey. This tree canopy layer was used to inform further surveys.

Flora surveys undertaken for this assessment included the refinement of previous vegetation mapping (Biosis Research 2011, Biosis 2014). Vegetation mapping was conducted using hand-held (uncorrected) tablet units using the ArcGIS Collector application, the tree canopy layer and aerial photo interpretation, with the boundaries of vegetation types determined by ground-truthing. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally  $\pm 5$  metres) and dependent on the limitations of aerial photo rectification and registration. Mapping has been produced using a GIS.

Delineation of PCT boundaries was undertaken using the vegetation community definitions of NPWS (2002), definitions for the relevant vegetation types obtained from the NSW Vegetation Information System (VIS): Classification Version 2.1, along with the final determination for the Illawarra Subtropical Rainforest EEC (NSW Scientific Committee 2002) and Illawarra Lowlands Grassy Woodland EEC (NSW Scientific Committee 2011).

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is vegetation type (or PCT). PCTs were identified using the VIS Classification Version 2.1.

PCTs were stratified into vegetation zones based on condition (low or moderate/good) and ancillary code (where relevant). Areas that do not currently support extensive native communities, but will be rehabilitated to provide buffers to other communities or to enhance the BioBank site, are mapped as PCTs in low condition.

Following stratification of vegetation zones, the site value was assessed using plot and transect survey data, as per the methodology outlined in Section 5 of the NSW BioBanking Assessment Methodology (OEH 2014). Plot and transect surveys included:

- A 20 metre x 50 metre quadrat and 50 m transect for assessment of site attributes.
- A 20 metre x 20 metre quadrat, nested within the quadrat outlined above, for full floristic survey to determine native plant species richness.

The minimum number of plots/transects per vegetation zone was determined using Table 3 of OEH (2014b). A total of 19 plots/transects were completed within the BioBank site (Figure 5).

Additional targeted flora surveys were undertaken between September and December 2015 with the entire BioBank site traversed on foot using the random meander method (Cropper 1993). These targeted surveys focused on identifying the following threatened species:

- Eastern Flame Pea (threatened population)
- Illawarra Greenhood *Pterostylis gibbosa*
- Illawarra Socketwood
- Illawarra Zieria *Zieria granulata*,
- Rainforest Cassia
- *Solanum celatum*.
- Spiked Rice-flower *Pimelea spicata*
- White-flowered Wax Plant.

A list of flora species was compiled for each vegetation type. Records of all flora species will be submitted to OEH for incorporation into the Atlas of NSW Wildlife.

## 3.3 Results

### 3.3.1 Vegetation description

The BioBank site supports 43.05 hectares of native vegetation as well as 3.76 hectares of vegetation that will be rehabilitated as outlined above (Figure 5).

The site supports open forest communities. Weed cover in these areas was generally low, with the exception of a moderate weed cover within Megarritys Creek and associated tributaries, where moisture and nutrient levels are elevated.

### 3.3.2 Plant community types

Site investigations, including determination of vegetation communities using the methodology outlined in Section 3.2.1, confirmed the presence of three vegetation communities within the BioBank site.

The condition of vegetation within the BioBank site was assessed in accordance with the NSW BioBanking Assessment Methodology (OEH 2014). Forest Red Gum - Thin-leaved Stringybark grassy woodland was assessed as being in moderate / good condition, but with a section of derived native grassland. Areas of Sydney Blue Gum X Bangalay - Lilly Pilly moist forest included areas in Moderate / good condition, but varying levels of weed infestation (ancillary code poor) and a derived native grassland area. Some sections of this community are currently in a degraded form and will be rehabilitated; these areas were considered to be in low condition using the NSW BioBanking Assessment Methodology (OEH 2014). Areas of Whalebone Tree - Native Quince dry subtropical rainforest were mostly in moderate / good condition with some areas subject to significant weed invasion, that will be rehabilitated, considered to be in low condition using the NSW BioBanking Assessment Methodology (OEH 2014)

As a result, eight vegetation zones have been mapped within the BioBank site. Vegetation zones identified within the BioBank site, including the PCT, the vegetation formation and vegetation class (Keith 2004) and the area of each vegetation zone is described in Table 2.

**Table 2: Vegetation zones mapped within the study area**

Vegetation zone <sup>1</sup>	Plant community type	Vegetation formation	Vegetation class	Condition	Ancillary code	Area (ha)
03	SR545 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Coastal Valley	Grassy woodlands	Moderate / good	–	8.98
04		Grassy Woodlands		Moderate / good	Derived grassland	0.32
05	SR652 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	Southern Escarpment	Wet sclerophyll forests (shrubby sub-formation)	Moderate / good	–	20.59
06		Wet Sclerophyll Forests		Moderate / good	Derived grassland	0.27
07				Moderate / good	Poor	1.86

<sup>1</sup> Numbering of vegetation zones continues from the Biodiversity certification agreement developed for the development site (Biosis 2015a, 2015b). As such, Vegetation Zones 01 and 02 are not referred to herein.


Vegetation zone <sup>1</sup>	Plant community type	Vegetation formation	Vegetation class	Condition	Ancillary code	Area (ha)
08				Low	–	4.15
09	SR662 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Rainforests	Dry rainforests	Moderate / good	–	9.61
10				Low	–	1.04

A detailed description of each vegetation zone is provided in Table 3 (Vegetation Zones 3 and 4) and Table 4 (Vegetation Zones 5 and 6).

**Table 3: Vegetation zones 3 and 4 – Forest Red Gum - Thin-leaved Stringybark grassy woodland**

Vegetation zones 3 and 4 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	
<b>Plant community type ID</b>	838
<b>Biometric vegetation type ID</b>	SR545
<b>Common name</b>	Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion
<b>Condition</b>	Moderate / good (Vegetation Zone 3) Moderate / good – Derived grassland (Vegetation Zone 4)
<b>Extent within study area</b>	8.98 hectares of moderate/good condition Forest Red Gum - Thin-leaved Stringybark grassy woodland was mapped within the BioBank site in Vegetation Zone 3, with a further 0.32 hectares of derived grassland in Vegetation Zone 4.
<b>Description</b>	This PCT spans the central ridge and upper slopes of the BioBank site (Figure 5).  The canopy is dominated by remnant and regrowth Forest Red Gum <i>Eucalyptus tereticornis</i> ranging in height from 15 to 25 metres. There is a midstorey that includes Maiden's Wattle <i>Acacia maidenii</i> , Red Ash <i>Alphitonia excelsa</i> , Grey Myrtle <i>Backhousia myrtifolia</i> , Willow Bottlebrush <i>Callistemon salignus</i> , regrowth <i>Eucalyptus tereticornis</i> and patches of Prickly-leaved Tea Tree <i>Melaleuca styphelioides</i> . The understorey varies from sparse to scattered occurrences of native shrubs such as Orange Thorn <i>Pittosporum multiflorum</i> and Veined Mock-olive <i>Notelaea venosa</i> . Lantana <i>Lantana camara</i> is present throughout as scattered occurrences under a well-developed canopy to dense thickets in places. The groundcover stratum is generally in good condition and dominated by native species such as <i>Carex longibrachiata</i> , Kidney Weed <i>Dichondra repens</i> , Pennywort <i>Hydrocotyle peduncularis</i> , Weeping Grass <i>Microlaena stipoides</i> var. <i>stipoides</i> , Whiteroot <i>Pratia purpurascens</i> and Bearded Tylophora <i>Tylophora barbata</i> .

**Vegetation zones 3 and 4 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion**

<b>Survey effort</b>	Four plots/transects were undertaken in the Vegetation Zone 3 and one plot/transect undertaken in Vegetation Zone 4 (Figure 5).
<b>Disturbance</b>	This PCT is generally in good condition, with disturbance limited to a 30 to 50% cover of Lantana in the northern section of the BioBank site and grazing by deer. Areas of derived grassland have been subject to past clearing and are devoid of a canopy and midstorey layer but maintain a predominantly native grassy groundcover.
<b>Species relied upon for identification of vegetation type and relative abundance</b>	The presence and dominance of Forest Redgum in the overstorey, with only scattered occurrence of other species, and the predominantly grassy groundcover were used to identify the extent of this vegetation type within the BioBank site.
<b>EEC Status</b>	Commonwealth EPBC Act: Not listed NSW TSC Act: <i>Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion</i> endangered ecological community
<b>Estimate of percent cleared value of PCT</b>	85%
<b>Plate 1: Forest Red Gum - Thin-leaved Stringybark grassy woodland (VZ03)</b>	

**Table 4: Vegetation zones 5, 6, 7 and 8 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest**

**Vegetation zones 5, 6, 7 and 8 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion**


<b>Plant community type ID</b>	1245
<b>Biometric vegetation type ID</b>	SR652 (HN597 in the Hawkesbury Nepean CMA and ME044 in the Metropolitan CMA)
<b>Common name</b>	<i>Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion</i>
<b>Condition</b>	Moderate / good (Vegetation Zone 5)



**Vegetation zones 5, 6, 7 and 8 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion**

	<p>Moderate / good – Derived grassland (Vegetation Zone 6)  Moderate / good – Poor (Vegetation Zone 7)  Low (Vegetation Zone 8)</p>
<b>Extent within study area</b>	<p>20.59 hectares of moderate/good condition Sydney Blue Gum X Bangalay - Lilly Pilly moist forest was mapped within the BioBank site, with another 0.27 hectares of derived grassland and 1.86 considered to be in poor condition. 4.15 hectares in low condition will be rehabilitated.</p>
<b>Description</b>	<p>Sydney Blue Gum X Bangalay - Lilly Pilly Moist Forest is the predominant PCT within the BioBank site, occurring across the northern slope and in the south-west corner of the site.</p> <p>The canopy is dominated by Forest Red Gum with occasional White-topped Box <i>Eucalyptus quadrangulata</i> in the higher areas whilst <i>Eucalyptus saligna</i> X <i>botryoides</i> is dominant in the lower stands with Forest Red Gum occasional. The midstorey and understory is absent in the higher ridge areas that are being slashed. The midstorey is variable in per cent cover but is dominated by Grey Myrtle, Red Olive-berry <i>Cassine australis</i> var. <i>australis</i>, and <i>Dodonaea viscosa</i> ssp. <i>angustifolia</i> on the higher slopes with occasional Willow Bottlebrush. The midstorey of the lower slope area of this community includes Two-veined Hickory <i>Acacia binervata</i>, Grey Myrtle, White Cedar <i>Melia azedarach</i> and Brush Cherry <i>Syzygium australe</i>. Similarly, understory vegetation cover and floristics are variable however Lantana, Cockspur Thorn <i>Maclura cochinchinensis</i> and Orange Thorn are present throughout, along with a dense cover of the weed Mysore Thorn <i>Caesalpinia decapetala</i> in some areas. The groundcover in the slashed areas is a mix of native and exotic grasses and forbs. Native species include Kidney Weed, Weeping Grass and <i>Oplismenus aemulus</i>, whilst exotic species are Narrow-leafed Carpet Grass <i>Axonopus fissifolius</i>, Cobbler's Pegs <i>Bidens pilosa</i>, Spear Thistle <i>Cirsium vulgare</i>, Panic Veldtgrass <i>Ehrharta erecta</i> and Black Medic <i>Medicago lupulina</i>. The groundcover stratum is sparse under areas of intact or advanced regrowth in the upper strata and includes native grasses, ferns and scramblers such as Giant Maidenhair <i>Adiantum formosum</i>, Old Man's Beard <i>Clematis aristata</i>, Prickly Rasp Fern <i>Doodia aspera</i>, Scrambling Lily <i>Geitonoplesium cymosum</i>, Sickle Fern <i>Pellaea falcata</i> and Pastel Flower <i>Pseuderanthemum variabile</i>.</p>
<b>Survey Effort</b>	<p>Five plots/transects were undertaken in the Vegetation Zone 5, one in Vegetation Zone 6, one in Vegetation 7 and two in Vegetation Zone 8 (Figure 5).</p>
<b>Disturbance</b>	<p>This PCT has low to high levels of disturbance, with dense infestations of Lantana and Mysore Thorn of greater than 50% cover in some areas, rubbish dumping and .</p>
<b>Species relied upon for identification of vegetation type and relative abundance</b>	<p>The presence of White-topped Box and <i>Eucalyptus saligna</i> X <i>botryoides</i> in the overstorey were used to identify the extent of this vegetation type within the BioBank site.</p>

**Vegetation zones 5, 6, 7 and 8 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion**


<b>EEC Status</b>	Commonwealth EPBC Act: Not listed NSW TSC Act: Not Listed
<b>Estimate of percent cleared value of PCT</b>	45%
<b>Plate 2: Sydney Blue Gum X Bangalay - Lilly Pilly moist forest</b>	

**Table 5: Vegetation zones 9 and 10 – Whalebone Tree - Native Quince dry subtropical rainforest**

**Vegetation zones 9 and 10 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion**

<b>Plant community type ID</b>	1300
<b>Biometric vegetation type ID</b>	SR662 (HN608 in the Hawkesbury Nepean CMA)
<b>Common name</b>	<i>Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion</i>
<b>Condition</b>	Moderate / good (Vegetation Zone 9) Low (Vegetation Zone 10)
<b>Extent within study area</b>	9.61 hectares of moderate/good condition Whalebone Tree - Native Quince dry subtropical rainforest was mapped within the BioBank site and another 1.04 hectares in low condition will be rehabilitated.
<b>Description</b>	<p>Whalebone Tree - Native Quince dry subtropical rainforest occurs on steeper slopes and gullies.</p> <p>The canopy is dominated by native trees species including Red Ash, Grey Myrtle, Red Olive-berry with occasional Willow Bottlebrush, Prickly-leaved Tea Tree and Whalebone Tree <i>Streblus brunonianus</i> on the higher slopes. Remnant and</p>

**Vegetation zones 9 and 10 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion**

	<p>regrowth Forest Red Gum is present as an occasional emergent. The understorey is very sparse and common species are Cockspur Thorn, Orange Thorn and regenerating Red Olive-berry. Lantana is also common as scattered individuals under dense canopy or moderate patches in more open areas. The groundcover stratum is also sparse under intact canopy and includes native ferns, grasses and forbs. Common species are Giant Maidenhair, Necklace Fern <i>Asplenium flabellifolium</i>, Kidney Weed, Prickly Rasp Fern, Scrambling Lily, <i>Oplismenus aemulus</i> and <i>Stellaria flaccida</i>. Exotic species in the groundcover stratum include Cape Ivy <i>Delairea odorata</i> in open areas and Madeira Winter Cherry <i>Solanum pseudocapsicum</i> in shadier locations.</p>
<b>Survey Effort</b>	<p>Three plots/transects were undertaken in the Vegetation Zone 9 and two plots/transects undertaken in Vegetation Zone 10 (Figure 5).</p>
<b>Disturbance</b>	<p>Some areas within this PCT are subject to dense weed infestations, particularly Lantana and moderate levels of impact from grazing by deer.</p>
<b>Species relied upon for identification of vegetation type and relative abundance</b>	<p>The presence of this PCT was indicated by a dense cover (&gt;70%) of mesic overstorey species such as Red Ash, Grey Myrtle, Red Olive-berry and Whalebone Tree,</p>
<b>EEC Status</b>	<p>Commonwealth EPBC Act: Not listed NSW TSC Act: <i>Illawarra Subtropical Rainforest in the Sydney Basin Bioregion</i> endangered ecological community</p>
<b>Estimate of percent cleared value of PCT</b>	<p>90%</p>
<b>Plate 3: Whalebone Tree - Native Quince dry subtropical rainforest</b>	

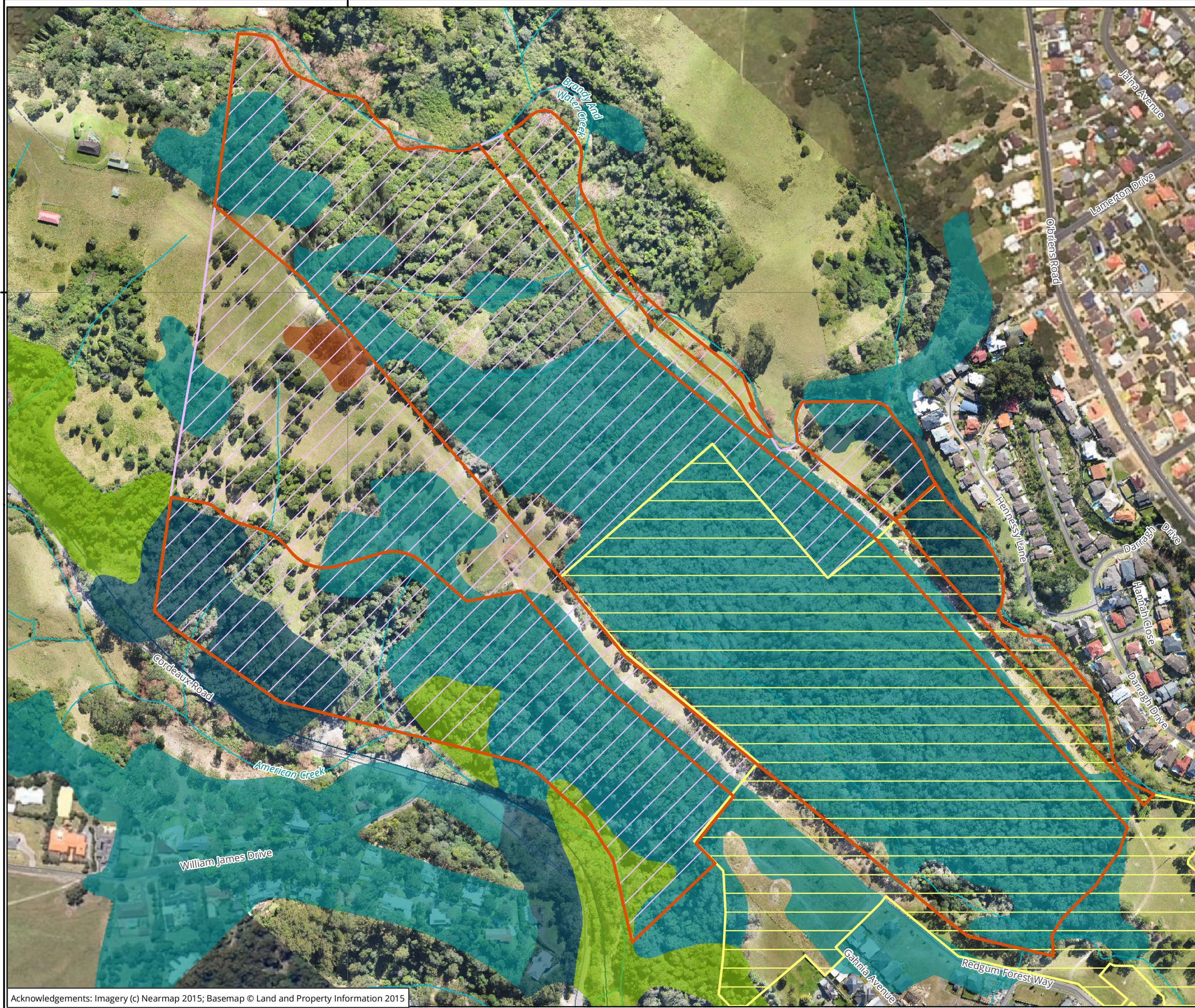
### 3.3.3 Site value scores

Plots and transect survey data was inputted into the BioBanking credit calculator to determine site value scores. All site attributes for vegetation zones 4 and 6 were scored as zero given that vegetation is currently

cleared. Plot and transect survey data is presented in Appendix 1. Current site value scores for each Vegetation Zone are outlined in Table 6.

**Table 6: Site value scores for all vegetation zones**

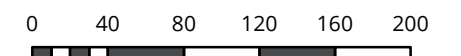
Vegetation zone	PCT	Site value score	Area
03	SR545 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	72.40	8.98
04		10.94	0.32
05	SR652 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	72.40	20.59
06		31.25	0.27
07		46.35	1.86
08		33.85	4.15
09	SR662 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	75.52	9.61
10		33.33	1.04



**Legend**

-  BioBank site
-  Lot 815 DP1193843
-  Lot 1801 DP1223063
- Native vegetation (NPWS 2002)**
-  Lowland Dry-Subtropical Rainforest (MU4)
-  Escarpment Moist Blue Gum Forest (MU8)
-  Moist Box-Red Gum Foothills Forest (MU13)
-  Coastal Grassy Red Gum Forest (MU23)

**Figure 4: Native vegetation mapping, NPWS (2002)**

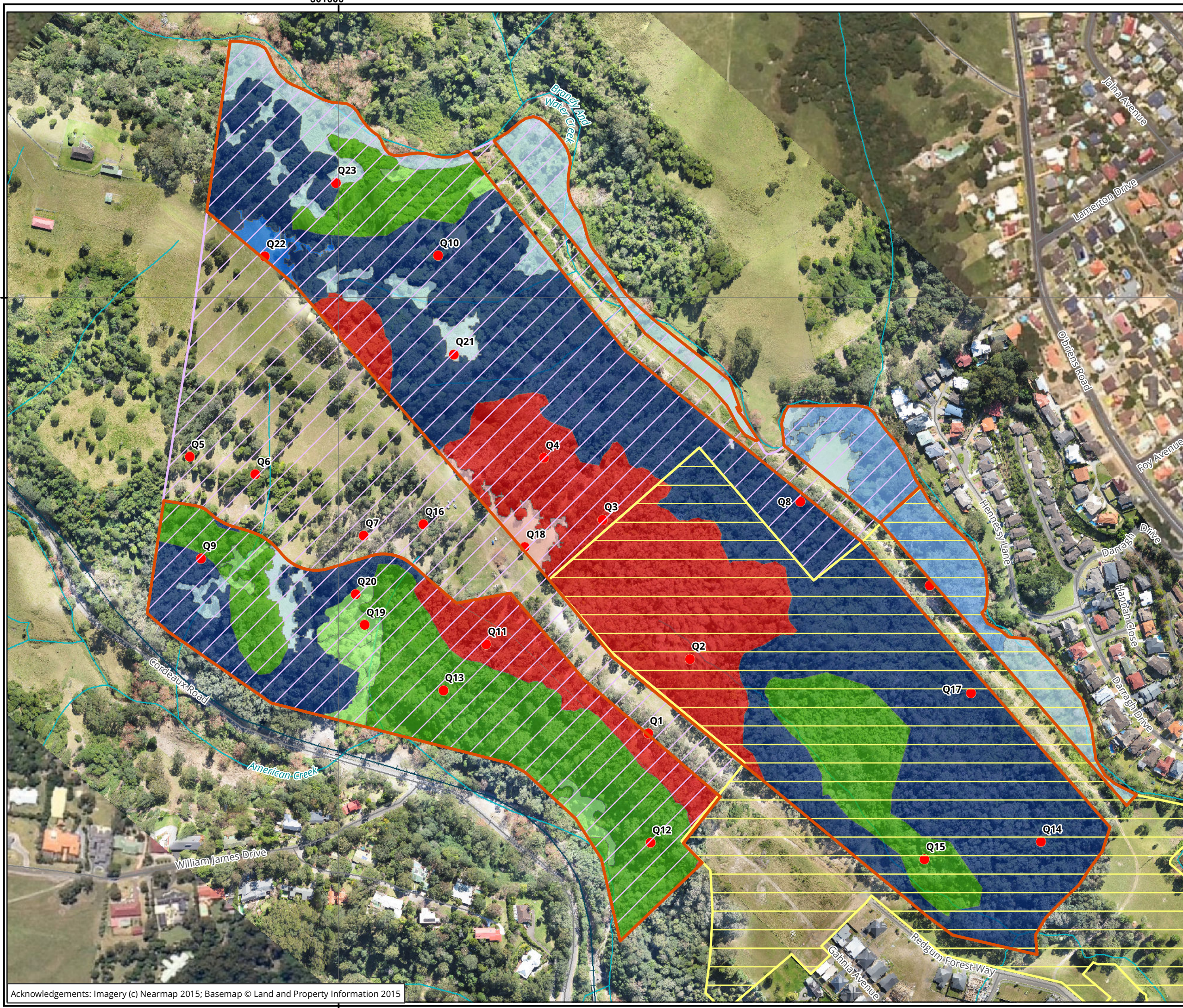


Metres  
 Scale: 1:4,000 @ A3  
 Coordinate System: GDA 1994 MGA Zone 56



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 Newcastle, Sydney, Wangaratta & Wollongong

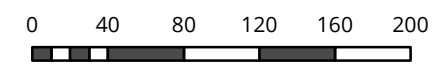
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 Date: 16 December 2016,  
 Checked by: NMG, Drawn by: LH, Last edited by: lharley  
 Location: P:\20200s\20289\Mapping\20289\_BB\_F4\_VegetationNPWS



**Legend**

- BioBank site
  - Lot 815 DP1193843
  - Lot 1801 DP1223063
  - Flora survey effort (Biosis 2015)
- Native vegetation (Biosis 2015)**
- VZ03: Forest Red Gum - Thin-leaved Stringybark grassy woodland - Moderate/Good
  - VZ04: Forest Red Gum - Thin-leaved Stringybark grassy woodland - Moderate/Good (Derived grassland)
  - VZ05: Sydney Blue Gum x Bangalay Lilly Pilly moist forest - Moderate/Good
  - VZ06: Sydney Blue Gum x Bangalay Lilly Pilly moist forest - Moderate/Good (Derived grassland)
  - VZ07: Sydney Blue Gum x Bangalay Lilly Pilly moist forest - Moderate/Good (Poor)
  - VZ08: Sydney Blue Gum x Bangalay Lilly Pilly moist forest - Low
  - VZ09: Whalebone Tree - Native Quince dry subtropical rainforest - Moderate/Good
  - VZ10: Whalebone Tree - Native Quince dry subtropical rainforest - Low

**Figure 5: Native vegetation of the BioBank site, including flora survey effort**



Scale: 1:4,000 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 20289  
 Date: 16 December 2016,  
 Checked by: NMG, Drawn by: LH, Last edited by: lharley  
 Location: P:\20200s\20289\Mapping\20289\_BB\_FS\_VegetationBiosis

## 4. Threatened species

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### 4.1 Methods

Flora and fauna assessments of the BioBank site have been undertaken between September 2011 and December 2015. Section 3.2.1 provides an overview of threatened species surveys undertaken within the BioBank site.

### 4.2 Geographic /habitat features

An assessment of the occurrence of geographic habitat features within the BioBank site, in accordance with Section 6.3 of the NSW BioBanking Assessment Methodology (OEH 2014). The species generated by the calculator associated with the NSW BioBanking Assessment Methodology (OEH 2014), along with the results of this assessment are outlined in Table 7.

**Table 7: Assessment of geographic habitat features within the study area**

Scientific name	Common name	Managed at site?	Feature	Justification
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	No	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.	Suitable roosting habitat for this species was not recorded within the BioBank site.
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	No	Land within 40 metres of heath, woodland or forest.	Suitable habitat for the species, in the form of ephemeral streams with suitable breeding pools, is not present.
<i>Mixophyes balbus</i>	Stuttering Frog	No	Rainforest or tall open wet forest with understorey and/or leaf litter and within 100 m of streams.	Suitable habitat for this species is so degraded as to warrant the species unlikely to occur.
<i>Petroica rodinogaster</i>	Pink Robin	No	Land within 40 metres of gullies in eucalypt forests.	The BioBank site is outside the known range of this species.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	No	Heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 metres of, ephemeral or intermittent drainage lines.	The Red-crowned Toadlet is restricted to Triassic sandstones. Suitable habitat not present.
<i>Chorizema parviflorum</i>	<i>Chorizema parviflorum</i> Benth. (a shrub) population, Wollongong and Shellharbour local government areas	No	Land within Shellharbour and Wollongong LGAs in Illawarra CMA subregion.	Whilst there is a record of this species approximately 5 kilometres south of the BioBank site, the species was not recorded during targeted surveys.



Scientific name	Common name	Managed at site?	Feature	Justification
<b><i>Lespedeza juncea</i> subsp. <i>sericea</i></b>	<i>Lespedeza juncea</i> subsp. <i>sericea</i> population, Wollongong Local Government Area	No	Land within Wollongong LGA in Illawarra CMA subregion.	The endangered population occurs south of Dapto, and is known from just one location. The BioBank site is outside of this area.
<b><i>Solanum celatum</i></b>	<i>Solanum celatum</i>		Land within Shoalhaven River Valley in Ettrema CMA subregion.	The BioBank site is not located in the correct CMA subregion, however suitable habitat is present within the BioBank site. The species was not recorded during targeted surveys.

### **4.3 Ecosystem credit species**

A list of ecosystem credit species predicted to occur within the study area, based on the PCTs present and generated by the calculator associated with the NSW BioBanking Assessment Methodology (OEH 2014), along with an assessment of whether they occur within the study area and the Vegetation Zone they are predicted to occur in is provided in Table 8. The potential for a species to occur within the study area was assessed in accordance with Section 6.3 of the NSW BioBanking Assessment Methodology (OEH 2014).

**Table 8: Assessment of ecosystem credit species within the BioBank site**

Scientific name	Common name	TS offset multiplier	Habitat on site	Vegetation zone
<i>Burhinus grallarius</i>	Bush Stone-curlew	2.6	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	2	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652) Vegetation Zones 9 and 10 (SR662)
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	1.8	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652)
<i>Circus assimilis</i>	Spotted Harrier	1.4	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Daphoenositta chrysoptera</i>	Varied Sittella	1.3	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652)
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	2.6	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	2.2	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6 and 7 (SR652)
<i>Glossopsitta pusilla</i>	Little Lorikeet	1.8	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Hieraetus morphnoides</i>	Little Eagle	1.4	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Kerivoula papuensis</i>	Golden-tipped Bat	1.3	Yes	Vegetation Zones 5, 6 and 7 (SR652) Vegetation Zone 9 (SR662)
<i>Lathamus discolor</i>	Swift Parrot	1.3	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Lophoictinia isura</i>	Square-tailed Kite	1.4	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652)
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	2.2	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652)

Scientific name	Common name	TS offset multiplier	Habitat on site	Vegetation zone
<i>Neophema pulchella</i>	Turquoise Parrot	1.8	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Ninox connivens</i>	Barking Owl	3	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Ninox strenua</i>	Powerful Owl	3	Yes	Vegetation Zones 5, 6, 7 and 8 (SR652) Vegetation Zones 9 and 10 (SR662)
<i>Petroica boodang</i>	Scarlet Robin	1.3	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Petroica phoenicea</i>	Flame Robin	1.3	Yes	Vegetation Zones 3 and 4 (SR545)
<i>Potorous tridactylus</i>	Long-nosed Potoroo	1.3	Yes	Vegetation Zone 9 (SR662)
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove	1.3	Yes	Vegetation Zones 9 and 10 (SR662)
<i>Ptilinopus superbus</i>	Superb Fruit-dove	1.3	Yes	Vegetation Zones 9 and 10 (SR662)
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	2.2	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652) Vegetation Zones 9 and 10 (SR662)
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	2.2	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652) Vegetation Zones 9 and 10 (SR662)
<i>Tyto novaehollandiae</i>	Masked Owl	3	Yes	Vegetation Zones 3 and 4 (SR545) Vegetation Zones 5, 6, 7 and 8 (SR652) Vegetation Zones 9 and 10 (SR662)
<i>Tyto tenebricosa</i>	Sooty Owl	3	Yes	Vegetation Zones 5, 6 and 7 (SR652) Vegetation Zone 9 (SR662)

The presence of most species could not be discounted using the methodology outlined in Section 6.3 of the NSW BioBanking Assessment Methodology (OEH 2014). It was therefore assumed that most species occurred within the BioBank site.

Tg values represent how well as species will respond to management at a BioBank site, and, therefore, how the removal of habitat features will impact on the species in a local area. If a species is reliant on habitat features that take a long time to develop (e.g. hollows), or management actions are ineffective at addressing a species decline, or the species has poor fecundity or dispersal capability this will generate a higher Tg value.

For all vegetation zones the forest owls have a Tg value of 0.325 and a resultant threatened species offset multiplier of 3.0. These species include:

- Barking Owl (Vegetation Zones 3 and 4).
- Powerful Owl (Vegetation Zones 5, 6, 7, 8, 19 and 10).
- Masked Owl (All vegetation zones).
- Sooty Owl (Vegetation Zones 5, 6, 7 and 9).

Vegetation Zones 3 and 4 align with the Illawarra Lowlands Grassy Woodland EEC, while Vegetation Zones 9 and 10 align with the Illawarra Subtropical Rainforest EEC. As these vegetation zones are EECs they will generate a threatened species multiplier of 3.0 and this multiplier will be used to determine the number of ecosystem credits created.

## 4.4 Species credit species

### 4.4.1 Flora species

A list of species credit species (flora) predicted to occur within the BioBank site, based on the PCTs present, along with an assessment of whether the BioBank site provides suitable habitat is provided in Table 9. The potential for a species to occur within the BioBank site was assessed in accordance with Section 6.5 of the NSW BioBanking Assessment Methodology (OEH 2014).

**Table 9: Species credit species (flora) and status within the BioBank site**

Scientific name	Common name	Habitat present in the BioBank site	Justification	Recorded during targeted surveys
<b><i>Cynanchum elegans</i></b>	White-flowered Wax Plant	Yes	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include Forest Redgum open forest and woodland, which is present within the BioBank site. There are numerous records of this species in proximity to the BioBank site, and the species was known to occur within the site based off records from previous assessments (Biosis Research 2011, Biosis 2014). Targeted surveys were undertaken.	Yes
<b><i>Chorizema parviflorum</i></b>	Eastern Flame Pea	Yes	The species inhabits heath and sclerophyll woodland and forest on heavy soils, particularly woodlands or forest dominated by Forest Red Gum and/or Woollybutt <i>Eucalyptus longifolia</i> . Areas of Forest Red Gum - Thin-leaved Stringybark grassy woodland were considered potential habitat. Targeted surveys were undertaken.	No
<b><i>Daphnandra johnsonii</i></b>	Illawarra Socketwood	Yes	Occupies the rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes. Associated vegetation includes rainforest and moist eucalypt forest. There are a number of records of this species approximately 5 kilometres south of the BioBank site. A precautionary approach was undertaken and it was considered there is potential for this species to occur in Sydney Blue Gum X Bangalay - Lilly Pilly moist forest and Whalebone Tree - Native Quince dry subtropical rainforest. Targeted surveys were undertaken.	No
<b><i>Irenepharsus trypherus</i></b>	Illawarra Irene	No	Occurs on coast and escarpment between Wollongong and the Shoalhaven River, typically inhabiting steep rocky slopes near cliff lines and ridge tops with the species being recorded from the upper slopes of the ridge systems that extend south and east of the Illawarra escarpment. Habitat associations include moist sclerophyll forest, Ironwood <i>Backhousia myrtifolia</i> thicket, and rainforest. There are a number of records of this species within the Illawarra IBRA subregion, but none in proximity to the BioBank site. For this reason the species was considered unlikely to occur within the BioBank site.	No

Scientific name	Common name	Habitat present in the BioBank site	Justification	Recorded during targeted surveys
<b><i>Pimelea curviflora</i> subsp. <i>curviflora</i></b>	<i>Pimelea curviflora</i> subsp. <i>curviflora</i>	Yes	Confined to the coastal area of the Sydney and Illawarra regions, with a new population discovered at Croom Reserve near Albion Park in Shellharbour LGA in August 2011. Whilst previously recorded on shale/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands the species was recorded in association with Illawarra Lowland Grassy Woodland (SR545) habitat at Croom reserve. A precautionary approach was undertaken and the BioBank site was considered to have potential to support the species in areas of Forest Red Gum - Thin-leaved Stringybark grassy woodland. Targeted surveys were undertaken.	No
<b><i>Pimelea spicata</i></b>	Spiked Rice-flower	Yes	The Spiked Rice-flower occurs in two disjunct areas, the Cumberland Plain and the Illawarra. In the Illawarra region the species is found in open woodland and also in coastal grassland communities with emergent shrubs. There are a number of records of this species in the Illawarra IBRA subregion, with most restricted to coastal areas and Blackbutt Reserve in Shellharbour. Areas of Forest Red Gum - Thin-leaved Stringybark grassy woodland were considered potential habitat for this species and targeted surveys were undertaken.	No
<b><i>Pterostylis gibbosa</i></b>	Illawarra Greenhood	Yes	Known from a small number of populations in the Hunter region, the Illawarra region and the Shoalhaven region, with all populations recorded from open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Redgum, Woollybutt and <i>Melaleuca decora</i> . There are a number of records from the Illawarra subregion and areas of Forest Red Gum - Thin-leaved Stringybark grassy woodland were considered potential habitat for this species. Targeted surveys were undertaken.	No

Scientific name	Common name	Habitat present in the BioBank site	Justification	Recorded during targeted surveys
<b><i>Senna acclinis</i></b>	Rainforest Cassia	Yes	Occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Preferred habitat is in or on the edges of subtropical and dry rainforest, often as a gap phase shrub. There is a single record of this species from the Illawarra IBRA subregion which is a planted specimen. A precautionary approach was undertaken and the species was considered a potential inhabitant of Sydney Blue Gum X Bangalay - Lilly Pilly moist forest on the margins of Whalebone Tree - Native Quince dry subtropical rainforest and targeted surveys were undertaken.	No
<b><i>Solanum celatum</i></b>	<i>Solanum celatum</i>	Yes	Restricted to an area from Wollongong to just south of Nowra, and west to Bungonia. Majority of records are prior to 1960 and the majority of populations are likely to have been lost to clearing. Grows in rainforest clearings, or in wet sclerophyll forests. Areas of Sydney Blue Gum X Bangalay - Lilly Pilly moist forest and Whalebone Tree - Native Quince dry subtropical rainforest were considered potential habitat for this species. Targeted surveys were undertaken.	No
<b><i>Zieria granulata</i></b>	Illawarra Zieria	Yes	Occurs in the Kiama district where it grows on dry rocky ridges in sclerophyll forest to rainforest margins (Harden 2002). The species primarily occupies the coastal lowlands between Oak Flats and Toolijooa, in the local government areas of Shellharbour and Kiama. The typical habitat is dry ridge tops and rocky outcrops on shallow volcanic soils. Less frequently found on the moist slopes of the Illawarra escarpment and in low-lying areas on Quaternary sediments. Associated vegetation includes <i>Melaleuca armillaris</i> scrub, Forest Red Gum woodland and rainforest margins, although the species has been recorded from a number of other vegetation types (DEC 2005v).	No



A number of flora species were identified as candidate species for further assessment, in accordance with Section 6.5 of the NSW BioBanking Assessment Methodology (OEH 2014). Targeted surveys for these species were undertaken as per the methodology outlined in Section 3.2.1. Survey effort is shown in Figure 6.

These targeted surveys recorded the White-flowered Wax Plant within the BioBank site, often with multiple stems at each location. However, as the White-flowered Wax Plant is known to be capable of suckering from rootstock in response to disturbance only groups of stem were counted. A total of 89 individual plants were observed within the BioBank site (Figure 6).

#### **4.4.2 Fauna species**

A list of species credit species (fauna) predicted to occur within the BioBank site, based on the PCTs present, along with an assessment of whether the BioBank site provides suitable habitat is provided in Table 10. The potential for a species to occur within the BioBank site was assessed in accordance with Section 6.5 of the NSW BioBanking Assessment Methodology (OEH 2014).

**Table 10: Species credit species (fauna) and status within the BioBank site**

Scientific name	Common name	Habitat present in the BioBank site	Justification
<b><i>Anthochaera phrygia</i></b>	Regent Honeyeater	No	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. There are only three known key breeding regions remaining, including the Capertee Valley and the Bundarra-Barraba region in NSW. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilizes a variety of other Eucalypt species. There are five records of this species within the Illawarra CMA subregion. The BioBank site is not part of a breeding region, and does not support key eucalypt feed species. Although the species may forage within the BioBank site on occasion, it is considered a vagrant species, in accordance with Part 3.3.2 of OEH (2015).
<b><i>Cercartetus nanus</i></b>	Eastern Pygmy-possum	No	The species occurs in a broad range of habitat types, with heaths and woodlands preferred. There are 11 records of this species within the Illawarra CMA subregion; however, these records are located in areas more associated with sandstone heaths. Habitat within the BioBank site is degraded and lacks a number of habitat features, including dense complex habitat, nectar producing species and hollows that the Eastern Pygmy Possum is reliant upon.
<b><i>Petaurus norfolcensis</i></b>	Squirrel Glider	No	In coastal areas the Squirrel Glider inhabits Blackbutt-Bloodwood forest with heath understory, often with mixed stands of Acacia species. Require abundant tree hollows for refuge and nest sites. There are two records within the Illawarra CMA subregion; however, these records are located at Jervis Bay and Kangaroo Valley where more suitable habitat occurs. No records exist in relation to the BioBank site, and the habitat is considered poor quality due to the absence of suitable forest types and suitable feed species.

Scientific name	Common name	Habitat present in the BioBank site	Justification
<b><i>Phascolarctos cinereus</i></b>	Koala	Yes	The Koala inhabits a number of forest and woodland vegetation types, with the presence of Koala feed trees an important indicator. In the Southern Rivers CMA Forest Redgum is considered a primary feed tree. There are 18 records of the Koala within the Illawarra CMA subregion; however the majority of these are aged, with only five records within the past 10 years with the majority coming from community surveys. The Koala is rare in the Illawarra. Although the BioBank site provides suitable habitat the species has not been observed within the site, and given the scarcity of the species it is considered unlikely to generate significant numbers of species credits.
<b><i>Pteropus poliocephalus</i> (Breeding Habitat)</b>	Grey-headed Flying-fox (Breeding habitat)	No	The BioBank site does not support a camp of the Grey-headed Flying-fox.
<b><i>Sminthopsis leucopus</i></b>	White-footed Dunnart	No	The White-footed Dunnart occurs in a wide range of vegetation types, including forest and woodland communities, generally with an open understory structure. There is one record of this species within the Illawarra CMA subregion, at the furthest southern reach of the subregion. There are no records in close proximity to the BioBank site. Habitat within the BioBank site is considered of only moderate quality, and the lack of records in close proximity decreases the likelihood that the species is present.

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Only one fauna species, the Koala, was identified as a candidate species for further assessment, in accordance with Section 6.5 of the NSW BioBanking Assessment Methodology (OEH 2014).

No targeted fauna surveys for threatened species were undertaken as a part of this assessment. No threatened fauna species credits will be created.

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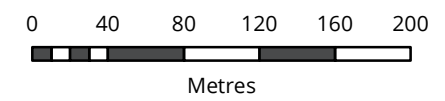
**Legend**

- BioBank site
- Lot 815 DP1193843
- Lot 1801 DP1223063
- Threatened flora survey (Biosis 2015)
- White-flowered Wax Plant

**Biosis Threatened Flora**

- White-flowered Wax Plant

**Figure 6: Threatened flora surveys and locations of the White-flowered Wax Plant**

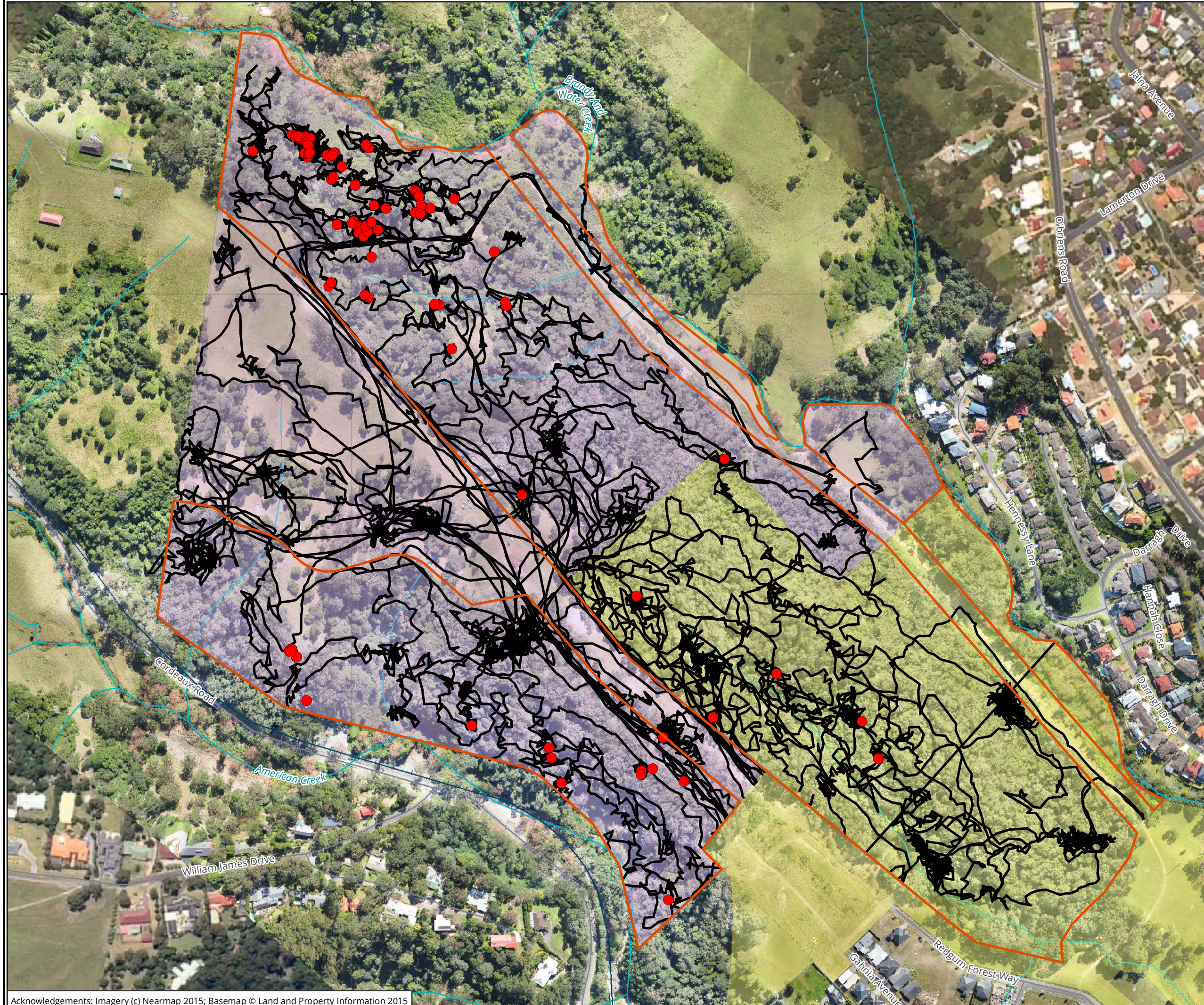


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Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

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 Date: 16 December 2016,  
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## Stage 3 – Improving biodiversity values

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## 5. Improving biodiversity values

This section details the improvement in biodiversity values that will occur by undertaking management of native vegetation within the BioBank site. It details the proposed management zones, the management actions to be undertaken within each management zone and the expected change in landscape value, averted loss and site value score that is predicted following their implementation.

### 5.1 Management zones

Nine management zones have been delineated (Table 11) based on the vegetation zones present within the BioBank site and future management. Vegetation Zone 3 was split into two management zones as a 1.05 hectare section of the vegetation zone will be managed as an asset protection zone (APZ).

**Table 11: BioBanking management zones**

Vegetation Zone	Plant Community Type	Condition	Ancillary code	Management Zone <sup>2</sup>	Area
03	SR545 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Moderate / good	–	MZ03	7.93
		Moderate / good	–	MZ04	1.05
04		Moderate / good	Derived grassland	MZ05	0.32
05	SR652 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	Moderate / good	–	MZ06	20.59
06		Moderate / good	Derived grassland	MZ07	0.27
07		Moderate / good	Poor	MZ08	1.86
08		Low	–	MZ09	4.15

<sup>2</sup> Numbering of management zones continues from continues from the Biodiversity certification agreement developed for the development site (Biosis 2015a, 2015b)

Vegetation Zone	Plant Community Type	Condition	Ancillary code	Management Zone <sup>2</sup>	Area
09	SR662 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Moderate / good	–	MZ10	9.61
03	SR545 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Low	–	MZ11	1.04

Vegetation will be retained within all management zones; the default management actions are detailed in Section 1 of Appendix 2 and summarized in Section 5.3.1.

## 5.2 Assessment of changes in biodiversity values for management zones within the BioBank site

### 5.2.1 Assessment of changes in landscape attribute values for the BioBank site

BioBanking the site will result in a small increase in the value of the landscape attributes at the site due to the following:

- Percent native vegetation cover within an inner assessment circle will increase from 39% to 41% following BioBanking due to rehabilitation of areas in low condition.

### 5.2.2 Averted loss

The native vegetation within the BioBank site has been assessed as having a low risk of decline over a 20 year period as it is currently zoned E2 Environmental Conservation under the Wollongong Local Environment Plan 2009 (LEP).

Therefore, averted loss is not included within biodiversity attribute assessment.

### 5.2.3 Assessment of changes in site value scores for each management zone

Changes in biodiversity value scores for each management zone are outlined in Table 24 to Table 32 in Appendix 2.

For all management zones, except management zone MZ04, default increases were used to determine increases in biodiversity value scores. For management zone MZ04, which is currently being managed for reduced fuel loads, it was assumed there would be no increase in site value, other than a reduction in exotic plant cover due to weed management in this area.



### 5.3 Management actions to improve biodiversity values

The management actions required for the management of biodiversity within the BioBank site have been developed in accordance with the template for management actions (version 1.3 – August 2011) and Section 12 of the NSW BioBanking Assessment Methodology (OEH 2014).

A list of management actions to improve biodiversity is attached at Appendix 3.

#### 5.3.1 Standard management actions for all vegetation zones

Appendix 3 provides the BioBanking management action template for the BioBank site. In summary, the following are compulsory actions for any BioBank site and will be undertaken where applicable in all management zones:

- Management of grazing for conservation.
  - Stock will not be permitted to graze in any area of the BioBank site.
- Weed control.
  - Declared noxious weeds are to be managed according to requirements under the *Noxious Weeds Act 1993*.
  - Other weeds should be removed following the guidelines of the Weed Management Plan set out in Appendix 3.
- Application of ecological fire management.
  - The compulsory Fire Management Plan has been set out in Appendix 3.
  - Given the proximity to residential development and presence of Whalebone Tree - Native Quince dry subtropical rainforest and the White-flowered Wax Plant, it is recommended that fires are suppressed within the Biobank site.
- Management of human disturbance.
  - All waste (Figure 7) will be removed from the BioBank site.
  - The BioBank site is to be fenced off to deter residents and members of the public from entering the area. Fencing requirements are set out in Appendix 2 and shown in Figure 7.
  - Access to the BioBank site for ongoing management will be via two access roads Figure 7. Access gates will be installed at all access points into the BioBank site Figure 7.
  - Signage will be installed at the boundaries of the BioBank site, in line with the requirements set out in Appendix 3 and shown in Figure 7.
- Retention of regrowth and remnant native vegetation.
  - Promote the regrowth of native vegetation by suppressing the growth of weeds.
- Replanting or supplementary planting.
  - Replanting requirements are set out in Appendix 3. Supplementary planting will be undertaken in management zones MZ06, MZ08, MZ10 and MZ11 to aid in rehabilitation of areas currently subject to dense weed infestations.
- Retention of dead timber.
  - Dead timber will not be removed from the BioBank site.

- Retention of rocks.
  - Rocks will not be removed from the BioBank site.

### 5.3.2 Additional management actions

Additional management actions are outlined in the credit report (Appendix 4) for creating ecosystem credits. Additional management actions outlined in the credit report include:

- Exclude commercial apiaries
- Exclude miscellaneous feral species
- Feral and/or over abundant native herbivore control
- Fox control
- Slashing

It is considered that control of feral and/or overabundant herbivores is not required at the BioBank site. Relevant management actions are set out in Appendix 3.

### 5.3.3 Existing Management Obligations

The study area does not have any existing conservation obligations such as:

- A restriction on use or public positive covenant under Part 4A of the *Crown Lands Act 1989*.
- A conservation agreement entered into under the *National Parks and Wildlife Act 1974* (NPW Act).
- A trust agreement entered into under the *Nature Conservation Trust Act 2001* (NCT Act).
- Any agreement entered into with a public authority under which the owner of the land received funding for biodiversity conservation purposes (other than BioBanking agreements).
- The study area is not publically owned land.

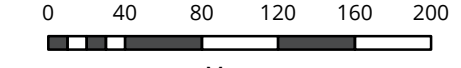
Therefore, the study area does not have any existing conservation obligations that would reduce the number of ecosystem or species credits.



**Legend**

- BioBank site
- Lot 815 DP1193843
- Lot 1801 DP1223063
- Photopoints
- Waste (to be removed)
- Signage
- Fencing**
- Three wire farm fence
- Wire and bollard
- Access gate
- Access track - upgrade existing (permanent)
- Access track - upgrade existing (temporary)
- Access track - new track (temporary)
- Weeds (to be managed)**
- >50% weed cover (mostly Lantana)
- >50% weed cover (Mostly Mysore Thorn)
- >30% and <50% weed cover (Mostly Lantana)
- >30% and <50% weed cover (Other weeds)
- Lantana along Rainforest edge and canopy gaps
- Management zones**
- MZ03
- MZ04
- MZ05
- MZ06
- MZ07
- MZ08
- MZ09
- MZ10
- MZ11

**Figure 7: Management zones and management actions**



Scale: 1:3,949 @ A3  
Coordinate System: GDA 1994 MGA Zone 56



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

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## 6. Biodiversity credits

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### 6.1.1 Ecosystem credits created

This section provides an assessment of the ecosystem credits created by the development of a BioBanking agreement over the BioBank site. A summary of ecosystem credits created for each management zone are detailed below in Table 12. The full credit profile is provided in Appendix 4.

**Table 12: Summary of ecosystem credits for each management zone**

PCT code	PCT name	Management zone	Management zone area (ha)	Landscape Value score	Current site value	Future site value	Gain in site value	Averted loss in site value	Number of ecosystem credits created
SR545	Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	3	7.93	24.6	72.4	94.79	22.39	6.64	106
SR545	Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	4	1.05	24.6	72.4	75.52	3.12	6.64	9
SR545	Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	5	0.32	24.6	10.94	24.65	13.71	0.52	3
SR652	Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	6	20.59	24.6	72.4	84.64	12.24	4.69	214
SR652	Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	7	0.27	24.6	31.25	52.78	21.53	2.86	3
SR652	Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	8	1.86	24.6	46.35	54.43	8.08	2.34	16
SR652	Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	9	4.15	24.6	33.85	52.78	18.93	2.69	48

PCT code	PCT name	Management zone	Management zone area (ha)	Landscape Value score	Current site value	Future site value	Gain in site value	Averted loss in site value	Number of ecosystem credits created
SR662	Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	10	9.61	24.6	75.52	87.5	11.98	7.16	105
SR662	Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	11	1.04	24.6	33.33	47.14	13.81	1.22	10

### 6.1.2 Species credits created

This section provides an assessment of the species credits created by BioBanking the study area. A summary of ecosystem credits created is provided in Table 13. The full credit profile is provided in Appendix 4.

**Table 13: Summary of species credits**

Scientific name	Common name	Number of species credits created
<i>Cynanchum elegans</i>	White-flowered Wax Plant	632

Based on the outcomes of Section 4.4, no credits for threatened fauna species are able to be created by the development of a BioBanking agreement over the site.

## 7. Conclusion

The development of a BioBanking agreement over the BioBank site, including the conservation and management of native vegetation and species habitat will result in the creation of 514 credits across three PCTs, as outlined in Table 14.

**Table 14: Summary of ecosystem credits**

PCT code	Plant community type name	Ecosystem credits created
<b>SR545</b>	Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	118
<b>SR652</b>	Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	281
<b>SR662</b>	Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	115

In addition, 632 White flowered Wax Plant credits will be created.

Management actions required to generate these credits are summarized in Section 5.3 and detailed in the list of management actions required at the BioBank site (Appendix 3).

A complete credit report is provided in Appendix 4.



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## Appendices

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## Appendix 1: Native vegetation data (BioBanking)

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### Appendix 1.1 Flora species lists

As some plots / transect were undertaken prior to the revision of the NSW BioBanking Assessment Methodology in 2014, some data has been collected using the modified Braun/Blanquet scores below.

**Modified Braun Blanquet cover:**

- 1: <5% - 3 or less individuals
- 2: <5% - more than 3 sparsely scattered
- 3: <5% - common throughout plot
- 4: 5% - 25%
- 5: 25% - 50%
- 6: 50% - 75%
- 7: 75% - 100%

All quadrats except quadrats Q18 to Q24 have used this modified Braun Blanquet cover scoring system. Quadrats Q18 to Q24 have used scores from 1 to 5 per cent and then to nearest five per cent.

**Table 15: Flora species recorded from the BioBank site, including cover scores**

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Acacia maidenii</i>	Maiden's Wattle	1	2	1	1	3	4	4	2	2	2	2				5	1	25	15	10
<i>Acacia mearnsii</i>	Black Wattle																			
<i>Acronychia oblongifolia</i>	White Aspen						1			1										
<i>Adiantum formosum</i>	Giant Maidenhair														1	2				
<i>Adiantum hispidulum</i>	Rough Maidenhair																			
<i>Ageratina adenophora</i>	Crofton Weed						2	3							5	2	10			
<i>Agrostis avenacea</i>	Blown Grass										1	2								
<i>Alchornea ilicifolia</i>	Native Holly																			
<i>Alectryon subcinereus</i>	Wild Quince					1				1	2									
<i>Alphitonia excelsa</i>	Red Ash					1		3												10
<i>Anagallis arvensis</i>	Scarlet Pimpernel				1					2	2			1				1		
<i>Aneilema biflorum</i>	0																			
<i>Aphanopetalum resinosum</i>	Gum Vine																			
<i>Araujia sericifera</i>	Moth Vine						1	3									1	1	1	1
<i>Asparagus asparagoides</i>	Bridal Creeper																			2
<i>Asplenium aethiopicum</i>	Shredded Spleenwort	1								1										
<i>Asplenium flabellifolium</i>	Necklace Fern									2					1	1				
<i>Asteraceae spp.</i>	#N/A									4	2	4								
<i>Axonopus compressus</i>	Broad-leaved Carpet Grass													60						
<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass				1					2	2	2						1		
<i>Backhousia myrtifolia</i>	Grey Myrtle						3				2									
<i>Bidens pilosa</i>	Cobbler's Pegs									2	2			1			1	1	1	1
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree																			
<i>Breynia oblongifolia</i>	Coffee Bush		1					1		2										
<i>Briza maxima</i>	Quaking Grass																			
<i>Briza minor</i>	Shivery Grass													1						
<i>Brunoniella australis</i>	Blue Trumpet																			
<i>Callistemon salignus</i>	Willow Bottlebrush	1	1						4		4	5								
<i>Calochlaena dubia</i>	Rainbow Fern			1							2	2				1				
<i>Caesalpinia decapetala</i>	Thorny Poinciana																			2

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Carex appressa</i>	Tall Sedge															1				
<i>Carex longebrachiata</i>	0	1	3		3	3	3	5	3					5		2	40	5	2	5
<i>Carlina vulgaris</i>	#N/A				1															
<i>Cassine australis</i>	Red Olive Plum	1				2	1		2	2										5
<i>Cayratia clematidea</i>	Native Grape									2	3	3								
<i>Celtis sinensis</i>	Japanese Hackberry									2	2									
<i>Centaurium erythraea</i>	Common Centaury									2	3									
<i>Centella asiatica</i>	Indian Pennywort			1	3	2		2		2	2			1				1		
<i>Cestrum parqui</i>	Green Cestrum														1	1				
<i>Cheilanthes sieberi</i>	Rock Fern	1																		
<i>Chloris gayana</i>	Rhodes Grass																		1	
<i>Citriobatus pauciflorus</i>	Orange Thorn								3											
<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum					3	1	1	1	1	2					5				
Climber sp. 1	#N/A																			
Climber sp. 2	#N/A																			
Climber sp. 3	#N/A									5										
Climber sp. 4	#N/A									2	2									
<i>Commelina cyanea</i>	Native Wandering Jew													1	1					
<i>Conyza bonariensis</i>	Fleabane									3	3	2								
<i>Conyza spp.</i>	A Fleabane									2										1
<i>Coprosma quadrifida</i>	Prickly Currant Bush					1	2	1		3		2				4			1	3
<i>Croton verreauxii</i>	Green Native Cascarilla						5	3	2							70				
<i>Cryptocarya glaucescens</i>	Jackwood								2	1										
<i>Cyathea cooperi</i>	Straw Treefern														1					
<i>Cymbopogon refractus</i>	Barbed Wire Grass													1				1		
<i>Cynanchum elegans</i>	White-flowered Wax Plant																			1
<i>Cynodon dactylon</i>	Common Couch			1	7						1			15			20	25		
<i>Cyperus gracilis</i>	Slender Flat-sedge									1	2									
<i>Cyperus spp.</i>														1						
<i>Cyperus tetraphyllus</i>				1																

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Delairea odorata</i>	Cape Ivy					3		2		4	3	3			2	2			1	2
<i>Dendrocnide excelsa</i>	Giant Stinging Tree															2			1	
<i>Desmodium spp.</i>	Tick-trefoil		3								1									
<i>Desmodium varians</i>	Slender Tick-trefoil									4				1				1		
<i>Dianella longifolia</i>	Blueberry Lily	1	1								1									
<i>Dichelachne crinita</i>	Longhair Plumegrass													3						
<i>Dichelachne spp.</i>	A Plumegrass																	1		
<i>Dichanthium spp.</i>																	3			
<i>Dichondra repens</i>	Kidney Weed	1	3	1	2	3	3	3	3		2	5						3	1	2
<i>Digitaria violascens</i>										2	1									
<i>Diospyros australis</i>	Black Plum							1		1										
<i>Doodia aspera</i>	Prickly Rasp Fern	1																		
<i>Duchesnea spp.</i>								1												
<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass	1								1				1				5		
<i>Echinopogon ovatus</i>	Forest Hedgehog Grass			1				1			2	4								
<i>Ehrharta erecta</i>	Panic Veldtgrass								2											
<i>Ehretia acuminata</i>															1					
<i>Elaeodendron australe</i>										3	3	3								
<i>Entolasia marginata</i>	Bordered Panic	1		1	2	1				2									1	1
<i>Entolasia stricta</i>	Wiry Panic								3											
<i>Eucalyptus botryoides x saligna</i>							4													40
<i>Eucalyptus quadrangulata</i>	White-topped Box				1		1			1										
<i>Eucalyptus tereticornis</i>	Forest Red Gum	1	5		3	5	4		5											30
<i>Eupomatia laurina</i>	Bolwarra														1					
<i>Eustrephus latifolius</i>	Wombat Berry	1				2	1	2	2							1	1	1		1
<i>Ficus coronata</i>	Creek Sandpaper Fig															1				
<i>Ficus spp.</i>							1			2	3	3								
<i>Gahnia aspera</i>	Rough Saw-sedge	1								3	3	4								
<i>Galium gaudichaudii</i>	Rough Bedstraw		2								2									
<i>Geitonoplesium cymosum</i>	Scrambling Lily	1	2			2			2	3	3	3						1	1	1

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Geitonoplesium</i> sp.								2		1										
<i>Geranium homeanum</i>								2		3	3						1			
<i>Glochidion ferdinandii</i>								1			1									5
<i>Glycine clandestina</i>	Twining glycine		2							2		2								
<i>Glycine tabacina</i>	Variable Glycine	1						2												
<i>Gomphocarpus</i> spp.				1							2						10	3		
<i>Guioa semiglauca</i>						1														3
<i>Gymnostachys anceps</i>	Settler's Twine			1			2			3	3									1
<i>Hardenbergia violacea</i>	False Sarsaparilla			1						2	1									
<i>Hibbertia scandens</i>	Climbing Guinea Flower	1			2					3	3	2					7	1		1
<i>Hibiscus</i> spp.							1		1		2									
<i>Holcus lanatus</i>	Yorkshire Fog													1						
<i>Hydrocotyle peduncularis</i>	A Pennywort																			
<i>Hypericum gramineum</i>	Small St John's Wort													5						
<i>Hypochoeris radicata</i>	Catsear				1					2	3	2		5						
<i>Imperata cylindrica</i>	Blady Grass			1	2						1						50			
<i>Juncus usitatus</i>								2				2		3		1	1			
<i>Lantana camara</i>	Lantana	1	1				5	3	3			2			95	30	5	1	40	50
<i>Ligustrum sinense</i>	Small-leaved Privet																			1
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	1																		
<i>Maclura cochinchinensis</i>	Cockspur Thorn											2							1	1
<i>Marsdenia rostrata</i>	Milk Vine		1						2			2						1		1
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	1					1													
<i>Melia azedarach</i>	White Cedar					1		1											5	2
<i>Melicope micrococca</i>	Hairy-leaved Doughwood										1					1				1
<i>Melicope</i> spp.							1	1	1											
<i>Microlaena stipoides</i>	Weeping Grass	1	4		4	3		3	3			2		5		1	3	30		
<i>Mimosa pudica</i>	Common Sensitive Plant																			
<i>Modiola caroliniana</i>	Red-flowered Mallow																			
<i>Morinda jasminoides</i>	Sweet Morinda											2								

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Myrsine</i> spp.							1		1											
<i>Myrsine variabilis</i>		1	2																	
<i>Nandina domestica</i>	Japanese Sacred Bamboo			1																
Native tree sp.												2								
<i>Notelaea longifolia</i>	Large Mock-olive					1	1	4	1			2								
<i>Notelaea ovata</i>		1														10				
<i>Notelaea venosa</i>	Veined Mock-olive											2								
<i>Onopordum acanthium</i>																		1		
<i>Oplismenus aemulus</i>		1			3		4		4					1	1		2	2	1	5
<i>Oplismenus imbecillis</i>		1	3					3								5				
<i>Oplismenus</i> spp.				1																
<i>Oxalis perennans</i>														1				1		
<i>Oxalis</i> spp.									2											
<i>Pandorea pandorana</i>	Wonga Wonga Vine	1	2		2	2	2	3	1							5	1		5	5
<i>Panicum pygmaeum</i>	Pygmy Panic																			
<i>Parsonsia straminea</i>	Common Silkpod																			
<i>Paspalidium criniforme</i>																				
<i>Paspalum dilatatum</i>	Paspalum		1		1															
<i>Paspalum</i> spp.														1			1	1		
<i>Passiflora edulis</i>	Common Passionfruit															1				1
<i>Passiflora subpeltata</i>	White Passionflower						1	1												
<i>Pellaea falcata</i>	Sickle Fern					3		3	3					1	2	2		1	5	
<i>Pennisetum clandestinum</i>	Kikuyu Grass				1									1						
<i>Pittosporum multiflorum</i>	Orange Thorn	1	2																	
<i>Pittosporum undulatum</i>	Sweet Pittosporum					1		1												2
<i>Plantago lanceolata</i>	Lamb's Tongues													3				1		
<i>Poa labillardieri</i>								3	2							1	10	30		
<i>Poa sieberiana</i>	Snowgrass	1	3		2															
<i>Poa</i> spp.																				
<i>Pomaderris</i> spp.																1				



Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Pouteria australis</i>	Black Apple			1																
<i>Pratia purpurascens</i>	Whiteroot	1			2															
<i>Prunella vulgaris</i>	Self-heal													1						
<i>Pseuderanthemum variabile</i>	Pastel Flower	1	2				3		3							1			1	1
<i>Pteridium esculentum</i>	Bracken														1					
<i>Rapanea variabilis</i>	Muttonwood															1		1		
<i>Romulea rosea</i>																				
<i>Rubus parvifolius</i>	Native Raspberry	1					1	1	1								1			
<i>Rubus rosifolius</i>	Rose-leaf Bramble														1	2				
<i>Sarcopetalum harveyanum</i>	Pearl Vine																			
<i>Scolopia braunii</i>	Flintwood																			
<i>Scutellinia spp.</i>						1														
<i>Senecio hispidulus</i>	Hill Fireweed																			
<i>Senecio longifolia</i>																				
<i>Senecio madagascariensis</i>	Fireweed				1			3						1			1	1		1
<i>Senna pendula</i>																				1
<i>Senna pendula var. glabrata</i>							2													
<i>Senna septemtrionalis</i>	Arsenic Bush			1																
<i>Setaria incrassata</i>	Purple Pigeon Grass							1												
<i>Setaria parviflora</i>																				
<i>Setaria spp.</i>														1			1			
<i>Sida rhombifolia</i>	Paddy's Lucerne	1	1											1			1		1	1
<i>Sigesbeckia orientalis subsp. Orientalis</i>	Indian Weed			1																
<i>Sisymbrium officinale</i>	Hedge Mustard			1																
<i>Smilax australis</i>	Lawyer Vine			1																
<i>Solanum mauritianum</i>	Wild Tobacco Bush			1				1												
<i>Solanum prinophyllum</i>	Forest Nightshade			1																
<i>Solanum pseudocapsicum</i>	Madeira Winter Cherry		1	1		3		3	3						2	2		3	5	3
<i>Solanum pungetium</i>	Eastern Nightshade					1	1													
<i>Sonchus oleraceus</i>	Common Sowthistle																			

Scientific name	Common name	Q2	Q3	Q4	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
<i>Sporobolus africanus</i>	Parramatta Grass													1						
<i>Stellaria flaccida</i>							2									1				
<i>Stellaria media</i>	Common Chickweed																			
<i>Stephania japonica</i>	Snake vine		2			3			1						1	2		1	1	2
<i>Stephania spp.</i>							1													
<i>Streblus brunonianus</i>	Whalebone Tree						1	1								1				1
<i>Syzygium smithii</i>							1													
<i>Taraxacum officinale</i>	Dandelion				1															
<i>Themeda australis</i>	Kangaroo Grass	1																		
<i>Toona ciliata</i>	Red Cedar																			
<i>Toxicodendron succedaneum</i>	Rhus Tree														1					3
<i>Trifolium repens</i>	White Clover							2												
<i>Tylophora barbata</i>	Bearded Tylophora	1							3											
<i>Urtica incisa</i>	Stinging Nettle					3									2	1				1
<i>Verbena bonariensis</i>	Purpletop																1	1		
<i>Verbena rigida</i>	Veined Verbena																			
<i>Veronica plebeia</i>	Trailing Speedwell					1										1	1	1	1	
<i>Wilkiea huegeliana</i>	Veiny Wilkiea															1				

## Appendix 1.2 Plot and transect field data

**Table 16: Plot and transect field data - Vegetation Zone 3**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q11	29	10	44	24	8	72	4	1	1	76	301169	6187604	56
Q2	31	36	24	50	8	24	8	0	1	16	301402	6187587	56
Q3	20	29	7.6	40	2	22	30	0	1	31	301302	6187746	56
Q4	17	30.5	17	42	4	34	15	1	1	29	301235	6187817	56

**Table 17: Plot and transect field data - Vegetation Zone 4**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q18	14	0.5	0	40	0	4	56	0	0	0	301213	6187715	56

**Table 18: Plot and transect field data - Vegetation Zone 5**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q10	28	65	13	50	0	12	30	0	1	0	301114	6188048	56
Q14	41	41	13.5	52	26	54	30	2	1	84	301803	6187378	56
Q17	41	27	33.5	60	14	36	18	4	1	37	301723	6187548	56

**Table 19: Plot and transect field data - Vegetation Zone 6**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q22	18	11	0	76	0	0	32	0	1	0	300916	6188047	56

**Table 20: Plot and transect field data - Vegetation Zone 7**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q24	25	25.5	25.5	8	2	48	54	0	0	28	301676	6187671	56

**Table 21: Plot and transect field data - Vegetation Zone 8**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q21	18	0.5	0	74	0	4	30	0	1	0	301132	6187935	56
Q23	18	9	4.5	4	0	8	88	0	0.33	0	300997	6188131	56

**Table 22: Plot and transect field data - Vegetation Zone 9**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q12	30	69	7.5	0	8	8	0	1	1	66	301357	6187377	56
Q13	22	63	19	0	4	14	0	0	1	65	301120	6187551	56
Q15	28	56	29.5	50	28	48	12	0	1	41	301670	6187358	56

**Table 23: Plot and transect field data - Vegetation Zone 10**

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Q19	12	7.5	0.5	8	0	0	92	0	0	0	301030	6187626	56
Q20	30	9	5	0	0	22	78	0	0.5	7	301020	6187661	56

## Appendix 2: Changes in biodiversity value scores for each management zone

**Table 24: Changes in biodiversity value scores for Management Zone MZ03**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	2	3	Default increase. No additional management required.
<b>Native over-storey cover:</b>	3	3	Cannot increase.
<b>Native mid-storey cover:</b>	2	3	Default increase. No additional management required.
<b>Native ground cover (grasses):</b>	3	3	Cannot increase.
<b>Native ground cover (shrubs):</b>	2	3	Default increase. No additional management required.
<b>Native ground cover (other):</b>	1	2	Default increase. No additional management required.
<b>Exotic plant cover:</b>	2	3	Default increase. No additional management required.
<b>Number of trees with hollows:</b>	2	2.5	Default increase. No additional management required.
<b>Overstorey regeneration:</b>	3	3	Cannot increase.
<b>Total length of fallen logs:</b>	3	3	Cannot increase.

**Table 25: Changes in biodiversity value scores for Management Zone MZ04**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	2	2	No increase due to ongoing slashing for fuel reduction.
<b>Native over-storey cover:</b>	3	3	Cannot increase.
<b>Native mid-storey cover:</b>	2	2	No increase due to ongoing slashing for fuel reduction.
<b>Native ground cover (grasses):</b>	3	3	Cannot increase.
<b>Native ground cover</b>	2	2	No increase due to ongoing slashing for

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>(shrubs):</b>			fuel reduction.
<b>Native ground cover (other):</b>	1	1	No increase due to ongoing slashing for fuel reduction.
<b>Exotic plant cover:</b>	2	3	Default increase. Weed management to be undertaken.
<b>Number of trees with hollows:</b>	2	2	No increase due to ongoing slashing for fuel reduction.
<b>Overstorey regeneration:</b>	3	3	Cannot increase.
<b>Total length of fallen logs:</b>	3	3	Cannot increase.

**Table 26: Changes in biodiversity value scores for Management Zone MZ05**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	1	1.25	Default increase. No additional management required.
<b>Native over-storey cover:</b>	0	1	Default increase. No additional management required.
<b>Native mid-storey cover:</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (grasses):</b>	3	3	Cannot increase.
<b>Native ground cover (shrubs):</b>	3	3	Cannot increase.
<b>Native ground cover (other):</b>	1	2	Default increase. No additional management required.
<b>Exotic plant cover:</b>	1	1.5	Default increase. No additional management required.
<b>Number of trees with hollows:</b>	0	0	No increase.
<b>Overstorey regeneration:</b>	0	0.5	Default increase. No additional management required.
<b>Total length of fallen logs:</b>	0	0	No increase.

**Table 27: Changes in biodiversity value scores for Management Zone MZ06**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	3	3	Cannot increase.
<b>Native over-storey cover:</b>	3	3	Cannot increase.
<b>Native mid-storey cover:</b>	3	3	Cannot increase.
<b>Native ground cover (grasses):</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (shrubs):</b>	1	2	Default increase. No additional management required.
<b>Native ground cover (other):</b>	3	3	Cannot increase.
<b>Exotic plant cover:</b>	2	3	Default increase. No additional management required.
<b>Number of trees with hollows:</b>	2	2.5	Default increase. No additional management required.
<b>Overstorey regeneration:</b>	3	3	Cannot increase.
<b>Total length of fallen logs:</b>	1	1.5	Default increase. No additional management required.

**Table 28: Changes in biodiversity value scores for Management Zone MZ07**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	2	3	Default increase. No additional management required.
<b>Native over-storey cover:</b>	1	2	Default increase. No additional management required.
<b>Native mid-storey cover:</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (grasses):</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (shrubs):</b>	3	3	Cannot increase.
<b>Native ground cover (other):</b>	0	1	Default increase. No additional management required.
<b>Exotic plant cover:</b>	2	3	Default increase. No additional management required.

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
Number of trees with hollows:	0	0	No increase.
Overstorey regeneration:	3	3	Cannot increase.
Total length of fallen logs:	0	0	No increase.

**Table 29: Changes in biodiversity value scores for Management Zone MZ08**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
Native plant species:	3	3	Cannot increase.
Native over-storey cover:	2	3	Default increase. No additional management required.
Native mid-storey cover:	3	3	Cannot increase.
Native ground cover (grasses):	3	3	Cannot increase.
Native ground cover (shrubs):	3	3	Cannot increase.
Native ground cover (other):	3	3	Cannot increase.
Exotic plant cover:	1	1.5	Default increase. No additional management required.
Number of trees with hollows:	0	0	No increase.
Overstorey regeneration:	0	0.5	Default increase. No additional management required.
Total length of fallen logs:	1	1.5	Default increase. No additional management required.

**Table 30: Changes in biodiversity value scores for Management Zone MZ09**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
Native plant species:	2	3	Default increase. No additional management required.
Native over-storey cover:	1	2	Default increase. No additional management required.



Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native mid-storey cover:</b>	1	2	Default increase. No additional management required.
<b>Native ground cover (grasses):</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (shrubs):</b>	3	3	Cannot increase.
<b>Native ground cover (other):</b>	3	3	Cannot increase.
<b>Exotic plant cover:</b>	1	1.5	Default increase. No additional management required.
<b>Number of trees with hollows:</b>	0	0	No increase.
<b>Overstorey regeneration:</b>	3	3	Cannot increase.
<b>Total length of fallen logs:</b>	0	0	No increase.

**Table 31: Changes in biodiversity value scores for Management Zone MZ10**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	3	3	Cannot increase.
<b>Native over-storey cover:</b>	2	3	Default increase. No additional management required.
<b>Native mid-storey cover:</b>	3	3	Cannot increase.
<b>Native ground cover (grasses):</b>	1	2	Default increase. No additional management required.
<b>Native ground cover (shrubs):</b>	2	3	Default increase. No additional management required.
<b>Native ground cover (other):</b>	3	3	Cannot increase.
<b>Exotic plant cover:</b>	3	3	Cannot increase.
<b>Number of trees with hollows:</b>	1	1.5	Default increase. No additional management required.
<b>Overstorey regeneration:</b>	3	3	Cannot increase.
<b>Total length of fallen logs:</b>	3	3	Cannot increase.

**Table 32: Changes in biodiversity value scores for Management Zone MZ11**

Site attribute	Current score (0-3)	Score with management (0-3)	Justification
<b>Native plant species:</b>	3	3	Cannot increase.
<b>Native over-storey cover:</b>	2	3	Default increase. No additional management required.
<b>Native mid-storey cover:</b>	2	3	Default increase. No additional management required.
<b>Native ground cover (grasses):</b>	3	3	Cannot increase.
<b>Native ground cover (shrubs):</b>	0	1	Default increase. No additional management required.
<b>Native ground cover (other):</b>	3	3	Cannot increase.
<b>Exotic plant cover:</b>	0	0.5	Default increase. No additional management required.
<b>Number of trees with hollows:</b>	0	0	No increase.
<b>Overstorey regeneration:</b>	0	0.5	Default increase. No additional management required.
<b>Total length of fallen logs:</b>	1	1.5	Default increase. No additional management required.

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## Appendix 3: Management actions template

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## Instructions for completing the template for management actions

This template for management actions should be filled in by the landowner and submitted to OEH with an application to establish a biobank site. These standard words and format must be used for the management actions (refer to the *Guide to establishing a biobank site* for guidance).

OEH will review the management actions and plans and make any necessary amendments after consultation with the landowner. These management actions will be incorporated into the biobanking agreement as Annexure C.

There are four sections to this template:

1. standard management actions – mandatory
2. additional management actions – only if indicated by the assessment
3. standard management plans (weeds and fire for conservation) – mandatory
4. additional management plans (feral and overabundant herbivores and vertebrate pests) – only if indicated by the assessment.

An additional short section is also included in this template that requires the details of photo points for monitoring purposes. This information will be incorporated into the agreement as Annexure D.

Green boxes like this one provide instructions and examples and will be deleted by OEH before the biobanking agreement is processed.

Yellow highlighted fields need to be customised by the landowner. Usually the landowner needs to provide the information required; sometimes the landowner 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 passive and active actions. Passive actions have little or no cost and include refraining from doing something, such as not removing fallen logs or bush rock. Passive management actions must be commenced as soon as the biobanking agreement is signed.

If a management action is active, you have to undertake specific activities to improve the site's biodiversity. Active management actions only need to be commenced when 80% of the Total Fund Deposit is met (ie from 'first payment date').

In the table below, the timing column indicates:

- passive actions by the term 'Ongoing from commencement date'
- active actions by a reference to 'Ongoing from first payment date'.

Managing grazing for conservation can be passive or active depending on the biobank site. For example, managing grazing for conservation is a passive management action if the biobank site is already suitably fenced, and it is an active management action if the biobank site needs to be fenced. Both options appear in the timing column and are highlighted yellow. Delete whichever option is not applicable.

## Section 1: Standard management actions

Standard management actions		
Item 1	Management of grazing for conservation	Timing
1.1	<p>Stock must not be permitted to graze in any area of the biobank site.</p> <p>If no grazing is to be allowed, replace the above item with: 'Stock must not be permitted to graze in any area of the biobank site.'</p> <p>Then delete the words in item 1.2 and 1.3 (but keep the numbering) and replace with: 'This item is not applicable'. The wording in the adjacent Timing column can also be deleted.</p>	Ongoing from commencement date.
1.2	<p>This item is not applicable.</p> <p>Insert any requirements specific to the site to accommodate local conditions and allow for flexibility in a framework of reasonable certainty.</p> <p>Delete 'Specific requirements:' if it is not relevant.</p> <p>The landowner can prevent stock from grazing or require stock to graze in specific areas by erecting and maintaining stockproof fencing. Fencing may be permanent or temporary (including electric fences). Indicate the specific type and length of fence to be erected and by when.</p> <p>Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.</p>	N/A
1.3	This item is not applicable.	N/A
1.4	If, at any time, the landowner observes stock in any area of the biobank site, other than an area on the biobank site where grazing is permitted, the landowner must take necessary measures to remove the stock from the area immediately.	Ongoing from commencement date.
Item 2	Weed control	Timing
2.1	<p>The landowner must implement and, at all relevant times, comply with, the integrated weed management plan included in Section 3 ('the weed management plan') (or such updated integrated weed management plan as has been approved by the Director General under item 2.2 below).</p> <p>To allow for adaptive management, minor alterations can be made to the implementation of the weed management plan. Any alterations must be recorded in writing in accordance with Section 3 of this Annexure.</p>	Ongoing from first payment date.

<p>2.2</p>	<p>The weed management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review.</p> <p>Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and must cover the matters outlined below and any additional matters specified by the Director General in writing:</p> <ul style="list-style-type: none"> <li>• a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present</li> <li>• the method/s of weed control in each zone</li> <li>• the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species</li> <li>• 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</li> <li>• methods for monitoring the success of weed control activities</li> <li>• a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the <i>Noxious Weeds Act 1993</i>)</li> <li>• additional weed control activities to destroy or remove any new weed species that are found on the site</li> <li>• measures for assessing and reporting monitoring results</li> <li>• a diary for recording actions taken in accordance with the weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.</li> </ul>	<p>Ongoing from first payment date.</p>
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Item 3	Management of fire for conservation	Timing
3.1	<p>The landowner must implement, and at all relevant times, comply with the fire management plan included in Section 3 (or such updated fire management plan as has been approved by the Director General under item 3.2 below) (<b>‘the fire management plan’</b>). To allow for adaptive management and weather conditions, minor alterations can be made to the implementation of the fire management plan, and must be recorded in writing in accordance with Section 3 of this Annexure.</p>	Ongoing from first payment date.
3.2	<p>The fire management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review.</p> <p>Where the Director General determines from the review that an update of the fire management plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and cover the matters outlined below and any additional matters specified by the Director General in writing:</p> <ul style="list-style-type: none"> <li>• the year the last fire went through, the type of fire and the extent of the fire and location, where known</li> <li>• frequency of natural fires in the area of the biobank site, where known</li> <li>• a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt</li> <li>• the methods that will be used for ecological burns</li> <li>• 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 <i>Rural Fires Act 1997</i> to ensure minimum frequency between ecological burns</li> <li>• the fire intensity for the recommended vegetation types</li> <li>• the time of year suitable for ecological burns</li> <li>• the diary for recording actions taken in accordance with the fire management plan and minor alterations to fire management plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.</li> </ul>	Ongoing from first payment date.
3.3	<p>Fires must not be lit on the biobank site other than for the purpose of ecological burning in accordance with the fire management plan or as permitted as a permissible human activity on the biobank site under item 4 of this Annexure or</p>	Ongoing from commencement date.

	clause 3.6 of this agreement.	
<b>Item 4</b>	<b>Management of human disturbance</b>	<b>Timing</b>
4.1	Except as permitted under clause 3 of this agreement or item 4.2 (below), human activities that adversely affect biodiversity values on the biobank site, including repeated disturbance of native animals, must not be carried out, or caused or permitted to be carried out, on the biobank site.	Ongoing from commencement date.
4.2	Human activities that may have a negative impact on biodiversity values on the biobank site are permitted if they are listed as permissible activities under clause 3.6 of this agreement or if they are undertaken as part of the management actions or management plans.	Ongoing from commencement date.
4.3	All waste shown on the map entitled <b>Figure 7: Management zones and management actions</b> dated 24/02/2016 must be removed from the biobank site in an appropriate manner.  If there is no waste on the biobank site delete the words of this item (but retain the numbering) and replace with: 'This item is not applicable.'	Commencing from first payment date.
4.4	The landowner must not store, dispose of, or cause or permit to be disposed of, any waste on the biobank site.  Note: The storage or disposal of waste on the biobank site may require an approval under the <i>Protection of the Environment Operations Act 1997</i> .	Ongoing from commencement date.
4.5	The landowner must take all reasonable steps to remove waste deposited by others on the biobank site, or which is otherwise present on the biobank site.	Ongoing from first payment date.
4.6	<b>Fencing and signage</b> must be installed and maintained to deter human disturbance including waste dumping. Signage must be the BioBanking signs available from the OEH. Specific requirements: <ul style="list-style-type: none"> <li>• Installation of approximately 876 metres of wire and bollard fencing at the interface between residential development and the southern section of the Biobank site.</li> <li>• Installation of approximately 1515 metres of wire and bollard fencing at the interface between residential development and the northern section of the Biobank site, and along the eastern boundary of the northern section of the BioBank site.</li> <li>• Installation of approximately 582 metres of wire and bollard fencing at the interface between residential areas to the north and the BioBank site. Signs, identify a Biobank site, will be installed along the fence.</li> <li>• Installation of approximately 327 metres of standard three-wire fencing along the western boundary of the BioBank site. Signs, identify a Biobank site, will be installed along the fence.</li> <li>• Wire and bollard fencing must be visually amenable and fit in with the adjacent residential development. This fencing is designed to indicate the presence of the BioBank site, but not prevent access to this area.</li> <li>• Creation of an access track into the southern section of the Biobank site to enable management activities. This</li> </ul>	Ongoing from first payment date.



	<p>access track will require minimal vegetation trimming to allow access for a small mechanical plant with rubberised tracks to undertake weed removal works. This access track will be temporary in nature for a maximum period of 5 years.</p> <ul style="list-style-type: none"> <li>• Upgrading of an existing access track in the northern section of the Biobank site to enable management activities. This track has not been used for a number of years and is now largely regenerated. This access track will require minimal vegetation trimming to allow access for a small mechanical plant with rubberised tracks to undertake weed removal works. This access track will be temporary in nature for a maximum period of 5 years.</li> <li>• Upgrading of an existing access tracks in the northern section of the Biobank site to enable management activities. This access track will be established on a permanent basis.</li> <li>• Installation of four access gates along access tracks at the interface with the BioBank site. Signs, identifying a BioBank site, will be installed on all access gates.</li> <li>• Installation of an access gate to allow access to management zone MZ04 for slashing associated with APZ management. A sign, identifying a BioBank site, will be installed on all access gates.</li> <li>• In addition to the signs identified above, five signs will be installed along the northern boundary of the BioBank site.</li> </ul> <p>Fencing, signage and access management is shown on the map entitled Figure 7: Management zones and management actions dated 24/02/2016.</p> <p>Signage should be located at points of access and other practical locations interfacing with adjoining properties. For biobank sites that are located fully within a larger private landholding, there should be at least one BioBanking sign to be placed at the main access gate to the site.</p> <p>It is recommended that required signage be installed within 3 months of first payment date.</p>	
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<p><b>Item 5</b></p>	<p><b>Retention of regrowth and remnant native vegetation</b></p> <p>Note: An approval under the <i>Native Vegetation Act 2003</i> may be required to carry out thinning or any other removal or damage to native vegetation under this item.</p>	<p><b>Timing</b></p>
<p>5.1</p>	<p>Native vegetation (whether remnant native vegetation or regrowth) on the biobank site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except in accordance with item 5.2 below, or if it is required as part of the management actions or it is essential for the carrying out of permissible development under clause 3.5 of this agreement.</p> <p>Note: Native vegetation on the biobank site may be managed to improve biodiversity values by thinning to benchmark stem densities over no more than 80% of each management zone. Benchmark stem densities has the same meaning as defined in the Vegetation Benchmark Database as published by OEH and updated from time to time. An approval under the <i>Native Vegetation Act 2003</i> may be required to carry out thinning or any other removal or damage to native vegetation under this item.</p>	<p>Ongoing from commencement date.</p>
<p>5.2</p>	<p>Native vegetation on the biobank site must not be burnt except in accordance with the fire management plan prepared pursuant to item 3 above.</p>	<p>Ongoing from commencement date.</p>
<p><b>Item 6</b></p>	<p><b>Replanting or supplementary planting where natural regeneration will not be sufficient</b></p>	<p><b>Timing</b></p>
<p>6.1</p>	<p>The landowner must undertake planting or seeding of the native groundcover/shrub/tree species indicated in the planting schedule for the biobank site as set out in item 6.6 below (<b>‘the planting schedule’</b>) in the areas of planting and within the timeframe indicated in the planting schedule.</p> <p>If the landowner cannot complete the planting within the timeframe indicated in the planting schedule due to local weather conditions, the landowner must complete the planting as soon as possible after that date and must make a record of and retain the reasons why the planting was not completed by the required time.</p> <p>Appropriate site treatment (e.g. weed control) of each area of planting or seeding identified in the planting schedule must be undertaken prior to such planting.</p> <p>Specific requirements:</p> <ul style="list-style-type: none"> <li>• Replanting will be undertaken by a licensed bush regenerator. The requirements outlined below provide a guide only, with replanting to be guided by the bush regenerator dependent on site specific conditions.</li> <li>• Intensive weed control works must be undertaken prior to any supplementary planting.</li> <li>• Site preparation works, including weed control prior to planting that will be undertaken to assist in establishment of plants.</li> <li>• Replanting will utilise species and planting densities outlined in the planting schedule (Section 6.6).</li> <li>• Supplementary planting will be undertaken in areas of low condition vegetation where there is currently a dense infestation of Mysore Thorn <i>Caesalpinia decapetala</i>.</li> </ul>	<p>Commencing from first payment date .</p>

	<p>These area will include, management zones MZ06, MZ10 and MZ11 along the southern boundary and management zones MZ08, MZ09 and MZ11 along Brandy and Water Creek.</p> <ul style="list-style-type: none"> <li>• The planting will be part of an integrated regeneration strategy that will stage weed removal and focus on planting pioneer species to assist staged removal by providing fast shade cover to provide light competition. Areas of Brandy and Water creek will also include limited shrub under planting to be consistent with flood planning requirements..</li> <li>• Other supplementary planting will be undertaken in management zones MZ08 and MZ09 where mechanical treatment and follow up treatment are less access restricted.</li> <li>• Supplementary planting may be required in other areas of moderate / good condition vegetation where there is a dense infestation of weeds, if natural regeneration is not successful.</li> <li>• If following initial weed control erosion becomes an issue jute mesh may be required to assist in stabilising soils.</li> </ul> <p>Include details regarding site treatment that must be undertaken before planting each area under the 'Specific requirements'.</p> <p>Planting or seeding is only required where natural regeneration is not sufficient to bring back native vegetation.</p> <p>Where no replanting is required, delete the words in every point of this item (but retain the numbering) and replace with: 'This item is not applicable.'</p>	
<p>6.2</p>	<p>Areas of planting or seeding as set out in the planting schedule must be protected from grazing for the first 3 years after planting or seeding or until the plants exceed 300 cm in height to ensure that the plants are established to such an extent that biodiversity values will be improved by such grazing and the plants will not be adversely impacted by grazing.</p> <p>Once that date or height has been met, grazing in the areas of planting or seeding must be managed in accordance with items 1.1, 1.2 and 1.4 of this Section 1.</p> <p>The landowner must make a record of the date when the date or height requirement under this item is reached and the particular area of replanting in which it has been reached, and maintain that record in accordance with the record keeping requirements.</p> <p>Specific requirements:</p> <ul style="list-style-type: none"> <li>• During initial establishment of pioneer species wire caging will be provided to prevent impacts from deer and other herbivores.</li> </ul> <p>If required, different years or heights for specific types of plants can be listed under 'Specific requirements'.</p>	<p>Ongoing from the completion of planting in each area of replanting.</p>
<p>6.3</p>	<p>The landowner must survey each area of planting or seeding established under item 6.1 above and document them to determine whether the planted plants or seeds have established and survived, and retain the findings in accordance with the record keeping requirements.</p> <p>If, after the first survey or subsequent surveys, the establishment</p>	<p>Conduct the first survey 24 months after the completion of planting or seeding in each area of planting or seeding, and then</p>

	and survival rate of plants in an area of planting or seeding are below those usual for the species and region, the landowner must supplement the planting in the adversely affected areas within a reasonable timeframe (usually within 12 months, though this can be varied and recorded in a diary with reasons for variation, if the weather is unsatisfactory for the establishment and survival of plants or seeds).	every 12 months thereafter.
6.4	Areas of planting and seeding must be managed as required to assist the establishment and survival of native plant species.  Management includes watering, slashing, scalping, spraying of weeds, plant replacement and strategic grazing by stock (in accordance with item 6.2 above) at strategic times of the year to control weeds to improve biodiversity values. The dates of planting must be recorded in accordance with the record keeping requirements set out in Annexure D.	As required, from the date that planting or seeding areas are established.
6.5	Seeds and plants used for planting and seeding must be obtained from locally collected provenances, unless there are reasons to do otherwise (e.g. to ensure genetic variability or for adaptation to climate change).	As required (from commencement date if relevant to prepare for future planting).

The planting schedule should be filled in including:

- **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 less; if direct seeding is used leave this field blank
- **planting method** – specify whether plants are to be tubestock, direct seeding or another method
- **timing** – describe as the number of months (or Year if relevant (ie Year 1, Year 2, etc)) for completion of planting from the first payment date.

### 6.6 Planting schedule at the biobank site

Species' common name	Species' scientific name	Management zone/s of planting	Number of plants per area	Planting method	Timing (months or Year)
In areas of Mysore Thorn control					
Maidens Wattle	<i>Acacia maidenii</i>	MZ06, MZ08, MZ09, MZ10, MZ11	1 per 100m <sup>2</sup>	Tubestock	Within 3 months following initial control.
Coast White Box	<i>Eucalyptus quadrangulata</i>				
Wollongong Woollybutt	<i>Eucalyptus saligna x botryoides</i>				
Morton Bay Fig	<i>Ficus microphylla</i>				
Native Rosella	<i>Hibiscus heterophyllus</i>				
White Cedar	<i>Melia azedarach</i>				
	<i>Melicope micrococca</i>				

Red Cedar	<i>Toona ciliata</i>						
General supplementary planting							
Weeping Grass	<i>Microlaena stipoides</i> var. <i>stipoides</i>	All zones	10 per m2	Broadcast seed collected from site	During extended rainfall in spring, summer and autumn		
	<i>Carex longebrachiata</i>	MZ08 and MZ09 (Brandy & Water Creek – eastern end)	1 per m2	Tubestock or hiko cell	Year 2, spring and autumn		
Tussock Grass	<i>Poa labillardiere</i>						
Kangaroo Grass	<i>Themeda triandra</i>						
Spiny-headed Mat-rush	<i>Lomandra longifolia</i>						
Many-flowered Mat-rush	<i>Lomandra multiflora</i>						
	<i>Juncus usitatus</i>						
Knobby Club-rush	<i>Ficinia (Isolepsis) nodosus</i>						
Blue Flax-lily	<i>Dianella caerulea</i>						
Scented Rosewood	<i>Synoum glandulosum</i>					1 per 5m2	Tubestock
Orange Thorn	<i>Pittosporum multiflorum</i>						
Native Bleeding Heart	<i>Homalanthus populifolius</i>						

<b>Item 7</b>	<b>Retention of dead timber</b>	<b>Timing</b>
7.1	<p>Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the biobank site except for the personal (non-commercial) use by the landowner for firewood for one dwelling only or for repair of fencing (not for construction of fencing).</p> <p>Dead timber used for fencing repair must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of dead timber collected from the biobank site for use in fencing, the location that that dead timber was collected from and the date it was collected (month, year).</p>	Ongoing from commencement date.
7.2	<p>Timber from outside the biobank site may be introduced to and placed on the biobank site to improve biodiversity values. Once the timber has been brought onto the site, it is subject to the requirements of item 7.1 above.</p> <p>Timber brought from outside the biobank site must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of timber brought from outside the biobank site, the location where the timber was placed on the biobank site and the date on which it was placed (month, year).</p>	When required but not required before the first payment date.
<b>Item 8</b>	<b>Erosion control</b>	<b>Timing</b>
8.1	<p>All reasonable steps must be undertaken to prevent, control and remedy erosion on the biobank site.</p> <p>Soil management for preventing and controlling erosion is to be undertaken using best practice management, such as that developed by the Soil Conservation Service, applied as relevant for the biobank site.</p> <p style="background-color: #d4edda;">If there is no existing erosion, delete the last paragraph.</p>	Commencing from first payment date.

<b>Item 9</b>	<b>Retention of rocks</b>	<b>Timing</b>
9.1	The landowner must not remove, or cause or permit to be removed, rocks from the biobank site or move, or cause or permit to be moved, rocks within the biobank site.	Ongoing from commencement date.
9.2	Rocks from outside the site may be placed on the biobank site to improve habitat for threatened species. Rocks, once placed on the biobank site, are subject to item 9.1 above. The landowner must make and retain records of the location of the rocks placed on the site and the date the rocks were brought onto the site in accordance with the record keeping requirements.	When required but not required before the first payment date.

## Section 2: Additional management actions

Additional management actions should only be completed when they are required for creating ecosystem credits or species credits. This will be stated on the Biobanking Agreement Credit Report.

Complete the required fields for any additional management actions required for your site. Leave all other additional management actions and OEH will delete them before including this section in your draft biobanking agreement.

Additional management actions		
Item 10	Control of feral and overabundant native herbivores	Timing
10.1	<p>The landowner must implement, and at all relevant times, comply with the management plan to control feral and overabundant native herbivores included in Section 4 (or such updated management plan as has been approved by the Director General under item 10.2 below) (<b>‘the feral and overabundant native herbivores management plan’</b>). To allow for adaptive management, minor alterations can be made to the implementation of the feral and overabundant native herbivores management plan, which must be recorded in writing in accordance with Section 3 of this Annexure.</p> <p>Note: A licence under Section 121 of the <i>National Parks and Wildlife Act 1974</i> may be required to control overabundant native herbivores.</p>	Ongoing from first payment date.
10.2	<p>The feral and overabundant native herbivores management plan must be reviewed at intervals of no less than 4 years and no more than 6 years. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review.</p> <p>Where the Director General determines from the review that an update of the feral and overabundant native herbivores management plan is required, the Director General will notify the landowner in writing that an update of the plan is required and the landowner must update the plan and submit the amended plan to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing:</p> <ul style="list-style-type: none"> <li>• a description of the feral or overabundant native herbivore/s</li> <li>• consideration of relevant current OEH and other pest management programs and methods</li> <li>• the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best</li> </ul>	Ongoing from first payment date.



	<p><del>practice management</del></p> <ul style="list-style-type: none"> <li><del>• the frequency and timing of the control actions in each management zone</del></li> <li><del>• methods for monitoring the success of the pest control actions</del></li> <li><del>• a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site</del></li> <li><del>• additional control actions to destroy or remove any new feral and overabundant native herbivore pest species that occur on site</del></li> <li><del>• measures for assessing and reporting monitoring results</del></li> <li><del>• a diary for recording actions taken in accordance with the feral and overabundant native herbivores management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.</del></li> </ul>	
<p><b>Item 11</b></p>	<p><b>Vertebrate pest management – Rusa Deer and Red Fox</b></p>	<p><b>Timing</b></p>
<p>11.1</p>	<p>The landowner must implement, and at all relevant times, comply with the vertebrate pest management plan included in Section 4 (or such updated vertebrate pest management plan as has been approved by the Director General under item 11.2 below) (<b>the vertebrate pest management plan</b>). To allow for adaptive management, minor alterations can be made to the implementation of the vertebrate pest management plan, but these must be recorded in writing in accordance with Section 3 of this Annexure.</p>	<p>Ongoing from first payment date.</p>
<p>11.2</p>	<p>The vertebrate pest management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the review commencement must be provided to the Director General in writing within 14 days of the commencement. The findings of the review must be submitted to the Director General within 3 months of commencing the review.</p> <p>Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing:</p> <ul style="list-style-type: none"> <li>• a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats</li> <li>• consideration of relevant current OEH and other pest management programs</li> <li>• the method/s of vertebrate pest control in each management zone determined in accordance with best management practice</li> <li>• the frequency and timing of vertebrate pest control actions in each management zone</li> </ul>	<p>Ongoing from first payment date.</p>

	<ul style="list-style-type: none"> <li>• methods for monitoring the success of vertebrate pest control actions</li> <li>• a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site</li> <li>• additional vertebrate pest control actions to destroy or remove any new vertebrate pest species that occur on-site</li> <li>• measures for assessing and reporting monitoring results</li> <li>• a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary.</li> </ul>	
<b>Item 12</b>	<b>Nutrient control</b>	<b>Timing</b>
12.1	Fertilisers, pesticides and herbicides must not be applied on the biobank site, except where required to undertake the management actions. Use of fertilisers for establishing native vegetation through planting or seeding, use of herbicides for controlling weeds or use of pesticides for controlling vertebrate pests or feral herbivores can be undertaken in accordance with best practice management when required to undertake the management actions.	Ongoing from commencement date.
<b>Item 13</b>	<b>Control of exotic fish species</b>	<b>Timing</b>
13.1	<p>Appropriate management actions must be conducted to suppress or control non-native fish species specify which non-native fish in waterways and water bodies specify which waterways and water bodies on the biobank site in accordance with best practice management.</p> <p>Specific requirements:</p> <p>_____x</p>	Ongoing from first payment date.
<b>Item 14</b>	<b>Maintenance or reintroduction of natural flow regimes</b>	<b>Timing</b>
14.1	<p>All artificial structures on waterways or waterbodies on the biobank site identified in the map entitled insert exact name of any existing structures map or other relevant map dated dd/mm/yyyy as requiring filling or removal in order to restore the natural flows must be removed or filled.</p> <p>All management actions associated with this item must be conducted in accordance with best practice management practice at the time.</p> <p>Specific requirements:</p> <p>_____x</p>	Commencing from first payment date.
14.2	All necessary rehabilitation resulting from the removal of artificial	Within xx months of the

	<p><del>structure/s referred to in item 14.1 must be undertaken.</del></p> <p><del>All management actions associated with this item must be conducted in accordance with best practice management.</del></p> <p><del>Specific requirements:</del></p> <p><del>_____ x</del></p>	<p><del>date an artificial structure is removed.</del></p>
<p>14.3</p>	<p><del>Artificial structures such as dams or levee banks that impede the natural flow regimes on the biobank site must not be constructed unless approved by the Director General in writing for the purpose of restoring natural flows.</del></p>	<p><del>Ongoing from commencement date.</del></p>

## Section 3: Standard management plans

### Completing the compulsory 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 target weed/s at the biobank site and their location/s, 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
- methods for monitoring weed control activities
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*)
- a diary for recording actions taken in accordance with the integrated weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 2.2), weed control activities may be amended, deleted or added to take into account the weed species on the site at that time.

### Weed management plan

The weed types, description and location (management zone/s) of weed infestations existing at the commencement date are listed in the weed management plan. The methods of weed control (management actions), monitoring and inspections are also listed.

The landowner must perform the methods of weed control and other weed management activities and monitoring in the weed management plan by the methods described (and in accordance with item 2 of this Annexure) for all weeds. The methods of control will apply to the weeds listed in the table below as well as any other weeds that may be present on the site from time to time.

The template for reporting of monitoring activities and the diary template for weed control management must be filled in to record observations during the implementation of the weed management plan, including any minor variations.

Weed types				
Weed	Common name of target weed	Scientific name of target weed	Description of infestation (eg intensity (% cover) & location within zone)	Management zone/s
	Turkey Rhubarb	<i>Acetosa sagittata</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;5% cover along American Creek in south-east of the BioBank site.</li> </ul>	All MZ10, MZ11
	Crofton Weed	<i>Ageratina adenophora</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;5% cover along American Creek in south-east of the BioBank site.</li> </ul>	All MZ10, MZ11
	Mistflower	<i>Ageratina riparia</i>	<5% cover at spot locations in all management zones.	All
	Madeira Vine	<i>Anredera cordifolia</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;5% cover in MZ10 and MZ11 in southeast, and also MZ09 in north east of BioBank site.</li> </ul>	All MZ08, MZ09, MZ10, MZ11
C	Moth Vine	<i>Araujia sericifera</i>	<5% cover at spot locations in all management zones.	All
	Ground Asparagus	<i>Asparagus aethiopicus</i>	<5% cover at spot locations in all management zones.	All
	Mysore Thorn	<i>Caesalpinia decapetala</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;10% cover in MZ10 and MZ11 in southeast of BioBank site.</li> <li>• &gt;50% cover in MZ06, MZ10 and MZ11 along banks of American Creek in southeast of BioBank site.</li> <li>• &gt;50% cover in MZ08 and MZ09 along banks of Brandy and Water Creek in northern section of the BioBank site.</li> <li>• &gt;50% cover in MZ06 in northeastern section of the BioBank site.</li> </ul>	All MZ06, MZ08, MZ09, MZ10, MZ11
	Hackberry	<i>Celtis occidentalis</i>	<5% cover at spot locations in all management zones. Target large established trees in MZ06 to reduce weed recruitment following weed	All MZ06

			control.	
	Green Cestrum	<i>Cestrum parqui</i>	<5% cover at spot locations in all management zones. Targeted through the northern edge of MZ06.	All MZ06
A	Cape Ivy	<i>Delairea odorata</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;5% cover in MZ10 and MZ11 in southeast of BioBank site.</li> </ul>	All MZ10, MZ11
	Coral Tree	<i>Erythrina x sykesii</i>	<5% cover along American Creek in south-east of the BioBank site. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;50% canopy cover in MZ08 and MZ09 along Brandy &amp; Water Creek</li> </ul>	Creeklines
	Narrow-leaved Cotton Bush	<i>Gomphocarpus fruticosus</i>	<5% cover at spot locations in all management zones.	All
	Lantana	<i>Lantana camara</i>	<5% cover at spot locations in all management zones. Particular infestation in: <ul style="list-style-type: none"> <li>• &gt;50% cover in MZ06, MZ09, MZ10 and MZ11 in southern section of the BioBank site.</li> <li>• &gt;50% cover in MZ06 in the northern section of the BioBank site.</li> <li>• 30-50% cover in MZ03, MZ05, MZ06, MZ07, MZ09, MZ10 and MZ11 in the northern section of the BioBank site.</li> <li>• Minor cover along the edge of MZ10 in northern section of the BioBank site.</li> </ul>	All MZ03, MZ05, MZ06, MZ07, MZ09, MZ10, MZ11
	Large-leaved Privet	<i>Ligustrum lucidum</i>	<5% cover at spot locations in all management zones. Particular infestation of mature trees in MZ06 south of access track, within moist gullies.	All
	Small-leaved Privet	<i>Ligustrum sinense</i>	>5% cover along American Creek in south-east of the BioBank site.	
D	Red-flowered Marrow	<i>Modiola caroliniana</i>	<5% cover at spot locations in all management zones.	All
	African Olive	<i>Olea europaea subsp. cuspidata</i>	<5% cover at spot locations in all management zones. Spot location large mature bush near rubbish in MZ03.	All

E		<i>Senna pendula var. glabrata</i>	<5% cover at spot locations in all management zones.	All
	Arsenic Bush	<i>Senna septemtrionalis</i>	<5% cover at spot locations in all management zones.	All
	Wild Tobacco Bush	<i>Solanum mauritianum</i>	<5% cover at spot locations in all management zones.	All
B	Madeira Winter	<i>Solanum pseudocapsicum</i>	<5% cover at spot locations in all management zones.	All
	Wandering Jew	<i>Tradescantia fluminensis</i>	<5% cover at spot locations in all management zones.  Particular infestation in:  • >5% cover in MZ10 and MZ11 in southeast of BioBank site.	All MZ10, MZ11

**Methods of weed control**

Management zone/s	Weed/s	Method of weed control	Frequency (months or Year)
All	All	Staged weed removal works undertaken by a qualified bush regenerator over a 4 – 5 year period (20% reduction in cover per year). This will include weed removal and replanting focusing on areas with heavy weed infestations, including areas with a greater than 30% cover of Lantana.	Years 1 to 5
MZ09, MZ10 and MZ11	Mysore Thorn	Specific control activities will include establishing weed free corridors at 10 m spacings (corridor width ~4m) using manual or mechanical control dependent on accessibility.. Revegetation will be undertaken using pioneer species listed within Section 6.6 at 1 per 100 m <sup>2</sup> to integrate passive control measures (shade competition).  Weed control will include spot spraying of corridor edges and natural assisted regeneration corridor groundcover.  Spot spray and mechanical control not allowed within 10 m of White-wax Flower <i>Cynanchum elegans</i> .	Years 1 to 5
All	All	Tri-annual maintenance inspections by a qualified bush regenerator.	Year 6 onwards
All		<u>Control of Woody Weeds</u>  Mechanical or manual control in steep areas undertaken by a qualified bush regenerator (mechanical plant to have rubberised tracks).  Spot spray using appropriate herbicide by suitably qualified contractor outside of riparian buffers as per herbicide directions. Manual control within riparian zone.	During maintenance inspections outlined above.

		Spot spray and mechanical control not allowed within 10 m of White-wax Flower <i>Cynanchum elegans</i> .	
All	All	<p><u>Control of Perennials/ Scrambling Weeds</u></p> <p>Individual plants/ small numbers: Manual removal of any fruits or propagules present on plants prior to manual removal or spraying. Manual removal of woody rhizomes for herbaceous perennials for each plant. This can be done using a knife for small plants or a mattock for large specimens. Rhizomes and fruit must be removed and disposed of appropriately. Water tubers are not propagules and do not require removal.</p> <p>Larger infestations: Spot spraying by a suitable qualified bush regenerator with an appropriate herbicide outside of riparian buffers as per herbicide directions.</p> <p>Spot spray and mechanical control not allowed within 10 m of White-wax Flower <i>Cynanchum elegans</i>.</p>	During maintenance inspections outlined above.
All	All	<p><u>Control of Annual and Grass Weeds</u></p> <p>Small areas or numbers: Manual removal of any seed heads present on plants, with seed heads taken offsite and disposed of appropriately. Plants can be manually removed by hand or cutting roots below crown.</p> <p>Large areas or numbers: Spot spraying of plants with diluted Glyphosate based herbicide outside of riparian buffers as per herbicide directions.</p> <p>Spot spray and mechanical control not allowed within 10 m of White-wax Flower <i>Cynanchum elegans</i>.</p>	During maintenance inspections outlined above.
All	All	<p><u>Control of Vines</u></p> <p>Manual control of vines without aerial tubers:</p> <p>Cut stump and herbicide application or hand pull vines, leave in canopy to break down to avoid disruption of nesting or canopy damage. Scrape and paint with herbicide for vines with suckering rootstocks. Follow-up control to inspect area for successful control of large plants and assess for suckering rootstocks and re-treatment.</p> <p>Manual control of vines with aerial tubers: Remove plants parts, as far as practicable, do not spread across BioBank site. Dispose of this material to a registered waste disposal facility. Follow-up control: Manual removal of tubers with small mattock or trowel. Spot spray – Qualified contractors can spray with diluted Glyphosate or appropriate selective herbicide (Starane) outside of riparian buffers as per herbicide directions.</p> <p>Repeated follow up treatment will be required to eradicate infestation vines with aerial tubers present within the soil.</p> <p>Spot spray and mechanical control not allowed within 10 m of White-wax Flower <i>Cynanchum elegans</i>.</p>	During maintenance inspections outlined above.

**Native planting required to provide habitat for native species affected by weed control activities**



Management zone	Description of planting required (reference planting schedule at item 6.6)		Timing
Areas with a dense infestation of Mysore Thorn in MZ10 and MZ11	Revegetation of areas with a dense weed infestation of Mysore Thorn in management zones MZ09, MZ10 and MZ11. Supplementary planting with a mixture of rainforest species such as Red Cedar <i>Toona ciliata</i> , Maiden's Wattle <i>Acacia maidenii</i> , <i>Melicope micrococca</i> , Giant Stinging Tree <i>Dendrocnide excelsa</i> , Small-leaved Fig <i>Ficus obliqua</i> and White Cedar <i>Melia azedarach</i> .		At completion of initial weed control.
Areas with a dense infestation of Mysore Thorn in MZ08 and MZ09	Revegetation of riparian areas with a dense weed infestation of Lantana & Mysore Thorn in management zones MZ08 and MZ09. Supplementary planting with a mixture of suitable species such as listed above.  Undertaken if natural regeneration is not successful.		
<b>Monitoring and inspections of existing and new weeds</b>			
Management zone/s	Weed/s	Method of monitoring	Date/s required
All	All	Maintenance inspections by a qualified bush regenerator. Maintenance inspections must document the following: <ul style="list-style-type: none"> <li>The results of inspections, including any new weeds recorded, the results of previous weed control works and any rubbish of pedestrian access issues.</li> <li>Describe works undertaken to implement weed control works or address other identified issues.</li> </ul>	As per schedule outlined above.
All	All	Annual review of the BioBank site by a qualified ecologist. During annual inspections the following information will be collected: <ul style="list-style-type: none"> <li>A review of weed control undertaken, and an assessment of the projective foliage cover of weeds using the BioBanking Assessment Methodology (OEH 2014).</li> <li>A description of the presence, type and abundance of weeds and comparison against weed cover outlined in this management plan and previous annual inspections.</li> <li>A description of any regenerating vegetation, including overstorey, midstorey and groundcover species.</li> <li>Any issues that need to be addressed during future weed control works.</li> </ul> <p>This information is to be included within the annual report.</p>	Annually from the first payment date
<b>Other weed management activities (where required)</b>			
All White-flowered Wax Plants <i>Cynanchum elegans</i> will be relocated, verified and flagged /			



## Completing the compulsory 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 of the vegetation on the biobank site (with date) and any infrastructure and built assets on the biobank site (the map to be included in the biobanking agreement)
- 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 biobank 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* to ensure minimum frequency between ecological burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for ecological burns
- 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 management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary in accordance with the record keeping requirements.

## Fire for conservation management plan

The plan includes information on all known previous fire events in the 'Fire history' table to demonstrate local fire conditions including intensity and frequency.

The ecological fire requirements for each vegetation type or threatened species on the biobank site are listed in the 'Fire requirements for vegetation types and threatened species' table. These are the fire frequency intervals recommended for the vegetation types and threatened species present on the biobank site. They include any requirement adjustments to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act (RFA) 1997* to ensure the minimum frequencies between ecological burns.

The landowner must carry out ecological burns for each management zone according to the method and frequency described (as informed by the history and requirements sections and in accordance with Section 3 of this annexure). These actions are set out in the 'Ecological burning actions table'. Monitoring and inspections (set out in the 'Fire management monitoring' table) as described must also be implemented. The landowner must also carry out the actions listed in the 'Other fire management activities' table.

The table titled 'Template of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the table titled 'Diary template for fire management activities' to record the management actions undertaken or observations made, including any minor variations.

Fire history for previous 20 years (or longer if known)				
Year of fire	Hazard reduction, wildfire or ecological burn and extent of fire			Management zone/s
	No fire history in past 20 years			
Fire requirements for vegetation types and threatened species				
Vegetation type and/or threatened species	Fire frequency required <sup>1</sup>	Time of year for burning	Fire intensity required	Adjustment required due to wildfires or RFA activities
SR545 – Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	5 – 40 years, with some intervals greater than 15 years	All year, ensuring a mosaic of seasonal burning	Low to moderate, ensuring a mosaic of fire intensity	Not applicable
SR652 – Sydney Blue Gum X Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	25 – 60 years, with crown fires avoided at the lower end of the fire interval	All year, ensuring a mosaic of seasonal burning	Low to moderate, ensuring a mosaic of fire intensity	Not applicable
SR662 – Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Fire to be avoided	Not applicable	Not applicable	Not applicable
White-flowered Wax Plant <i>Cynanchum elegans</i>	Fire to be avoided	Not applicable	Not applicable	Not applicable
Ecological burning actions				
Management zone/s	Actions	Supervision & extinguishing techniques	Time of year for burning	Frequency (years)
All	Given the proximity to residential development and presence of Whalebone Tree - Native Quince dry subtropical rainforest and the White-flowered Wax Plant it is recommended that fires are suppressed within the Biobank site.	Not applicable	Not applicable	Not applicable

<sup>1</sup> NPWS 2004. Guidelines for ecologically sustainable fire management. NSW biodiversity strategy. NSW National Parks and Wildlife Service, Hurstville.



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## Section 4: Additional management plans

### If required, complete this control of feral and overabundant native herbivores management plan

A table is provided below for the management plan to control feral and overabundant native herbivores. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the feral or overabundant native herbivore/s
- consideration of relevant current OEH and other pest management programs and methods
- the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management
- the frequency and timing of the control actions in each management zone
- methods for monitoring the success of the pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site
- a diary for recording actions taken in accordance with the management plan to control feral and overabundant native herbivores and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 10.2 in Section 1), control activities may be amended, deleted or added to take into account the feral and overabundant native herbivore on the site at the time.

### ~~Management plan to control feral and overabundant native herbivores~~

~~The management plan for feral and overabundant native herbivores includes information on the management requirements for the feral and overabundant native herbivores at the biobank site listed in the 'Feral and overabundant native herbivores' table. The possible methods of control for each species, used by OEH and other pest management programs, are listed and the suitability of each method is described in the 'Methods considered' table.~~

~~The landowner must carry out the methods for control for feral and overabundant native herbivores for each management zone according to the method and frequency as described in the 'Methods for control' table. The methods of control applied to the feral or overabundant native herbivores listed in the 'Feral or overabundant native herbivores' table as well as any other feral or overabundant herbivores that may be present on the site from time to time.~~

~~Monitoring and inspections of existing and new feral and overabundant herbivores at the biobank site as described in the 'Monitoring and inspections' table must be implemented.~~

~~The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of the monitoring activities. The landowners must complete the table titled 'Diary template for feral and overabundant herbivore management' to record the management actions undertaken including any minor variations or observations made.~~

<b>Feral and overabundant native herbivores</b>			
<b>Feral type</b>	<b>Name of feral/overabundant native herbivore</b>	<b>Description of extent</b>	<b>Management zone/s</b>
A			
B			
C			
D			
E			
<b>Methods considered</b>			
<b>Feral type</b>	<b>Name and description of program or method</b>		<b>Describe suitability</b>
<b>Methods of control</b>			
<b>Management zone/s</b>	<b>Feral type</b>	<b>Method of control</b>	<b>Frequency and timing</b>
<b>Monitoring and inspections</b>			
<b>Management zone/s</b>	<b>Feral type/s</b>	<b>Method of monitoring</b>	<b>Date/s required</b>





### If required, complete this vertebrate pest management plan

A table is provided below for the vertebrate pest management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats
- consideration of relevant current OEH and other pest management programs
- the method/s of vertebrate pest control in each management zone determined in accordance with best management practice
- the frequency and timing of vertebrate pest control actions in each management zone
- methods for monitoring the success of vertebrate pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site
- a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary in accordance with the requirements.

All pest species identified as requiring management on a biobank site must be included in the vertebrate pest management plan.

Separate management plans can be developed for each pest species.

When the management plan is reviewed (see item 11.2 in Section 1), control activities may be amended, deleted or added to take into account vertebrate pest species found on the site at that time.

### Vertebrate pest management plan

The management plan for vertebrate pests includes information on the vertebrate pests and their extent existing at the time of the agreement as listed in the 'Vertebrate pests' table. The possible methods of control for each species, used by OEH and other pest management programs are listed and the suitability of each method to the biobank site is described in the 'Methods considered' table.

The landowner must carry out the methods for vertebrate pest control for each management zone according to the method and frequency described in the 'Methods of control' table. The methods of control will apply to the vertebrate pests listed in the 'Vertebrate pests' table as well as any other vertebrate pests that may be present on the site from time to time.

Monitoring and inspections of existing and new vertebrate pests on the biobank site, as described in the 'Monitoring and inspections' table, must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the 'Diary template for vertebrate pest management' to record the management actions undertaken, including any minor variations, and observations made.

### Vertebrate pests

Pest	Name of vertebrate pest (e.g. pig, fox, goat, dog)	Description of extent	Management zone/s
A	Rusa Deer <i>Rusa timorensis</i>	Deer are abundant within the BioBank site, causing extensive damage to vegetation.	All
B	Red Fox <i>Vulpes vulpes</i>	None recorded – assumed.	All
Methods considered			
Pest type	Name and description of program or method <sup>23</sup>	Describe suitability	
A	Ground-based shooting	<p>High.</p> <p>Ground-based shooting is considered the cost-effective method for deer control for the site, particularly if undertaken as a part of a coordinated program across the local area. This will allow control of deer within and moving into the BioBank site.</p> <p>The site is currently part of the Northern Illawarra Deer Management Program, managed by Local Land Services (LLS). This control method will require an ongoing contribution to the Northern Illawarra Deer Management Program.</p>	
A	Fencing	<p>Low.</p> <p>Fencing required to prevent deer accessing the site must be a minimum of 2 metres in height and dug into the ground to prevent deer pushing under the fence. Over 2.7 kilometres of deer fencing would need to be constructed to minimise access for deer.</p> <p>The installation of deer proof fencing sufficient to prevent access by deer would be extremely costly. Furthermore, fencing of the BioBank site to prevent deer entering the site will also prevent other ground-dwelling fauna species moving through and impact on connectivity values of the site.</p>	
A	Trapping and relocation	<p>Low.</p> <p>This method may be used in conjunction with other methods, but the success is unknown and is likely to be quite costly. In addition, prior to any trapping a deer farm willing to accept any deer would need to be identified.</p> <p>This method should be used in conjunction with other methods, such as fencing, when deer number increase.</p>	
A	Trapping and culling	<p>Undetermined.</p> <p>This method is being investigated by Council and the CLHPA. At this stage, it is not considered feasible for the BioBank site for the reason outlined above under shooting.</p>	
B	Shooting	<p>Low.</p> <p>Given the proximity of the BioBank site to residential development</p>	

<sup>2</sup> DPI 2014. Biology, ecology and management of vertebrate pests in NSW. State of New South Wales through Department of Trade and Investment, Regional Infrastructure and Services 2014

<sup>3</sup> WCC 2013. Pest Management Plan 2013-2014 – Deer. Wollongong City Council.

		this method of control is deemed undesirable, particularly given other available techniques.
B	Baiting using 1080 poison	Moderate. Most effective method for control. However, there is a risk to humans and domestic pets due to proximity to residential areas. In addition, this is not deemed required due to low density populations. Should monitoring identify an increase in fox density this method may be implemented in consultation with LLS.
B	Trapping (using cage traps and leg-hold traps)	Low. Whilst this method can be effective it is time consuming and costly. Given the low density populations that may be present trapping is not required.
B	Monitoring	High. Given Foxes were not recorded within the BioBank site this is deemed the most effective method.

**Methods of control**

Management zone/s	Pest type	Method of control	Frequency and timing
All	A	Ground-based shooting will be undertaken as a part of the Northern Illawarra Deer Management Program.	Annual
All	B	Monitoring – see below.	Annual

**Monitoring and inspections of existing and new vertebrate pests**

Management zone/s	Pest type/s	Method of monitoring	Date/s required
All	A	Annual inspections of the BioBank site to determine the extent of damage by deer. The results of these inspections must be included in annual reports.	Annually
All	B	Monitoring of Fox abundance will be undertaken using unbaited remote cameras. Twenty (20) cameras will be placed out across the BioBank site for 14 nights during late summer, when independent young are expected to dispersing and adults will be active (DPI 2014).  The results of monitoring will be included within the annual report. Should monitoring identify the presence of Foxes within the BioBank site additional controls will be implemented in consultation with LLS.	Annually from first payment date

**Other management activities (where required)**

Nil.



## Photo points

This section of the management actions template is not part of *Annexure C: Management actions* but is required for *Annexure D* of the biobanking agreement which requires information relating to the placement of photo points for monitoring purposes. Fill in the table below so that this information can be included in the appropriate format in the final agreement. A map of the photo point locations is also required to be submitted.

Photo points should be positioned in areas that are likely to show change over time. Some plot locations can be used as photo points but many plot locations (especially in vegetated areas already in very good condition) may not show any change over time. Locate photo points where there will be changes because of management actions such as areas currently in low to moderate condition, targeted for revegetation and/or intensive weed control.

Photos are required to be taken every 12 months at the same location, direction, height and time of day.

## Annexure D: Monitoring, reporting and record keeping requirements

### 1 Monitoring requirements

- 1.1 The landowner must ensure that photographs are taken at photo-points at each of the locations and in the direction identified in the table below titled 'Locations of plots and photo points' within 12 months of the commencement date and then at least every 12 months thereafter.
- 1.2 The photo points are identified on the map entitled insert **Figure 7: Management zones and management actions** dated 24/02/2016 in Annexure A of this agreement. The purpose of the photographs is to show changes over time. Photographs should be taken at approximately the same direction, location, height and time of day (during daylight hours) in each reporting period (as defined in item 2.2 of this Annexure D) and retained for the life of this agreement. All photographs must be dated, stating the direction in which they were taken and identified with their locations.

Locations of photo points			
Projected coordinate system: GDA94 Zone 56			
Photo point reference	Easting	Northing	Direction of photo (magnetic degrees)
PP01	301335.8	6187499	135 and 315
PP02	301169	6187604	90 and 270
PP03	301120	6187551	90 and 270
PP04	301030	6187626	90 and 270
PP05	300973.9	6187580	90 and 270
PP06	300909.8	6187658	0 and 180
PP07	300835.7	6187624	90 and 270
PP08	301114	6188048	135 and 315

PP09	301047.3	6188109	90 and 270
PP10	301235	6187817	135 and 315
PP11	300888.6	6188145	90 and 270
PP12	301302	6187746	45 and 225
PP13	301614.9	6187625	135 and 315
PP14	301670	6187358	90 and 270
PP15	301803	6187378	45 and 225
PP16	301213	6187715	135 and 315
PP17	301653.6	6187747	135 and 315
PP18	301811	6187556	135 and 315
PP19	300940.5	6187648	0 and 180
PP20	301132	6187935	0 and 180
PP21	300920.7	6188061	135 and 315
PP22	301278.6	6187416	135 and 315
PP23	300983.3	6188205	90 and 270
PP24	301776.2	6187453	135 and 315
PP25	301055.7	6187514	90 and 270

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## Appendix 4: Credit profile report

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This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 3/03/2016

Time: 9:26:12AM

Calculator version: v4.0

## Biobank details

**Proposal ID:** 0103/2015/2276B

**Proposal name:** Lots 814 & 815, Redgum Ridge BioBank Site

**Proposal address:** Redgum Forest Way, Figtree NSW 2525 Figtree NSW 2525

**Proponent name:** Edenvell Pty Ltd

**Proponent address:** 30 Kenny Street Wollongong NSW 2500

**Proponent phone:** 02 4229 8799

**Assessor name:** Nathan Garvey

**Assessor address:** 8 Tate Street WOLLONGONG NSW 2500

**Assessor phone:** 4229 5222

**Assessor accreditation:** 0103

### Additional information required for approval:

- Use of local benchmark
- Expert report...
- Request for additional gain in site value

## Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	9.30	118.00
Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	26.87	281.00
Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	10.65	115.00
<b>Total</b>	<b>46.82</b>	<b>514</b>

## Credit profiles

### 1. Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion, (SR662)

Number of ecosystem credits created	105
IBRA sub-region	Illawarra

### 2. Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion, (SR662)

Number of ecosystem credits created	10
IBRA sub-region	Illawarra

### 3. Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion, (SR652)

Number of ecosystem credits created	233
IBRA sub-region	Illawarra

### 4. Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion, (SR652)

Number of ecosystem credits created	48
IBRA sub-region	Illawarra

### 5. Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion, (SR545)

Number of ecosystem credits created	118
IBRA sub-region	Illawarra

## Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
White-flowered Wax Plant	Cynanchum elegans	89.00	632

## Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Exclude commercial apiaries
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Exclude miscellaneous feral species
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Fox control
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Slashing
Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	Exclude miscellaneous feral species
Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion	Fox control
Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Exclude miscellaneous feral species
Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion	Fox control