

## **APPENDIX D**

### ***NSW Biobanking Assessment***

7 May 2013

Daniel Sullivan  
Senior Environmental Scientist  
Hansen Bailey  
6/127-129 John Street  
Singleton NSW 2330

## BIOBANKING ASSESSMENT OF THE DRAYTON SOUTH COAL PROJECT

Dear Daniel,

Cumberland Ecology  
PO Box 2474  
Carlingford Court 2118  
NSW Australia  
Telephone (02) 9868 1933  
Mobile 0425 333 466  
Facsimile (02) 9868 1977  
Web: [www.cumberlandecology.com.au](http://www.cumberlandecology.com.au)

Cumberland Ecology has prepared a BioBanking assessment of the Drayton South Coal Project (the Project) and the Project's Biodiversity Offset Package (BOP). The purpose of this letter is to explain briefly what BioBanking is and to present the key findings of the BioBanking assessment for comparison with the results presented in a recent submission by the NSW Office of Environment and Heritage (OEH). The technical BioBanking assessment is provided in **Appendix A** of this letter and the supporting documentation is provided in **Appendix B**.

## 1. Background

### 1.1 What is BioBanking?

BioBanking is a voluntary scheme that allows for an assessment of all biodiversity values as defined by the NSW *Threatened Species Conservation Act 1995* (TSC Act), including the composition, structure and function of ecosystems.

The BioBanking scheme relies on the use of the BioBanking Assessment Methodology (BBAM) to assess the current biodiversity values of development and conservation (or Biobank) sites. The BBAM provides a prescriptive method for measuring the loss of biodiversity values at a development site and conversely, the gain in biodiversity values resulting from the management of a biobank site for biodiversity conservation (DECC, 2009). The biodiversity values are measured in units referred to as "Biodiversity Credits". There are two types of biodiversity credits: ecosystem credits (covering plant communities), and species credits (covering threatened species).

### 1.2 Use of BioBanking in Assessing Part 3A Projects

BioBanking is typically called for by OEH to assess offsets for large development

proposals under Part 3A Major Projects, Part 4 State Significant Developments (SSD) and Part 5.1 State Significant Infrastructure (SSI) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). However, the use of the BBAM to assess developments and biodiversity offsets is not mandatory and Anglo American did not elect to use BioBanking to assess the Project and the BOP. Notwithstanding this, BBAM is often used as a tool by OEHL to help standardise its assessment of major projects that involve large offsetting measures.

The Environmental Assessment (EA) (Hansen Bailey, 2012) for the Project has now been submitted to the NSW Department of Planning and Infrastructure (DP&I) and has been received by various agencies, including OEHL, for review. To assist in its assessment of the Project, OEHL completed a BioBanking assessment of the Project and the BOP. However, as explained below, the OEHL BioBanking assessment was an approximation and did not use data collected from either the proposed development area or the proposed offsets.

### 1.3 OEHL BioBanking Assessment of the Project and BOP

The outcomes of OEHL's BioBanking assessment indicated that the BOP would only be able to provide 40% of the total ecosystem credits required and only 12% of the total species credits required to adequately compensate for the Project impacts (see **Table 1**).

**Table 1 Summary of Results of BioBanking Assessment of the Project vs the BOP (OEHL assessment)**

| Credit Type       | Development Site | Onsite Offset | Offsite Offset | Total Offset | % of required credits gained |
|-------------------|------------------|---------------|----------------|--------------|------------------------------|
| Ecosystem Credits | 32,150           | 804           | 11,434         | 12,238       | 40%                          |
| Species Credits   | 515              | 0             | 60             | 60           | 12%                          |

Since OEHL's BioBanking assessment relied largely on benchmark and other assumed data, OEHL has stated that Anglo American should also commission a BioBanking assessment of the Project and the BOP using empirical field data. Therefore, Cumberland Ecology was commissioned to prepare the current BioBanking assessment of the Project and BOP where empirical field data was utilised to achieve a more accurate representation of the Project's BioBanking liability.

## 2. BioBanking Assessment of the Project and BOP

BioBanking assessments have now been prepared by Cumberland Ecology for the Project Disturbance Area and the BOP. The BOP includes the following components:

- The Offsite Offset;

- The Onsite Offset Areas (comprising the Saddlers Creek Restoration Area and conservation of the primary ridgeline); and
- The Mine Rehabilitation Area.

Although the OEH BioBanking assessment did not include the rehabilitation component of the BOP, offsetting using mine rehabilitation is recognised in the BBAM and has been included in this BioBanking Assessment. As has been accepted for other mining projects in NSW in recent times, a discount of 50% has been applied to the mine rehabilitation areas in recognition that on rehabilitated land, the vegetation is likely to take a considerable period to develop. BioBanking assessments conducted on mine rehabilitated areas are assessed on the condition of the area taken immediately before the commencement of restoration activities, as stated in the BioBanking Assessment Methodology Operational Manual (DECC, 2009).

### 3. Methods and Assumptions

Cumberland Ecology's BioBanking assessment has been carried out in accordance with the methods prescribed by BBAM. The nature and location of the Project and the BOP are described in **Appendix A** of this letter. All technical aspects of the assessment and the assumptions underpinning the assessment are also presented in **Appendix A** of this letter. The credit profile outputs are attached to this letter in **Appendix B**.

### 4. Key Findings

#### 4.1 Biodiversity Credits Required to Adequately Offset the Project

The BioBanking assessment completed by Cumberland Ecology demonstrates that the BOP will supply 33,579 ecosystem credits, which is approximately 64% of the ecosystem credits required to adequately offset the Project impacts. The BOP will also supply 36,038 species credits, which is approximately 44% of the species credits required to offset the Project impacts on threatened species. These results are summarised in **Table 2** below.

**Table 2 Summary of Results of BioBanking Assessment of the Project vs the BOP (Cumberland Ecology assessment)**

| Credit Type       | Development Site | Onsite Offset | Offsite Offset | Rehabilitation Offset (at 50%) | Total Offset | % of required credits gained |
|-------------------|------------------|---------------|----------------|--------------------------------|--------------|------------------------------|
| Ecosystem Credits | 52,165           | 1,823         | 22,553         | 9,203                          | 33,579       | 64%                          |
| Species Credits   | 82,618           | 4,024         | 32,014         | -                              | 36,038       | 44%                          |



## 4.2 Like for Like Matching

Opportunities to offset in the Hunter Valley are limited because of the lack of availability of suitable offset land. For this reason, the BOP includes a substantial Offsite Offset component that is located just outside the Sydney Basin Bioregion (in the Nandewar Bioregion). Provided that the vegetation communities are of the same “formation” and “class” this is acceptable under the BBAM.

We have matched vegetation types from the Project Disturbance Area with appropriate formations and classes of vegetation in the Offsite. Such vegetation supports a very similar array of threatened plants and animals to those which occur in the vegetation of the impact area.

## 5. Conclusion

The BioBanking assessment shows that the ecosystem credit points generated by the BOP addresses approximately 64% of the credit points required to offset the Project impacts on biodiversity. Three of the four species used to generate species credits have been recorded from the Offset Areas and will address approximately 44% of the credit points required by the Project.

This BioBanking assessment has been prepared for comparison purposes only with OEH's BioBanking approximation included in their submission for the Project. Anglo American's position with regard to justifying the BOP for the Project is included in the Ecology Section of the Response to Submission Document (main Report) as prepared by Hansen Bailey dated May 2013.

Should you have any further queries, I can be contacted on 9868 1933.

Yours sincerely



David Robertson  
Director

[david.robertson@cumberlandecology.com.au](mailto:david.robertson@cumberlandecology.com.au)

---

---

*Appendix A*

BioBanking Assessment

---

---

## A.1 Introduction

BioBanking is a voluntary scheme that allows for an assessment of all biodiversity values as defined by the NSW *Threatened Species Conservation Act 1995* (TSC Act), including the composition, structure and function of ecosystems.

The BioBanking scheme relies on the use of the BioBanking Assessment Methodology (BBAM) to assess the current biodiversity values of development and conservation (or Biobank) sites. The BBAM provides a prescriptive method for measuring the loss of biodiversity values at a development site and conversely, the gain in biodiversity values resulting from the management of a biobank site for biodiversity conservation (DECC, 2009). The biodiversity values are measured in units referred to as “Biodiversity Credits”. There are two types of biodiversity credits: ecosystem credits (covering plant communities), and species credits (covering threatened species).

BioBanking is typically called for by the Office of Environment and Heritage (OEH) to assess offsets for large development proposals under Part 3A Major Projects, Part 4 State Significant Developments (SSD) and Part 5.1 State Significant Infrastructure (SSI) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). However, the use of the BBAM to assess developments and biodiversity offsets is not mandatory and Anglo American did not elect to use BioBanking to assess the Project and the BOP. Notwithstanding this, BBAM is often used as a tool by OEH to help standardise its assessment of major projects that involve large offsetting measures.

The Environmental Assessment (EA) (Hansen Bailey, 2012) for the Project has now been submitted to the NSW Department of Planning and Infrastructure (DP&I) and has been received by various agencies, including OEH, for review. To assist in its assessment of the Project, OEH completed a BioBanking assessment of the Project and the BOP.

Since OEH’s BioBanking assessment relied largely on benchmark and other assumed data, OEH has stated that Anglo American should also commission a BioBanking assessment of the Project and the BOP using empirical field data. Therefore, Cumberland Ecology was commissioned to prepare the current BioBanking assessment of the Project and BOP where empirical field data was utilised to achieve a more accurate representation of the Project’s BioBanking liability.

## A.2 Background

### A.2.1 Project Description

The Drayton South Coal Project (the Project) will allow for the continuation of mining at Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area (Drayton South) while continuing to utilise the existing infrastructure and equipment from Drayton Mine.

As detailed in the Project Ecology Impact Assessment (Cumberland Ecology, 2012), it was recognised that the Project will result in significant impacts to local biodiversity values. To address these ecological impacts, a substantial Biodiversity Offset Package (BOP) with a “maintain or improve” approach was developed. The BOP incorporates various onsite and offsite components to compensate for the residual ecological impacts of the Project once avoidance and mitigation measures have been implemented, the main components of which are:

- Onsite Offsets, comprising the following:
  - Restoration of Saddlers Creek;
  - Conservation of areas proposed for retention along the primary ridgeline of the Drayton South Study Area; and
  - Rehabilitation of the Project Disturbance Footprint; and
- Offsite Offset Land.

## **A.2.2 Location and Surrounding Environment**

### *i. The Project*

The Project is located directly south of Drayton Mine, approximately 10 km north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW) (**Figure 1**).

Open cut coal mining operations exist within the vicinity of the Project. These include the existing Drayton Mine (Anglo American); Mt Arthur Coal (MAC) Mine (BHP Billiton); Bengalla (Rio Tinto Coal and Wesfarmers); and Hunter Valley Operations (Rio Tinto Coal). Both the Liddell and Bayswater coal-fired power stations are situated to the north-east of the Project area, as is Plashett Dam (a purpose-built water storage reservoir to supply Bayswater power station). Two horse studs and a vineyard are located to the south, and other rural holdings are within the vicinity of the Project.

### *ii. The Offsite Offset*

The Offsite Offset is an approximately 2079 ha grazing property situated in the undulating hills near the township of Murrurundi in the Liverpool Plains local government area (LGA). It is located approximately 75 km north of the Project within the southern extremity of Nandewar Bioregion, at its boundary with the Sydney Basin Bioregion. The Offsite Offset does not adjoin a conservation reserve; however, several are located within the locality.

The Offsite Offset features relatively steep country that ranges from 500 to 900 metres in elevation and receives a high annual rainfall. The eastern half of the property occurs on soils derived from basalt whilst the western half occurs on soils derived from mudstone. Two semi-permanent creeks and their tributaries, Chilcotts Creek and Back Creek, flow through the property and contain water for the majority of the year.

The property is currently used for stock grazing (sheep and cattle) and some areas have been improved, producing a mixture of native and improved pastures. Nevertheless, the property is well vegetated and continues to support extensive areas of diverse remnant woodland and open forest with a natural or semi-natural understorey.

### **A.3 Methodology**

The BioBanking Assessment Methodology (BBAM) is outlined in the BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECC, 2009) and the Draft Operational Manual for using the BioBanking Credit Calculator v2.0 (OEH, 2012). The Calculator Tool used was Version 2.0. The BioBanking Credit Calculator is a computer software program that calculates “biodiversity credits”, which are effectively the units of BioBanking transactions. Biodiversity credits are ecosystem or species credits required to offset the loss of biodiversity values on development sites. It is important to understand that such credits are not directly equivalent to areas in hectares and the credits generated for an area of impact will vary based upon the vegetation types present, the patch size of each vegetation type, threatened species present or likely to occur and the connectivity of vegetation.

The BBAM must be applied separately for proposed development sites and for proposed offset sites. The methodology can be divided into three distinct phases:

1. Preliminary Assessment;
2. Field Data Collection; and
3. Generation of a Credit Profile.

Each of the BioBanking assessments carried out for the BOP was conducted using a Simplified Assessment Methodology (SAM) that has been approved by OEH. Simplified Assessments are carried out for large assessments that require large amounts of data to be entered into the credit calculator, such as for the Project. In the SAM, assessment circles (see **Section A.3.3** below), vegetation zones and threatened species subzones can be combined based on percentage native vegetation cover values.

#### **A.3.1 Components Assessed in the BioBanking Assessment**

The Project’s BioBanking assessment includes the application of BBAM to the following areas:

- Project Disturbance Area;
- BOP components, including:
  - Offsite Offset;

- Onsite Offset Areas (including the restoration of Saddlers Creek and retention of the primary ridgeline); and
- Rehabilitation Area.

BioBanking credit profile reports have been prepared for each of the above areas and these are attached in **Appendix B**.

### **A.3.2 Biodiversity Credits**

The biodiversity values of a development site and BioBank site are measured in units referred to as “Biodiversity Credits”. There are two types of biodiversity credits: ecosystem credits (covering plant communities), and species credits (covering threatened species).

The presence or absence of most threatened species can be reliably predicted on the basis of habitat utilisation. For this reason, BBAM uses ecosystem credits as a surrogate to assess a suite of threatened species. Those species that are not assessed using ecosystem credits as surrogates are assessed directly using species credits.

Species credits are created for threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. For flora species the actual number of individual plant specimens is entered into the calculator, while for fauna species the size of potential habitat within the site is estimated, which usually consists of the total area of vegetation communities known to provide habitat for the species in question.

Most of the threatened species predicted to be impacted by the Project have been assessed using ecosystem credits as a surrogate. The following species have not been included in ecosystem credits and have been assessed for species credits:

- Spotted Harrier (*Circus assimilis*)
- Little Eagle (*Hieraaetus morphnoides*)
- Large-eared Pied Bat (*Chalinolobus dwyer*); and
- Pine Donkey Orchid (*Diuris tricolor*).

### **A.3.3 Assessment Circles**

Assessment Circles are circles of 100 ha and 1000 ha in which percent native vegetation cover in the landscape is assessed, taking into account both cover and condition of vegetation, for calculating credit profiles and for Landscape Value scores (DECC, 2009). Assessment circles are grouped together in one of four categories based on the percent of native vegetation cover. Each category is a new assessment circle hence there will be between one and four assessment circles. This reduces the number of Threatened Species Subzones created by amalgamating them where the following values are identical:

- Percent native vegetation cover of the 1000ha assessment circle;

- BioBanking vegetation community;
- Condition; and
- Adjacent remnant area size.

Maps for the development site and offset sites showing the placement of the assessment circles, the native vegetation cover and adjacent remnant vegetation areas are provided in **Figures A.1-3** (development site), **A.4-6** (Offsite offset), **A.9-11** (onsite offset), and **A.13-14** (mine rehabilitation).

### **A.3.4 Vegetation Communities**

Ecological communities are used in the methodology as a surrogate for general biodiversity values. They are referred to as 'vegetation types'. The names used for vegetation types in a BioBanking Assessment are selected from a database within the Credit Calculator itself. The names available differ to some extent from those used in the existing vegetation maps for the sites and also from names used for Commonwealth and State endangered ecological communities (EECs). The selection of vegetation types influences the outcome of the assessment because different vegetation types create different credits, due to some plant communities supporting more threatened flora/fauna species than others.

The nomenclature used for plant communities is summarised in **Table 3**. Vegetation maps for the development site and offset sites are provided in **Figures A.4** (development site), **A.8** (offsite offset), **A.12** (onsite offset) and **A.15** (mine rehabilitation).

## **A.4 Assumptions and Limitations**

Although BioBanking methodology is systematic, there is also a considerable scope for "professional judgement" to be applied; meaning different operators may arrive at differing credit calculations. Thus, a number of assumptions have been made throughout the assessment process:

- The credits calculated in this assessment are ecosystem credits and species credits, both of which include threatened flora and fauna species. If further field surveys reveal additional threatened species to occur on the impact or offset site, the number of ecosystem and/or species credits may increase;
- It has been assumed that the whole Development Area will be cleared. If some areas within the development site can be retained, i.e. will not be impacted by the development, the numbers of credits generated for the affected vegetation communities might change;
- Approximately 62 ha of riparian vegetation will be replanted in the Saddlers Creek Restoration Area within the Onsite Offset Area. This was given the vegetation type "HU599: River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)" with a Mod/Good Condition;

- Site Value scores for the Onsite Offset Area was increased more than the default values in the online calculator due to the additional management actions along Saddlers Creek, where there will be the maintenance and restoration activities on the riparian vegetation and river flow regime;
- The Rehabilitation Area was given plot data scores of zero for all site attributes as they will not yet exist prior to the commencement of restoration activities;
- Vegetation condition for vegetation within the Rehabilitation Area was assigned low condition as it is assessed on the state of the site prior to the commencement of restoration activities; and
- Site Value scores for the Rehabilitation Area were increased more than the default values in the online calculator, following the guidelines provided in Table A.5 of the BioBanking Operational Manual (DECC 2009). Additional management actions to be carried out will be outlined in the Biodiversity Action Plan (BAP), as discussed in the EIA (Cumberland Ecology, 2012).

## A.5 Results

### A.5.1 Ecosystem credits

A summary of the ecosystem credits generated for the Project Disturbance Area and Offset Areas is provided in **Table 3** below. The table lists the vegetation communities present within the Project Disturbance Area and Offset Areas with a comparison of the vegetation community names as provided in the Project EIA (Cumberland Ecology, 2012) and each community's equivalent BioBanking vegetation type. Areas of each community and the number of ecosystem credits they generate are also provided.

**Table 3** indicates that clearance of the Development Area would create a liability of 52,165 credits, while the various components of the BOP (Onsite, Offsite and Rehabilitation Offsets) can provide a total of 33,579 credits. Of this total, the Offsite Offset generates the majority of credits (22,553) due to the presence of large areas of vegetation that conform to TSC Act-listed communities and habitat that it provides for flora and fauna.

The BOP would therefore address 64% of the ecosystem credit requirement for the Project.

### A.5.2 Species credits

The species credit liability for the Project and the species credits generated by the BOP are summarised in **Table 4** below. The results shown in **Table 4** indicate that clearance of the Development Area would create a liability of 82,618 species credits, while the various components of the BOP (Onsite and Offsite) can provide a total of 36,038 species credits. The mine rehabilitation component of the BOP was assumed to provide no species credits at the commencement of the rehabilitation works.

The BOP would therefore address 44% of the species credit requirement for the Project.



Table 3 BioBanking Assessment Ecosystem Credit Summary

| Vegetation Community (CE)                                                                                   | Vegetation Type (BioBanking)                                                                                                              | Development Area |         | Offsite Offset |         | Onsite Offsets |         | Rehabilitation Offset |         |           | TOTAL OFFSETS  |                        | Credit Difference |  |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------|----------------|---------|----------------|---------|-----------------------|---------|-----------|----------------|------------------------|-------------------|--|
|                                                                                                             |                                                                                                                                           | Area (ha)        | Credits | Area (ha)      | Credits | Area (ha)      | Credits | Area (ha)             | Credits | Area (ha) | Credits (100%) | Credits (50% discount) | Sum of Area (ha)  |  |
| Central Hunter Box-Ironbark Woodland                                                                        | Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin                            | 181.08           | 6,447   |                |         | 54.21          | 559     | 777.49                | 10,003  | 5,002     | 831.70         | 5,561                  | -887              |  |
| Coocha Scrub                                                                                                | Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin                            | 8.67             | 287     |                |         | 34.92          | 302     |                       |         |           | 34.92          | 302                    | 15                |  |
| Other Grassland                                                                                             | Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin                            | 1,439.84         | 31,637  |                |         |                |         |                       |         |           | 0.00           | 0                      | -31,637           |  |
| Hunter Valley River Oak Forest                                                                              | River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | 2.16             | 145     |                |         |                |         |                       |         |           | 0.00           | 0                      | -145              |  |
| River Oak riparian woodland, eastern NSW                                                                    | River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  |                  |         | 0.96           | 9       |                |         |                       |         |           | 0.96           | 9                      | 9                 |  |
| Hunter Floodplain Red Gum Woodland Complex                                                                  | River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                                             | 11.26            | 509     |                |         | 20.2           | 253     |                       |         |           | 20.20          | 253                    | -256              |  |
| Hunter Floodplain Red Gum Woodland Complex Derived Native Grassland                                         | River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                                             | 3.92             | 112     |                |         |                |         |                       |         |           | 0.00           | 0                      | -112              |  |
| Other Grassland                                                                                             | River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                                             |                  |         |                |         | 62.17          | 709     |                       |         |           | 62.17          | 709                    | 709               |  |
| Derived Native Grassland                                                                                    | Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast |                  |         | 0.99           | 10      |                |         |                       |         |           | 0.99           | 10                     | 10                |  |
| Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands                      | Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast |                  |         | 7.85           | 66      |                |         |                       |         |           | 7.85           | 66                     | 66                |  |
| Derived Native Grassland                                                                                    | Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          |                  |         | 10.78          | 88      |                |         |                       |         |           | 10.78          | 88                     | 88                |  |
| Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar | Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          |                  |         | 2.55           | 22      |                |         |                       |         |           | 2.55           | 22                     | 22                |  |
| Narrabeen Footslopes Slaty Box Woodland                                                                     | Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney                                                    | 98.19            | 5,444   |                |         |                |         | 626.21                | 8,402   | 4,201     | 626.21         | 4,201                  | -1,243            |  |

Table 3 BioBanking Assessment Ecosystem Credit Summary

| Vegetation Community (CE)                                                                                   | Vegetation Type (BioBanking)                                                                                                  | Development Area |         | Offsite Offset |         | Onsite Offsets |         | Rehabilitation Offset |         |           | TOTAL OFFSETS  |                        | Credit Difference |  |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------|---------|----------------|---------|----------------|---------|-----------------------|---------|-----------|----------------|------------------------|-------------------|--|
|                                                                                                             |                                                                                                                               | Area (ha)        | Credits | Area (ha)      | Credits | Area (ha)      | Credits | Area (ha)             | Credits | Area (ha) | Credits (100%) | Credits (50% discount) | Sum of Area (ha)  |  |
| Upper Hunter White Box-Ironbark Grassy Woodland                                                             | Basin<br>White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South              | 63.21            | 3,256   |                |         |                |         |                       |         |           | 0.00           | 0                      | -3,256            |  |
| Upper Hunter White Box-Ironbark Grassy Woodland Derived Native Grassland                                    | White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South_Grassland             | 103.15           | 3,416   |                |         |                |         |                       |         |           | 0.00           | 0                      | -3,416            |  |
| Central Hunter Bulloak Forest Regeneration                                                                  | Bull Oak Forests of the Central Hunter Valley                                                                                 | 24.86            | 912     |                |         |                |         |                       |         |           | 0.00           | 0                      | -912              |  |
| River Oak riparian woodland, eastern NSW                                                                    | River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)                                    |                  |         | 31.33          | 306     |                |         |                       |         |           | 31.33          | 306                    | 306               |  |
| Derived Native Grassland                                                                                    | Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       |                  |         | 73.13          | 829     |                |         |                       |         |           | 73.13          | 829                    | 829               |  |
| Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands                      | Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       |                  |         | 245.45         | 2,418   |                |         |                       |         |           | 245.45         | 2,418                  | 2,418             |  |
| Derived Native Grassland                                                                                    | Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  |                  |         | 16.89          | 202     |                |         |                       |         |           | 16.89          | 202                    | 202               |  |
| Rough-barked Apple - Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar          | Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  |                  |         | 25.38          | 240     |                |         |                       |         |           | 25.38          | 240                    | 240               |  |
| Derived Native Grassland                                                                                    | Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands |                  |         | 24.70          | 256     |                |         |                       |         |           | 24.70          | 256                    | 256               |  |
| Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar | Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands |                  |         | 68.06          | 727     |                |         |                       |         |           | 68.06          | 727                    | 727               |  |
| White Box - stringybark shrubby woodlands, Brigalow Belt South and Nandewar                                 | White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion                 |                  |         | 336.41         | 3,419   |                |         |                       |         |           | 336.41         | 3,419                  | 3,419             |  |
| Derived Native Grassland                                                                                    | White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                                  |                  |         | 640.81         | 8,025   |                |         |                       |         |           | 640.81         | 8,025                  | 8,025             |  |

Table 3 BioBanking Assessment Ecosystem Credit Summary

| Vegetation Community (CE)                                    | Vegetation Type (BioBanking)                                                 | Development Area |         | Offsite Offset |         | Onsite Offsets |         | Rehabilitation Offset |         | TOTAL OFFSETS  |                        | Credit Difference |         |
|--------------------------------------------------------------|------------------------------------------------------------------------------|------------------|---------|----------------|---------|----------------|---------|-----------------------|---------|----------------|------------------------|-------------------|---------|
|                                                              |                                                                              | Area (ha)        | Credits | Area (ha)      | Credits | Area (ha)      | Credits | Area (ha)             | Credits | Credits (100%) | Credits (50% discount) | Sum of Area (ha)  |         |
| Low Diversity Derived Native Grassland                       | White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions | 97.22            | 1,006   |                |         |                |         |                       |         | 97.22          | 1,006                  | 1,006             |         |
|                                                              |                                                                              |                  |         |                |         |                |         |                       |         |                |                        |                   |         |
| White Box grassy woodland, Brigalow Belt South and Nandewar  | White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions | 395.99           | 3,742   |                |         |                |         |                       |         | 395.99         | 3,742                  | 3,742             |         |
|                                                              |                                                                              |                  |         |                |         |                |         |                       |         |                |                        |                   |         |
| Box - gum grassy woodlands, Brigalow Belt South and Nandewar | Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion     | 66.94            | 855     |                |         |                |         |                       |         | 66.94          | 855                    | 855               |         |
|                                                              |                                                                              |                  |         |                |         |                |         |                       |         |                |                        |                   |         |
| Derived Native Grassland                                     | Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion     | 35.07            | 333     |                |         |                |         |                       |         | 35.07          | 333                    | 333               |         |
| Grand Total                                                  |                                                                              | 1,936.33         | 52,165  | 2,080.50       | 22,553  | 171.5          | 1823    | 1403.7                | 18,405  | 9202.5         | 3,655.70               | 33,579            | -18,587 |

Table 4 BioBanking Species Credit Summary

| Species Assessed      | Scientific Name               | Project Disturbance Area |         | Offsite Offset |         | Onsite Offset |         | Total Offsets |         |
|-----------------------|-------------------------------|--------------------------|---------|----------------|---------|---------------|---------|---------------|---------|
|                       |                               | Area                     | Credits | Area           | Credits | Area          | Credits | Area          | Credits |
| Spotted Harrier       | <i>Circus assimilis</i>       | 1,936                    | 26,167  | 2,083          | 12,499  | 172           | 1,029   | 2,255         | 13,528  |
| Little Eagle          | <i>Hieraaetus morphnoides</i> | 1,936                    | 26,167  | 2,083          | 12,499  | 172           | 1,029   | 2,255         | 13,528  |
| Large-eared Pied Bat  | <i>Chalinolobus dwyer</i>     | 389                      | 29,923  | 1,169          | 7,016   | 172           | 1,966   | 1,341         | 8,982   |
| Pine Donkey Orchid    | <i>Diuris tricolor</i>        | 30 individuals           | 361     | 0              | 0       | 0             | 0       | 0             | 0       |
| TOTAL Species Credits |                               |                          | 82,618  |                | 32,014  |               | 4,024   |               | 36,038  |

## A.6 Conclusion

The BioBanking reports show that the ecosystem credit points generated by the Offset Areas address approximately 64% of the credit points required for the Development Area. Three of the four species used to generate species credits have been recorded from the Offset Areas and will address approximately 44% of the credit points required for the Development Area.

The proposed Offset Areas do not contain all of the vegetation types that are present in the Development Area, which results in the vegetation types having slightly different names within the BioBanking Calculator and which makes them difficult to match (i.e. *White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions* vs. *White Box – Yellow Box grassy woodland on basalt slopes in the Upper Hunter Valley, Brigalow Belt South*).

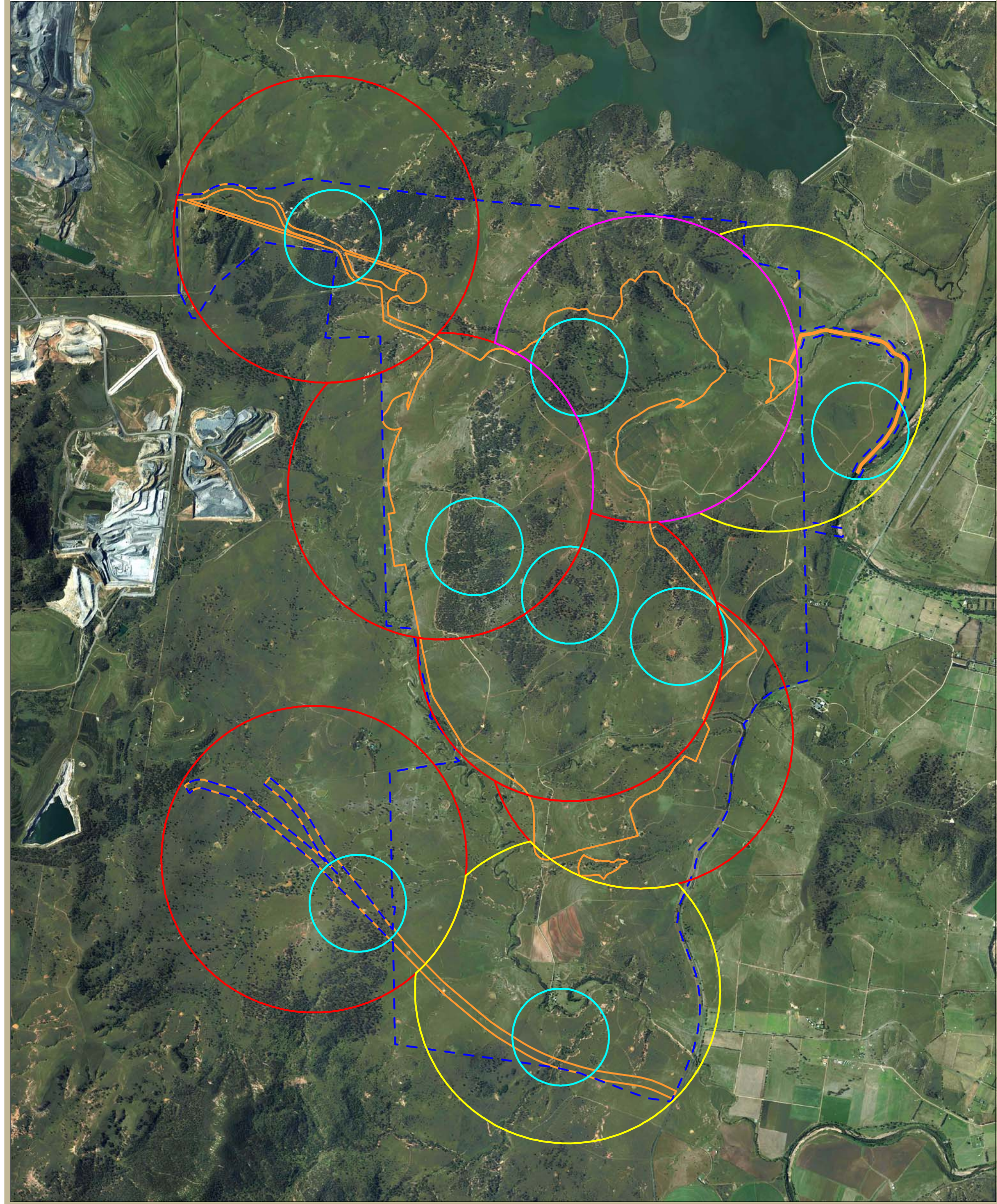
Furthermore, recent changes to threatened species legislation have resulted in the listing of EECs that have not yet been captured by the BioBanking databases. For instance, Hunter Floodplain Red Gum Woodland Complex Derived Native Grassland (CEEC) has no EEC equivalent in the Vegetation Types database, and the nearest alternative, *River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)*, must be chosen.

This BioBanking assessment has been prepared for comparison purposes only with OEH's BioBanking approximation included in their submission for the Project. Anglo American's position with regard to justifying the BOP for the Project is included in the Ecology Section of the Response to Submission Document (main Report) as prepared by Hansen Bailey dated May 2013.

## A.7 References

- Cumberland Ecology (2012) Drayton South Ecology Impact Assessment - Final Report  
*Prepared for Hansen Bailey, Carlingford Court, NSW.*
- DECC (2009) *BioBanking Assessment Methodology and Credit Calculator Operational Manual*.  
Department of Environment and Climate Change, Hurstville, NSW.
- Hansen Bailey (2012) Drayton South Coal Project Environmental Assessment. Prepared for  
Anglo American Metallurgical Coal Pty Ltd (ed), Singleton, NSW.
- OEH (2012) *Draft Biobanking Credit Calculator v2.0 Operational Manual*. NSW Office of  
Environment and Heritage.





**Legend**

 Development Site

 Study Area

**Assessment Circles**

-  100 ha Assessment Circle
-  1000 ha Assessment Circle (Simplified 1)
-  1000 ha Assessment Circle (Simplified 2)
-  1000 ha Assessment Circle (Simplified 3)

Image Source:  
Drayton June 2011



Figure A.1. Study Area and Assessment Circles of the Development Site





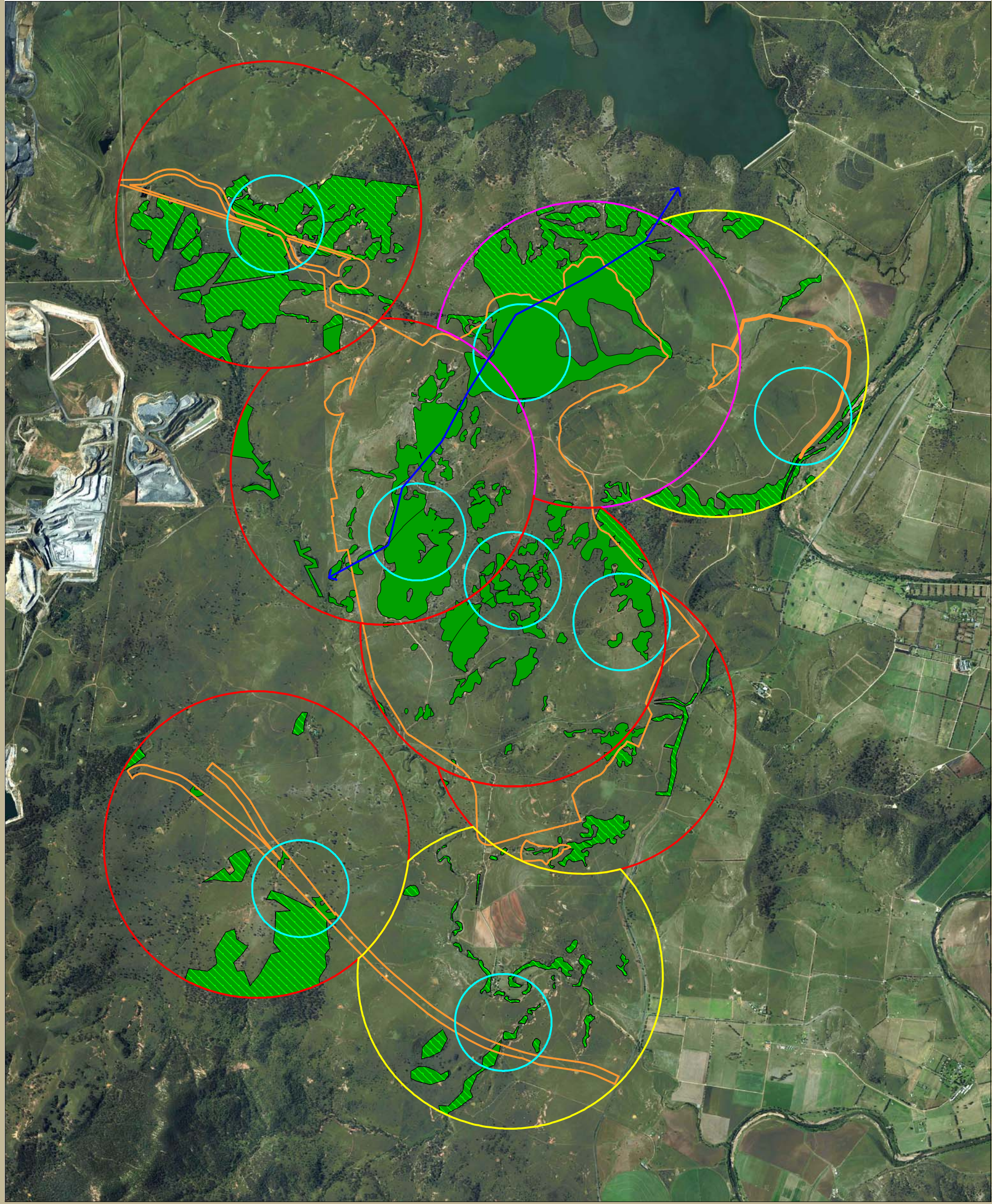


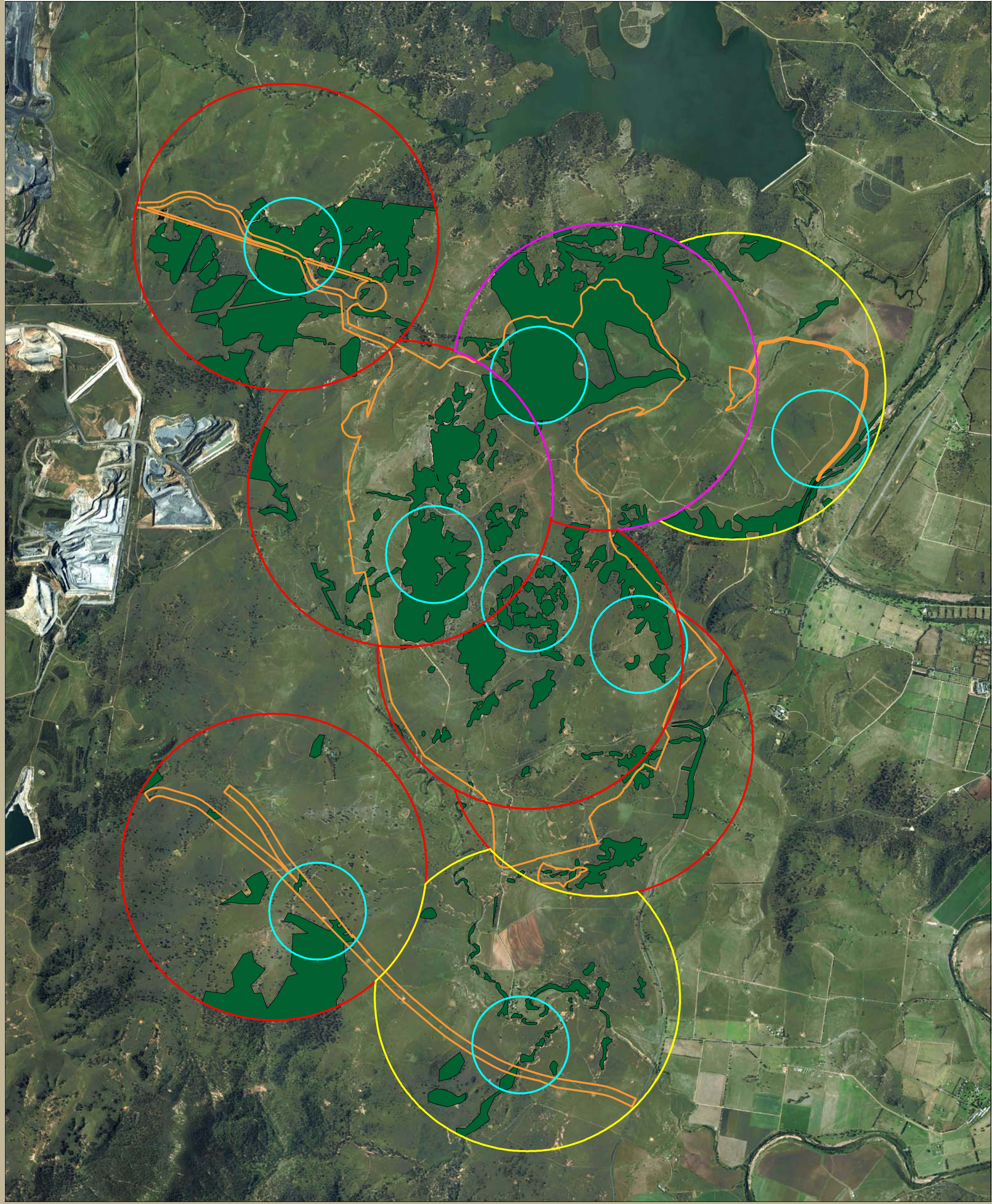
Image Source:  
Drayton June 2011



Figure A.2. Native Vegetation and Connectivity of the Development Site







**Legend**

Development Site

**Assessment Circles**

- 100 ha Assessment Circle
- 1000 ha Assessment Circle (Simplified 1)
- 1000 ha Assessment Circle (Simplified 2)
- 1000 ha Assessment Circle (Simplified 3)

**Adjacent Remnant Area**

- > 501 ha

Image Source:  
Drayton June 2011



Figure A.3. Adjacent Remnant Area calculations





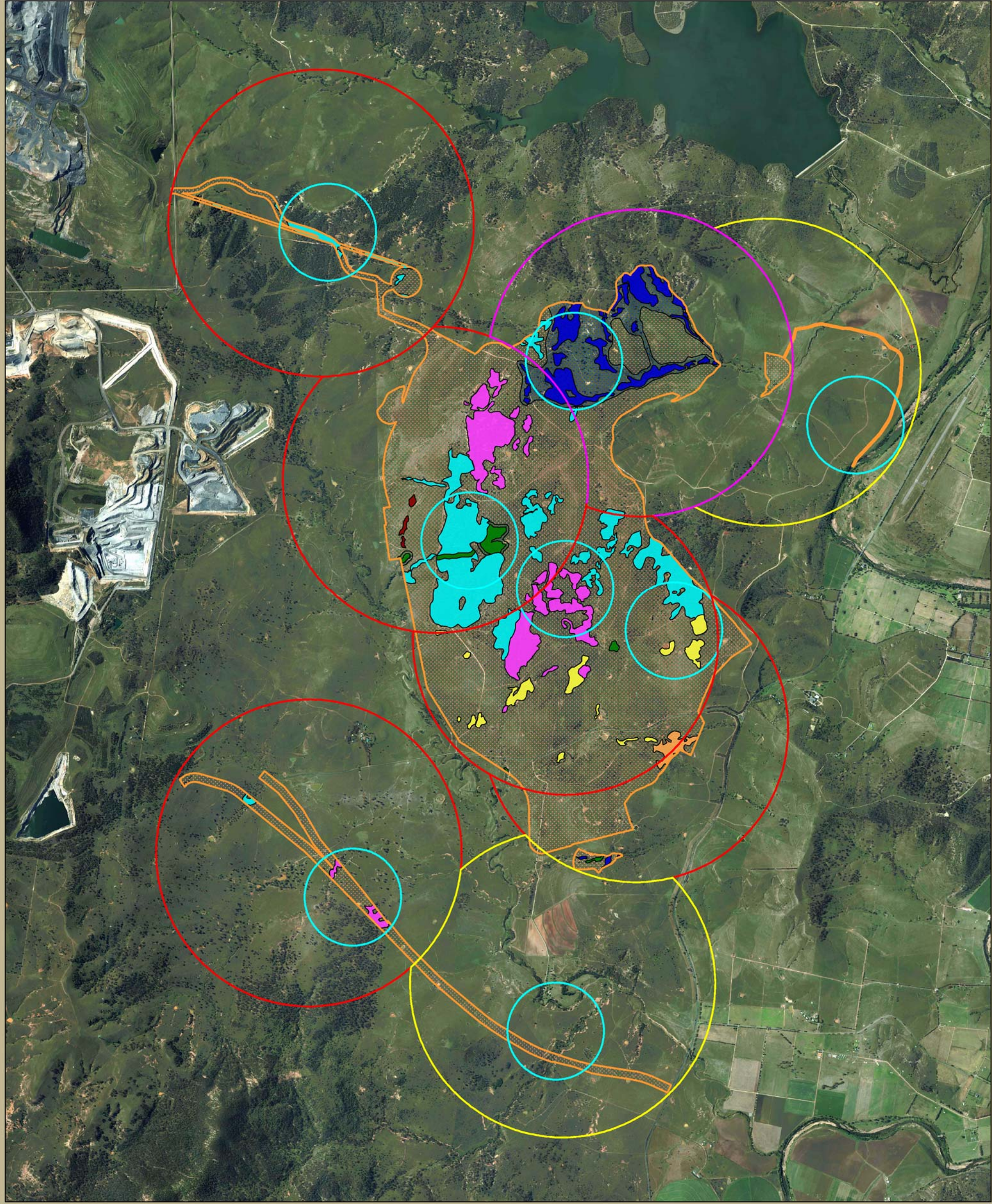


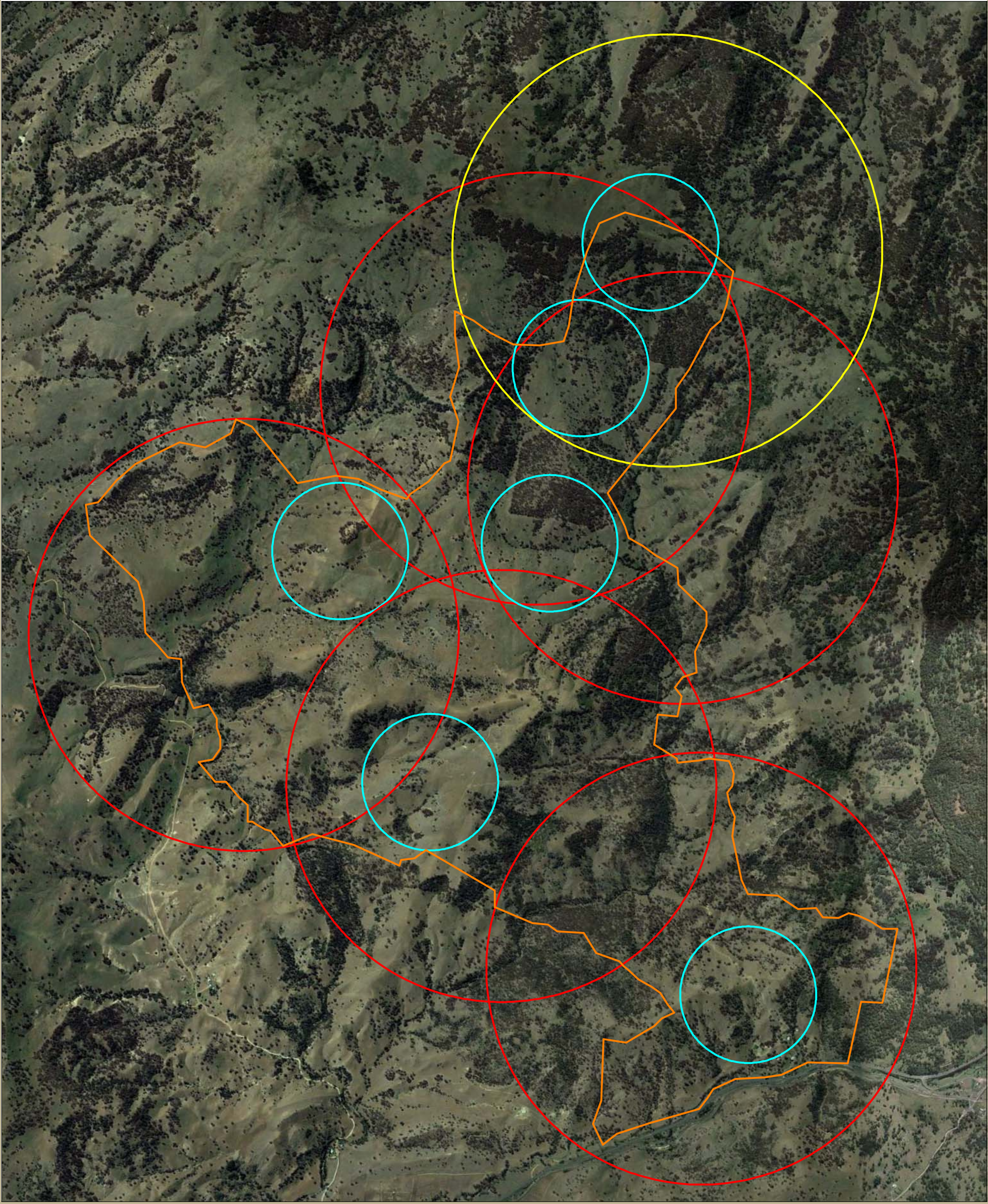
Image Source:  
Drayton June 2011



Figure A.4. BioBanking Vegetation Communities of the Development Site







**Legend**

Offsite Offset Area

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified; Namoi CMA)

1000 ha Assessment Circle (Simplified; Hunter/Central Rivers CMA)

Image Source:

Image © 2013 DigitalGlobe

© 2013 Cnes/Spot Image

Image © 2013 Sinclair Knight Merz



Figure A.5. Assessment Circles of the Offsite Offset Area







- Legend**
- Offsite Offset Area
  - Connectivity Link with most limiting width (50m)
  - Assessment Circles**
    - 100 ha Assessment Circle
    - 1000 ha Assessment Circle (Simplified; Namoi CMA)
    - 1000 ha Assessment Circle (Simplified; Hunter/Central Rivers CMA)
  - Native Vegetation Cover**
    - Native Vegetation Cover Before BioBank
    - Native Vegetation Cover After BioBank

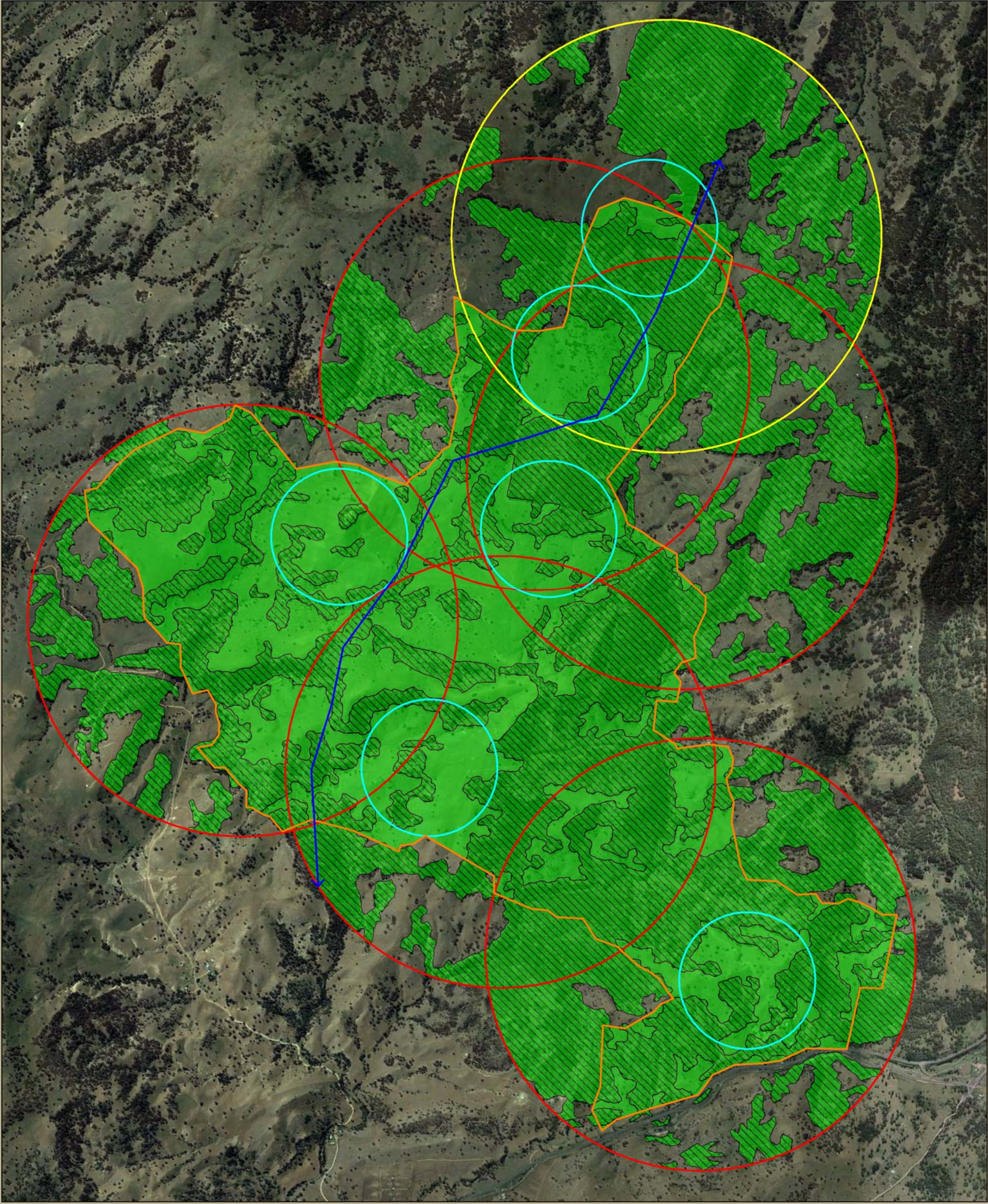


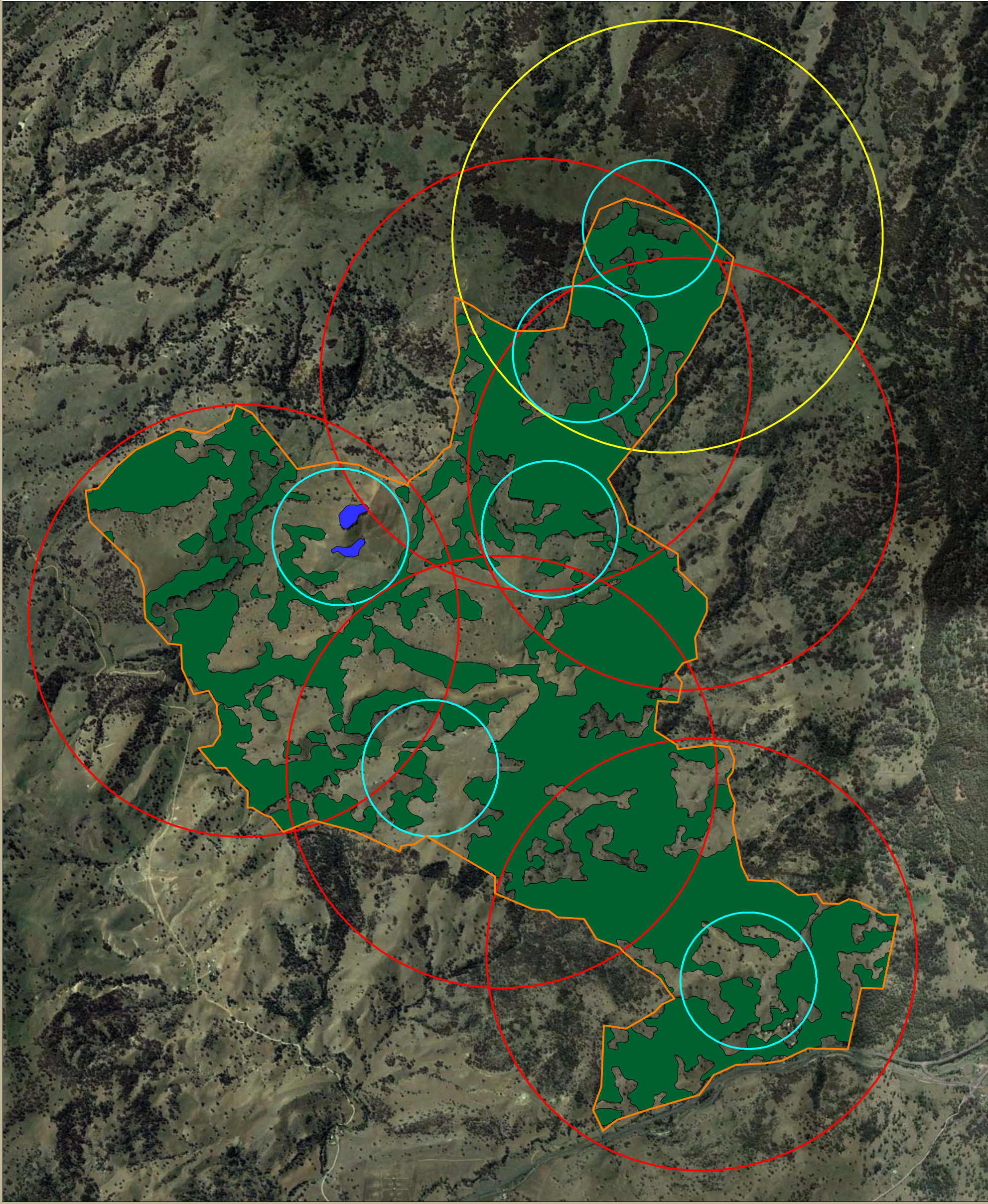
Image Source:  
Image © 2013 DigitalGlobe  
© 2013 Cnes/Spot Image  
Image © 2013 Sinclair Knight Merz



Figure A.6. Native Vegetation Cover and Connectivity of the Offsite Offset Area







**Legend**

Offsite Offset Area

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified;

Namoi CMA)

1000 ha Assessment Circle (Simplified;

Hunter/Central Rivers CMA)

**Adjacent Remnant Area**

> 501 ha

< 5 ha

Image Source:

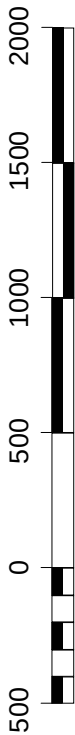
Image © 2013 DigitalGlobe

© 2013 Cnes/Spot Image

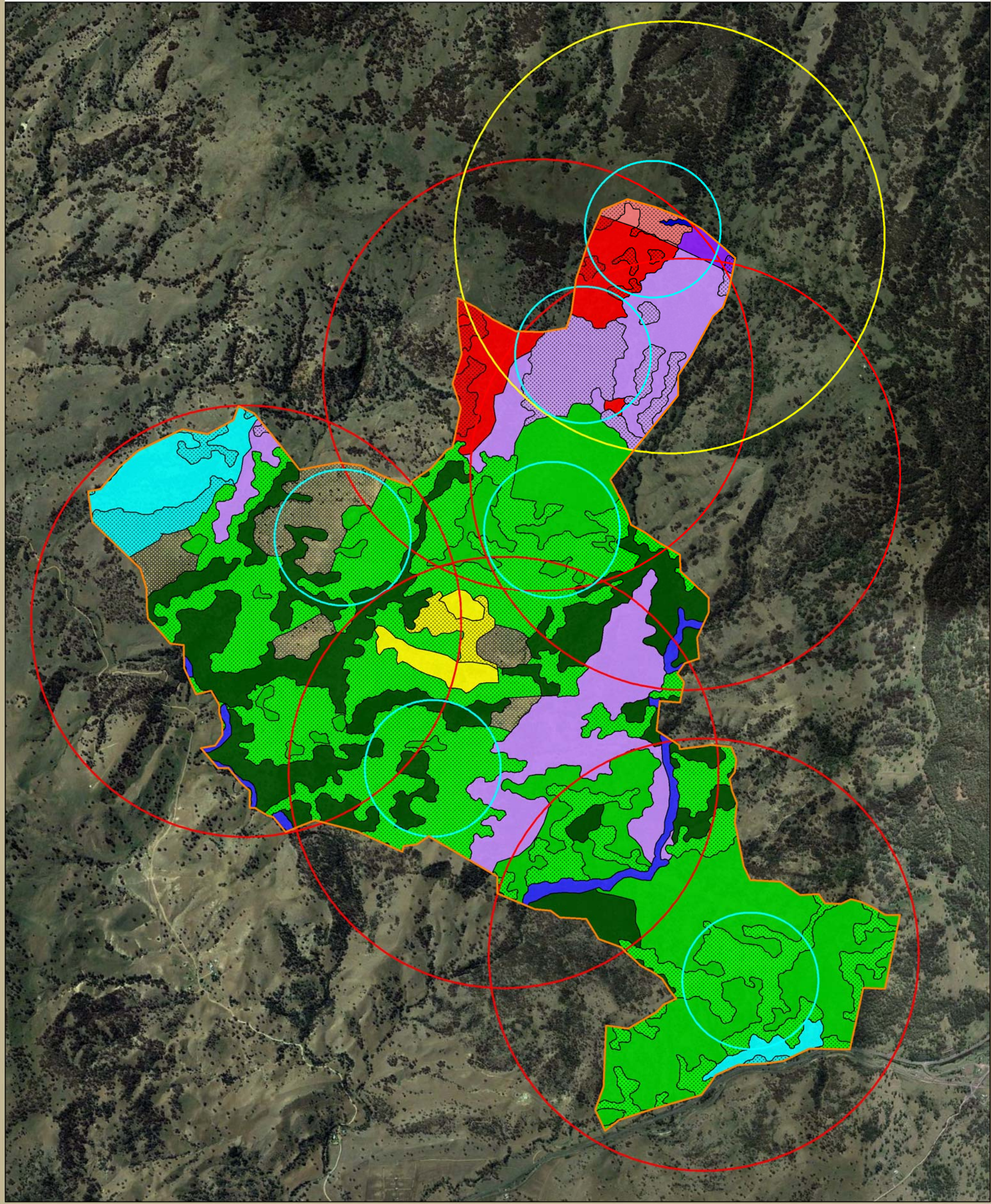
Image © 2013 Sinclair Knight Merz



Figure A.7. Adjacent Remnant Area of the Offsite Offset Area







**Legend**

Offsite Offset Area

**Assessment Circles**

- 100 ha Assessment Circle
- 1000 ha Assessment Circle (Simplified; Namoi CMA)
- 1000 ha Assessment Circle (Simplified; Hunter/Central Rivers CMA)

**BioMetric Vegetation Types**

- NA226 / White Box grassy woodland, Brigalow Belt South and Nandewar
- NA226 / Derived Native Grassland
- NA223 / White Box - stringybark shrubby woodlands, Brigalow Belt South and Nandewar
- NA237 / Box - gum grassy woodlands, Brigalow Belt South and Nandewar
- NA237 / Derived Native Grassland
- NA197 / Rough-barked Apple - Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar
- NA197 / Derived Native Grassland
- NA226 / Low Diversity Derived Native Grassland
- NA196 / Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands
- NA196 / Derived Native Grassland
- NA208 / Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar
- NA208 / Derived Native Grassland
- NA191 / River Oak riparian woodland, eastern NSW
- HU603 / Silvertop Stringybark grassy open forest eastern Nandewar and New England Tablelands
- HU603 / Derived Native Grassland
- HU598 / River Oak riparian woodland, eastern NSW
- HU616 / Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar
- HU616 / Derived Native Grassland

Image Source:  
Image © 2013 DigitalGlobe  
© 2013 Cnes/Spot Image  
Image © 2013 Sinclair Knight Merz



Figure A.8. BioBanking Vegetation Types of the Offsite Offset Area





**Legend**

Onsite Offset Area

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified 1)

1000 ha Assessment Circle (Simplified 2)

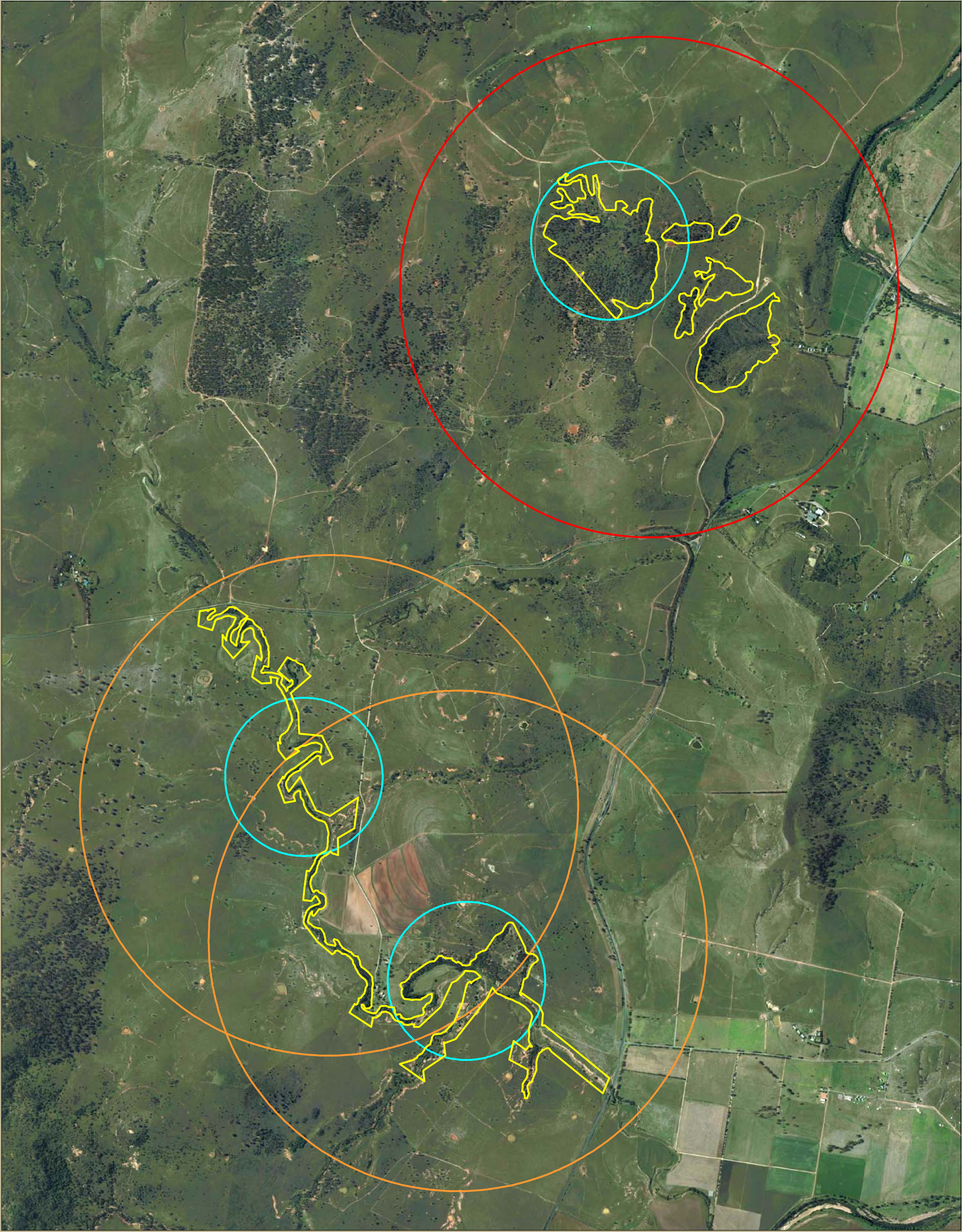
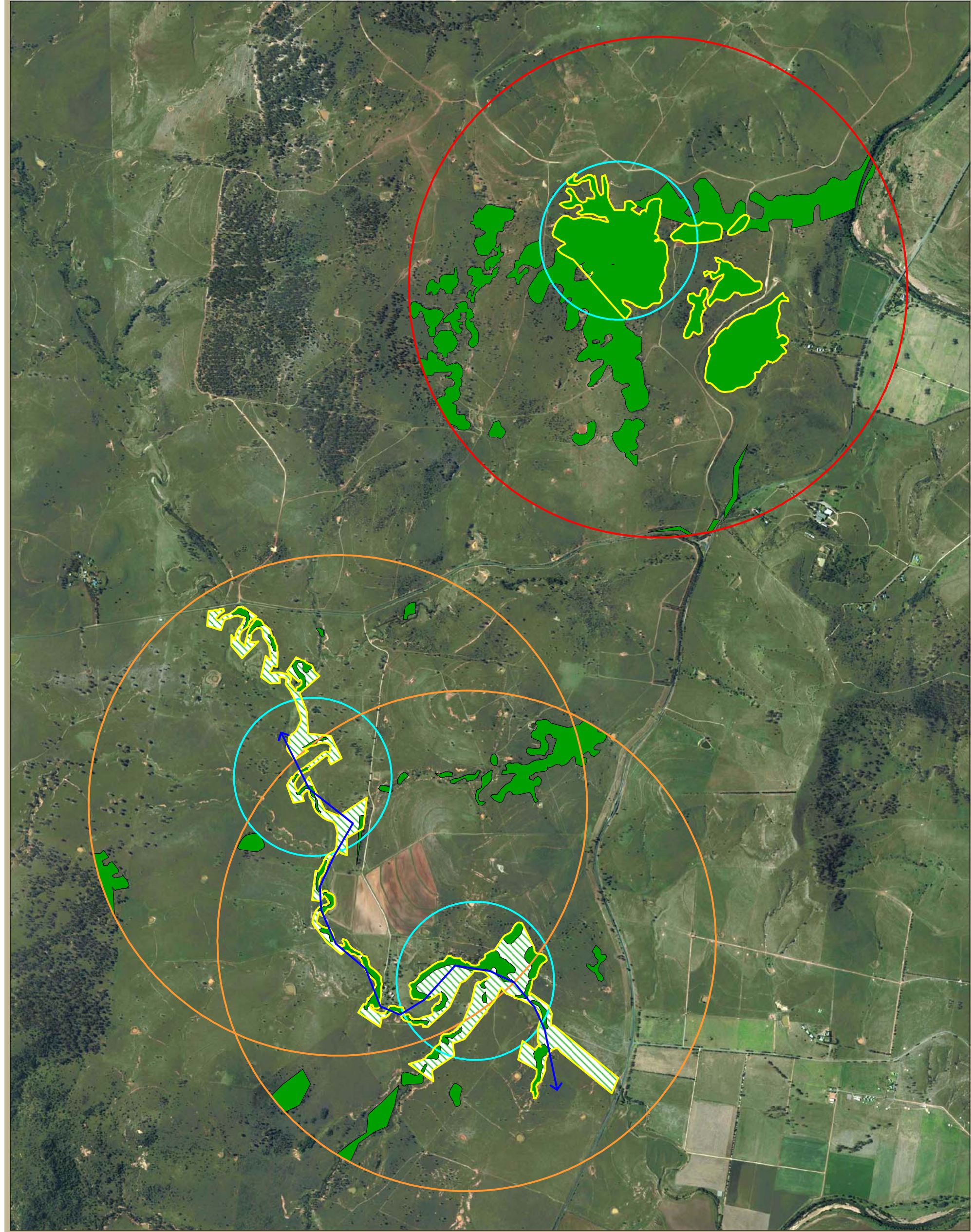


Figure A.9. Assessment Circles of the Onsite Offset Area







**Legend**

Onsite Offset Area

Connectivity Link with most limiting width (0-5m)

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified 1

1000 ha Assessment Circle (Simplified 2

**Native Vegetation Cover**

Native Vegetation Cover Before BioBank

Native Vegetation Cover After BioBank

Image Source:  
Drayton June 2011



Figure A.10. Native Vegetation Cover and Connectivity of the Onsite Offset Area





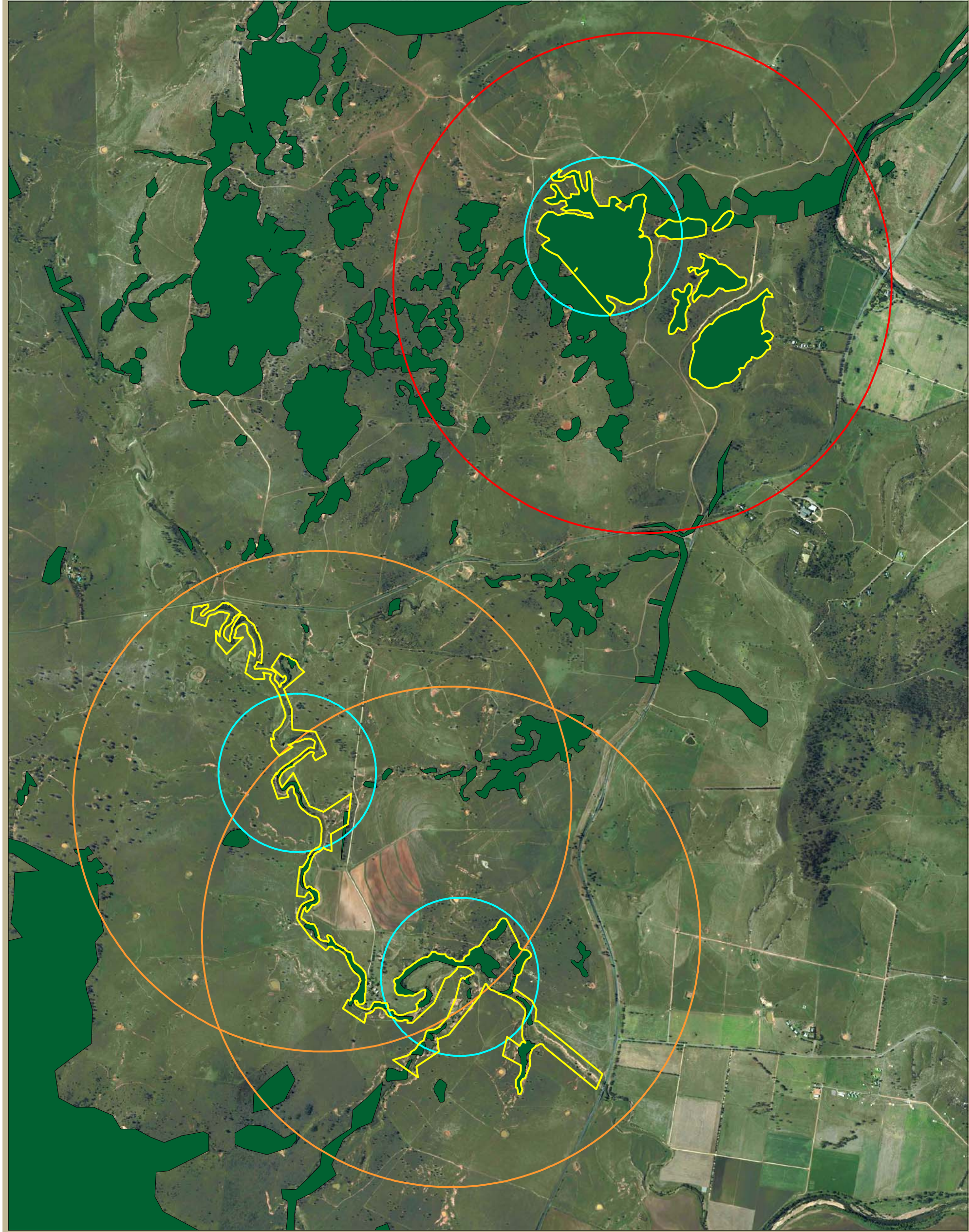


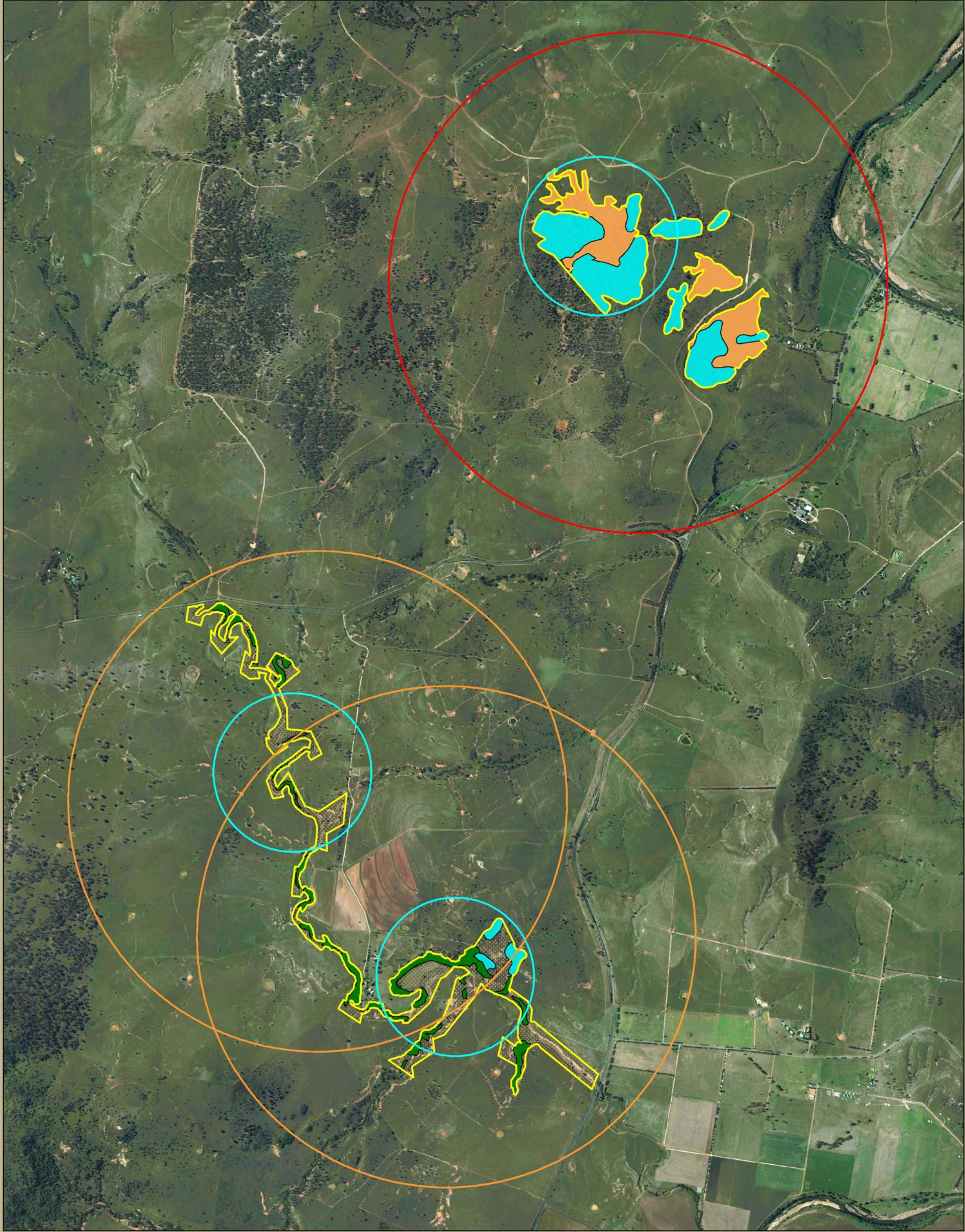
Image Source:  
Drayton June 2011



Figure A.11. Adjacent Remnant Vegetation of the Onsite Offset Area







**Legend**

Onsite Offset Area

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified 1)

1000 ha Assessment Circle (Simplified 2)

**BioMetric Vegetation Type**

HU551: Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin (Mod/Good)

HU551: Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin (Mod/Good\_Other)

HU599: River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (Mod/Good)

HU599: River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (Mod/Good\_Poor)

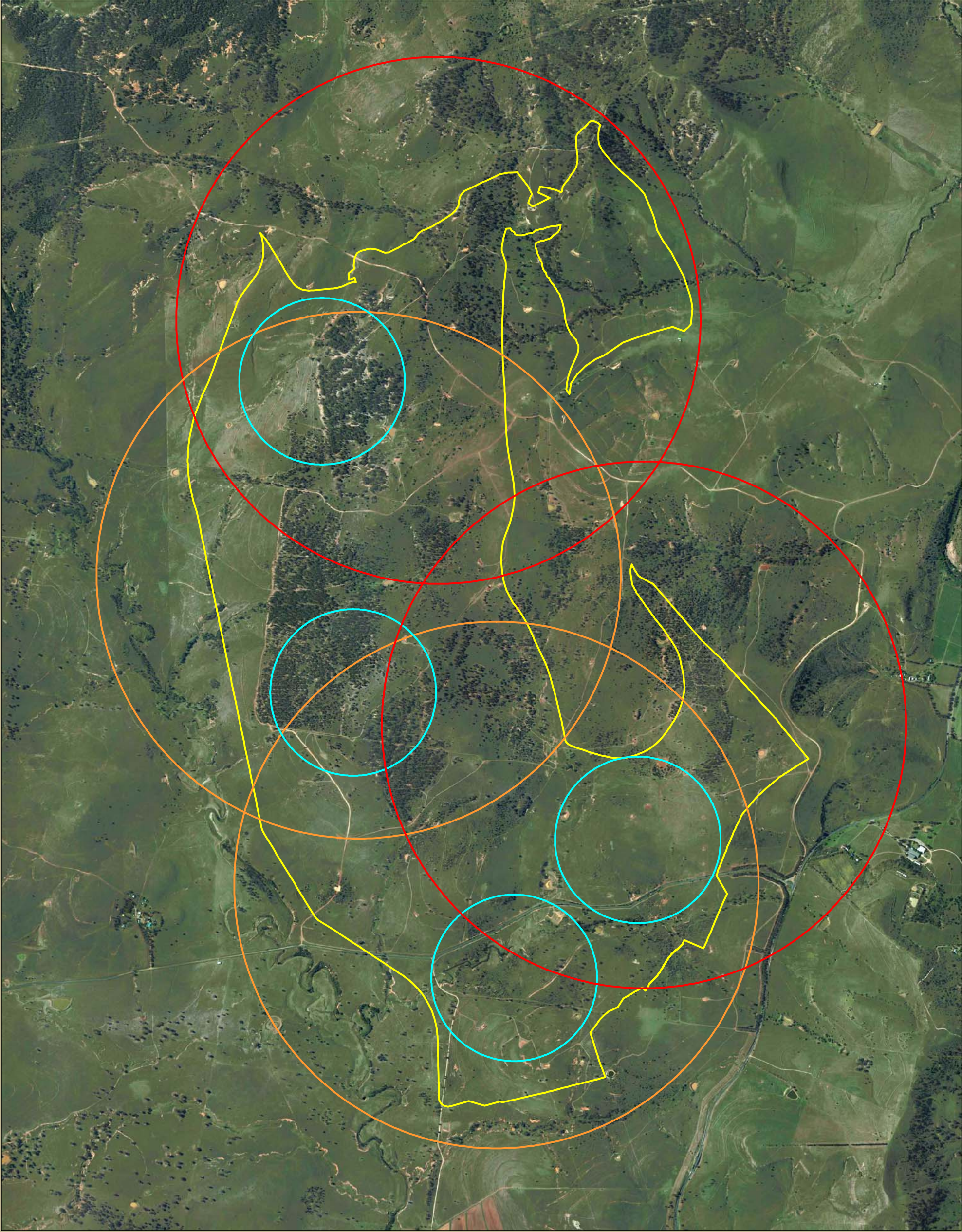
Image Source:  
Drayton June 2011



Figure A.12. BioBanking Vegetation Types of the Onsite Offset Area







**Legend**

Rehabilitation Offset

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified 1)

1000 ha Assessment Circle (Simplified 2)

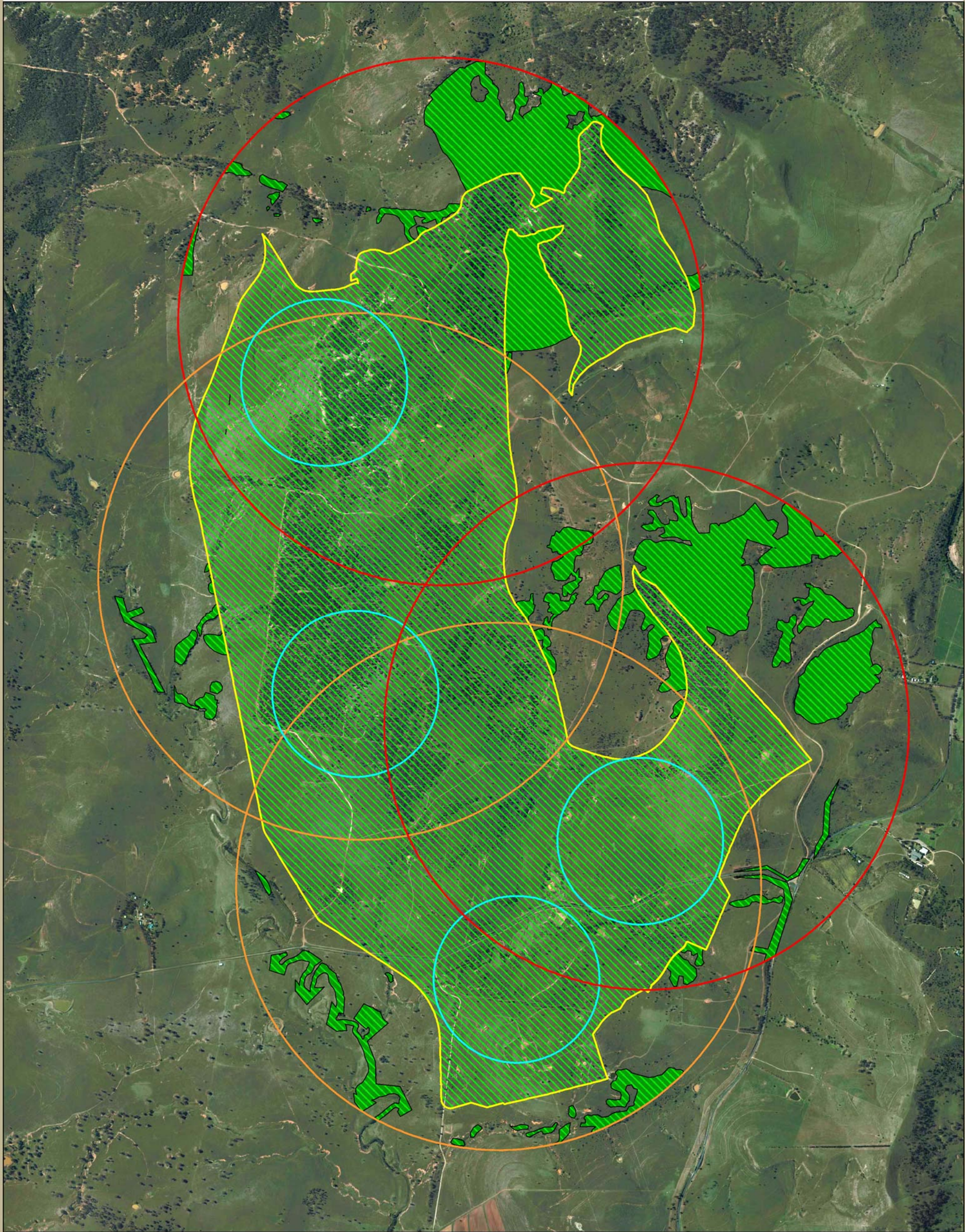
Image Source:  
Drayton June 2011



Figure A.13. Assessment Circles of the Rehabilitation Offset







**Legend**

- Rehabilitation Offset
- Assessment Circles
  - 100 ha Assessment Circle
  - 1000 ha Assessment Circle (Simplified 1)
  - 1000 ha Assessment Circle (Simplified 2)
- Native Vegetation Cover
  - Native Vegetation Cover Before BioBank
  - Native Vegetation Cover After BioBank

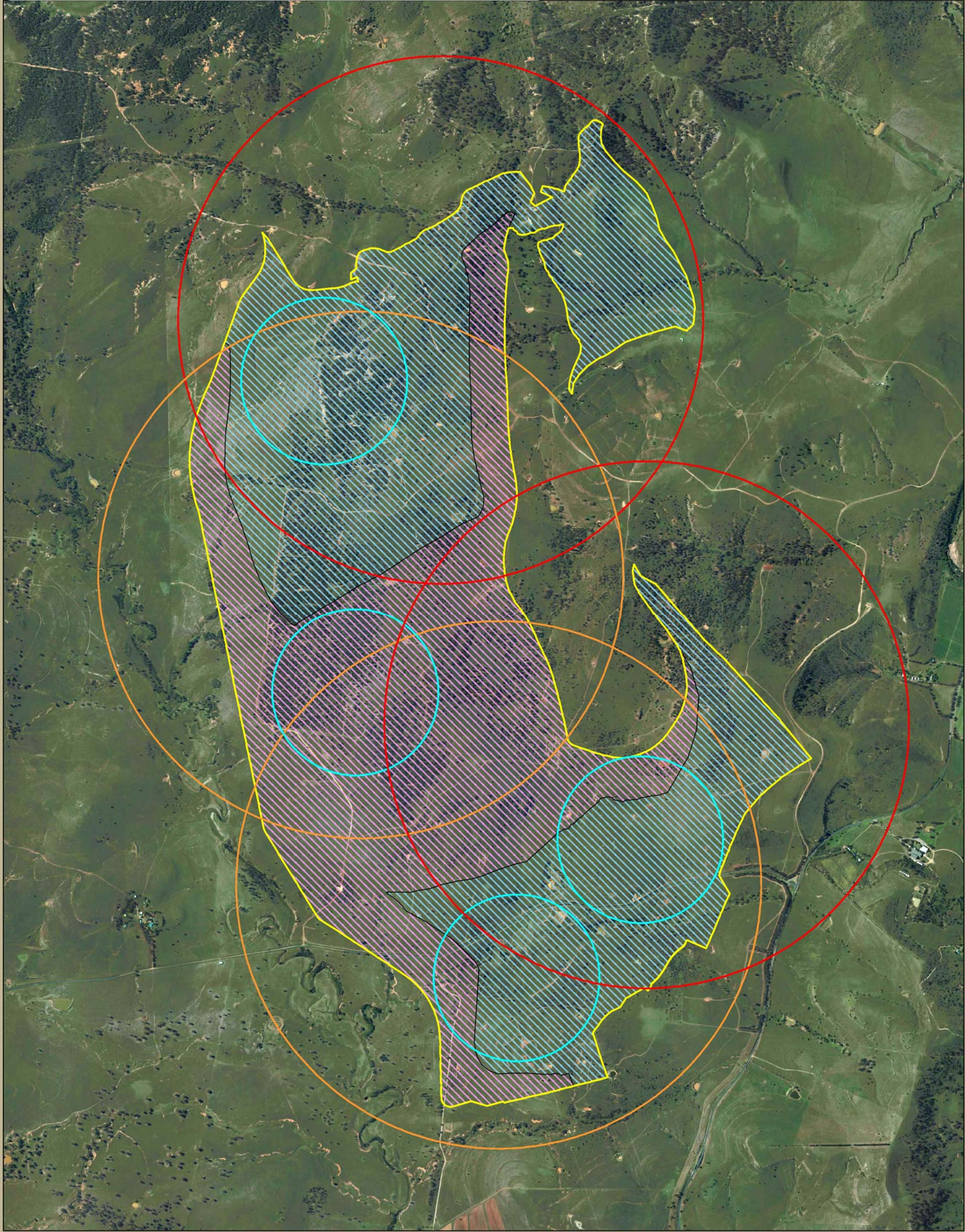
Image Source:  
Drayton June 2011



Figure A.14. Native Vegetation of the Rehabilitation Offset







**Legend**

Rehabilitation Offset

**Assessment Circles**

100 ha Assessment Circle

1000 ha Assessment Circle (Simplified 1)

1000 ha Assessment Circle (Simplified 2)

**BioMetric Vegetation Type**

HU618: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin (Low)

HU551: Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin (Low)

Image Source:  
Drayton June 2011



Figure A.15. BioBanking Vegetation Types of the Rehabilitation Offset





---

---

*Appendix B*

BioBanking Reports

---



# BioBanking Credit Calculator



Office of  
Environment  
& Heritage

## BioBanking credit report

This report identifies the number and type of credits required at a **DEVELOPMENT SITE**.

Date of report: 4/04/2013

Time: 4:39:05PM

Tool version: 2.0

### Development details

**Proposal ID:** 0057/2013/0491D  
**Proposal name:** 9080 - Development (V1 BM / V2 50%BM / V3 - Plots)  
**Proposal address:** 1 Mountain Street Epping NSW 2121  
  
**Proponent name:** Cumberland Ecology  
**Proponent address:** 1 Mountains Street Epping NSW 2121  
**Proponent phone:** (02) 9869 1933  
  
**Assessor name:** David Robertson  
**Assessor address:** PO BOX 2474 Carlingford Court NSW 2118  
**Assessor phone:** 9868 1933  
**Assessor accreditation:** 0057

### Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

| Red flag                                                                                                | Reason                                                                                  |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                           | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                           | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                           | Vegetation type being > 70% cleared; or it contains an endangered ecological community; |

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

#### Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark



- ☐ Change negligible loss
- ☐ Expert report
- ☐ Predicted threatened species not on site
- ☐ Change threatened species response to gain (Tg value)



## Ecosystem credits summary

| Vegetation type                                                                                                | Area (ha) | Credits required | Red flag |
|----------------------------------------------------------------------------------------------------------------|-----------|------------------|----------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 175.23    | 6,238            | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 8.67      | 287              | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 1,244.48  | 27,698           | No       |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | 11.15     | 505              | Yes      |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | 3.92      | 112              | Yes      |
| Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin                   | 98.19     | 5,444            | No       |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South        | 7.01      | 361              | Yes      |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South        | 11.86     | 392              | Yes      |
| Bull Oak Forests of the Central Hunter Valley                                                                  | 24.86     | 912              | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 5.85      | 209              | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 155.49    | 3,468            | No       |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South        | 56.19     | 2,895            | Yes      |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South        | 91.29     | 3,024            | Yes      |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 39.87     | 471              | No       |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                       | 2.16      | 145              | Yes      |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | 0.11      | 4                | Yes      |
| <b>Total</b>                                                                                                   | 1,936.33  | 52,165           |          |

## Credit profiles

### 1. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)



|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 471     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 0-10%   |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                               | Offset options - CMA sub-regions             |
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)         | Hunter                                       |
| White Box - Grey Gum - Kurrajong grassy woodland on slopes of the northern Capertee Valley, Sydney Basin, (HN609)               | Yuraygir                                     |
| White Box - Narrow-leaved Ironbark grassy woodland of the Capertee Valley, Sydney Basin, (HN610)                                | Clarence Lowlands                            |
| Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands, (HU515)                            | Richmond - Tweed (Qld - Scenic Rim) (Part A) |
| Cabbage Gum open forest or woodland on flats of the North Coast and New England Tablelands, (HU526)                             | Wollemi - Hawkesbury/Nepean                  |
| Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands, (HU597) | Wollemi (Part A)                             |
| Grassy Yellow Box tall woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276), (MU552)        | Wollemi (Part B)                             |
| Riverine Inland Grey Box grassy woodland of the semi-arid (warm) climate zone (Benson 237), (MU588)                             | Orange - Lachlan                             |
| Riverine Yellow Box - River Red Gum tall grassy woodland of NSW South West Slopes and Riverina Bioregions (Benson 74), (MU589)  | Karuah Manning                               |
| Black Sallee grassy woodland of the New England Tablelands, (NR113)                                                             | Yengo - Hawkesbury/Nepean                    |
| Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands, (NR127)                            | Yengo - Hunter/Central Rivers                |
| Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands, (NR131)                            | Wyong                                        |
| Cabbage Gum open forest or woodland of the North Coast and New England Tablelands, (NR145)                                      | Coffs Coast & Escarpment                     |
| Candlebark - Manna Gum woodland of the New England Tablelands, (NR146)                                                          | Clarence Sandstones                          |
| Fuzzy Box open forest of the New England Tableland Bioregion (Benson 203), (NR165)                                              | MU Fans                                      |
| Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast, (NR186)  | Upper Hunter                                 |
| New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands, (NR214)             | Nandewar, Northern Complex                   |
| Snow Gum - Black Sallee grassy woodland of the New England Tablelands, (NR237)                                                  | Upper Slopes - Murray                        |
| Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tablelands, (NR238)                         | Upper Slopes - Murrumbidgee                  |
| Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast, (NR239)        | Upper Slopes - Lachlan                       |
|                                                                                                                                 | Wollemi (Part C)                             |
|                                                                                                                                 | Lower Slopes - Murray                        |
|                                                                                                                                 | Lower Slopes - Murrumbidgee                  |
|                                                                                                                                 | Lower Slopes - Lachlan                       |
|                                                                                                                                 | MR - Murray                                  |
|                                                                                                                                 | Stanthorpe Plateau                           |



|                                                                                                              |  |
|--------------------------------------------------------------------------------------------------------------|--|
| Snow Gum woodland of the New England Tablelands and North Coast, (NR240)                                     |  |
| Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands, (NR283) |  |

## 2. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 34,223  |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                              | Offset options - CMA sub-regions |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)        | Hunter                           |
| Cabbage Gum open forest or woodland on flats of the North Coast and New England Tablelands, (HU526)                            | Wyong                            |
| Black Sallee grassy woodland of the New England Tablelands, (NR113)                                                            | Stanthorpe Plateau               |
| Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands, (NR127)                           |                                  |
| Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands, (NR131)                           |                                  |
| Candlebark - Manna Gum woodland of the New England Tablelands, (NR146)                                                         |                                  |
| Fuzzy Box open forest of the New England Tableland Bioregion (Benson 203), (NR165)                                             |                                  |
| Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast, (NR186) |                                  |
| New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands, (NR214)            |                                  |
| Snow Gum - Black Sallee grassy woodland of the New England Tablelands, (NR237)                                                 |                                  |
| Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tablelands, (NR238)                        |                                  |
| Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast, (NR239)       |                                  |
| Snow Gum woodland of the New England Tablelands and North Coast, (NR240)                                                       |                                  |
| Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands, (NR283)                   |                                  |

## 3. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)



|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 3,677   |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 31-70%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                       | Offset options - CMA sub-regions |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551) | Hunter                           |
| Cabbage Gum open forest or woodland on flats of the North Coast and New England Tablelands, (HU526)                     | Wyong                            |
|                                                                                                                         | Stanthorpe Plateau               |

#### 4. River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42), (HU599)

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 4       |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 0-10%   |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                      | Offset options - CMA sub-regions                |
|----------------------------------------------------------------------------------------|-------------------------------------------------|
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42), (HU599) | Hunter                                          |
|                                                                                        | Clarence Lowlands                               |
|                                                                                        | Richmond - Tweed (Qld - Scenic Rim) (Part A)    |
|                                                                                        | Murwillumbah (Qld - Southeast Hills and Ranges) |
|                                                                                        | Orange - Lachlan                                |
|                                                                                        | Karuah Manning                                  |
|                                                                                        | Cumberland - Hawkesbury/Nepean                  |
|                                                                                        | Walcha Plateau - Northern Rivers                |
|                                                                                        | Macleay Hastings - Northern Rivers              |
|                                                                                        | Armidale Plateau                                |
|                                                                                        | Coffs Coast & Escarpment                        |
|                                                                                        | Bateman                                         |
|                                                                                        | Illawarra                                       |
|                                                                                        | Monaro - Murrumbidgee                           |
|                                                                                        | MU Fans                                         |
|                                                                                        | Nandewar, Northern Complex                      |
|                                                                                        | Upper Slopes - Murray                           |
|                                                                                        | Upper Slopes - Murrumbidgee                     |
|                                                                                        | Upper Slopes - Lachlan                          |



|  |                                                                                               |
|--|-----------------------------------------------------------------------------------------------|
|  | Lower Slopes - Murray<br>Lower Slopes - Murrumbidgee<br>Lower Slopes - Lachlan<br>MR - Murray |
|--|-----------------------------------------------------------------------------------------------|

**5. River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42), (HU599)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 617     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                      | Offset options - CMA sub-regions                               |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------|
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42), (HU599) | Hunter<br>Walcha Plateau - Northern Rivers<br>Armidale Plateau |

**6. White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South, (HU654)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 753     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                | Offset options - CMA sub-regions                                     |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South, (HU654) | Hunter<br>Kerrabee - Hunter/Central Rivers<br>Pilliga - Central West |

**7. White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South, (HU654)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 5,919   |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 31-70%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                | Offset options - CMA sub-regions           |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South, (HU654) | Hunter<br>Kerrabee - Hunter/Central Rivers |



**8. Bull Oak Forests of the Central Hunter Valley, (HU668)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 912     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                                | Offset options - CMA sub-regions |
|------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Bull Oak Forests of the Central Hunter Valley, (HU668)                                                           | Hunter                           |
| Cabbage Gum open forest or woodland on flats of the North Coast and New England Tablelands, (HU526)              | Kerrabee - Hunter/Central Rivers |
| White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South, (HU654) | Pilliga - Central West           |

**9. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin, (HU618)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 5,444   |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                                     | Offset options - CMA sub-regions |
|-------------------------------------------------------------------------------------------------------|----------------------------------|
| Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin, (HU618) | Hunter                           |
|                                                                                                       | Kerrabee - Hunter/Central Rivers |
|                                                                                                       | Pilliga - Central West           |

**10. River Oak riparian woodland of the North Coast and northern Sydney Basin, (HU598)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 145     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

| Offset options - vegetation types                                                 | Offset options - CMA sub-regions             |
|-----------------------------------------------------------------------------------|----------------------------------------------|
| River Oak riparian woodland of the North Coast and northern Sydney Basin, (HU598) | Hunter                                       |
|                                                                                   | Clarence Lowlands                            |
|                                                                                   | Richmond - Tweed (Qld - Scenic Rim) (Part A) |
|                                                                                   | Karuah Manning                               |
|                                                                                   | Walcha Plateau - Northern Rivers             |
|                                                                                   | Macleay Hastings - Northern Rivers           |
|                                                                                   | Armidale Plateau                             |



|  |                          |
|--|--------------------------|
|  | Coffs Coast & Escarpment |
|  | Bateman                  |



**Species credits**

| Common name          | Scientific name               | Extent of impact | Number of species credits required |
|----------------------|-------------------------------|------------------|------------------------------------|
| Spotted Harrier      | <i>Circus assimilis</i>       | 1,936.35         | 26,167                             |
| Little Eagle         | <i>Hieraaetus morphnoides</i> | 1,936.35         | 26,167                             |
| Large-eared Pied Bat | <i>Chalinolobus dwyeri</i>    | 389.00           | 29,923                             |
| Pine Donkey Orchid   | <i>Diuris tricolor</i>        | 30.00            | 361                                |



# BioBanking Credit Calculator



Office of  
Environment  
& Heritage

## BioBanking credit report

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

Date of report: 12/04/2013

Time: 8:53:38AM

Tool version: 2.0

### Biobank details

**Proposal ID:** 0057/2013/0501B  
**Proposal name:** 9080 - Offset Part 1 (Hunter CR CMA)  
**Proposal address:** 1 Mountain Street Epping NSW 2121  
  
**Proponent name:** Cumberland Ecology  
**Proponent address:** 1 Mountain Street Epping NSW 2121  
**Proponent phone:** (02) 9868 1933  
  
**Assessor name:** David Robertson  
**Assessor address:** PO BOX 2474 Carlingford Court NSW 2118  
**Assessor phone:** 9868 1933  
**Assessor accreditation:** 0057

### Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)



**Ecosystem credits summary**

| Vegetation type                                                                                                               | Area (ha)       | Credits required | Red flag |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|----------|
| River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)                                    | 31.33           | 306              | No       |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       | 73.13           | 829              | No       |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       | 245.45          | 2,418            | No       |
| Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  | 25.38           | 240              | No       |
| Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  | 16.89           | 202              | No       |
| Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands | 68.06           | 727              | No       |
| Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands | 24.70           | 256              | No       |
| White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion                 | 336.41          | 3,419            | No       |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                                  | 97.22           | 1,006            | No       |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                                  | 395.99          | 3,742            | No       |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                                  | 640.81          | 8,025            | No       |
| Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion                                                      | 66.94           | 855              | No       |
| Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion                                                      | 35.07           | 333              | No       |
| <b>Total</b>                                                                                                                  | <b>2,057.38</b> | <b>22,358</b>    |          |

**Credit profiles**

1. Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands, (NA196)



|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 3,247        |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**2. Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion, (NA197)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 442          |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**3. Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands, (NA208)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 983          |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**4. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions, (NA226)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 1,006        |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           |              |

**5. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions, (NA226)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 11,767       |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**6. Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (NA237)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 1,188        |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**7. White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion, (NA223)**

|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 3,419        |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |

**8. River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84), (NA191)**



|                                               |              |
|-----------------------------------------------|--------------|
| Number of ecosystem credits required          | 306          |
| CMA sub-region                                | Peel - Namoi |
| Minimum percent native vegetation cover class | 31-70%       |
| Minimum adjacent remnant area class           | >100 ha      |



**Species credits**

| Common name          | Scientific name        | Extent of impact | Number of species credits required |
|----------------------|------------------------|------------------|------------------------------------|
| Little Eagle         | Hieraaetus morphnoides | 2,060.00         | 12,360                             |
| Large-eared Pied Bat | Chalinolobus dwyeri    | 1,158.00         | 6,948                              |
| Spotted Harrier      | Circus assimilis       | 2,060.00         | 12,360                             |

**Additional management actions**

Additional management actions are required for:

| Vegetation type or threatened species                                                                                         | Management action details                                                     |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)                                    | Cat and/or Fox control                                                        |
| River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)                                    | Exclude miscellaneous feral species                                           |
| River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)                                    | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       | Cat and/or Fox control                                                        |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       | Exclude miscellaneous feral species                                           |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands       | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  | Cat and/or Fox control                                                        |
| Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  | Exclude miscellaneous feral species                                           |
| Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion                                                  | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands | Cat and/or Fox control                                                        |
| Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands | Exclude miscellaneous feral species                                           |
| Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion                 | Cat and/or Fox control                                                        |
| White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion                 | Exclude miscellaneous feral species                                           |



|                                                                                                               |                                                                               |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                  | Cat and/or Fox control                                                        |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                  | Exclude miscellaneous feral species                                           |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions                                  | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion                                      | Cat and/or Fox control                                                        |
| Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion                                      | Exclude miscellaneous feral species                                           |
| Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion                                      | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |



# BioBanking Credit Calculator



Office of  
Environment  
& Heritage

## BioBanking credit report

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

Date of report: 12/04/2013

Time: 8:54:51AM

Tool version: 2.0

### Biobank details

**Proposal ID:** 0057/2013/0502B  
**Proposal name:** 9080 - Offset Part 2 (Namoi CMA)  
**Proposal address:** 1 Mountain Street Epping NSW 2121  
  
**Proponent name:** Cumberland Ecology  
**Proponent address:** 1 Mountain Street Epping NSW 2121  
**Proponent phone:** (02) 9868 1933  
  
**Assessor name:** David Robertson  
**Assessor address:** PO BOX 2474 Carlingford Court NSW 2118  
**Assessor phone:** 9868 1933  
**Assessor accreditation:** 0057

### Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)



## Ecosystem credits summary

| Vegetation type                                                                                                                           | Area (ha)    | Credits required | Red flag |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|----------|
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | 0.96         | 9                | No       |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast | 7.85         | 66               | No       |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast | 0.99         | 10               | No       |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | 2.55         | 22               | No       |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | 10.78        | 88               | No       |
| <b>Total</b>                                                                                                                              | <b>23.13</b> | <b>195</b>       |          |

## Credit profiles

### 1. Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South, (HU616)

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 110     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 31-70%  |
| Minimum adjacent remnant area class           | >100 ha |

### 2. Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast, (HU603)

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 76      |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 31-70%  |
| Minimum adjacent remnant area class           | >100 ha |

### 3. River Oak riparian woodland of the North Coast and northern Sydney Basin, (HU598)

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 9       |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 31-70%  |
| Minimum adjacent remnant area class           | >100 ha |



**Species credits**

| Common name          | Scientific name        | Extent of impact | Number of species credits required |
|----------------------|------------------------|------------------|------------------------------------|
| Spotted Harrier      | Circus assimilis       | 23.13            | 139                                |
| Little Eagle         | Hieraaetus morphnoides | 23.13            | 139                                |
| Large-eared Pied Bat | Chalinolobus dwyeri    | 11.36            | 68                                 |

**Additional management actions**

Additional management actions are required for:

| Vegetation type or threatened species                                                                                                     | Management action details                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | Cat and/or Fox control                                                        |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | Control feral pigs                                                            |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | Exclude miscellaneous feral species                                           |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| River Oak riparian woodland of the North Coast and northern Sydney Basin                                                                  | Maintain or reintroduce flow regimes (aquatic flora)                          |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast | Cat and/or Fox control                                                        |
| Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast | Exclude miscellaneous feral species                                           |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | Cat and/or Fox control                                                        |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | Exclude miscellaneous feral species                                           |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South                                          | Maintain or reintroduce flow regimes (aquatic flora)                          |



# BioBanking Credit Calculator



Office of  
Environment  
& Heritage

## BioBanking credit report

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

Date of report: 5/04/2013

Time: 3:47:43PM

Tool version: 2.0

### Biobank details

**Proposal ID:** 0057/2013/0578B  
**Proposal name:** 9080- Onsite Offsets  
**Proposal address:** 1 Mountain St Epping NSW 2121  
  
**Proponent name:** Cumberland Ecology  
**Proponent address:** 1 Mountain Street Epping NSW 2121  
**Proponent phone:** 02 9868 1933  
  
**Assessor name:** David Robertson  
**Assessor address:** PO BOX 2474 Carlingford Court NSW 2118  
**Assessor phone:** 9868 1933  
**Assessor accreditation:** 0057

### Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)
  - River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)
    - Large-eared Pied Bat Chalinolobus dwyeri



**Ecosystem credits summary**

| Vegetation type                                                                                                | Area (ha) | Credits required | Red flag |
|----------------------------------------------------------------------------------------------------------------|-----------|------------------|----------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 49.66     | 509              | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 34.92     | 302              | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 4.55      | 50               | No       |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | 20.20     | 253              | No       |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | 62.17     | 709              | No       |
| <b>Total</b>                                                                                                   | 171.50    | 1,823            |          |

**Credit profiles****1. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 50      |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 0-10%   |
| Minimum adjacent remnant area class           | >100 ha |

**2. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 811     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 11-30%  |
| Minimum adjacent remnant area class           | >100 ha |

**3. River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42), (HU599)**

|                                               |         |
|-----------------------------------------------|---------|
| Number of ecosystem credits required          | 962     |
| CMA sub-region                                | Hunter  |
| Minimum percent native vegetation cover class | 0-10%   |
| Minimum adjacent remnant area class           | >100 ha |



**Species credits**

| Common name          | Scientific name        | Extent of impact | Number of species credits required |
|----------------------|------------------------|------------------|------------------------------------|
| Spotted Harrier      | Circus assimilis       | 171.50           | 1,029                              |
| Large-eared Pied Bat | Chalinolobus dwyeri    | 171.50           | 1,966                              |
| Little Eagle         | Hieraaetus morphnoides | 171.50           | 1,029                              |

**Additional management actions**

Additional management actions are required for:

| Vegetation type or threatened species                                                                          | Management action details                                                     |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | Cat and/or Fox control                                                        |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | Exclude miscellaneous feral species                                           |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | Maintain or reintroduce flow regimes (aquatic flora)                          |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | Control feral pigs                                                            |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | Exclude miscellaneous feral species                                           |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc) |
| River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)                                  | Maintain or reintroduce flow regimes (aquatic flora)                          |



# BioBanking Credit Calculator



Office of  
Environment  
& Heritage

## BioBanking credit report

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

Date of report: 5/04/2013

Time: 2:57:34PM

Tool version: 2.0

### Biobank details

**Proposal ID:** 0057/2013/0580B  
**Proposal name:** 9080 - Rehab Offset  
**Proposal address:** 1 Mountain St Epping NSW 2121  
  
**Proponent name:** Cumberland Ecology  
**Proponent address:** 1 Mountain Street Epping NSW 2121  
**Proponent phone:** 02 9868 1933  
  
**Assessor name:** David Robertson  
**Assessor address:** PO BOX 2474 Carlingford Court NSW 2118  
**Assessor phone:** 9868 1933  
**Assessor accreditation:** 0057

### Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)



## Ecosystem credits summary

| Vegetation type                                                                                                | Area (ha)       | Credits required | Red flag |
|----------------------------------------------------------------------------------------------------------------|-----------------|------------------|----------|
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 82.69           | 1,153            | No       |
| Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin                   | 354.27          | 4,938            | No       |
| Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin                   | 271.94          | 3,464            | No       |
| Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin | 694.80          | 8,850            | No       |
| <b>Total</b>                                                                                                   | <b>1,403.70</b> | <b>18,405</b>    |          |

## Credit profiles

### 1. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)

|                                               |        |
|-----------------------------------------------|--------|
| Number of ecosystem credits required          | 1,153  |
| CMA sub-region                                | Hunter |
| Minimum percent native vegetation cover class | 0-10%  |
| Minimum adjacent remnant area class           |        |

### 2. Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin, (HU551)

|                                               |        |
|-----------------------------------------------|--------|
| Number of ecosystem credits required          | 8,850  |
| CMA sub-region                                | Hunter |
| Minimum percent native vegetation cover class | 11-30% |
| Minimum adjacent remnant area class           |        |

### 3. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin, (HU618)

|                                               |        |
|-----------------------------------------------|--------|
| Number of ecosystem credits required          | 4,938  |
| CMA sub-region                                | Hunter |
| Minimum percent native vegetation cover class | 0-10%  |
| Minimum adjacent remnant area class           |        |

### 4. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin, (HU618)

|                                               |        |
|-----------------------------------------------|--------|
| Number of ecosystem credits required          | 3,464  |
| CMA sub-region                                | Hunter |
| Minimum percent native vegetation cover class | 11-30% |
| Minimum adjacent remnant area class           |        |



**Species credits**

**Additional management actions**