



Premier & Cabinet

DPC10/01656 - LB

Ms Lynn Lovelock
Clerk of the Parliaments
Legislative Council
Parliament House
SYDNEY NSW 2000

15 DEC 2010

Dear Ms Lovelock

Request for Papers – Cessnock Council

I refer to the resolution of the Legislative Council under Standing Order 52 made on 19 May 2010 concerning Cessnock Council.

Enclosed is a letter from the Department of Environment, Climate Change and Water advising that it has identified a report entitled 'Desktop Biobank Assessment of Revised Hunter Economic Zone Masterplan 2009 (15 February 2010)' that should have been produced in response to the Standing Order 52. A copy of the report is enclosed.

Should you require any clarification or further assistance please do not hesitate to contact Ms Rachel McCallum, Acting Executive Director, Legal Branch on (02) 9228 5543.

Yours sincerely

Brendan O'Reilly
Director General

Received at 3:00pm
Wednesday 15 December 2010

Lynn Lovelock

1 CD of non-privileged data.



Environment,
Climate Change
& Water

Our reference:
Contact

DOC10/56701
Simon Smith, 9999 6222

Mr Brendan O'Reilly
Director General
Department of Premier and Cabinet
Level 39
1 Farrer Place
Sydney NSW 2000

Brendan

Dear Mr O'Reilly

I refer to the documents that the NSW Department of Environment, Climate Change and Water provided to your office earlier this year in relation to the Legislative Council's resolution of 19 May 2010 under Standing Order 52 for the production of documents relating to Cessnock Council.

Since providing those documents to you, it has come to my attention that the attached report titled, 'Desktop Biobank Assessment of Revised Hunter Economic Zone Masterplan 2009 (15 February 2010)' was inadvertently overlooked when documents were being prepared for release. This was an unintentional administrative error.

The report was commissioned by DECCW and prepared by Eco Logical Australia Pty Ltd. It provides an independent assessment of the adequacy of biodiversity offsets for the State Significant Site study and proposed rezoning of Hunter Economic Zone.

Please arrange for the report to be provided to the Legislative Council as soon as possible.

If you have any queries regarding this matter, please do not hesitate to contact me or have your officers contact Mr Simon Smith, Deputy Director General, Climate Change, Policy and Programs, on (02) 9995 6222.

Yours sincerely

Lisa Corbyn

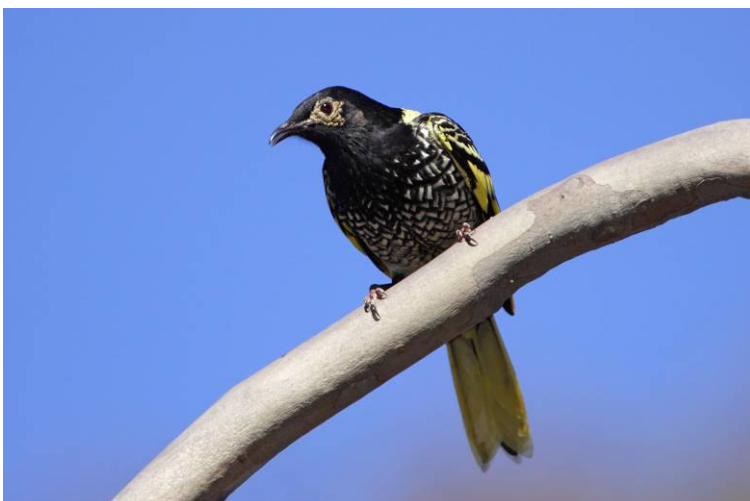
LISA CORBYN
Director General



Desktop Biobank Assessment of Revised Hunter Economic Zone Masterplan 2009

Prepared for
Department of Environment, Climate Change and Water (DECCW)

15 February 2010





Desktop Biobank Assessment for Revised Hunter Economic Zone Masterplan 2009

PREPARED FOR	Department of Environment, Climate Change and Water (DECCW)
PROJECT NO	10SUTENV-0002
DATE	February 2010

DOCUMENT TRACKING

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This document has been prepared by Eco Logical Australia Pty Ltd with support from Lucas Grenadier DECCW. Cover photos: Colin Driscoll- Hunter ECO, Regent Honeyeater- Dean Ingwersen

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Abbreviations

ABBREVIATION	DESCRIPTION
Assessment Methodology	BioBanking Assessment Methodology and Credit Calculator Operational Manual
Credit Calculator	BioBanking Credit Calculator
DECC	NSW Department of Environment & Climate Change (now DECCW)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	NSW Environmental Planning and Assessment Act
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Operational Manual	BioBanking Assessment Methodology and Credit Calculator Operational Manual
TSC Act	NSW Threatened Species Conservation Act

Executive Summary

1 Introduction

1.1 PROJECT BACKGROUND

The Department of Environment, Climate Change and Water (DECCW) is currently undertaking an assessment of the proposed rezoning of the Hunter Economic Zone (HEZ) industrial estate. The proposed rezoning contains a number of land uses including industrial, residential and commercial components, as well as conservation/offset areas including lands proposed for dedication to the National Park estate.

DECCW has commissioned Eco Logical Australia (ELA) to complete a indicative Biobanking Assessment for the proposed rezoning, including both development precincts and the proposed offset areas. The assessment is to determine the number of ecosystem and species credits required by the development, compared to the number generated by the offset.

The Biobanking Assessment is to be conducted consistent with the Biobanking Assessment Methodology and Credit Calculator, however some components of the assessment have been determined through a desktop approach using existing data to estimate the data inputs required. The use of desktop data has been clearly identified.

This report has been prepared to meet the project brief, and includes:

- All relevant background information;
- Methodology used including justification of landscape and site value scores, and details of the vegetation zones;
- Results including credits required and generated by the proposal, and their profile;
- Discussion, including comment on whether the proposed conservation offset areas are adequate in terms of number and types of credits, and of possible alternative solutions should the conservation offset areas be inadequate (e.g. modification to development areas, likely viability of additional offset areas within the region etc).

1.2 STUDY AREA

The HEZ study area is located in the Hunter region of NSW, approximately 2kms south-west of Kurri Kurri and 10kms east of Cessnock (Figure 1). The proposed development site occupies 786.6 hectares, 644.5 of which contains native vegetation. The proposed offset site covers 988.9 hectares, 887.0 of which contains native vegetation.

Previous ecological assessments of the site (HSO 2004, RPS HSO 2009) on the site has identified areas of high biodiversity value, with 9 vegetation communities (including 5 endangered ecological communities), 6 threatened flora species and 26 threatened fauna species confirmed as present on the site.

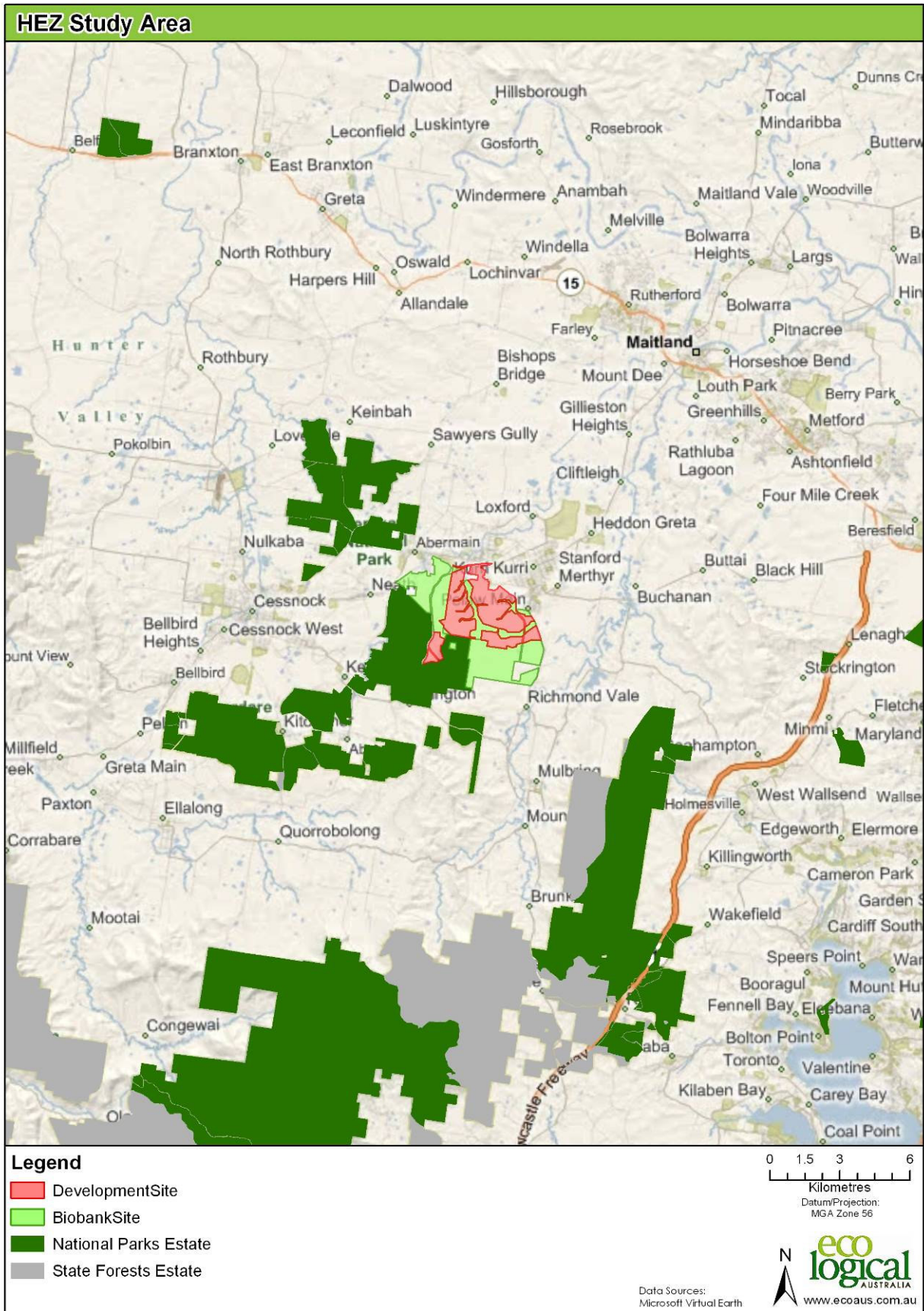


Figure 1: HEZ Study Area

1.3 VEGETATION MAPPING

The vegetation mapping used to complete this assessment was sourced from the 'Vegetation of the Cessnock-Kurri region, Cessnock LGA, New South Wales: Survey, Classification & Mapping' mapping conducted by Eastcoast Flora Survey in 2007 (EFS 2007). On-site confirmation of these vegetation types has not been undertaken as part of this project.

Both the 'Extant' and 'Disturbed' layers were used for this project. As vegetation communities were not allocated to the disturbed layer, the nearest located or adjacent vegetation community was assigned by ELA during the assessment to allow disturbed areas to be entered into the Biobanking Credit Calculator. Disturbed areas were also assumed to be in Low condition (as defined by Biobanking), while extant vegetation has been assumed to be in Moderate/Good condition.

The vegetation mapping used did not map vegetation across easements, water bodies, tracks, roads or cleared land throughout the study area. These areas have therefore been excluded from the Biobanking assessments undertaken. In addition, the vegetation mapping had mapped as vegetated the main access road to the HEZ road which has since been cleared and constructed. This area of vegetation was therefore removed for this study as this road was approved under a separate development application and should therefore not be included in this credit assessment.

In total nine vegetation types were mapped across the study area in the development and Biobank sites, with all vegetation types occurring in Moderate/Good condition. Of the nine vegetation types identified, four were also mapped in Low condition (Table 1 and Figure 2).

Table 1: Vegetation Types

Biometric Vegetation Type	REMs vegetation Type Equivalent	Condition	Development Area (ha)	Offset Area (ha)	Total Area (ha)
Coastal Floodplain Sedgelands, Rushlands, and Forblands of the North Coast/M/G	Freshwater Wetland Complex	Mod/Good	0.0	6.9	6.9
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Hunter Lowlands Redgum Forest	Low	0.3	6.3	6.6
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Hunter Lowlands Redgum Forest	Mod/Good	11.3	68.1	79.4
Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	Not defined	Mod/Good	0.0	1.7	1.7
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Kurri Sand Swamp Woodland	Low	11.9	1.3	13.2
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Kurri Sand Swamp Woodland	Mod/Good	60.7	168.0	228.7
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Wollombi Redgum - River Oak Forest	Low	0.0	7.4	7.4
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	Wollombi Redgum - River Oak Forest	Mod/Good	0.0	54.1	54.1
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Lower Hunter Spotted Gum - Ironbark Forest	Low	26.8	8.4	35.2
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Lower Hunter Spotted Gum - Ironbark Forest	Mod/Good	432.2	452.8	885.0
Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Coastal Foothills Spotted Gum - Ironbark Forest	Mod/Good	84.0	106.0	190.0
Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Central Hunter Riparian Forest	Mod/Good	0.0	5.7	5.7
Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Not defined	Mod/Good	17.2	0.3	17.5
Vegetated Total			644.5	887.0	1531.4
No vegetation (cleared, water bodies, tracks, roads, easements etc)		Excluded	142.1	101.9	244.0
Grand Total			786.6	988.9	1775.4

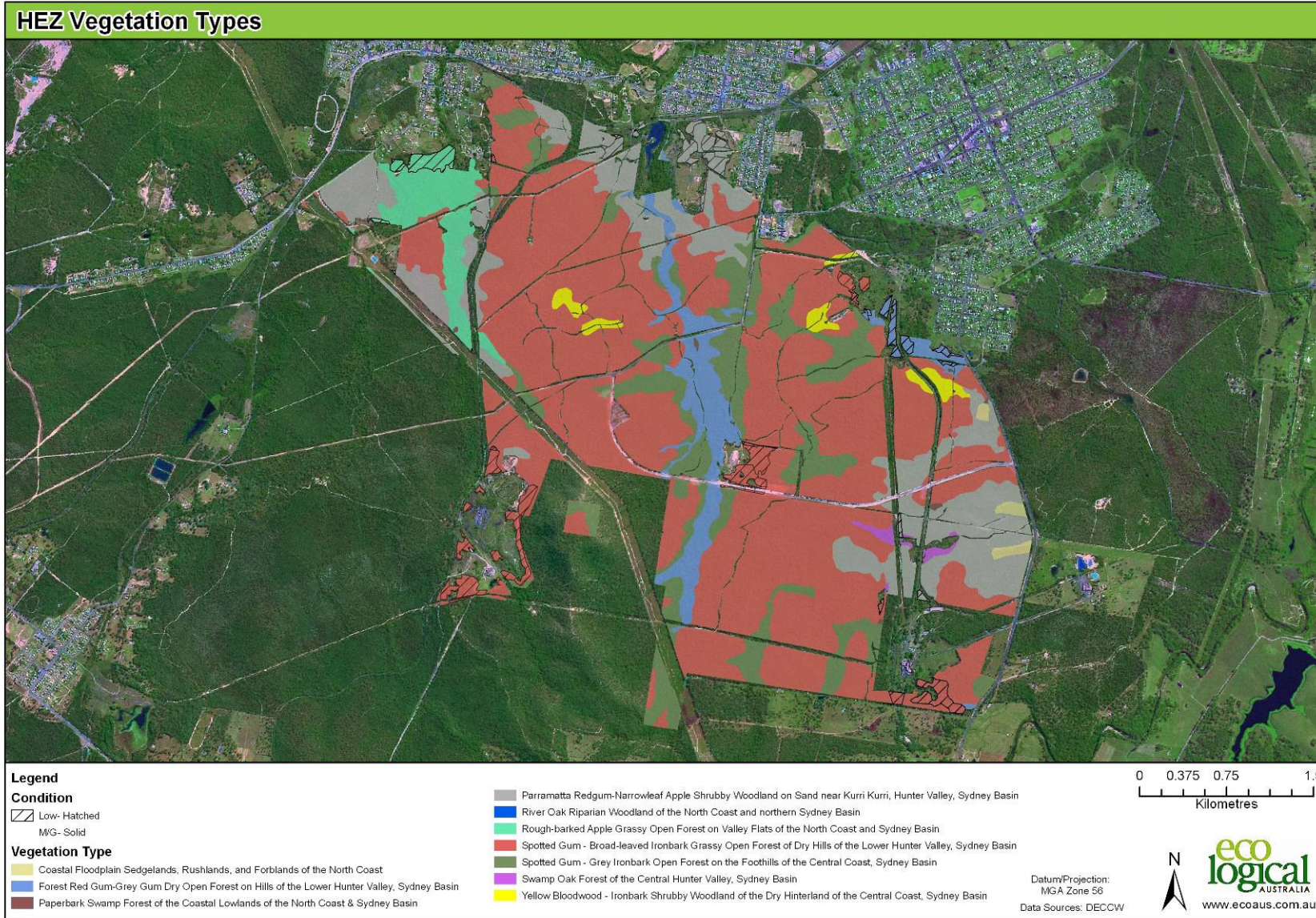


Figure 2: HEZ Vegetation Types

2 Biobanking Assessment- Proposed Development Areas

2.1 IMPACT AREA

The development site assessed for this project is 786.6 hectares in size, 644.5 hectares of which is vegetated. The development site is located adjacent to existing development in the north of the site, extending south. A riparian corridor (part of the assessed Biobank site) extends through the middle of the main development areas, with a small outlying development area placed in the south-west. All areas of easements, tracks, water bodies and cleared land were excluded from the credit calculations.

2.2 VEGETATION TYPES

Six of the nine vegetation types mapped within the HEZ study area are present on the development site, with several of these vegetation types in low condition (Table 2 and Figure 3). The Revised Biometric Vegetation Types assigned by Eastcoast Flora Surveys have been used in this assessment.

Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin is the most prevalent vegetation type within the development site, covering approximately 430 hectares. Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G is the next most common vegetation type, with approximately 84.0 hectares within the development site.

Table 2: Development Site Vegetation Types

Vegetation Type	Condition	Area (ha)
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	0.3
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	11.3
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	11.9
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Mod/Good	60.7
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	26.8
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	432.2
Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Mod/Good	84.0
Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Mod/Good	0.0
Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Mod/Good	17.2

Vegetation Type	Condition	Area (ha)
Vegetation Total		644.5
No vegetation (cleared, water bodies, tracks, roads, easements etc)	Excluded	142.1
GRAND TOTAL		786.6

2.3 CMA REGION, CMA SUBREGION AND MITCHELL LANDSCAPE

The study site occurs entirely within the **Hunter Central Rivers CMA** region and the **Hunter CMA** subregion.

The site straddles two Mitchell Landscapes, being the Newcastle Coastal Ramp and the Central Hunter Foothills. As **Newcastle Coastal Ramp** is the predominant Mitchell Landscape it has been selected for the assessment.

2.4 ASSESSMENT CIRCLES

The amount of vegetation within the 100ha and 1000ha assessment circles before the proposed development was calculated using ArcGIS. The vegetation was digitised at a scale of 1:10,000.

Due to the large nature of the development site three 1000ha circles (and therefore three 100ha circles) were required (Figure 4). The circles are numbered from the west to east. 100ha circles have been centred over the area of greatest vegetation loss, the 1000ha circles have been centred over the development site and placed to cover the entire site.

The amount of vegetation in each circle was calculated before development. As the development is to remove quite large amounts of vegetation, the development footprint was then used to calculate the amount of vegetation to be removed, assuming 100% loss within the development footprint. The figures recorded were then entered into the credit calculator.

Table 3 outlines the vegetation in each circle (before the development site), the vegetation in each circle estimated after the development site and the associated Native Vegetation Cover Class (%) to be entered into the Biobanking calculator.

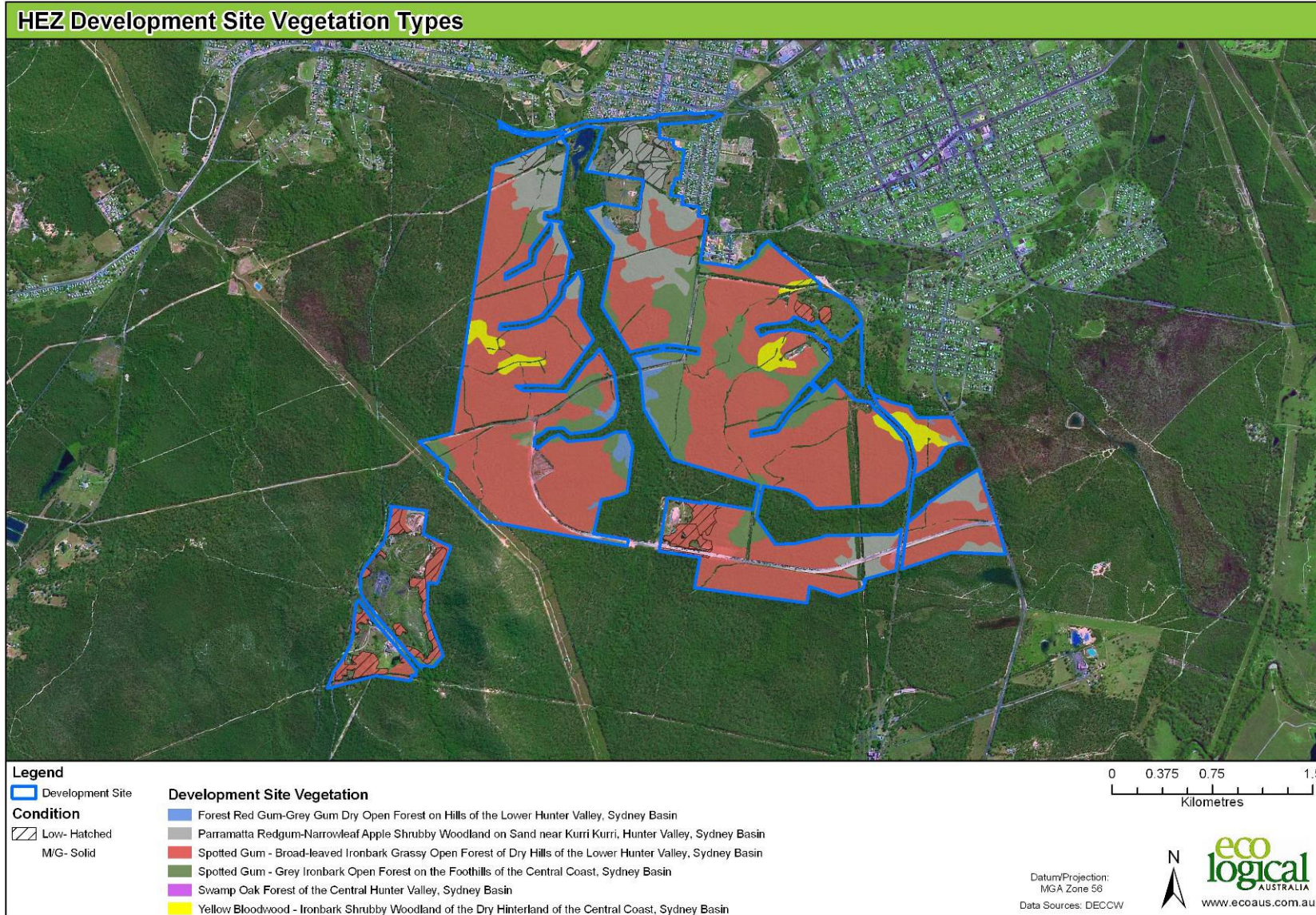


Figure 3: HEZ Development Site Vegetation Types

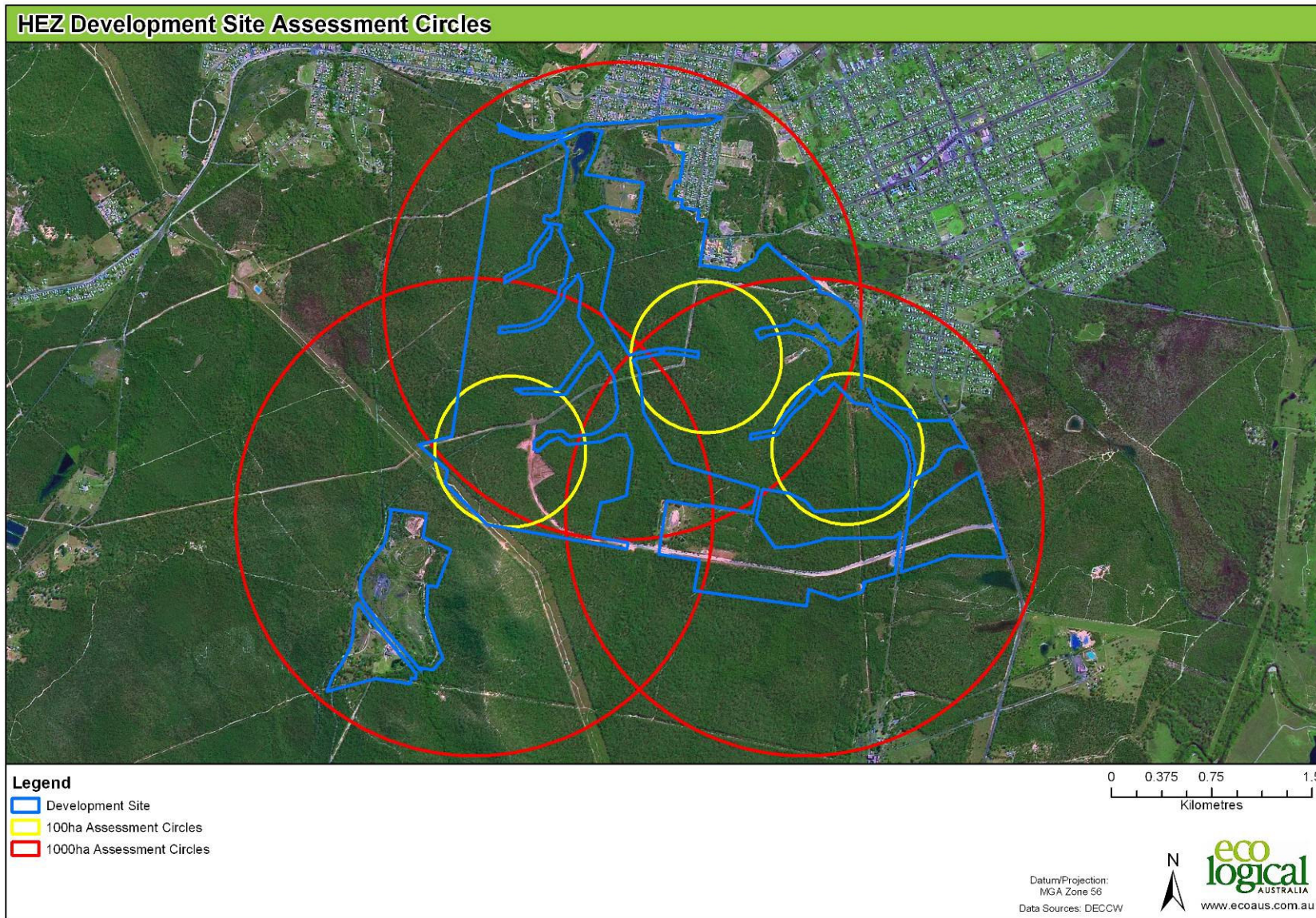


Figure 4: HEZ Development Site Assessment Circles

Table 3: Area of Vegetation in Each Assessment Circle

Circle	BEFORE DEVELOPMENT		AFTER DEVELOPMENT	
	Area of Vegetation Within Assessment Circle (ha)	Native Vegetation Cover Class (%)	Area of Vegetation Within Assessment Circle (ha)	Native Vegetation Cover Class (%)
1				
100ha	87	80-90%	7	0-10%
1000ha	882	80-90%	645	60-70%
2				
100ha	95	90-100%	4	0-10%
1000ha	774	70-80%	311	30-40%
3				
100ha	85	80-90%	16	10-20%
1000ha	852	80-90%	508	50-60%

2.5 CONNECTIVITY ASSESSMENT

A connectivity assessment was conducted for the proposal using the technique outlined in the Biobanking Methodology. The following aspects were considered:

- The width of the current and future connecting link
- The condition of the current and future connecting link (over-storey and mid-storey/ground cover)

As the circles overlap the Biobanking Methodology stipulates that only one connectivity assessment be conducted for the proposal.

2.5.1 Connectivity Width Assessment

The narrowest point of the current vegetated connection is identified in Figure 5, and occurs to the south of the development site. GIS analysis has identified the minimum width of the current connection at approximately 350m, placing it into the **100m-500m** connectivity width category (Table 4).

The narrowest point produced by the development is that of the riparian corridor. Although a significant amount of vegetation is to be removed, the width of the vegetation remaining is approximately 150m, meaning that no loss is recorded in the tool for connectivity. **100-500m** is therefore recorded in the tool.



Figure 5: HEZ Development Site Connectivity

Table 4: Width Classes Before and After Development Site

	Width Class (Before Biobank)	Width Class (After Biobank)
Connectivity Value (Width)	350m (100m-500m)	150m (100m-500m)

2.5.2 Connectivity Condition Assessment

The condition of the vegetation within the connections across, and off the site, is predominantly good, with much of the vegetation within National Parks or State Forests Estate. Although the vegetation within the development site is slightly below benchmark, this vegetation makes up only a small portion of the total corridor vegetation, and therefore the condition of both over-storey and ground cover is considered to be in benchmark before the development site.

The development site is to remove a large amount of native vegetation, but that which remains will be in good condition. The remainder of the corridor is also, on average, in benchmark condition. Therefore there is no change in the over-storey or ground cover condition after development (Table 5).

Table 5: Condition Classes Before and After Development Site

Storey	Condition Class (Before Biobank)	Condition Class (After Biobank)
Connectivity Value (Over-storey Condition)	% foliage cover within benchmark	% foliage cover within benchmark
Connectivity Value (Mid-storey/Ground Cover Condition)	% foliage cover within benchmark	% foliage cover within benchmark

2.6 VEGETATION ZONES

Vegetation zones are defined as areas of the same vegetation type and condition within the Biobank area, and have been mapped for the site as outlined in Section 1.3. ELA have assigned condition categories to all vegetation. The majority of the vegetation is in moderate/good condition, with some vegetation considered as low condition.

Moderate/good condition areas include vegetation which is generally in or just below benchmark for most of the vegetation attributes. Low condition vegetation is below benchmark for most attributes, with no scores for hollows and higher exotic cover.

In total there are 9 vegetation zones. The area of each is detailed in (Table 6), while the spatial configuration of each vegetation zone is shown in Figure 6. Areas that were not mapped as native vegetation, or excluded due to the existence of water bodies, tracks or roads have been classified as "cleared" and have therefore not been allocated to a vegetation zone.

Table 6: Vegetation Zones

Zone ID	Vegetation Type	Condition	Area (ha)
1	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	0.3
2	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	11.3
3	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	11.9
4	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Mod/Good	60.7
5	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	26.8
6	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	432.2
7	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Mod/Good	84.0
8	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Mod/Good	0.0
9	Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Mod/Good	17.2
Total	N/A	N/A	644.5

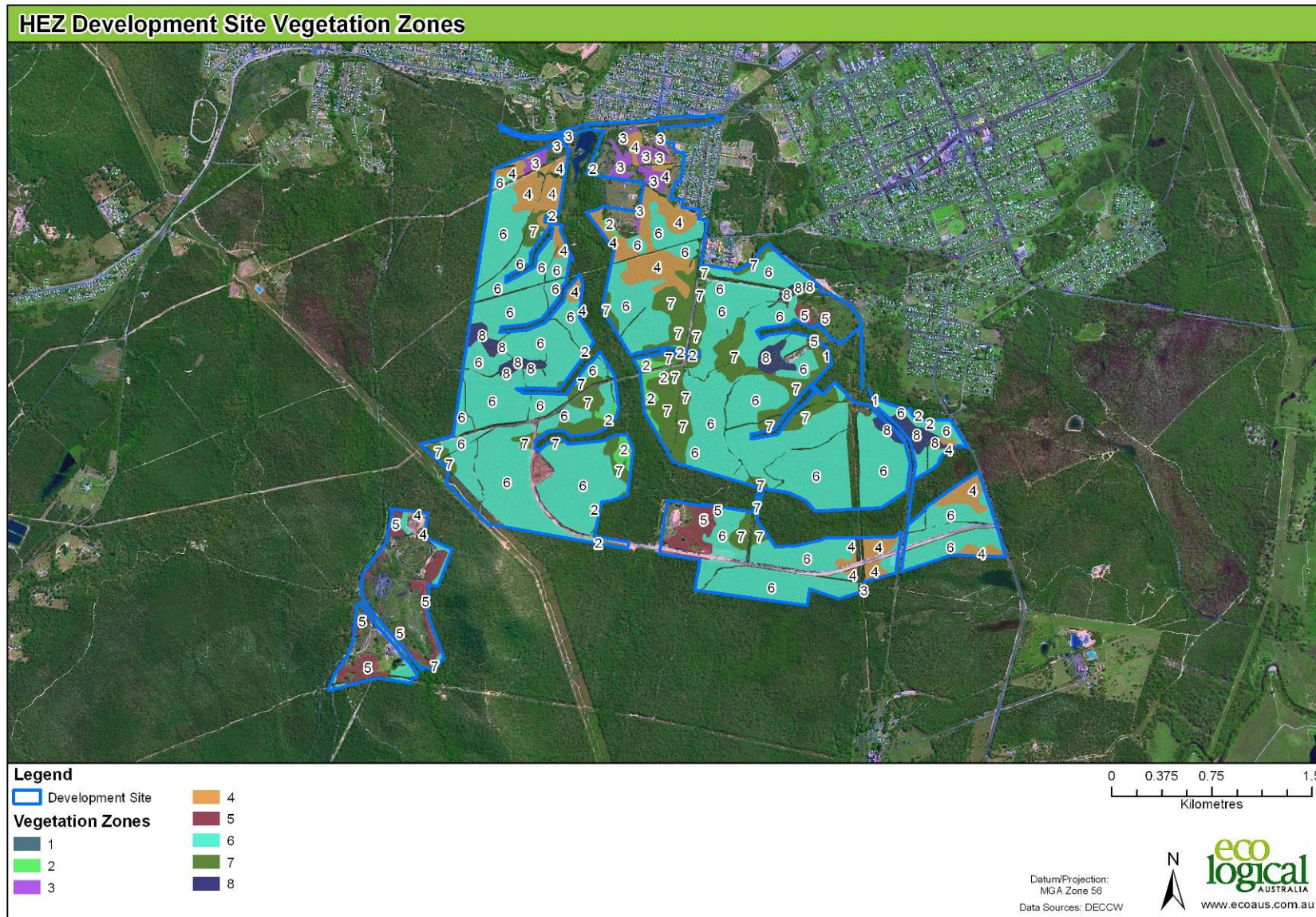


Figure 6: HEZ Development Site Vegetation Zones

2.7 THREATENED SPECIES SUB ZONES

Threatened Species Sub Zones, which form the base units of vegetation zones, were mapped for the development site (Figure 7). The Threatened Species Sub Zones are the base units entered into the credit calculator, and allow the entry of data such as adjacent remnant area and patch size for individual vegetation polygons. As each Threatened Species Sub Zone is allocated to a 1000ha Assessment Circle, the vegetation has been split along the boundary of Circles 1, 2 and 3. In total 18 TS Sub Zones were mapped for the development site. The area of each Threatened Species Sub Zone is outlined in Table 7.

Adjacent Remnant Area and Patch Size, including Low condition, were mapped for the study area and surrounding vegetation. As the patches of vegetation generally occur within 100m of another patch of vegetation, and the vegetation is contiguous with large areas of remnant vegetation, both Adjacent Remnant Area and Patch Size, including Low condition, have been allocated the maximum value of 501 hectares.

Table 7: Threatened Species Sub Zones

TSSZ ID	Vegetation Type	Condition	Area (ha)
1	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	8.8
2	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	0.8
3	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Low	23.9
4	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	161.3
5	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	31.6
6	Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	M/G	6.1
7	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	1.5
8	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	Low	11.9
9	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	44.5
10	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	62.5
11	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	13.3
12	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Low	0.3
13	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	1
14	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	15.4
15	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Low	2.9
16	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	208.4

TSSZ ID	Vegetation Type	Condition	Area (ha)
17	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	39.1
18	Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	M/G	11.1
Total	N/A	N/A	644.5

2.8 GEOGRAPHIC AND HABITAT FEATURES

The following questions were asked in Step 2 of the calculator (Table 8). The default answer for these questions is “Yes”, however an answer of “No” was given where evidence suggested that this was the correct answer.

Does any part of the development impact on:

Table 8: Geographic and Habitat Questions

Question	Answer
deep, low-nutrient sands	Yes
heath on sandy soils, or moist areas in open forest	Yes
heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	Yes
Hollow-bearing trees, bridges, caves or artificial structures within 200 m of riparian zone	Yes
land containing caves or similar structures	No
land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	No
land containing triassic sandstone outcroppings in Wollemi (Part A) CMA subregion	No
land within 1 km of rock outcrops or clifflines	Yes
land within 100 m of semi-permanent or ephemeral ponds or depressions containing leaf litter	Yes
land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	Yes
land within 40 m of rainforest, coastal scrub, riparian or estuarine communities	Yes
land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	Yes
land within a 10 km radius of north Rothbury in Hunter CMA subregion	No
land within northern section of sub-region, associated with poorly drained sand deposits within 10km radius of Kurri Kurri in Wyong CMA subregion	Yes
rainforest, eucalypt forest, heathland, marshland, grassland or rocky areas	Yes

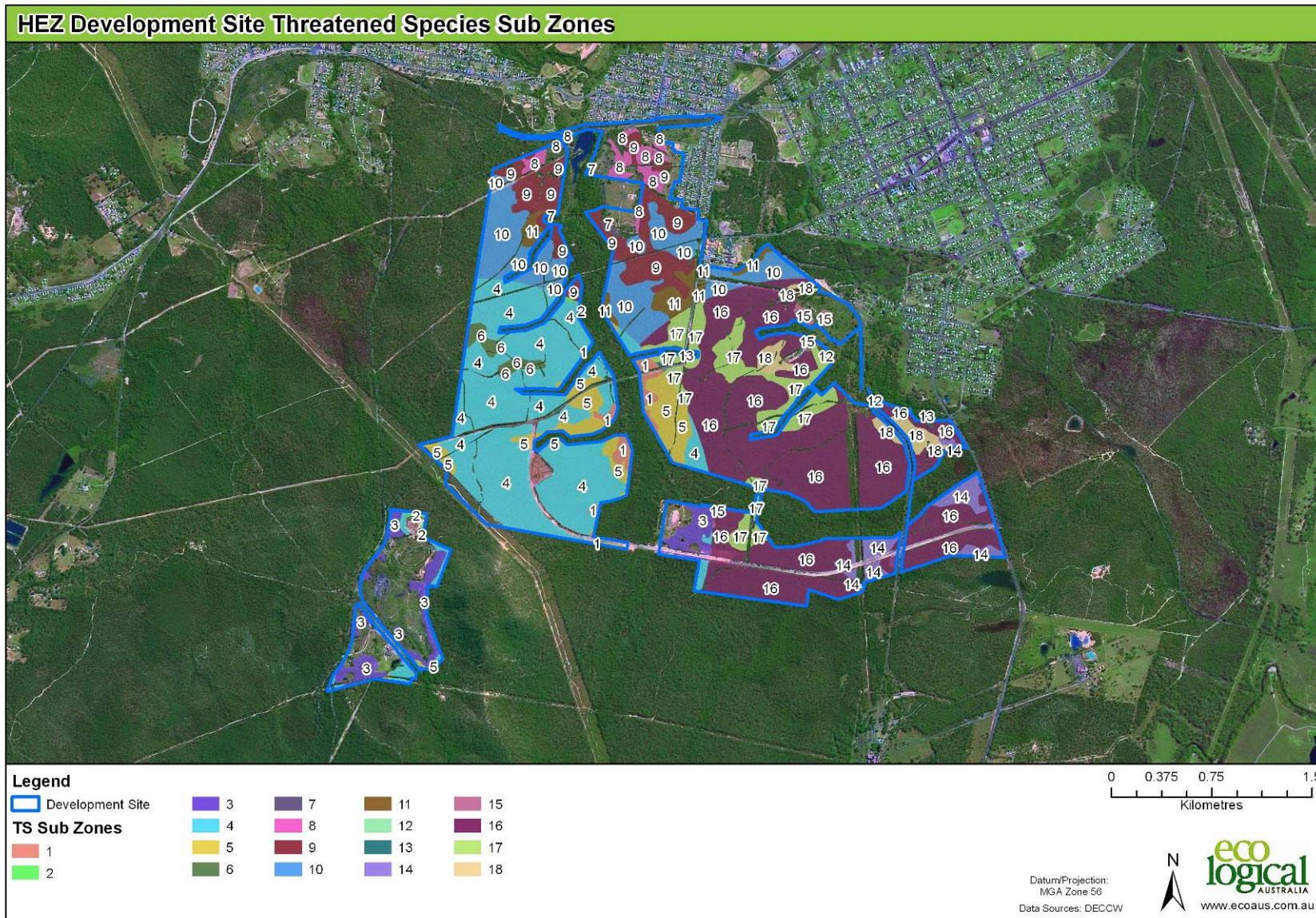


Figure 7: HEZ Development Site Threatened Species Sub Zones

2.9 MANAGEMENT ZONES AND SITE SCORES

Management zones combine the mapping of vegetation zones with the final development outcome on site (Table 9 and Figure 8). They enable the assessor to increase, or decrease, the number of credits required depending on the final development outcome (ie complete clearing, APZ etc).

As no information is available on a final development footprint, it has been assumed that all vegetation will be completely removed in the proposal. This may be an overestimate of the actual vegetation clearing.

Table 9: Management Zones

Mgmt Zone ID	Vegetation Type	Condition	TS Sub Zone ID	Final Mgmt Outcome	Area (ha)
1	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	8.8	Development	8.8
2	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	0.8	Development	0.8
3	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Low	23.9	Development	23.9
4	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	161.3	Development	161.3
5	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	31.6	Development	31.6
6	Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	M/G	6.1	Development	6.1
7	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	1.5	Development	1.5
8	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	Low	11.9	Development	11.9
9	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	44.5	Development	44.5
10	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	62.5	Development	62.5
11	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	13.3	Development	13.3
12	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Low	0.3	Development	0.3
13	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	M/G	1	Development	1
14	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	M/G	15.4	Development	15.4
15	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Low	2.9	Development	2.9
16	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	M/G	208.4	Development	208.4
17	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	M/G	39.1	Development	39.1
18	Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	M/G	11.1	Development	11.1

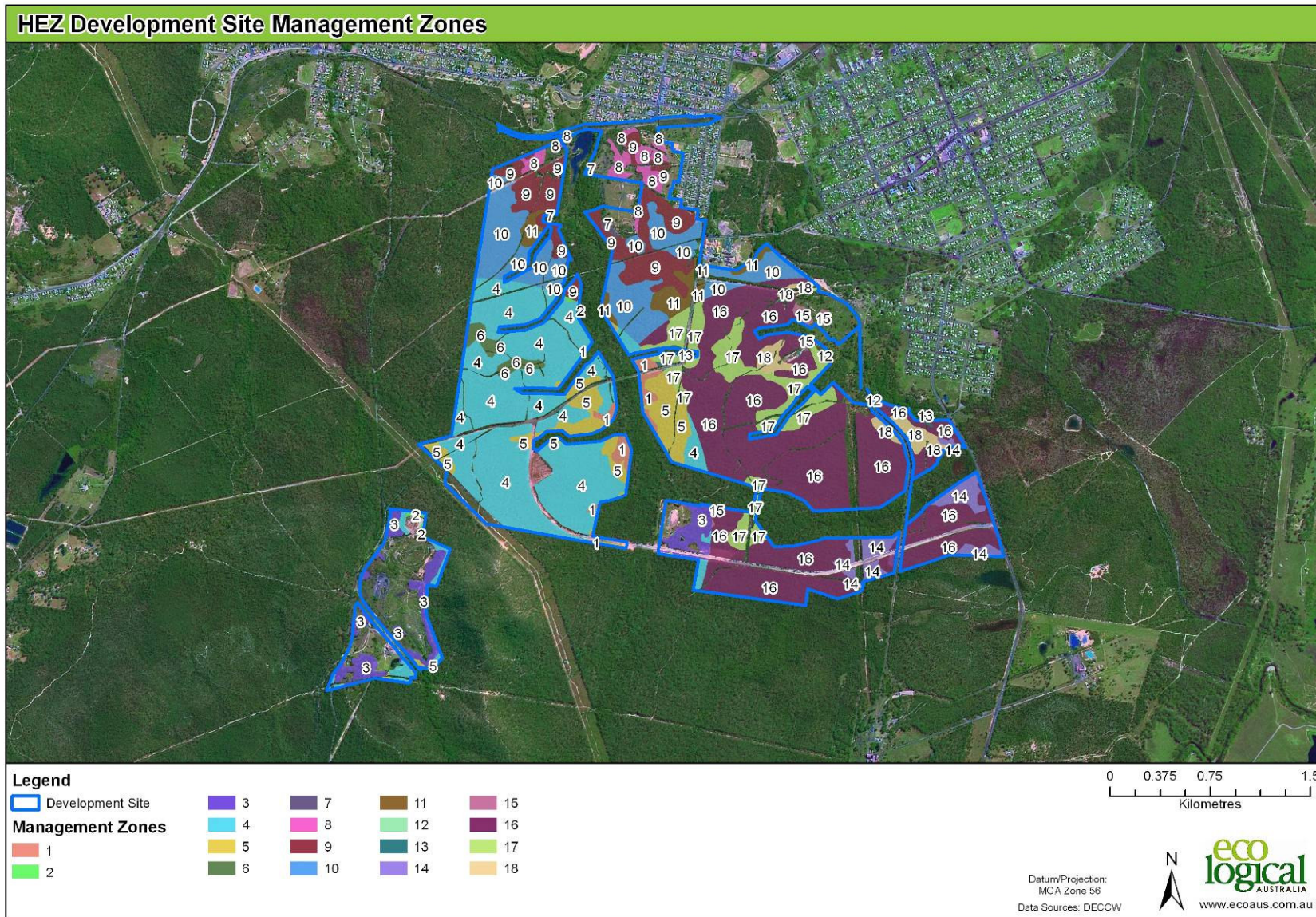


Figure 8: HEZ Development Site Management Zones

2.9.1 Site Value Scores

Each vegetation zone (and therefore management zone) has received a current site value score calculated out of 100. This score has been determined by estimating the potential current site value scores for the development site. Each of the 10 attributes were allocated a score out of 3 using:

- Existing knowledge of the condition of the site
- Vegetation mapping information, especially 'extant' versus 'disturbed' mapping to determine low and moderate/good condition vegetation
- Plot data collected for the same vegetation types on an adjoining site

The scores allocated have also been used on the Biobank site, to ensure consistency between the two assessments. While no vegetation on site is considered to be entirely in benchmark, several of the attributes are in benchmark condition for the moderate/good condition vegetation. Table 10 contains more details, as does Appendix 5.

Table 10: Site Value Scores

Vegetation Type	Condition	Species Richness	Over Storey Cover	Mid Storey Cover	Ground Cover (grass)	Ground Cover (shrubs)	Ground Cover (other)	Exotics	Hollows	Over Storey Regeneration	Fallen Logs
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	0	3	2
Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2

2.10 THREATENED SPECIES HABITAT

Although no direct survey has been undertaken as part of this project, several other projects have undertaken targeted survey on the HEZ site to map the occurrence and density of threatened species throughout the study area. While many of the species identified in these studies are contained within the ecosystem credits, and therefore do not require assessment, some threatened species requiring species credits have been identified on site.

ELA has identified the number of individuals (flora), or area of habitat (fauna), on the development site from the figures contained in the HEZ Ecological Assessment Report (HSO 2009). The area, or number of individuals, within the development site can be seen in Table 11.

Where figures were not quoted directly for each species, as for *Grevillea parviflora* and the Green-thighed Frog, ELA have made several assumptions. For *Grevillea parviflora* an estimated 3,000,000 individuals occur within the HEZ study area. In this study we have therefore worked out the area of habitat mapped for *Grevillea parviflora* within the Biobank site, and calculated the number individuals based on the proportion of habitat within the Biobank site.

For Green-thighed Frog the area of habitat was estimated using the 'High' and 'Moderate' habitat mapped by HSO (HSO 2009). The riparian high and moderate habitat mapped by HSO was buffered by 20m either side of the drainage line, and the area of habitat within the Biobank site calculated.

Table 11: Threatened Species Habitat

Flora Species	Individuals in Development Site
<i>Acacia bynoeana</i>	1028
<i>Callistermon linearfollius</i>	3,528
<i>Eucalyptus parramattensis</i>	1,524
<i>Eucalyptus glaucina</i>	19
<i>Grevillea parviflora</i>	864,000
<i>Rutidosis heterogama</i>	14,369
Fauna Species	Area in Development Site (ha)
Green-thighed Frog	2.0
Square-tailed Kite	725.4

2.11 RED FLAGS

Several vegetation types throughout the study area meet the definition of an EEC, or are >70% cleared, and are therefore red flagged under the Biobanking Methodology (Figure 9). Table 12 outlines which vegetation types are EECs or >70% cleared, and the area of vegetation red flags triggered by the development. Vegetation in low condition is not red flagged. In total 504.2 hectares of vegetation is red flagged.

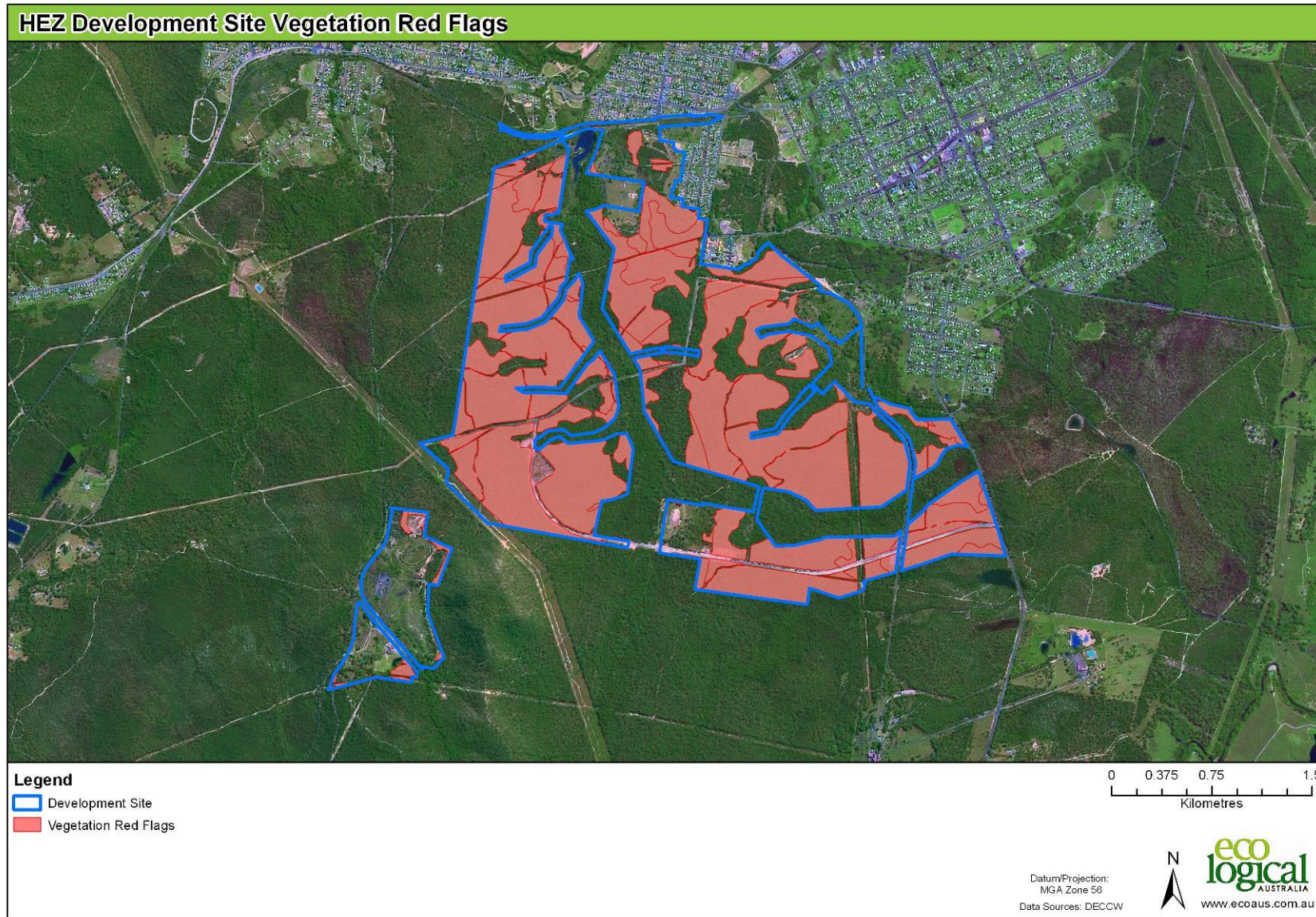


Figure 9: HEZ Development Site Red Flagged Vegetation

Table 12: Vegetation Red Flags

Revised Biometric Vegetation Type	Red Flag Reason	EEC Name	Area Impacted (ha)
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	>70% Cleared; EEC	Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions	11.3
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	EEC	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	60.7
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	EEC	Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion	432.2
Total	N/A	N/A	504.2

Several of the threatened species are also red flagged, as the loss expected through development is greater than the species can withstand. Of the eight species credit species six are red flagged for the development (Table 13).

Table 13: Species Red Flags

Species Name	Red Flag Reason
Flora Species	
Acacia bynoeana	An impact greater than that allowed
Callistermon linearfollius	An impact greater than that allowed
Eucalyptus parramattensis	An impact greater than that allowed
Grevillea parviflora	An impact greater than that allowed
Rutidosis heterogama	An impact greater than that allowed
Fauna Species	
Green-thighed Frog	An impact greater than that allowed

2.12 CREDITS REQUIRED

Provided below are the results of the credit calculations, including the number of credits required and credit profile information.

2.12.1 Ecosystem Credits

A total of 37,010 ecosystem credits are required for the proposed road, with the main species driving the ecosystem credits being the Bush Stone-curlew, Speckled Warbler and Masked Owl. Vegetation types Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin and Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin do not have any predicted ecosystem credit species, and therefore have a relatively low credit requirement.

The final credit report identifies 8 credit groups and can be seen in Appendix 7. As some of these groups are for the same vegetation type, and can be combined, a summary of the credits required, by vegetation type, is provided below in Table 14.

Several of the vegetation types can be offset throughout the Hunter/Central Rivers CMA Region, including Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin and Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin. The other vegetation types are restricted to the Hunter CMA subregion. The vegetation types able to be used to offset the development are relatively lenient, with all vegetation types being impacted able to be offset in at least two different vegetation types.

Table 14: Summary of Ecosystem Credits Required

Vegetation Type	Area (ha)	Credits Req.	Credits Req./ha	Minimum % Surrounding Vegetation	Minimum Patch Size (ha)	CMA Subregions able to receive offset	Vegetation Types able to receive offset
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	11.6	250	21.6	0%	0ha	Barrington Comboyne Plateau Ellerston Hunter Hunter/Central Rivers - marine zone Karuah Manning Kerrabee Liverpool Range Macleay Hastings Mummel Escarpment Pilliga Tomalla	Bendemeer White Gum - Silvertop Stringybark grassy open forest of hills of the southern Nandewar and North Coast (HU504) Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU544) Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast (HU619) Melaleuca decora low forest of the central Hunter Valley, Sydney Basin (HU564) Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517) Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (HU519)
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	72.6	4208	58.0	30%	100ha	Hunter	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) Parramatta Red Gum - Scribbly Gum heathy woodland on the Tomago sand beds of the southern North Coast (HU593) Rough-barked Apple - Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin (HU600) Scribbly Gum - Red Bloodwood heathy woodland on the coastal plains of the Central Coast, Sydney Basin (HU610) Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney

Desktop Biobank Assessment for Revised HEZ Masterplan

Vegetation Type	Area (ha)	Credits Req.	Credits Req./ha	Minimum % Surrounding Vegetation	Minimum Patch Size (ha)	CMA Subregions able to receive offset	Vegetation Types able to receive offset
							Basin (HU641)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	459.0	29610	64.5	30%	100ha	Hunter	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517) Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556) Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	84.0	1852	22.0	0%	0ha	Barrington Comboyne Plateau Ellerston Hunter Hunter/Central Rivers - marine zone Karuah Manning Kerrabee Liverpool Range Macleay Hastings Mummel Escarpment Pilliga	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin (HU631) Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (HU577) New England stringybarks - peppermint open forest of the New England Tablelands (HU589) Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556) Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629) Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast (HU603) Rough-barked Apple - Silvertop Stringybark - Ribbon Gum shrub/grass open forest on hills of the southern Nandewar Bioregion (HU604)

Desktop Biobank Assessment for Revised HEZ Masterplan

Vegetation Type	Area (ha)	Credits Req.	Credits Req./ha	Minimum % Surrounding Vegetation	Minimum Patch Size (ha)	CMA Subregions able to receive offset	Vegetation Types able to receive offset
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	17.2	1090	63.4	30%	100ha	Hunter	Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateau areas of the southern Central Coast, Sydney Basin (HU622) Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin (HU641) Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)
Total	644.4	37010	57.4	N/A	N/A	N/A	N/A

2.12.2 Species Credits

Species credits are required for the same eight species identified during the assessment of the Biobank site. The number of credits for each species can be seen in Table 15.

Table 15: Summary of Species Credits Required

Flora Species	Individuals in Development Site	Credits Required
Acacia bynoeana	1028	9,846
Callistermon linearfollius	3,528	50,400
Eucalyptus parramattensis	1,524	21,771
Eucalyptus glaucina	19	271
Grevillea parviflora	864,000	12,705,882
Rutidosis heterogama	14,369	221,062
Fauna Species	Area in Development Site (ha)	Credits Required
Green-thighed Frog	2.0	154
Square-tailed Kite	725.4	9,936

3 Biobanking Assessment- Proposed Offset Areas

3.1 BIOBANK AREA

The Biobank site assessed for this project is 988.9 hectares in size, 887.0 hectares of which is vegetated. The Biobank site is located predominantly on the western and southern sides of the HEZ study area, the exceptions to this being the riparian areas running through the development footprint and a small in-holding within Werakata National Park to the south of the main body of the HEZ study area. All areas of easements, tracks, cleared land and water bodies were excluded from the credit calculations.

3.2 VEGETATION TYPES

All nine vegetation types mapped within the study area are present on the Biobank site, with several of these vegetation types in low condition (Table 16 and Figure 10). The Revised Biometric Vegetation Types assigned by Eastcoast Flora Surveys have been used in this assessment.

Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin is the most prevalent vegetation type within the Biobank site, covering approximately 450 hectares. Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin is the next most common vegetation type, with approximately 170 hectares within the Biobank site.

Table 16: Biobank Site Vegetation Types

Vegetation Type	Condition	Area (ha)
Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	Mod/Good	6.9
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	6.3
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	68.1
Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	Mod/Good	1.7
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	1.3
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Mod/Good	168.0
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Low	7.4
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	Mod/Good	54.1

Vegetation Type	Condition	Area (ha)
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	8.4
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	452.8
Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Mod/Good	106.0
Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Mod/Good	5.7
Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Mod/Good	0.3
Vegetation Total		887.0
No vegetation (cleared, water bodies, tracks, roads, easements etc)- Excluded	N/A	101.9
GRAND TOTAL		988.9

3.3 CMA REGION, CMA SUBREGION AND MITCHELL LANDSCAPE

The study site occurs entirely within the **Hunter Central Rivers CMA** region and the **Hunter CMA** subregion.

The site straddles two Mitchell Landscapes, being the Newcastle Coastal Ramp and the Central Hunter Foothills. As **Newcastle Coastal Ramp** is the predominant Mitchell Landscape it has been selected for the assessment.

3.4 ASSESSMENT CIRCLES

The amount of vegetation within the 100ha and 1000ha assessment circles before the proposed Biobank site was calculated using ArcGIS. The vegetation was digitised at a scale of 1:10,000.

Due to the large nature of the Biobank site four 1000ha circles (and therefore four 100ha circles) were required (Figure 11). The circles are numbered from the north-west to the south-east. 100ha circles have been centred over the area of greatest gain, the 1000ha circles have been centred over the Biobank site and placed to cover the entire site.

The amount of vegetation in each circle was calculated before the Biobank site. As the vegetation is already in a condition close to benchmark, only a small increase in over-storey cover is expected within each circle. Therefore it is unlikely that the canopy cover will cross a 10% threshold unless the circle is already close to the 10% threshold.

Of the four 1000 hectare circles only two increase across the vegetation cover thresholds (Table 17). As three of the four 100 hectare circles already contain over 90% canopy cover, only one 100ha circle increases across a threshold. Table 17 outlines the vegetation in each circle (before the Biobank site), the vegetation in each circle estimated (after the Biobank site), and the associated Native Vegetation Cover Class (%) to be entered into the Biobanking calculator.

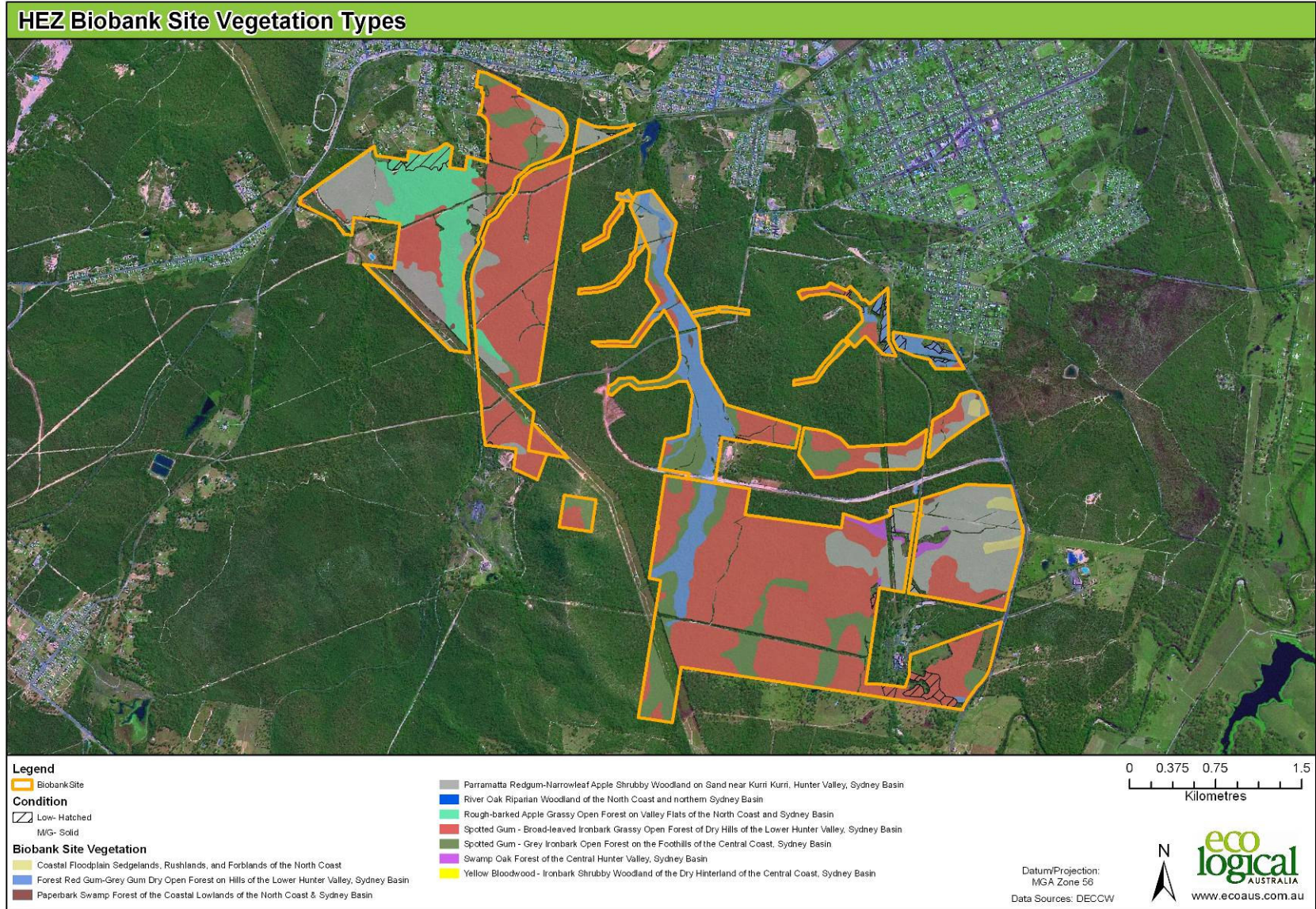


Figure 10: HEZ Biobank Site Vegetation Types

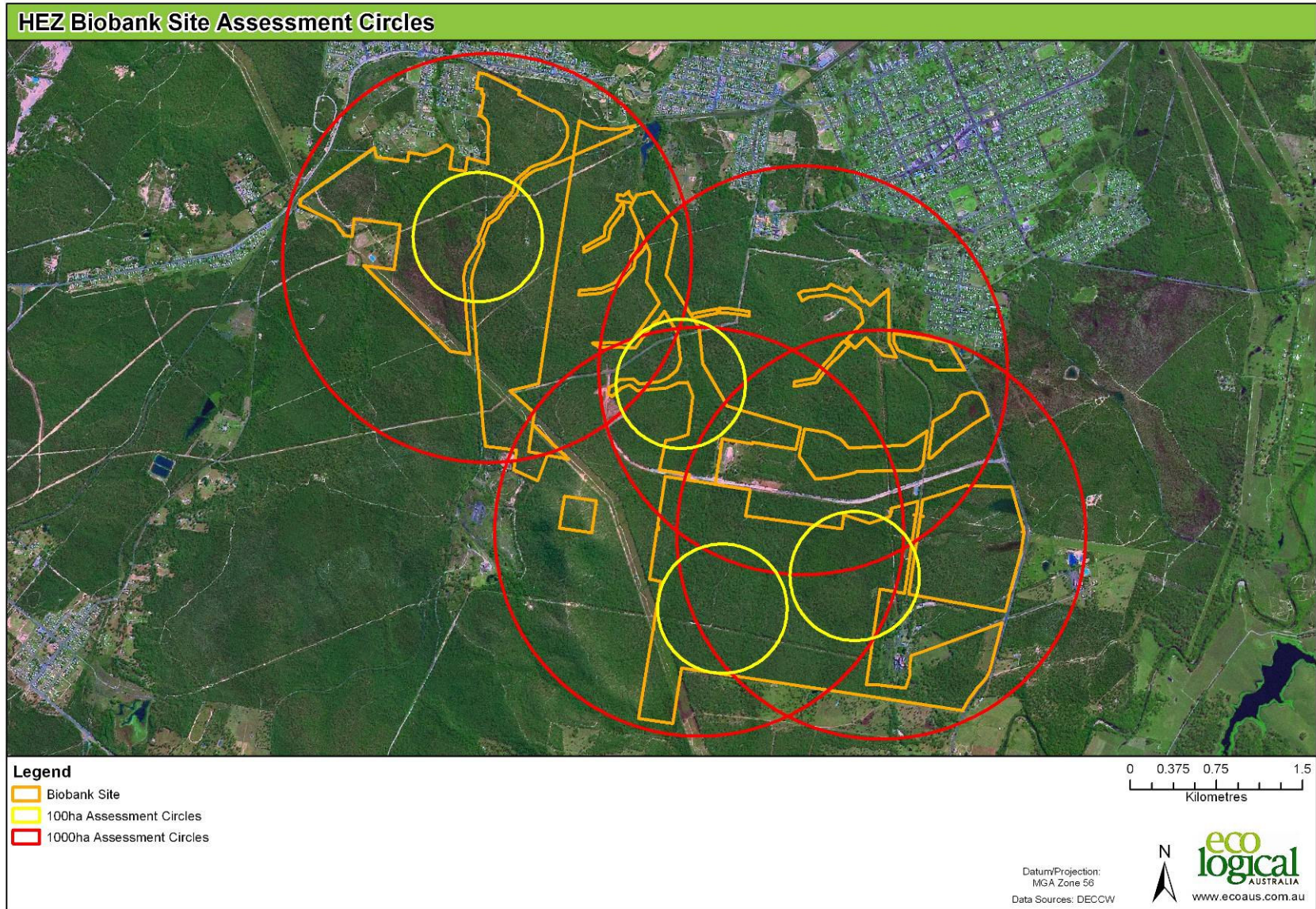


Figure 11: HEZ Biobank Site Assessment Circles

Table 17: Area of Vegetation in Each Assessment Circle

Circle	BEFORE BIOBANK		AFTER BIOBANK	
	Area of Vegetation Within Assessment Circle (ha)	Native Vegetation Cover Class (%)	Area of Vegetation Within Assessment Circle (ha)	Native Vegetation Cover Class (%)
1				
100ha	87.6	80-90%	90+	90-100%
1000ha	790	70-80%	800+	80-90%
2				
100ha	95.2	90-100%	90+	90-100%
1000ha	804	80-90%	800+	80-90%
3				
100ha	92.7	90-100%	90+	90-100%
1000ha	893	80-90%	900+	90-100%
4				
100ha	95.6	90-100%	90+	90-100%
1000ha	802	80-90%	800+	80-90%

3.5 CONNECTIVITY ASSESSMENT

A connectivity assessment was conducted for the proposal using the technique outlined in the Biobanking Methodology. The following aspects were considered:

- The width of the current and future connecting link
- The condition of the current and future connecting link (over-storey and mid-storey/ground cover)

As the circles overlap the Biobanking Methodology stipulates that only one connectivity assessment be conducted for the proposal.

The HEZ is relatively well connected to surrounding vegetation, with connections only currently restricted by urban development in the north.

3.5.1 Connectivity Width Assessment

The narrowest point of the current vegetated connection is identified in Figure 12 and occurs to the south of the Biobank site. GIS analysis has identified the minimum width of the current connection at approximately 350m, placing it into the **100m-500m** connectivity width category (Table 18).

As the narrowest point of the connection occurs off site, the Biobank site will not influence the width of the connection and therefore the width remains **100m-500m**.

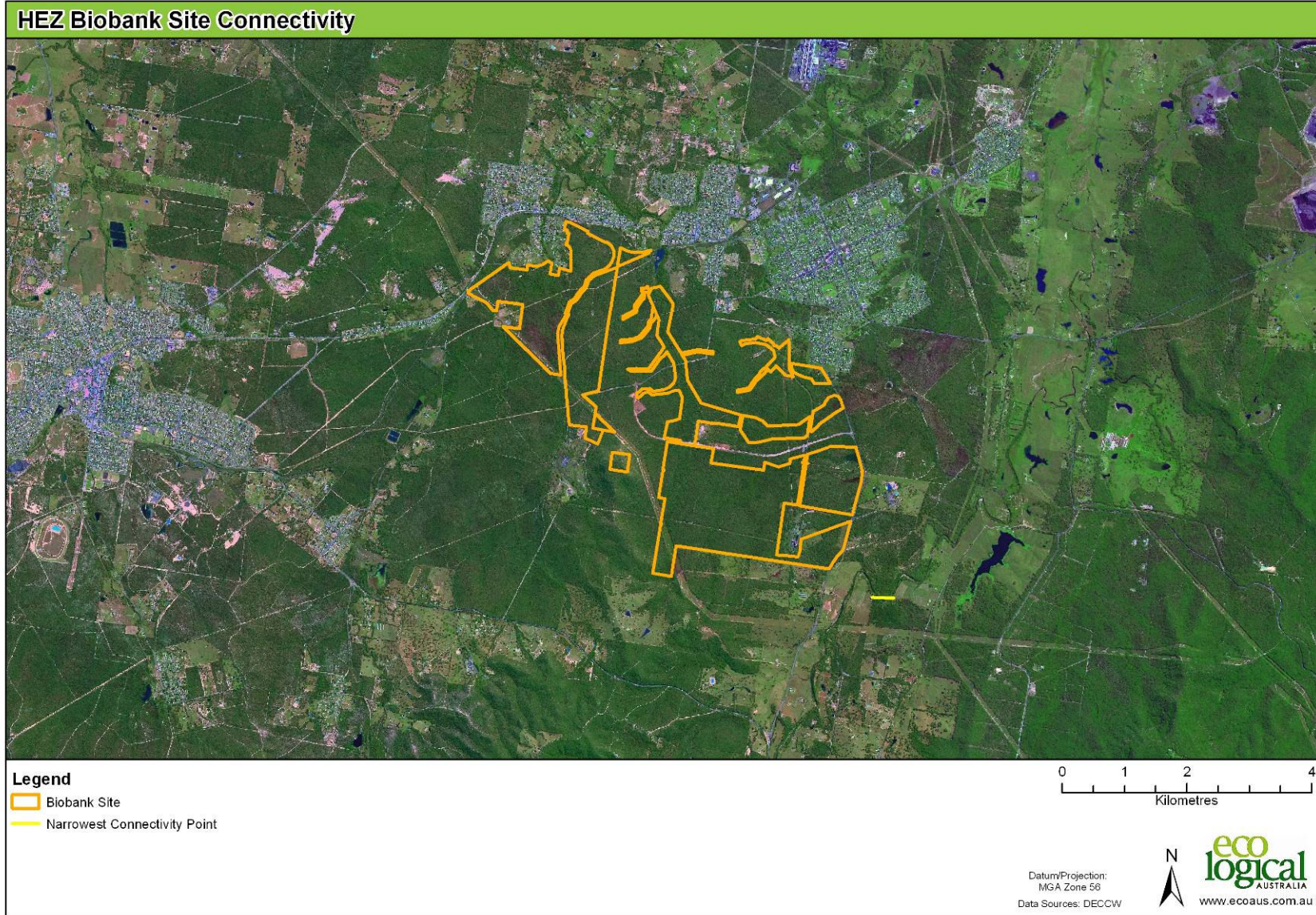


Figure 12: HEZ Biobank Site Connectivity

Table 18: Width Classes Before and After Biobank site

	Width Class (Before Biobank)	Width Class (After Biobank)
Connectivity Value (Width)	350m (100m-500m)	350m (100m-500m)

3.5.2 Connectivity Condition Assessment

The condition of the vegetation within the connections across, and off the site, is predominantly good, with much of the vegetation within National Parks or State Forests Estate. Although the vegetation within the Biobank site is slightly below benchmark, this vegetation makes up only a small portion of the total corridor vegetation, and therefore the average condition of both over-storey and ground cover throughout the corridor is considered to be in benchmark both before and after the Biobank site (Table 19).

Table 19: Condition Classes Before and After Biobank Site

Storey	Condition Class (Before Biobank)	Condition Class (After Biobank)
Connectivity Value (Over-storey Condition)	% foliage cover within benchmark	% foliage cover within benchmark
Connectivity Value (Mid-storey/Ground Cover Condition)	% foliage cover within benchmark	% foliage cover within benchmark

3.6 VEGETATION ZONES

Vegetation zones are defined as areas of the same vegetation type and condition within the Biobank area, and have been mapped for the site as outlined in Section 1.3. ELA have assigned condition categories to all vegetation. The majority of the vegetation is in moderate/good condition, with some vegetation considered as low condition.

Moderate/good condition areas include vegetation which is generally in or just below benchmark for most of the vegetation attributes. Low condition vegetation is below benchmark for most attributes, with no scores for hollows and higher exotic cover.

In total there are 13 vegetation zones. The area of each is detailed in Table 20, while the spatial configuration of each vegetation zone is shown in Figure 13. Areas that were not mapped as native vegetation, or excluded due to the existence of water bodies, tracks or roads have been classified as “cleared” and have therefore not been allocated to a vegetation zone.

Table 20: Vegetation Zones

Zone ID	Vegetation Type	Condition	Area (ha)
1	Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	M/G	6.9
2	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	6.3
3	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	68.1
4	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	1.7
5	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri,	Low	1.3

Zone ID	Vegetation Type	Condition	Area (ha)
	Hunter Valley, Sydney Basin/Low		
6	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	168.0
7	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Low	7.4
8	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	M/G	54.1
9	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	8.4
10	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	452.8
11	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	106.0
12	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	5.7
13	Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	M/G	0.3
Total	N/A	N/A	887.0

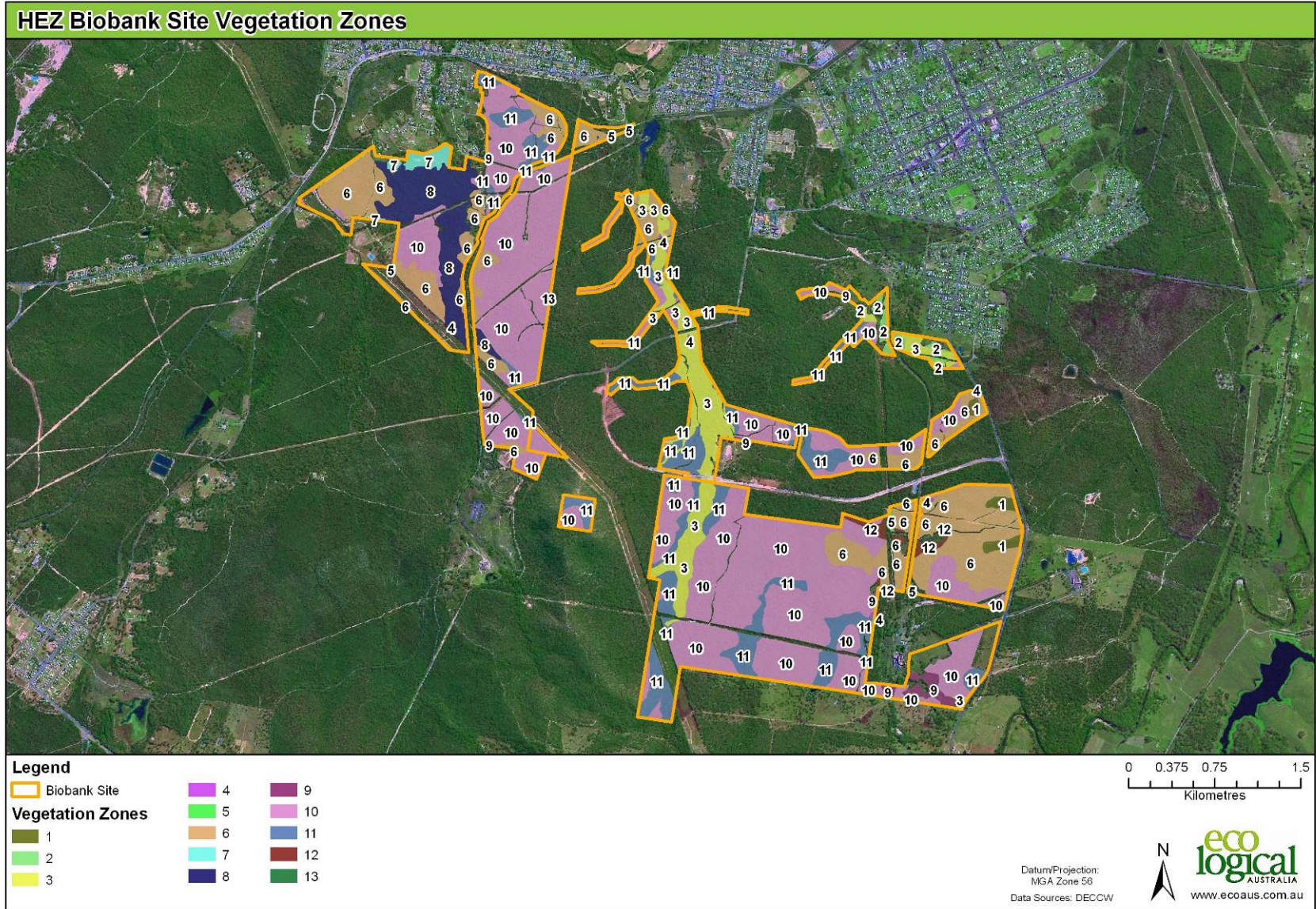


Figure 13: HEZ Biobank Site Vegetation Zones

3.7 THREATENED SPECIES SUB ZONES

Threatened species sub zones, which form the base units of vegetation zones, were mapped for the Biobank site (Figure 14). The Threatened Species Sub Zones are the base units entered into the credit calculator, and allow the entry of data such as adjacent remnant area and patch size for individual vegetation polygons. As each Threatened Species Sub Zone is allocated to a 1000ha Assessment Circle, the vegetation has been split along the boundary of Circles 1, 2, 3 and 4. In total 35 TS Sub Zones were mapped for the site. The area of each Threatened Species Sub Zone is outlined in Table 21.

Adjacent Remnant Area and Patch Size, including Low condition, were mapped for the study area and surrounding vegetation. As the patches of vegetation generally occur within 100m of another patch of vegetation, and the vegetation is contiguous with large areas of remnant vegetation, both Adjacent Remnant Area and Patch Size, including Low condition, have been allocated the maximum value of 501 hectares for all TS Sub Zones.

Table 21: Threatened Species Sub Zones

TSSZ ID	Vegetation Type	Condition	Area (ha)
1	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	11.1
2	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	0.4
3	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	0.2
4	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	75.0
5	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Low	7.4
6	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	M/G	54.1
7	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	0.3
8	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	169.9
9	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	18.8
10	Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	M/G	0.3
11	Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	M/G	1.4
12	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	6.3
13	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	44.6
14	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	1.1

TSSZ ID	Vegetation Type	Condition	Area (ha)
15	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	0.6
16	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	35.0
17	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	0.8
18	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	100.9
19	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	36.3
20	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	3.4
21	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	11.9
22	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	0.2
23	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	5.1
24	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	0.3
25	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	144.3
26	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	47.5
27	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	0.2
28	Coastal Floodplain Sedgelands, Rushlands, and Forblands of the North Coast/M/G	M/G	5.5
29	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	0.5
30	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	0.5
31	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	52.9
32	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	7.0
33	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	37.7
34	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	3.4
35	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	2.1
Total	N/A	N/A	887.0

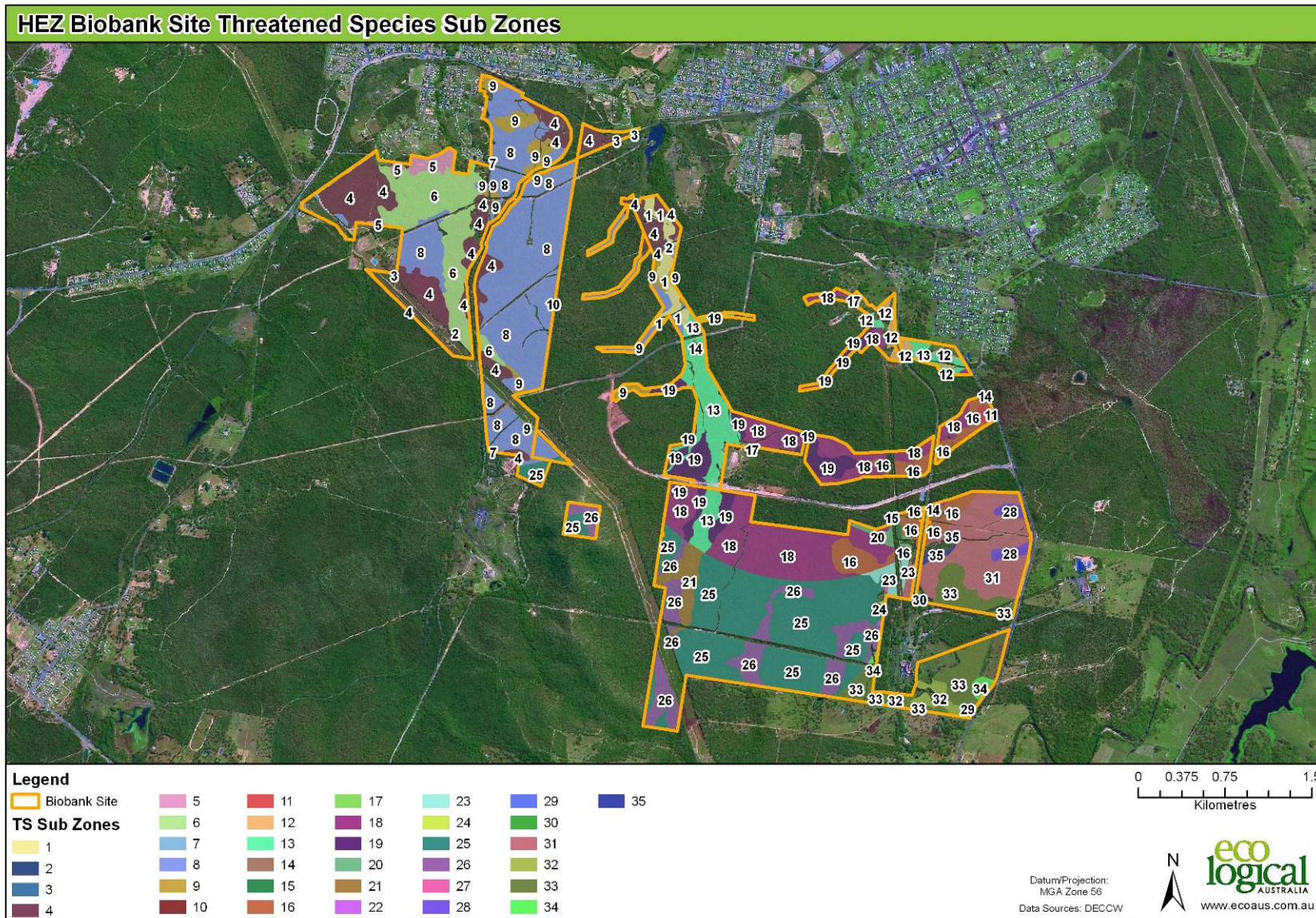


Figure 14: HEZ Biobank Site Threatened Species Sub Zones

3.8 GEOGRAPHIC AND HABITAT FEATURES

The following questions were asked in Step 2 of the calculator (Table 22). The default answer for these questions is “Yes”, however an answer of “No” was given where evidence suggested that this was the correct answer.

Does any part of the development impact on:

Table 22: Geographic and Habitat Questions

Question	Answer
deep, low-nutrient sands	Yes
floodplains of watercourses, including rivers, creeks, intermittent streams or billabongs	Yes
heath on sandy soils, or moist areas in open forest	Yes
heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	Yes
Hollow-bearing trees, bridges, caves or artificial structures within 200 m of riparian zone	Yes
land containing caves or similar structures	No
land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	Yes
land containing triassic sandstone outcroppings in Wollemi (Part A) CMA subregion	No
land within 1 km of rock outcrops or clifflines	Yes
land within 100 m of emergent aquatic or riparian vegetation	Yes
land within 100 m of semi-permanent or ephemeral ponds or depressions containing leaf litter	Yes
land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	Yes
land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation or emergent aquatic vegetation	Yes
land within 40 m of permanent wetlands with a good surface cover of floating vegetation	Yes
land within 40 m of rainforest, coastal scrub, riparian or estuarine communities	Yes
land within 40 m of swamps, wet or dry heaths or sedge grasslands	Yes
land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	Yes
land within 5 km of Wallaroo Nature Reserve in Upper Hunter CMA subregion	No
land within a 10 km radius of north Rothbury in Hunter CMA subregion	No
land within northern section of sub-region, associated with poorly drained sand deposits within 10km radius of Kurri Kurri in Wyong CMA subregion	Yes*
rainforest, eucalypt forest, heathland, marshland, grassland or rocky areas	Yes
swamps or shallow fresh water on clay	Yes
swamps, swamp margins or creek edges	Yes

*Question relates to the Wyong subregion, so answer technically should have been ‘No’. On advice from DECCW we answered ‘Yes’. This question needs revision in the database

3.9 MANAGEMENT ZONES AND SITE SCORES

3.9.1 Management Zones

Management zones combine the mapping of vegetation zones with the final development outcome on site (Table 23 and Figure 15). They enable the assessor to increase, or decrease, the number of credits generated depending on the management intended once the Biobank site is established.

No additional rehabilitation works have been proposed on the Biobank site, and therefore the credits generated for each management zone have used only the default score increase allowed by the credit calculator.

Table 23: Management Zones

Mgmt Zone ID	Vegetation Type	Condition	TS Sub Zone ID	Final Mgmt Outcome	Area (ha)
1	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	1	Biobank	11.1
2	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	2	Biobank	0.4
3	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	3	Biobank	0.2
4	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	4	Biobank	75.0
5	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Low	5	Biobank	7.4
6	Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	M/G	6	Biobank	54.1
7	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	7	Biobank	0.3
8	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	8	Biobank	169.9
9	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	9	Biobank	18.8
10	Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	M/G	10	Biobank	0.3
11	Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	M/G	11	Biobank	1.4
12	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	12	Biobank	6.3
13	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	13	Biobank	44.6
14	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	14	Biobank	1.1
15	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	15	Biobank	0.6
16	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	16	Biobank	35.0
17	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	17	Biobank	0.8
18	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	18	Biobank	100.9
19	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	19	Biobank	36.3
20	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	20	Biobank	3.4
21	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	21	Biobank	11.9

Mgmt Zone ID	Vegetation Type	Condition	TS Sub Zone ID	Final Mgmt Outcome	Area (ha)
22	Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	M/G	22	Biobank	0.2
23	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	23	Biobank	5.1
24	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	24	Biobank	0.3
25	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	25	Biobank	144.3
26	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	26	Biobank	47.5
27	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	27	Biobank	0.2
28	Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	M/G	28	Biobank	5.5
29	Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	29	Biobank	0.5
30	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	30	Biobank	0.5
31	Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	M/G	31	Biobank	52.9
32	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	32	Biobank	7.0
33	Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	M/G	33	Biobank	37.7
34	Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	M/G	34	Biobank	3.4
35	Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	M/G	35	Biobank	2.1

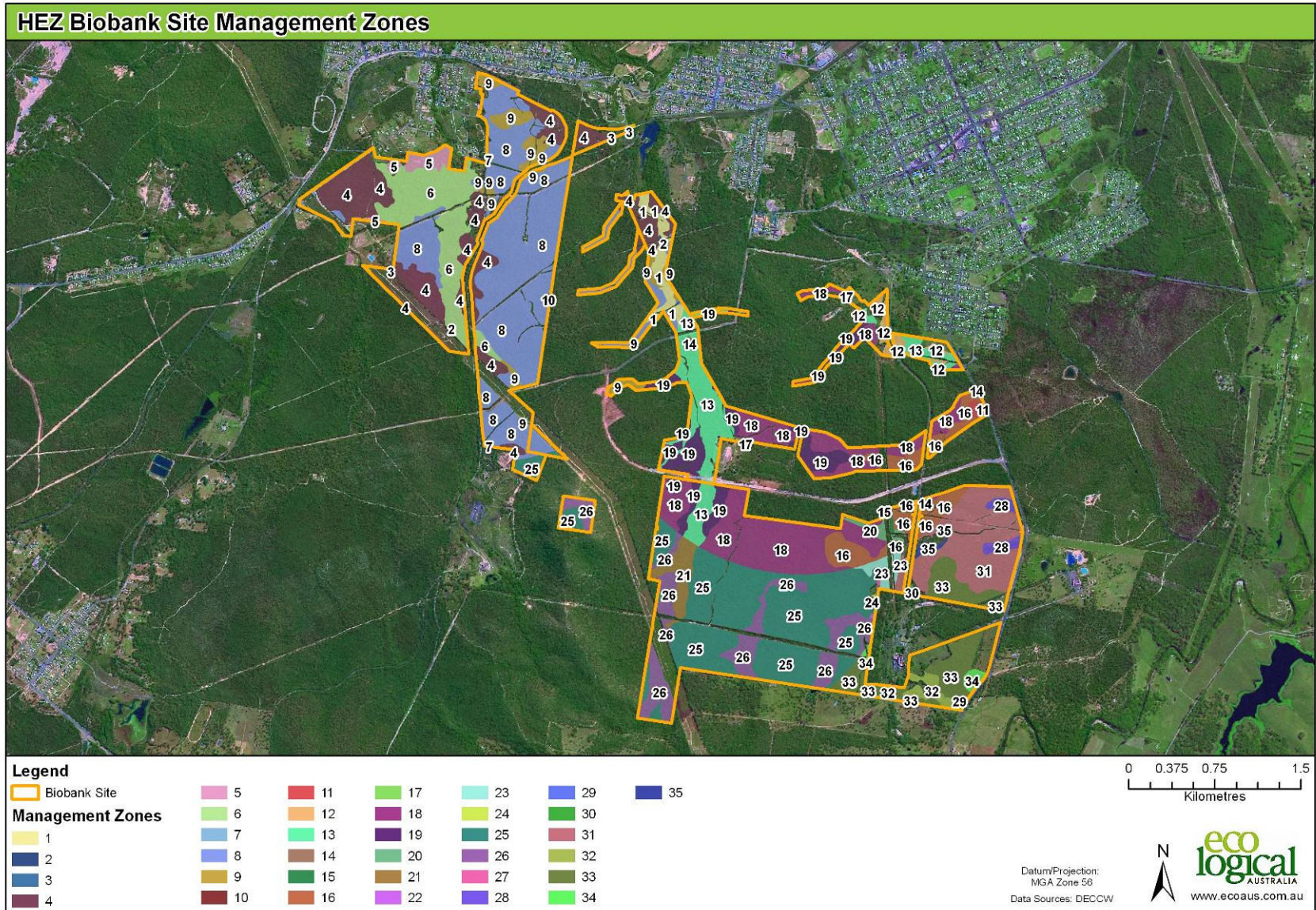


Figure 15: HEZ Biobank Site Management Zones

3.9.2 Site Value Scores

Each vegetation zone (and therefore management zone) has received a current site value score calculated out of 100. This score has been determined by estimating the potential current site value scores for the Biobank site. Each of the 10 attributes were allocated a score out of 3 using:

- Existing knowledge of the condition of the site
- Vegetation mapping information, especially 'extant' versus 'disturbed' mapping to determine low and moderate/good condition vegetation
- Plot data collected for the same vegetation types on an adjoining site

The scores allocated have also been used on the development site, to ensure consistency between the two assessments. While no vegetation on site is considered to be entirely in benchmark, several of the attributes are in benchmark condition for the moderate/good condition vegetation. Table 24 contains more details, as does Appendix 5.

Table 24: Site Value Scores

Vegetation Type	Condition	Species Richness	Over Storey Cover	Mid Storey Cover	Ground Cover (grass)	Ground Cover (shrubs)	Ground Cover (other)	Exotics	Hollows	Over Storey Regeneration	Fallen Logs
Coastal Floodplain Sedgeland, Rushlands, and Forblands of the North Coast/M/G	Mod/Good	2	2	3	3	3	3	2	0	3	2
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Forest Red Gum-Grey Gum Dry Open Forest on Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Paperbark Swamp Forest of the Coastal Lowlands of the North Coast & Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	0	3	2
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Parramatta Redgum-Narrowleaf Apple Shrubby Woodland on Sand near Kurri Kurri, Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
River Oak Riparian Woodland of the North Coast and northern Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	0	3	2
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Rough-barked Apple Grassy Open Forest on Valley Flats of the North Coast and Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/Low	Low	1	1	1	2	2	2	1	0	3	1
Spotted Gum - Broad-leaved Ironbark Grassy Open Forest of Dry Hills of the Lower Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2
Spotted Gum - Grey Ironbark Open Forest on the Foothills of the Central Coast, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2

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Vegetation Type	Condition	Species Richness	Over Storey Cover	Mid Storey Cover	Ground Cover (grass)	Ground Cover (shrubs)	Ground Cover (other)	Exotics	Hollows	Over Storey Regeneration	Fallen Logs
Swamp Oak Forest of the Central Hunter Valley, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	0	3	2
Yellow Bloodwood - Ironbark Shrubby Woodland of the Dry Hinterland of the Central Coast, Sydney Basin/M/G	Mod/Good	2	2	3	3	3	3	2	1	3	2

3.10 THREATENED SPECIES HABITAT

Although no direct survey has been undertaken as part of this project, several other projects have undertaken extensive targeted survey on the HEZ site to map the occurrence and density of threatened species throughout the study area (HSO 2004, RPS HSO 2009). While many of the species identified in these studies are contained within the ecosystem credits, and therefore do not require assessment, some threatened species requiring species credits have been identified on site.

ELA has identified the number of individuals (flora), or area of habitat (fauna), on the Biobank site from the figures contained in the HEZ Ecological Assessment Report (RPS HSO 2009). The area, or number of individuals, within the Biobank site can be seen in Table 25.

Where figures were not quoted directly for each species, as for *Grevillea parviflora* and the Green-thighed Frog, ELA have made several assumptions. For *Grevillea parviflora* an estimated 3,000,000 individuals occur within the HEZ study area (Lucas Grenadier, DECCW, pers. Comm. February 2009). In this study we have therefore calculated the area of habitat mapped for *Grevillea parviflora* within the Biobank site, and calculated the number individuals based on the proportion of habitat within the Biobank site.

For Green-thighed Frog the area of habitat was estimated using the 'High' and 'Moderate' habitat mapped by RPS HSO (RPS HSO 2009). The riparian high and moderate habitat mapped by HSO was buffered by 20m either side of the drainage line, and the area of habitat within the Biobank site calculated.

Table 25: Threatened Species Habitat

Flora Species	Individuals in Biobank Site
<i>Acacia bynoeana</i>	109
<i>Callistermon linearfollius</i>	1,593
<i>Eucalyptus parramattensis</i>	208
<i>Eucalyptus glaucina</i>	7
<i>Grevillea parviflora</i>	927,000
<i>Rutidosis heterogama</i>	11,993
Fauna Species	Area in Biobank Site (ha)
Green-thighed Frog	28.2
Square-tailed Kite	865.7

3.11 CREDITS GENERATED

Provided below are the results of the credit calculations, including the number of credits generated and the credit profile information.

3.11.1 Ecosystem Credits

A total of 9,607 ecosystem credits are generated on the Biobank site. The final credit report identifies 13 credit groups and can be seen in Appendix 6. As some of these groups are for the same vegetation type, and can be combined, a summary of the credits generated, by vegetation type, is provided below in Table 26.

Table 26: Summary of Ecosystem Credits Generated

Vegetation Type	Biobank Area (ha)	Credits Generated	Credits Generated/ha
Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	6.9	67	9.6
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	74.4	788	10.6
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin	1.7	20	11.6
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	169.3	1,839	10.9
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin	61.5	659	10.7
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	461.2	5,012	10.9
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	106.0	1,153	10.9
Swamp Oak forest of the central Hunter Valley, Sydney Basin	5.7	66	11.5
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	0.3	3	11.1
Total	887.0	9,607	10.8

As can be seen in Table 26 over 50% of the credits have been generated for Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin. Large numbers of credits have also been generated for Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin and Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin.

3.11.2 Species Credits

Species credits have been generated for a series of flora and fauna species. Table 27 provides details on the number of credits generated. To generate credits for these species the default increase was selected, rather than selecting an individual management zone. This was done as the species are widespread across several management zones.

Table 27: Summary of Species Credits Generated

Flora Species	Individuals in Biobank Site	Credits Generated
Acacia bynoeana	109	654
Callistermon linearfollius	1,593	9,558
Eucalyptus parramattensis	208	1,248
Eucalyptus glaucina	7	42
Grevillea parviflora	927,000	5,562,000
Rutidosis heterogama	11,993	71,958
Fauna Species	Area in Biobank Site (ha)	Credits Generated
Green-thighed Frog	28.2	169
Square-tailed Kite	865.7	5,194

4 Ability to Offset Proposed Development Area Using Credits Generated at Proposed Offset Site

An analysis into the credit status of the development as a whole has been undertaken. This analysis has compared the number of credits required by the development with those generated at the Biobank site. The results, for both ecosystem and species credits, can be seen below.

4.1 ECOSYSTEM CREDITS

The site, when comparing credits generated to required, has a significant credit deficit. The 644.4 hectares of clearing requires 37,010 credits, while the 887.0 hectares of Biobank site generates 9,607 credits. This results in a credit shortfall of 27,403 credits. The results can be seen in Table 28.

Table 28: Ecosystem Credit Status

Vegetation Type	Biobank Area (ha)	Total Credits Generated	Development Area (ha)	Total Credits Required	Credit Status
Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	6.9	67	0.0	0	67
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	74.4	788	11.6	250	538
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin	1.7	20	0.0	0	20
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	169.3	1,839	72.6	4,208	-2,369
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin	61.5	659	0.0	0	659
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	461.2	5,012	459.0	29,610	-24,598
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	106.0	1,153	84.0	1,852	-699
Swamp Oak forest of the central Hunter Valley, Sydney Basin	5.7	66	0.0	0	66
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	0.3	3	17.2	1,090	-1,087
Grand Total	887.0	9,607	644.4	37,010	-27,403

The majority of the credits are required for Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin, with over 24,000 credits still required for this vegetation type. Some vegetation types, such as Coastal floodplain sedgeland, rushlands, and forblands of the North Coast, Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin, Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin, Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin and Swamp Oak forest of the central Hunter Valley, Sydney Basin are in credit surplus.

The offset required for the credit deficit has been calculated using an average credit amount generated at a Biobank site. As Biobank sites can generate varying amounts of credits, depending on their condition, ELA has calculated the additional offset required using a range of 7-11 credits generated per hectare (Table 29). The results show that between 2,614-4,107 hectares of additional offset is required to satisfy the offset required by the Biobanking assessment. This offset is predominantly made up of the Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin vegetation type, which requires between 2,236-3,514 hectares of additional offset.

Table 29: Additional Ecosystem Credits Offset Required

Vegetation Type	Credit Status	Additional Offset Area Req. (11 Credits/ha)	Additional Offset Area Req. (7 Credits/ha)
Coastal floodplain sedgeland, rushlands, and forblands of the North Coast	67	N/A	N/A
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	538	N/A	N/A
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin	20	N/A	N/A
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	-2,369	215	338
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin	659	N/A	N/A
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	-24,598	2236	3514
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	-699	64	100
Swamp Oak forest of the central Hunter Valley, Sydney Basin	66	N/A	N/A
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	-1,087	99	155
Grand Total	-27,403	2614	4107

4.2 SPECIES CREDITS

The situation for species credits is similar, with only one species (Green-thighed Frog) being in surplus. As species credits must be traded for the identical species (and the units of measurement are different between flora and fauna) it is not possible to add all species credits to determine the actual extent of the

deficit, however the deficit is substantial for individual species such as *Grevillea parviflora*, *Rutidosia heterogama* and *Callistemon linearifolius* (Table 30).

Table 30: Species Credit Status

Flora Species	Individuals in Biobank Site	Credits Generated	Individuals in Development Site	Credits Required	Credit Status
<i>Acacia bynoeana</i>	109	654	1028	9,846	-9,192
<i>Callistemon linearifolius</i>	1,593	9,558	3,528	50,400	-40,842
<i>Eucalyptus parramattensis</i>	208	1,248	1,524	21,771	-20,523
<i>Eucalyptus glaucina</i>	7	42	19	271	-229
<i>Grevillea parviflora</i>	927,000	5,562,000	864,000	12,705,882	-7,143,882
<i>Rutidosia heterogama</i>	11,993	71,958	14,369	221,062	-149,104
Fauna Species	Area in Biobank Site (ha)	Credits Generated	Area in Development Site (ha)	Credits Required	Credit Status
Green-thighed Frog	28.2	169.2	2.0	154	15
Square-tailed Kite	865.7	5,194	725.4	9,936	-4,742

Assuming that the individual species are in the same density at any offset site than they are at the HEZ Biobank site, analysis can be performed on the likely offset area required for fauna species, and the likely number of individuals required on an offset site for flora species. This analysis has been performed using the default value of a 60% increase in species on an offset site (Table 31).

Table 31: Additional Species Credits Offset Required

Flora Species	Credit Status	Additional Individuals Req. on Offset Site
<i>Acacia bynoeana</i>	-9,192	1,532
<i>Callistemon linearifolius</i>	-40,842	6,807
<i>Eucalyptus parramattensis</i>	-20,523	3,421
<i>Eucalyptus glaucina</i>	-229	38
<i>Grevillea parviflora</i>	-7,143,882	1,190,647
<i>Rutidosia heterogama</i>	-149,104	24,851
Fauna Species	Credit Status	Additional Habitat (ha) Req. on Offset Site
Green-thighed Frog	15	N/A
Square-tailed Kite	-4,742	790

The table demonstrates that a significant number of *Grevillea parviflora* individuals are required to offset the shortfall in credits, with the Square-tailed Kite also requiring a significant area. Please note that

these credits can be obtained on the same offset site as ecosystem credits if the species is confirmed as present.

5 Options to Meet the Calculated Offset Requirements

If the offset requirements for the revised Masterplan for the HEZ site are to be assessed using the Biobanking Methodology, there are a number of factors that need to be taken into consideration.

This assessment is an indicative assessment only using site condition data obtained from an adjacent site (Cessnock Crown lands) as a guide to the biometric condition of the vegetation on the HEZ site. A formal biobank assessment may stratify the HEZ site into more vegetation zones with different site scores than used in this study.

The assessment of the proposed development area has assumed 100% of all biodiversity values throughout the area. In reality, this is often not the case and there are usually areas of native vegetation retained, even as scattered trees with a managed understory such as in Asset Protection Zones (APZs) where the biodiversity values are only partially lost. Once a more definite development footprint is known which identified APZs within the development footprint, a recalculation of the credits required for these areas will result in between 10-20% fewer credits being required.

This assessment has used the data sets in version 1.1 of the Biobanking Tool. DECCW has advised that several Biobank data sets are currently being reviewed for their accuracy (predictions of species occurring in CMA subregions, vegetation types, response to management etc), all of which may affect the number of credits required at a development site and/or generated at an offset site. Assessments undertaken using the current data sets may apply for a "Local Data Variation" if it can be demonstrated that species that are predicted to occur at a particular site are either a data error, unlikely to occur or have been satisfactorily demonstrated not to occur based on the results of comprehensive surveys targeting these species.

In regards to the HEZ site, there have been a number of comprehensive surveys over several years and seasons that have recorded 26 threatened fauna species. There are still however several species that have been predicted to occur that have not been recorded, are unlikely to occur or are data errors e.g. Bush Stone Curlew, Nth Coast Endangered Population of Emu, Barking and Sooty Owls, Spot-tail Quoll, Brush-tailed Phascogale, Fruit Dove etc (See Appendix 3 and 4). If these species are removed from the credit calculations, particularly those that have a low Tg score and are driving the credits requirements (Bush Stone Curlew), the number of credits required at the development site will be significantly less.

The number of credits generated in the proposed offset areas could potentially be increased by including the 100 +/- ha of land within the offset area not used in this assessment e.g. the power easements and cleared land). Whilst these areas will not generate as many credits as areas in moderate-good condition, they could generate between 5-6 credits per hectare under suitable management arrangements, i.e. approximately 5-600 credits.

Ultimately, a reduction in the development footprint is likely to have the biggest influence on the number of credits required as for each ha of loss removed from the development footprint results in between 5-7

hectares less offset required. The removal of development area also increases the area potentially available as an offset.

Should the development footprint not be able to be reduced any further, the most cost effective means of meeting the offset requirements as calculated by this assessment would be to secure additional conservation areas in accordance with the credit profiles (i.e. the range of vegetation types and regions detailed in Table 14). It may be possible to secure the required deficit of credit types in areas some distance from the HEZ site where land values are significantly lower and thus more cost effective.

Finally as the HEZ project is likely to be assessed under Part 3A of the EP&A act. The Minister for Planning, in accordance with Section 75JA of the EP&A Act, can issue an approval "*whether or not a Biobanking Statement has been obtained and may specify the number and class of credits to be retired*".

Glossary of Biobanking Terminology

The following glossary has been taken from the Biobanking Assessment Methodology and Operational Manual (DECC 2009)

accredited assessor this is a person who has been accredited in accordance with s. 142B(1)(c) of the TSC Act to use the methodology and credit calculator.

adjacent remnant area The area of moderate to good condition native vegetation of which the biobank site or development site is a part which is linked ($\leq 100\text{m}$ for woody vegetation and $\leq 30\text{m}$ for non-woody vegetation) to the next area of native vegetation. Adjacent remnant area provides landscape context to the biobank or development site and may extend onto adjoining land.

assessment circle 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 credit profiles and for Landscape Value score.

benchmarks (vegetation benchmarks) Quantitative measures of the range of variability in vegetation condition where there is relatively little evidence of modification by humans since European (post-1750) settlement. Benchmarks are defined for specified variables for vegetation communities. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback and no evidence of recent fire or flood. It is not subject to high-frequency burning and has evidence of recruitment of native species. Benchmarks are available by vegetation class (*sensu* Keith 2004) at <http://www.environment.nsw.gov.au/projects/BiometricTool.htm> and can also be obtained from reference sites or published sources.

biobanking agreement An agreement between the landowner and the Minister for Climate Change and the Environment (under Part 7A of the TSC Act) for the purpose of establishing a biobank site. The agreement states the management actions to be carried out to improve biodiversity values on the site and thereby create biodiversity credits under the scheme (s. 127D of the TSC Act).

biobank site Land designated by a biobanking agreement to be a biobank site. This term is also used in the Operational Manual for land that is being assessed as a biobank site

biobanking statement A statement issued under s. 127ZL of the TSC Act, specifying the number and class of credits to be retired for a particular development in accordance with the methodology. The statement may include other conditions to minimise the impact of the development on biodiversity values. If provided to consent or determining authority under the EP&A Act, the statement must be included as a condition of development consent or approval.

biodiversity credits Ecosystem or species credits required to offset the loss of biodiversity values on development sites or created on biobank sites from management actions that improve biodiversity values.

biodiversity values Include composition, structure and function of ecosystems, and include (but are not limited to) threatened species, populations and ecological communities and their habitats, as

defined by the TSC Act, and exclude fish or marine vegetation, unless that fish or marine vegetation has been the subject of an order under s. 5A of the TSC Act.

certified local data *see more appropriate local data*

cleared land Where the native over-storey has been cleared, there is no native mid-storey (or the native mid-storey has been cleared), and less than 50% of the ground cover vegetation is indigenous species or greater than 90% of the ground cover (dead or alive) is cleared.

CMA area The area of operation of a catchment management authority, as described in Schedule 2 of the *Catchment Management Authorities Act 2003*.

CMA sub-region Sub-regions of catchment management authority areas as set out in the Environmental Outcomes Assessment Methodology, Native Vegetation Regulation 2005.

connectivity A measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

Credit Calculator A computer program that applies the methodology and calculates the number and classes of credits required at a development site or created at a biobank site.

credit profile A description of the credit created or required in a vegetation zone or group of zones, according to the attributes of CMA sub-region, vegetation type, vegetation formation, surrounding vegetation cover, and patch size including low-condition vegetation.

critically endangered ecological community As defined in s. 4(1) of the TSXC Act and any additional critically endangered ecological communities listed under Part 13 of the EPBC Act.

crown cover Area covered by the crowns of trees, when the area of each crown is treated as a solid object. Expressed as percent. In Biobanking assessments crown cover is only used in the assessment of paddock trees

deferred retirement arrangement An arrangement under s. 127ZT of the TSC Act that enables the Minister for Climate Change and the Environment to hold biodiversity credits until restorative actions have been completed at a development site.

derived vegetation communities **Native vegetation** communities where one or more structural components of the vegetation have been entirely removed or severely reduced or have developed where they were previously absent, as a consequence of management practices (sometimes in association with environmental conditions) since European settlement.

development Includes development within the meaning of the *Environmental Planning and Assessment Act 1979* and includes an activity within the meaning of Part 5 of that Act, and may also include projects under Part 3A of that Act.

development site An area of land that is subject to a proposed development proposal for which a biobanking statement is sought or obtained.

ecosystem credits The class of biodiversity credits created or required for the impact on general biodiversity values and some threatened species, i.e. for biodiversity values except threatened species or populations that require species credits. Species that require ecosystem credits are listed in the Threatened Species Profile Database (TSPD).

endangered ecological community As defined in s. 4(1) of the TSXC Act and any additional endangered ecological communities listed under Part 13 of the EPBC Act. Endangered and critically endangered ecological communities are collectively referred to as EECs.

environmental contribution A contribution for the conservation or enhancement of the natural environment, as defined in section 127B(10) of the TSC Act.

EPBC Act means the *Environmental Protection and Biodiversity Conservation Act 1999*

expert An expert is a person who is accredited by the Director General under s. 142B(1)(b) of the TSC Act, or, if arrangements for accreditation under s. 142B(1)(b) are not in place, a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.

general biodiversity values Biodiversity values assessed in the methodology, excluding assessment of threatened species and populations.

GPS means a Global Positioning System receiver.

grassland Native vegetation classified in the vegetation formation Grasslands in *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT* (Keith, D. 2004, Department of Environment and Conservation NSW, Hurstville NSW). Grasslands are generally dominated by large perennial tussock grasses, a lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.

group of credits Credits from a development or biobank site that have an identical credit profile.

habitat An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.

habitat surrogates Measures of habitat for threatened species, populations and communities; in the methodology they are CMA sub-region, vegetation type, percent vegetation cover, vegetation condition and patch area including low-condition vegetation.

herbfield Native vegetation that predominantly does not contain an over-storey or mid-storey and where the ground cover is dominated by non-grass species.

highly cleared vegetation type A vegetation type that has 10% or less of its estimated pre-1750 distribution in the CMA remaining (as shown by the Vegetation Types Database).

Identified Population A population present within an area of land if identified as habitat for a particular species and listed in the Identified Population Database.

Identified Population Database A database that may be published by DECC and made publicly available on the web; it contains information such as a map or criteria that describe the location of an Identified Population.

impact assessment The impact assessment that is referred to in s. 127ZK(3)(c) of the TSC Act and must be prepared in accordance with the methodology. The methodology requires the impact assessment to address the criteria used to justify an impact on a red flag area under section 2.3 of the methodology, the assessment of indirect impacts of the development under section 2.4, and the assessment of the direct impacts of the development under sections 3 and 4.

impacts on biodiversity values Refers to loss in biodiversity values on or off the development site and gain in biodiversity values at the biobank site.

individual A single, mature organism.

Landscape Value A measure of fragmentation, connectivity and adjacency of native vegetation at a site. Landscape Value comprises: (a) percent native vegetation cover in the 100-ha and 1000-ha

assessment circles in which the development or biobank sites are located; (b) connectivity with surrounding vegetation; and (c) total adjacent remnant area.

low-condition vegetation Woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and

less than 50% of ground cover vegetation is indigenous species, or
greater than 90% of ground cover vegetation is cleared.

Native grassland, wetland or herbfield where:

less than 50% of ground cover vegetation is indigenous species, or
more than 90% of ground cover vegetation is cleared.

If native vegetation is not in low condition, it is in moderate to good condition.

management zone Where the extent of development impact or improvement through management varies over a vegetation zone, a management zone is used for the purpose of calculating the change in Site Value for that vegetation zone.

Methodology means the Biobanking Assessment Methodology.

Minister means the Minister for Climate Change and the Environment.

Mitchell Landscape Landscape with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250 000.

moderate to good condition vegetation Native vegetation that is not in low condition, as defined in section 2.1.1 of the methodology.

more appropriate local data Data that more accurately reflects local environmental conditions, as certified by the Director General in relation to the Vegetation Benchmarks Database, the Vegetation Types Database and the Threatened Species Profile Database.

native vegetation Vegetation described in section 6 of the NV Act. Native vegetation is used as a surrogate for general biodiversity values in the methodology.

notional assessment and notional information Undertaking an assessment by using information on vegetation type, vegetation condition or presence/absence of threatened species obtained from remote imagery rather than from site surveys; or assessment of threatened species from surveys or Expert Reports without using the initial or secondary filtering criteria.

offset rules Circumstances in which credits can be used (retired) for a development to improve or maintain biodiversity values.

Operational Manual Means the Biobanking Operational Manual, which provides guidance on how to use the credit calculator and undertake surveys.

patch size, including low-condition vegetation The area of moderate- to good- and low- condition native vegetation of which the biobank site or development site is a part which is linked to ($\leq 100\text{m}$ from for woody vegetation and $\leq 30\text{m}$ for non-woody vegetation) the next area of native vegetation. Patch size including low condition vegetation provides landscape context to the biobank or development site, and may extend onto adjoining land.

percent cleared The percentage of a vegetation type that has been cleared within a CMA area as a proportion of its pre-1750 extent, as identified in the Vegetation Types Database.

percent foliage cover The percentage of ground that would be covered by a vertical projection of the foliage, and branches and trunk of a plant or plants.

percent vegetation cover (percent native vegetation cover in the landscape, surrounding vegetation cover) The percentage of native vegetation cover in the 100-ha and 1000-ha assessment circles in which the vegetation zone is located. The percent native vegetation cover within the assessment circles is visually estimated from aerial or satellite imagery, taking into account both cover and condition of vegetation

plot An area in which some of the 10 site attributes that make up the Site Value score are assessed in a vegetation zone.

red flag area An area of land at the development site with high biodiversity conservation values where the impact of the development on biodiversity values cannot be offset by the retirement of biodiversity credits in order to improve or maintain biodiversity values, unless the Director General determines that strict avoidance of the red flag area is unnecessary in the circumstances.

reference sites Relatively unmodified sites used to obtain local benchmark information when benchmarks in the Vegetation Benchmark Database are too broad or otherwise incorrect for the vegetation type and/or local situation. Benchmarks can also be obtained from published sources.

retirement of biodiversity credits A change in the status of a credit such that the credit can no longer be bought or sold. Retirement of credits may be required to comply with a biobanking statement or a direction issued by the Minister for Climate Change and the Environment, or they may be retired voluntarily.

site attributes Attributes used to assess Site Value and threatened species habitat. The 10 site attributes are native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

Site Value A quantitative measure of structural, compositional and functional condition of native vegetation, measured by site attributes.

species that cannot withstand loss In general, a species is identified as not being able to withstand loss within a CMA if the species is known to occur in less than three populations within that CMA area (also see section 2.3 of the methodology).

species credits The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Species Profile Database.

species polygon The actual area of habitat, or number of individuals of a threatened species, impacted by development at the development site or by management actions at the biobank site.

surrounding percent vegetation cover see **percent vegetation cover**

surrounding vegetation cover see **percent vegetation cover**

Tg value The ability of a species to respond to improvement in Site Value or other habitat improvement at a biobank site with management actions. Tg is based on the lowest value of the following: effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.

threatened population An endangered population as defined in s. 4(1) of the TSC Act.

threatened species Critically endangered, endangered or vulnerable threatened species and populations as defined in s. 4(1) of the TSC Act; or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

TSC Act means the *Threatened Species Conservation Act 1995*.

Threatened Species Profile Database The database containing information on habitat characteristics, range, response to management actions, survey requirements, and the class of biodiversity credit required for the species. It is used for calculation of ecosystem or species credits, filtering to determine the likely presence of threatened species, information on threatened species ability to withstand loss, and threatened species' response to management.

threatened species sub-zone The area of vegetation that is assessed initially to determine which threatened species are assessed for biodiversity credits at a development site and a biobank site.

threatened species survey A targeted survey for a threatened species, undertaken in accordance with DECC guidelines to determine if the species is present.

transect A line or narrow belt along which environmental data is collected.

Vegetation Benchmarks Database A database of benchmarks for vegetation classes and some vegetation types. Vegetation benchmarks can also be collected from reference sites.

vegetation class Level of classification of vegetation communities defined in *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT* (Keith, D. 2004, Department of Environment and Conservation NSW, Hurstville, NSW). There are 99 vegetation classes in NSW.

vegetation formation A broad level of vegetation classification, as defined in *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT* (Keith, D. 2004, Department of Environment and Conservation NSW, Hurstville, NSW). There are 12 vegetation formations in NSW.

vegetation type The finest level of classification of native vegetation used in the methodology. Vegetation types are assigned to vegetation classes, which in turn are assigned to vegetation formations. There are approximately 1600 vegetation types within NSW.

Vegetation Types Database A database which contains the information on each vegetation type used in the methodology and comprises a description of each vegetation type, its class and formation, the CMA area within which the vegetation type occurs, the percent cleared value of the vegetation type, and the source of the information.

vegetation zone (zone) A relatively homogenous area in a proposal area (development or biobank site) that is of the same vegetation type and broad condition. A single zone must not contain a mix of vegetation in low condition and not in low condition. Zones with the same vegetation type and in moderate to good condition (i.e. not in low condition) can be combined within one ecosystem credit profile (as a sub-zone). A zone may comprise one or more discontinuous areas.

viability The ability of biodiversity values in an area to persist for many generations or long time periods.

wetland Native vegetation classified in the vegetation formation defined as Freshwater Wetland in *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT* (Keith, D. 2004, Department of Environment and Conservation NSW, Hurstville, NSW).

woody native vegetation Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

zone *see* vegetation zone.

References

DECC (2009). BioBanking Assessment Methodology and Credit Calculator Operational Manual. Department of Environment and Climate Change (NSW), Sydney.

EFS (2007) Vegetation of the Cessnock-Kurri region, Cessnock LGA, New South Wales: Survey, Classification & Mapping. Final Report to Department of Environment & Climate Change. Eastcoast Flora Survey.

HSO (2004) Ecological Constraints Masterplan (ECMP) for the Hunter Economic Zone (HEZ), February 2004.

RPS HSO (2009) Ecological Assessment Report For State Significant Site Hunter Economic Zone Kurri Kurri, NSW. Prepared for: HEZ Nominees Pty Ltd.

Appendix 1- Species Requiring Survey (Proposed Development Area)

Scientific Name	Common Name
<i>Acacia bynoeana</i>	Bynoe's Wattle
<i>Callistemon linearifolius</i>	Netted Bottle Brush
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid
<i>Cynanchum elegans</i>	White-flowered Wax Plant
<i>Diuris pedunculata</i>	Small Snake Orchid
<i>Diuris praecox</i>	Rough Double Tail
<i>Eucalyptus glaucina</i>	Slaty Red Gum
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake
<i>Litoria brevipalmata</i>	Green-thighed Frog
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Melaleuca groveana</i>	Grove's Paperbark
<i>Myotis adversus</i> (Breeding Habitat)	Large-footed Myotis (Breeding Habitat)
<i>Pandion haliaetus</i>	Osprey
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby
<i>Planigale maculata</i>	Common Planigale
<i>Prostanthera cineolifera</i>	Singleton Mint Bush
<i>Prostanthera cryptandroides</i> subsp. <i>Cryptandroides</i>	Wollemi Mint-bush
<i>Pteropus poliocephalus</i> (Breeding Habitat)	Grey-headed Flying-fox (Breeding Habitat)
<i>Rutidosis heterogama</i>	Heath Wrinklewort
<i>Tetradlea juncea</i>	Black-eyed Susan

Appendix 2- Species Requiring Survey (Proposed Offset Area)

Scientific Name	Common Name
<i>Acacia bynoeana</i>	Bynoe's Wattle
<i>Archaeophya adamsi</i>	Adam's emerald dragonfly
<i>Callistemon linearifolius</i>	Netted Bottle Brush
<i>Chalinolobus dwyeri</i> (Breeding Habitat)	Large-eared Pied Bat (Breeding Habitat)
<i>Crinia tinnula</i>	Wallum Froglet
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid
<i>Cynanchum elegans</i>	White-flowered Wax Plant
<i>Diuris pedunculata</i>	Small Snake Orchid
<i>Diuris praecox</i>	Rough Double Tail
<i>Eucalyptus glaucina</i>	Slaty Red Gum
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake
<i>Irediparra gallinacea</i>	Comb-crested Jacana
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Litoria aurea</i>	Green and Golden Bell Frog
<i>Litoria brevipalmata</i>	Green-thighed Frog
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Maundia triglochinooides</i>	<i>Maundia triglochinooides</i>
<i>Melaleuca biconvexa</i>	Biconvex Paperbark
<i>Melaleuca groveana</i>	Grove's Paperbark
<i>Myotis adversus</i> (Breeding Habitat)	Large-footed Myotis (Breeding Habitat)
<i>Pandion haliaetus</i>	Osprey
<i>Persicaria elatior</i>	Tall Knotweed
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby
<i>Planigale maculata</i>	Common Planigale
<i>Prostanthera cineolifera</i>	Singleton Mint Bush
<i>Prostanthera cryptandroides</i> subsp. <i>Cryptandroides</i>	Wollemi Mint-bush
<i>Pteropus poliocephalus</i> (Breeding Habitat)	Grey-headed Flying-fox (Breeding Habitat)
<i>Rutidosis heterogama</i>	Heath Wrinklewort
<i>Tetrateca juncea</i>	Black-eyed Susan

Vespadelus troughtoni (Breeding Habitat)

Eastern Cave Bat (Breeding Habitat)

Appendix 3- Species Predicted on Site (Development Area)

Scientific Name	Common Name	Species recorded on Site
<i>Ninox connivens</i>	Barking Owl	No
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Yes
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Yes
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	No
<i>Burhinus grallarius</i>	Bush Stone-curlew	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Yes
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Yes
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Yes
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	No
<i>Calyptorhynchus lathami</i>	Glossy Black-cockatoo	Yes
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	No
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat (south eastern form)	No
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Yes
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	No
<i>Phascolarctos cinereus</i>	Koala	Yes
<i>Myotis adversus</i>	Large-footed Myotis	Yes
<i>Miniopterus australis</i>	Little Bentwing-bat	Yes
<i>Tyto novaehollandiae</i>	Masked Owl	Yes
<i>Grantiella picta</i>	Painted Honeyeater	No
<i>Ninox strenua</i>	Powerful Owl	Yes
<i>Xanthomyza phrygia</i>	Regent Honeyeater	Yes
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	No
<i>Lathamus discolor</i>	Swift Parrot	Yes
<i>Neophema pulchella</i>	Turquoise Parrot	Yes
<i>Petaurus australis</i>	Yellow-bellied Glider	yes
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	No
<i>Stagonopleura guttata</i>	Diamond Firetail	Yes
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Yes
<i>Dromaius novaehollandiae</i> - endangered population	Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area	No

Pyrrholaemus sagittatus	Speckled Warbler	Yes
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Appendix 4- Species Predicted on Site (Offset Area)

Scientific Name	Common Name	Species recorded on Site
<i>Anseranas semipalmata</i>	Magpie Goose	No
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Yes
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Yes
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Yes
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Yes
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	No
<i>Dromaius novaehollandiae</i> - endangered population	Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Yes
<i>Phascolarctos cinereus</i>	Koala	Yes
<i>Myotis adversus</i>	Large-footed Myotis	Yes
<i>Miniopterus australis</i>	Little Bentwing-bat	Yes
<i>Xanthomyza phrygia</i>	Regent Honeyeater	Yes
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove	No
<i>Tyto tenebricosa</i>	Sooty Owl	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	No
<i>Ptilinopus superbus</i>	Superb Fruit-dove	No
<i>Lathamus discolor</i>	Swift Parrot	Yes
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	No
<i>Ninox connivens</i>	Barking Owl	No
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Yes
<i>Burhinus grallarius</i>	Bush Stone-curlew	No
<i>Calyptorhynchus lathami</i>	Glossy Black-cockatoo	No

<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat (south eastern form)	No
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	No
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	No
<i>Tyto novaehollandiae</i>	Masked Owl	Yes
<i>Grantiella picta</i>	Painted Honeyeater	No
<i>Ninox strenua</i>	Powerful Owl	Yes
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	No
<i>Neophema pulchella</i>	Turquoise Parrot	Yes
<i>Petaurus australis</i>	Yellow-bellied Glider	Yes
<i>Stagonopleura guttata</i>	Diamond Firetail	Yes
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Yes
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	Yes

Appendix 5- Site Value Scores

Vegetation Zone: Coastal floodplain sedgelands, rushlands, and forblands of the North Coast-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	57	0	78

Vegetation Zone: Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin-Low

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	1	0	1.5
Native over-storey cover	1	0	2
Native mid-storey cover	1	0	2
Native ground cover (grasses)	2	0	3
Native ground cover (shrubs)	2	0	3
Native ground cover (other)	2	0	3
Exotic plant cover	1	0	1.5
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	1	0	1.5
Site Value	28	0	45

Vegetation Zone: Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin-
Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Vegetation Zone: Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin-
Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	73	0	100

Vegetation Zone: Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin-Low

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	1	0	1.5
Native over-storey cover	1	0	2
Native mid-storey cover	1	0	2
Native ground cover (grasses)	2	0	3
Native ground cover (shrubs)	2	0	3
Native ground cover (other)	2	0	3
Exotic plant cover	1	0	1.5
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	1	0	1.5
Site Value	28	0	45

Vegetation Zone: Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Vegetation Zone: Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin-
Low

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	1	0	1.5
Native over-storey cover	1	0	2
Native mid-storey cover	1	0	2
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	2	0	3
Native ground cover (other)	2	0	3
Exotic plant cover	1	0	1.5
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	1.5
Site Value	28	0	45

Vegetation Zone: Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin-
Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Vegetation Zone: Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin-Low

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	1	0	1.5
Native over-storey cover	1	0	2
Native mid-storey cover	1	0	2
Native ground cover (grasses)	2	0	3
Native ground cover (shrubs)	2	0	3
Native ground cover (other)	2	0	3
Exotic plant cover	1	0	1.5
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	1	0	1.5
Site Value	28	0	45

Vegetation Zone: Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Vegetation Zone: Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Vegetation Zone: Swamp Oak forest of the central Hunter Valley, Sydney Basin-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	73	0	100

Vegetation Zone: Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin-Moderate/Good

Site Attribute	Current Score	After Development Score	After Biobank Score
Native plant species richness	2	0	3
Native over-storey cover	2	0	3
Native mid-storey cover	3	0	3
Native ground cover (grasses)	3	0	3
Native ground cover (shrubs)	3	0	3
Native ground cover (other)	3	0	3
Exotic plant cover	2	0	3
Number of trees with hollows	1	0	1.5
Over-storey regeneration	3	0	3
Total length of fallen logs	2	0	3
Site Value	65	0	89

Appendix 6- Biobank Credit Report

Supplied in separate document

Appendix 7- Development Credit Report

Supplied in separate document



HEAD OFFICE

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

SYDNEY

Suite 604, Level 6
267 Castlereagh Street
Sydney NSW 2000
T 02 9993 0566
F 02 9993 0573

ST GEORGES BASIN

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

CANBERRA

Level 4
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

HUNTER

Suite 17, Level 4
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

NAROOMA

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

COFFS HARBOUR

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

ARMIDALE

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

BRISBANE

93 Boundary St
West End QLD 4101
T 0429 494 886

WESTERN AUSTRALIA

108 Stirling Street
Perth WA 6000
T 08 9227 1070
F 08 9227 1078

Biobanking Agreement Credit Report

This report identifies the number and type of credits that may be created at a BIOBANK SITE.

Date of report: 12/02/2010 Time: 09:15 Tool Version: 1.1

Property Details

Proposal ID: 0032/2010/B001

Biobank Name: HEZ Development Desktop Biobanking Assessment (Biobank)

Biobank Location: HEZ Development Desktop Biobanking Assessment (Biobank)

Biobank Address:

CMA: Hunter/Central Rivers

Landholder Name:

Landholder Address:

Landholder Phone:

Assessor Name: Darren James

Assessor Address:

Assessor Phone:

Assessor Accreditation Number: 0032

The following information is required to be submitted with this BioBanking Agreement (where ticked)

- All or part of the biobank site is covered by a covenant, has received govt funding or is crown land
- Expert Report for the following species:
- Justification for request of additional increase in site value score with management for the following vegetation zones:
- The minimum number of plots were not entered for the following vegetation zones



Ecosystem Credits

Vegetation Type	Area (ha)	Credits created
Coastal floodplain sedgeland, rushland, and forblands of the North Coast	6.9	67
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	68.1	737
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	6.3	51
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin	1.7	20
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	168	1,829
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin	1.3	11
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin	54.1	598
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin	7.4	61
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	452.8	4,945
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	8.4	68
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin	106	1,153
Swamp Oak forest of the central Hunter Valley, Sydney Basin	5.7	66
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin	0.3	3

Credit Profile

Group 1 : Ecosystem credits: 67 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Coastal floodplain sedgeland, rushland, and forblands of the North Coast
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 6.9 ha



Group 2 : Ecosystem credits: 737 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 68.1 ha

Group 3 : Ecosystem credits: 51 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	0 - 5 ha

Total area of Vegetation zone(s) included in this group: 6.3 ha

Group 4 : Ecosystem credits: 20 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 1.7 ha

Group 5 : Ecosystem credits: 1829 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 168 ha

Group 6 : Ecosystem credits: 11 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	0 - 5 ha

Total area of Vegetation zone(s) included in this group: 1.3 ha

Group 7 : Ecosystem credits: 598 credits



CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 54.1 ha

Group 8 : Ecosystem credits: 61 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	0 - 5 ha

Total area of Vegetation zone(s) included in this group: 7.4 ha

Group 9 : Ecosystem credits: 4945 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 452.8 ha

Group 10 : Ecosystem credits: 68 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	0 - 5 ha

Total area of Vegetation zone(s) included in this group: 8.4 ha

Group 11 : Ecosystem credits: 1153 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 106 ha

Group 12 : Ecosystem credits: 66 credits



CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Swamp Oak forest of the central Hunter Valley, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 5.7 ha

Group 13 : Ecosystem credits: 3 credits

CMA	Hunter/Central Rivers
CMA Sub-region	Hunter (758)
Vegetation type	Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin
Surrounding vegetation cover class	>70%
Patch size, including low condition	>100 ha

Total area of Vegetation zone(s) included in this group: 0.3 ha



Species Credits

The property is capable of creating species credits for 8 species.

Bynoe's Wattle	<i>Acacia bynoeana</i>
Number of Species Credits capable of being created:	654 Credits
Area of habitat:	109 individuals
Netted Bottle Brush	<i>Callistemon linearifolius</i>
Number of Species Credits capable of being created:	9,558 Credits
Area of habitat:	1593 individuals
Slaty Red Gum	<i>Eucalyptus glaucina</i>
Number of Species Credits capable of being created:	42 Credits
Area of habitat:	7 individuals
Eucalyptus parramattensis subsp. decadens	<i>Eucalyptus parramattensis subsp. decadens</i>
Number of Species Credits capable of being created:	1,248 Credits
Area of habitat:	208 individuals
Small-flower Grevillea	<i>Grevillea parviflora subsp. parviflora</i>
Number of Species Credits capable of being created:	5,562,000 Credits
Area of habitat:	927000 individuals
Green-thighed Frog	<i>Litoria brevipalmata</i>
Number of Species Credits capable of being created:	169 Credits
Area of habitat:	28.2 ha
Square-tailed Kite	<i>Lophoictinia isura</i>
Number of Species Credits capable of being created:	5,194 Credits
Area of habitat:	865.7 ha
Heath Wrinklewort	<i>Rutidosia heterogama</i>
Number of Species Credits capable of being created:	71,958 Credits
Area of habitat:	11993 individuals

Additional Management Actions

The following management actions are required at the property. These actions are in addition to the standard management actions required at the property

Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)	
Eucalyptus parramattensis subsp. decadens	208 individuals
Netted Bottle Brush	1593 individuals



Importance of envtl flows

Eucalyptus parramattensis subsp. decadens 208 individuals

Maintain or reintroduce flow regimes (aquatic flora)

Green-thighed Frog 28.2 ha

Nutrient Control

Netted Bottle Brush 1593 individuals

Cat and/or Fox control

Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532) 1.4 ha

Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532) 5.5 ha

Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591) 0.2 ha

Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591) 0.4 ha

Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591) 1.1 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 0.2 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 0.5 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 0.6 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 5.1 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 35 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 52.9 ha

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) 75 ha

Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605) 7.4 ha

Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605) 54.1 ha

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629) 0.3 ha

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629) 0.8 ha



Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	37.7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	100.9 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	144.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	169.9 ha
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)	0.3 ha
Control feral pigs	
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	1.4 ha
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	5.5 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.2 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.4 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	1.1 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	7.4 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	54.1 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.8 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	37.7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	100.9 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	144.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	169.9 ha



Exclude miscellaneous feral species

Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.2 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.4 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	1.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.2 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.5 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.6 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	5.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	35 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	52.9 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	75 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	7.4 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	54.1 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.8 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	37.7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	100.9 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	144.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	169.9 ha
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)	0.3 ha



Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)

Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	1.4 ha
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	5.5 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.2 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.4 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	1.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.2 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.5 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.6 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	5.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	35 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	52.9 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	75 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	7.4 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	54.1 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.8 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	37.7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	100.9 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	144.3 ha



Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	169.9 ha
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)	0.3 ha



Maintain or reintroduce flow regimes (aquatic flora)

Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	1.4 ha
Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (HU532)	5.5 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.2 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	0.4 ha
Paperbark swamp forest of the coastal lowlands of the North Coast and Sydney Basin (HU591)	1.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.2 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.5 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	0.6 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	5.1 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	35 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	52.9 ha
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)	75 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	7.4 ha
Rough-barked apples grassy open forest on valley flats of the North Coast and Sydney Basin (HU605)	54.1 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.3 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	0.8 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	37.7 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	100.9 ha
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	144.3 ha



Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)	169.9 ha
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)	0.3 ha



Biobanking Credit Report

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

Date of report: 12/02/2010 Time: 09:14 Tool Version: 1.1

Development Details

Proposal ID: 0032/2010/D003

Development Name: HEZ Development Desktop Biobanking Assessment (Development)

Development Location: HEZ Development Desktop Biobanking Assessment (Development)

Development Address:

CMA: Hunter/Central Rivers

Proponent Name:

Proponent Address:

Proponent Phone:

Assessor Name: Darren James

Assessor Address:

Assessor Phone:

Assessor Accreditation Number: 0032

The following information is required to be submitted with this BioBanking Statement (where ticked)

- Local reference data is required for the following vegetation zones
- An Expert Report for the following species
- The minimum number of plots were not entered for the following vegetation zones



Improving or maintaining biodiversity values

The proposal has 1 or more Red Flag areas, as listed below:

Red Flag

Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin

Bynoe's Wattle

Eucalyptus parramattensis subsp. decadens

Green-thighed Frog

Heath Wrinklewort

Netted Bottle Brush

Small-flower Grevillea

Reason

Vegetation type being > 70% cleared; Vegetation type contains an endangered ecological community;

Vegetation type contains an endangered ecological community;

Vegetation type contains an endangered ecological community;

An impact greater than that allowed;

An impact greater than that allowed;

An impact greater than that allowed;

An impact greater than that allowed;

An impact greater than that allowed;

An impact greater than that allowed;

The development does not improve or maintain biodiversity values and a biobanking statement cannot be issued.



Ecosystem Credits

Vegetation Type	Area (ha)	Credits Required	Red Flag
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin [HU544]	0.3	4	No
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin [HU544]	11.3	246	Yes
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin [HU592]	60.7	3,733	Yes
Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin [HU592]	11.9	475	No
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin [HU629]	432.2	28,583	Yes
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin [HU629]	26.8	1,027	No
Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin [HU631]	84.0	1,852	No
Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin [HU657]	17.2	1,090	No

Credit Profiles

Group: 1 Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin

Ecosystem credits: 250 credits

Total area of polygon(s): 11.6 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
<p>Description: Minimum surrounding vegetation cover in which the credits must be obtained.</p> <p>Minimum percent cover: 0%</p>	<p>Description: Minimum area of contiguous vegetation in which credits must be obtained.</p> <p>Minimum area: 0 ha</p>

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)

Barrington
Comboyne Plateau
Ellerston

Veg Type(s)

Bendemeer White Gum - Silvertop Stringybark grassy open forest of hills of the southern Nandewar and North Coast (HU504)
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU544)



Hunter	Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast (HU619)
Hunter/Central Rivers - marine zone	Melaleuca decora low forest of the central Hunter Valley, Sydney Basin (HU564)
Karuah Manning	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517)
Kerrabee	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (HU519)
Liverpool Range	
Macleay Hastings	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Group: 2 Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin

Ecosystem credits: 250 credits

Total area of polygon(s): 11.6 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
<p>Description: Minimum surrounding vegetation cover in which the credits must be obtained.</p> <p>Minimum percent cover: 0%</p>	<p>Description: Minimum area of contiguous vegetation in which credits must be obtained.</p> <p>Minimum area: 0 ha</p>

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Barrington	Bendemeer White Gum - Silvertop Stringybark grassy open forest of hills of the southern Nandewar and North Coast (HU504)
Comboyne Plateau	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU544)
Ellerston	Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast (HU619)
Hunter	Melaleuca decora low forest of the central Hunter Valley, Sydney Basin (HU564)
Hunter/Central Rivers - marine zone	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517)
Karuah Manning	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (HU519)
Kerrabee	
Liverpool Range	
Macleay Hastings	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	



Walcha Plateau
 Wollemi (Part A)
 Wollemi (Part B)
 Wollemi (Part C)
 Wyong
 Yengo

Group: 3 Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin

Ecosystem credits: 3,733 credits

Total area of vegetation(s): 60.7 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
Description: Minimum surrounding vegetation cover in which the credits must be obtained. Minimum percent cover: 30%	Description: Minimum area of contiguous vegetation in which credits must be obtained. Minimum area: 100 ha

3. CMA subregion & vegetation types
 Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592) Parramatta Red Gum - Scribbly Gum heathy woodland on the Tomago sand beds of the southern North Coast (HU593) Rough-barked Apple - Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin (HU600) Scribbly Gum - Red Bloodwood heathy woodland on the coastal plains of the Central Coast, Sydney Basin (HU610) Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin (HU641)

Group: 4 Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin

Ecosystem credits: 475 credits

Total area of vegetation(s): 11.9 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
Description: Minimum surrounding vegetation cover in which the credits must be obtained. Minimum percent cover: 30%	Description: Minimum area of contiguous vegetation in which credits must be obtained. Minimum area: 100 ha



3. CMA subregion & vegetation types

Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)

Hunter

Veg Type(s)

Parramatta Red Gum - Narrow-leaved Apple shrubby woodland on sand near Kurri Kurri in the Hunter Valley, Sydney Basin (HU592)

Parramatta Red Gum - Scribbly Gum heathy woodland on the Tomago sand beds of the southern North Coast (HU593)

Rough-barked Apple - Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin (HU600)

Scribbly Gum - Red Bloodwood heathy woodland on the coastal plains of the Central Coast, Sydney Basin (HU610)

Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin (HU641)

Group: 5 Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin

Ecosystem credits: 28,583 credits

Total area of vegetation(s): 432.2 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
Description: Minimum surrounding vegetation cover in which the credits must be obtained. Minimum percent cover: 30%	Description: Minimum area of contiguous vegetation in which credits must be obtained. Minimum area: 100 ha

3. CMA subregion & vegetation types

Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)

Hunter

Veg Type(s)

Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517)

Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556)

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)

Group: 6 Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin

Ecosystem credits: 1,027 credits

Total area of vegetation(s): 26.8 ha



1. Surrounding vegetation cover	2. Patch size, including low condition
<p>Description: Minimum surrounding vegetation cover in which the credits must be obtained.</p> <p>Minimum percent cover: 30%</p>	<p>Description: Minimum area of contiguous vegetation in which credits must be obtained.</p> <p>Minimum area: 100 ha</p>

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)

Hunter

Veg Type(s)

Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517)

Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556)

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)

Group: 7 Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin

Ecosystem credits: 1,852 credits

Total area of polygon(s): 84 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
<p>Description: Minimum surrounding vegetation cover in which the credits must be obtained.</p> <p>Minimum percent cover: 0%</p>	<p>Description: Minimum area of contiguous vegetation in which credits must be obtained.</p> <p>Minimum area: 0 ha</p>

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)

Barrington

Comboyne Plateau

Ellerston

Hunter

Hunter/Central Rivers - marine zone

Karuah Manning

Kerrabee

Liverpool Range

Macleay Hastings

Mummel Escarpment

Pilliga

Veg Type(s)

Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin (HU631)

Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (HU577)

New England stringybarks - peppermint open forest of the New England Tablelands (HU589)

Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556)

Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU629)

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

Rough-barked Apple - Silvertop Stringybark - Ribbon Gum shrub/grass open forest on hills of the southern Nandewar Bioregion (HU604)



Tomalla	Bendemeer White Gum - Silvertop Stringybark grassy open forest of hills of the southern Nandewar and North Coast (HU504)
Upper Hunter	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU544)
Walcha Plateau	Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast (HU619)
Wollemi (Part A)	Melaleuca decora low forest of the central Hunter Valley, Sydney Basin (HU564)
Wollemi (Part B)	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the gorges and upper Hunter Valley, North Coast (HU517)
Wollemi (Part C)	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (HU519)
Wyong	
Yengo	

Group: 8 Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin

Ecosystem credits: 1,090 credits

Total area of vegetation(s): 17.2 ha

1. Surrounding vegetation cover		2. Patch size, including low condition	
Description:	Minimum surrounding vegetation cover in which the credits must be obtained.	Description:	Minimum area of contiguous vegetation in which credits must be obtained.
	Minimum percent cover: 30%		Minimum area: 100 ha

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the southern Central Coast, Sydney Basin (HU622) Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin (HU641) Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin (HU657)

Species Credits

Species credits are required for 8 species.

Bynoe's Wattle	Acacia bynoeana
Number of species credits required:	9,846
Extent of impact:	128 individuals
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;



Netted Bottle Brush	Callistemon linearifolius
Number of species credits required:	50,400
Extent of impact:	3528 individuals
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;
Slaty Red Gum	Eucalyptus glaucina
Number of species credits required:	271
Extent of impact:	19 individuals
Identification method:	Survey
Impact on red flag area?	No
Reason for red flag area:	
Eucalyptus parramattensis subsp. decadens	Eucalyptus parramattensis subsp. decadens
Number of species credits required:	21,771
Extent of impact:	1524 individuals
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;
Small-flower Grevillea	Grevillea parviflora subsp. parviflora
Number of species credits required:	12,705,882
Extent of impact:	864000 individuals
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;
Green-thighed Frog	Litoria brevipalmata
Number of species credits required:	154
Extent of impact:	2 ha
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;
Square-tailed Kite	Lophoictinia isura
Number of species credits required:	9,936
Extent of impact:	725.35 ha
Identification method:	Survey
Impact on red flag area?	No
Reason for red flag area:	
Heath Wrinklewort	Rutidosia heterogama
Number of species credits required:	221,062
Extent of impact:	14369 individuals
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed;

