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DRAFT

Glenning Valley Improve or Maintain Assessment

Indicative Biocertification Calculations

Prepared for
Glenning Valley Partnership Pty Ltd

27 January 2011

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PREPARED FOR	**Glenning Valley Partnership Pty Ltd**
PROJECT NO	**10SUTENV-0032**
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Abbreviations

ABBREVIATION	DESCRIPTION
APZ	Asset Protection Zone
Assessment Methodology	Draft Biocertification Assessment Methodology
Biobanking	Biodiversity Banking
Biocertification	Biodiversity Certification
CMA Region	Catchment Management Authority Region
Credit Calculator	BioBanking Credit Calculator
DECC	NSW Department of Environment and Climate Change (now DECCW)
DECCW	NSW Department of Environment, Climate Change and Water (formerly DECC)
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts
DSNR	former NSW Department of Sustainable Natural Resources
EA Report	Environmental Assessment Report
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*
EP&A Act	NSW *Environmental Planning and Assessment Act, 1979*
LGA	Local Government Area
Methodology	Biodiversity Certification Methodology
Operational Manual	*BioBanking Assessment Methodology and Credit Calculator Operational Manual*
TSC Act	NSW *Threatened Species Conservation Act, 1995*

1 Introduction

Travers Bushfire and Ecology has prepared an environmental assessment on behalf of Glenning Valley Partnership Pty Ltd for a proposed rezoning at Glenning Valley in the Wyong LGA on the NSW Central Coast (Travers Bushfire and Ecology 2010). The proposed rezoning will result in the loss of 28.7 hectares of 3 vegetation types, and habitat for a range of threatened fauna, and includes a conservation area of 14.5 hectares. Following discussions with Wyong Council and the Department of Environment, Climate Change and Water (DECCW) in November 2010, the proponent has been requested to provide further information regarding whether the proposed rezoning will "improve or maintain" environmental values (John Travers, Travers Bushfire and Ecology, pers. comm.).

Eco Logical Australia (ELA) have been commissioned by Glenning Valley Partnership Pty Ltd to undertake this assessment given ELAs experience with the improve or maintain methodology in the NSW Biobanking Scheme, and trails undertaken for the DECCW and Wyong Council using the Biocertification methodology.

This Biocertification Methodology is being developed to determine if Biocertification proposals meet the 'Improve or Maintain' (IoM) test. While the methodology is currently in draft form, it is understood that major changes to the final methodology are unlikely, and therefore the results contained within this report are not likely to change significantly. From discussions with DECCW, ELA believe that final approval of the methodology will occur in early 2011.

ELA have conducted the Biocertification Assessment using field data collected by Travers Bushfire and Ecology (Travers Bushfire and Ecology, 2010). ELA has not visited the site to prepare this indicative assessment. Data provided by Travers Bushfire and Ecology includes:

- Vegetation type and condition mapping;
- Vegetation plots undertaken using the Biometric method;
- Threatened species survey results;
- Development footprint details.

This report has been prepared to provide details of the assessment, and includes:

- Conversion of vegetation types mapped to Biometric vegetation types required by the assessment methodology;
- Calculation of the credits required for the proposed rezoning and credits generated by the proposed conservation area;
- Estimates of the area of offset required to meet the Improve or Maintain principles under the draft methodology;
- Identification of red-flag areas.

1.1 STUDY SITE

The study site lies within the Wyong Local Government Area (LGA) on the NSW Central Coast (Figure 1). The site is approximately 53.0 hectares in size, and is bounded by Berkeley Road in the south and Bundeena Road in the east. Enterprise Drive lies 100m to the north of the site, with the F3 Freeway is 3 kilometres to the west of the site. Tuggerah Lake is approximately 1 kilometre to the east of the study site.

1.2 THE PROPOSAL

The current zoning of the site is part 7(a) Conservation Zone, 7(f) Environmental Protection Zone and 7(g) Wetlands Management Zone. The proposed rezoning of the site includes the conversion of the existing zonings into Part R2 (Low Density Residential) and part E3 (Environmental Management Zone). In total the proposed rezoning includes 38.5 hectares of development land and Asset Protection Zone (APZ) areas and 14.5 hectares of conservation land.

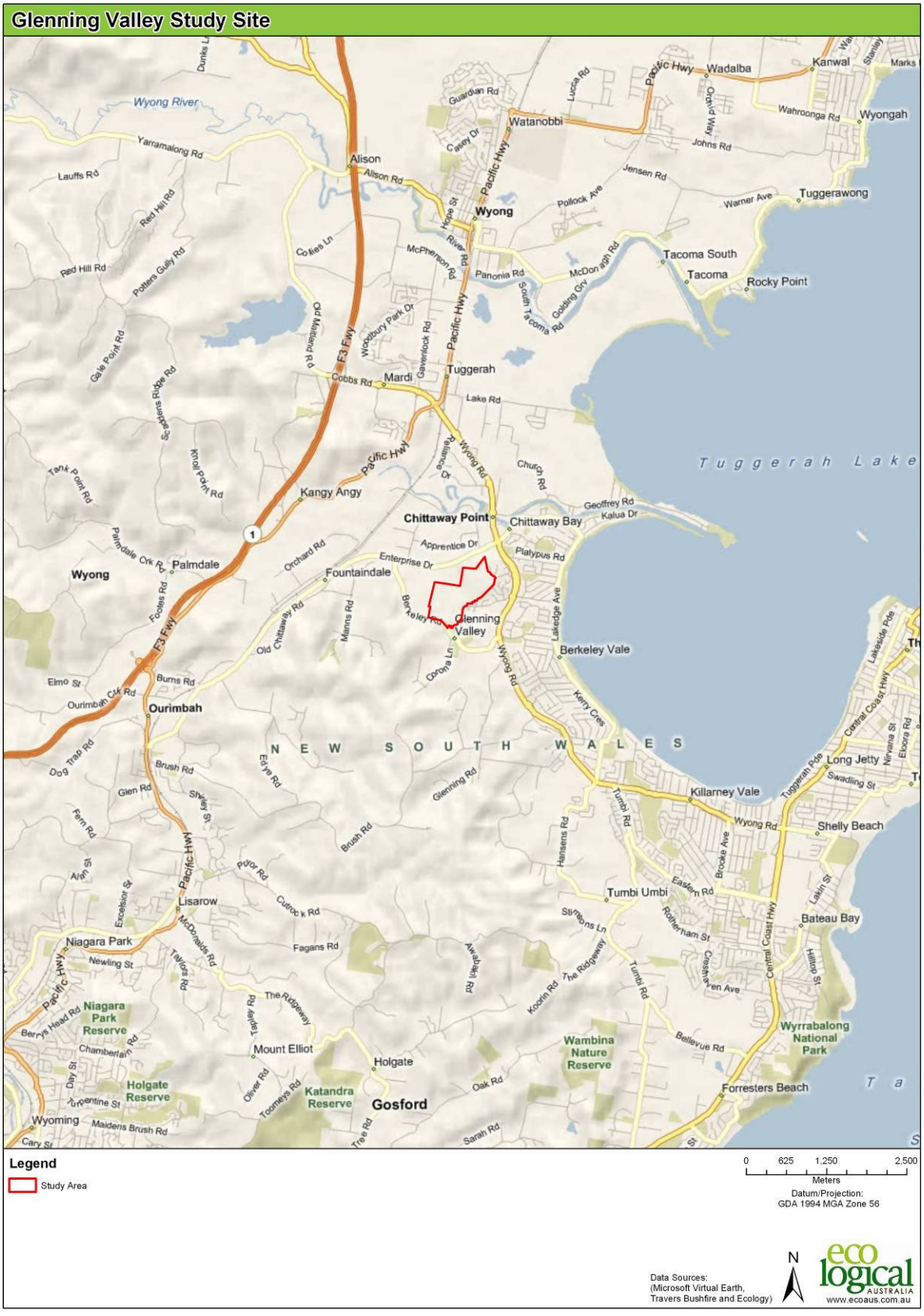

Figure 1: Study Area

2 Biocertification Assessment

2.1 DEVELOPMENT SCENARIO

The Glenning Valley proposal includes a new area for residential zoned land, providing additional residential development opportunities on the Central Coast. The residential footprint has been designed to reduce impacts to areas of high biodiversity values (endangered ecological communities- termed "red flagged" vegetation in the Biocertification methodology) within the study area, and also on the adjacent SEPP 14 wetland. The area set aside for conservation on site consists of the high biodiversity value vegetation type Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions Endangered Ecological Community (EEC), and adjacent Blackbutt vegetation.

In total, 32.8 hectares of developable area is identified within the study area, with an additional 5.6 hectares to be impacted by the proposed APZ (Table 1 and Figure 2). 14.6 hectares of conservation lands are proposed within the certification boundary. This land has been set aside to protect the majority of the EEC found on site

Finally, 0.09 hectares of the study site has been assigned a 'neutral' footprint tag for this assessment. This area contains *Melaleuca biconvexa* a species listed as vulnerable on the *NSW Threatened Species Act* and federal *Environmental Protection and Biodiversity Conservation Act* and is adjacent to an existing dam. Due to the presence of this species on site, the proposed development will avoid this area, with the land set aside into an open space zoning (or equivalent). While not directly managed for conservation, the area will also not be cleared and therefore there will be no impact on the *Melaleuca biconvexa*.

Table 1: Development footprint

Development Footprint	Area (ha)
Development	32.9
APZ	5.6
Conservation	14.5
Neutral	0.09
Total	**53.1**

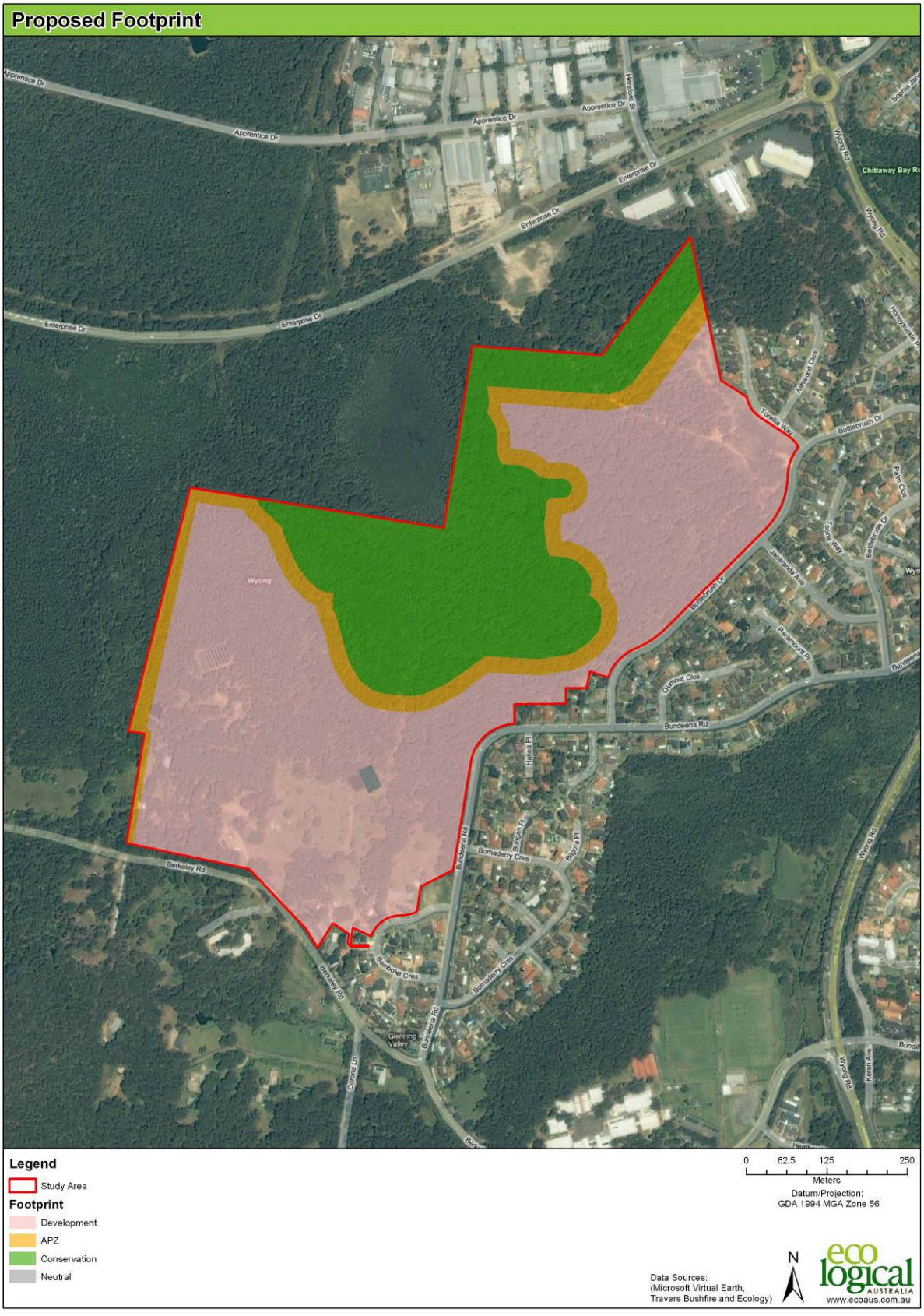

Figure 2: Proposed Footprint

2.2 VEGETATION MAPPING AND ZONES

In total, across the entire site, Travers Bushfire and Ecology identified three vegetation types, with areas of non-native vegetation (pine plantation, roads and cleared land) also identified (Travers Bushfire and Ecology, 2010). ELA further refined the vegetation mapping through on-screen digitsing using more recent aerial photos, and converted the vegetation mapped into biometric vegetation types.

Three Biometric vegetation types were identified within three vegetation classes (Table 2). In total 42.4 hectares of native vegetation was mapped across the site, with the dominant vegetation type being Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin (making up 32.5 hectares of the 42.4 hectares of native vegetation on site).

In addition to the native vegetation mapped on site, non-native vegetation was also mapped, including 4.9 hectares of pine forest, 0.1 hectares of dams and 5.7 hectares of cleared land. Areas of Pine Forest were excluded from the assessment of development areas (as it has been assumed they are cleared) however they have been included in the assessment of conservation areas as these lands will be rehabilitated and will therefore generate credits.

Table 2: Area of vegetation within study area

Travers Bushfire and Ecology Vegetation Type	Biometric Vegetation Type	Vegetation Class	Vegetation Formation	Area (ha)
Blackbutt Open Forest	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby subformation)	32.5
Apple/Mahogany Woodland	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Coastal Floodplain Wetlands	Forested Wetlands	0.4
Swamp Mahogany Open Woodland	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Coastal Swamp Forests	Forested Wetlands	9.5
Disturbed Pine Forest	Disturbed Pine Forest	N/A	N/A	4.9
N/A	Dam	N/A	N/A	0.1
N/A	Cleared	N/A	N/A	5.7
Total	**N/A**	**N/A**	**N/A**	**53.1**

The three vegetation types have been separated into 7 vegetation zones for this assessment. A small area of Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin in low condition has been incorporated into the moderate condition zone for the same vegetation type, in accordance with the draft methodology, due to the fact that less than 0.25 hectares exist on site. In addition, the area of Pine Forest has been included as a vegetation type within the conservation area (as Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin) as this area will be rehabilitated.

The zones have been separated by condition, and include the following:

- Low- low condition vegetation meeting the definition of low under the Biocertification methodology;
- Scattered trees- highly disturbed areas through former clearing and agricultural activities;
- Moderate- area with some disturbance (former clearing) and exotic species dominating ground cover;

- Good- best examples of native vegetation on site.

Table 3 and Figure 3 outlines the area of each vegetation zone within conservation, development and 'neutral' lands. In total 14.5 hectares is to be conserved, including 13.7 hectares of existing native vegetation and 0.8 hectares of pine forest. 28.7 hectares of native vegetation is within the 32.9 hectare development footprint, with a further 0.1 hectares of vegetation within the neutral lands.

Table 3: Area of vegetation zones within the study area

			Area (ha)			
Veg Zone ID	**Biometric Vegetation Type**	**Condition**	**Conservation**	**Development (including APZ)**	**Neutral**	**Total**
1	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Pine Forest	0.8	0.0	0.0	0.8
2	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Scattered Trees	0.0	3.5	0.0	3.5
3	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Good	5.2	23.8	0.1	29.1
4*	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Moderate	0.0	0.4	0.0	0.4
5	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Low	0.6	0.5	0.0	1.1
6	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Moderate	1.3	0.5	0.0	1.8
7	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Good	6.8	0.0	0.0	6.8
Total	**N/A**	**N/A**	**14.7**	**28.7**	**0.1**	**43.5**

* Includes 0.14 hectares of Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin in low condition. This was included as it is too small to form its own vegetation zone.

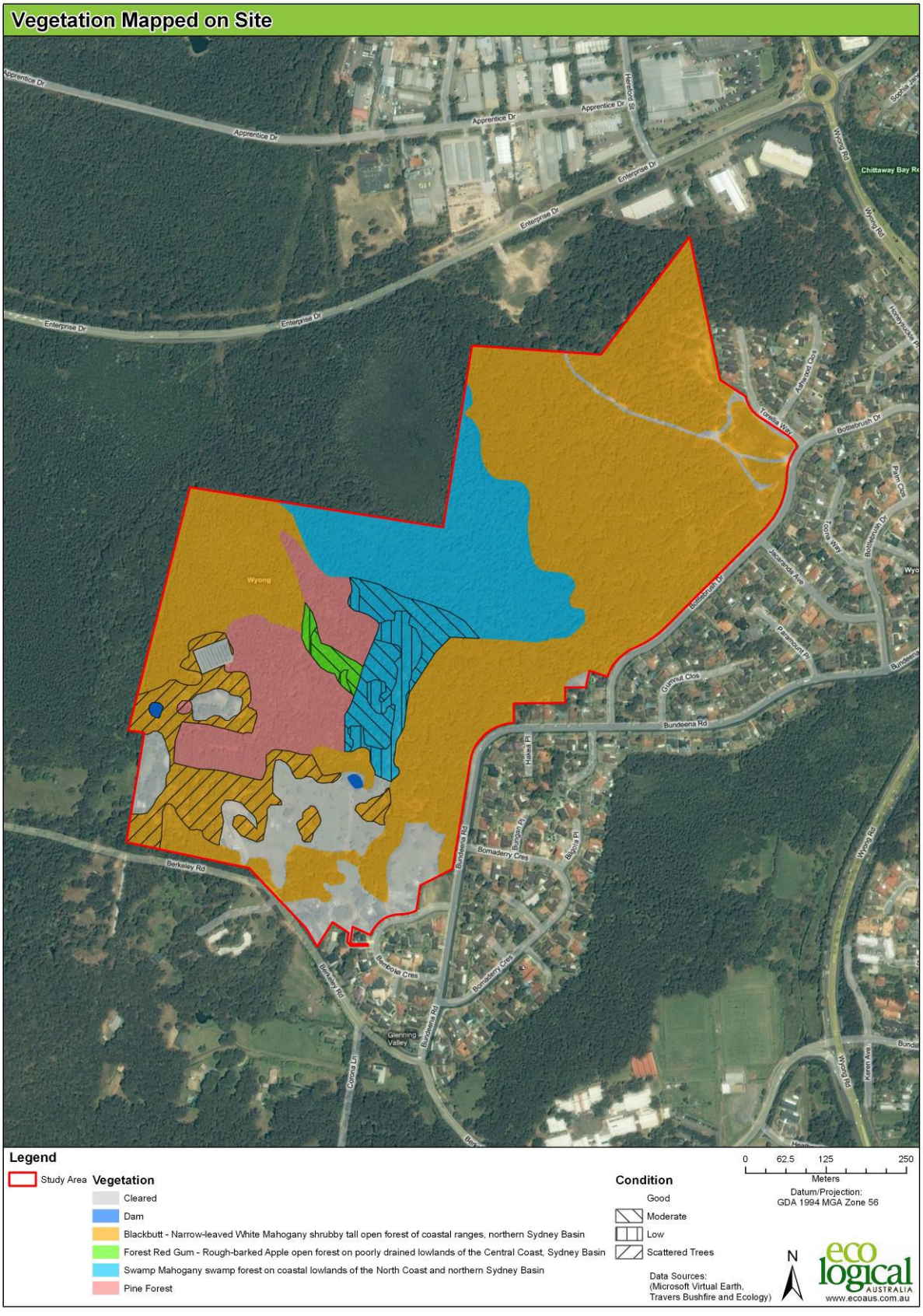

Figure 3: Vegetation mapped on site

2.3 LANDSCAPE TG VALUES

Landscape Tg values are required to calculate ecosystem credits using the Biocertification Methodology. The Landscape Tg values are generated for each vegetation type by averaging the Tg values of all species predicted to occur in each vegetation type within the study site.

ELA calculated the Landscape Tg value for each vegetation type within the study areas using the Biobanking Credit Calculator to determine which species were predicted in each vegetation type. The Tg values for these species were then averaged to calculate the Landscape Tg. The table below provides details of the landscape Tg score used for each vegetation type assessed. Appendix 1 provides more detail.

Table 4: Landscape Tg assigned to each vegetation type

Vegetation Type	Landscape Tg
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	0.53
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	0.56
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	0.56

2.4 PLOTS AND SITE VALUE SCORES

Biometric plot data was collected across the site to calculate site value scores for each of the vegetation zones mapped (Appendix 2). In order to calculate current and future site value scores for development, APZ and conservation areas for each vegetation zone, the plot data was entered into the Biobanking Credit Calculator. The calculator, while not designed specifically for use in Biocertification Assessments, calculates site value using the same method, and can therefore be use for this part of Biocertification Assessments.

A total of 33 plots were collected on site (Travers Bushfire and Ecology 2010), however only 23 plots were used to determine site value scores as several plots were undertaken on the boundary of two vegetation types, making the data unreliable for the generation of site value (Figure 4, Table 5 and Table 6). While the methodology is currently still a draft, it is anticipated that the number of plots collected will be adequate for the assessment.

Table 5: Vegetation zones and plots

Veg Zone ID	Biometric Vegetation Type	Condition	Area	No. of Plots
1	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Pine Forest	0.8	2
2	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Scattered Trees	3.5	2
3	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Good	29.1	10
4	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Moderate	0.4	1

Veg Zone ID	Biometric Vegetation Type	Condition	Area	No. of Plots
5	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Low	1.1	1
6	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Moderate	1.8	1
7	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Good	6.8	6
Total	**N/A**	**N/A**	**43.5**	**23**

Table 6: Site value scores allocated to each vegetation zone

Veg Zone ID	Biometric Vegetation Type	Condition	Current Site Value Score	Future Site Value Score (Conservation)	Future Site Value Score (Development)	Future Site Value Score (APZ)
1	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Pine Forest	33	48	N/A	N/A
2	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Scattered Trees	33	N/A	0	10
3	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Good	86	100	0	23
4	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Moderate	58	N/A	0	10
5	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Low	60	78	0	11
6	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Moderate	68	91	0	13
7	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Good	81	96	0	N/A

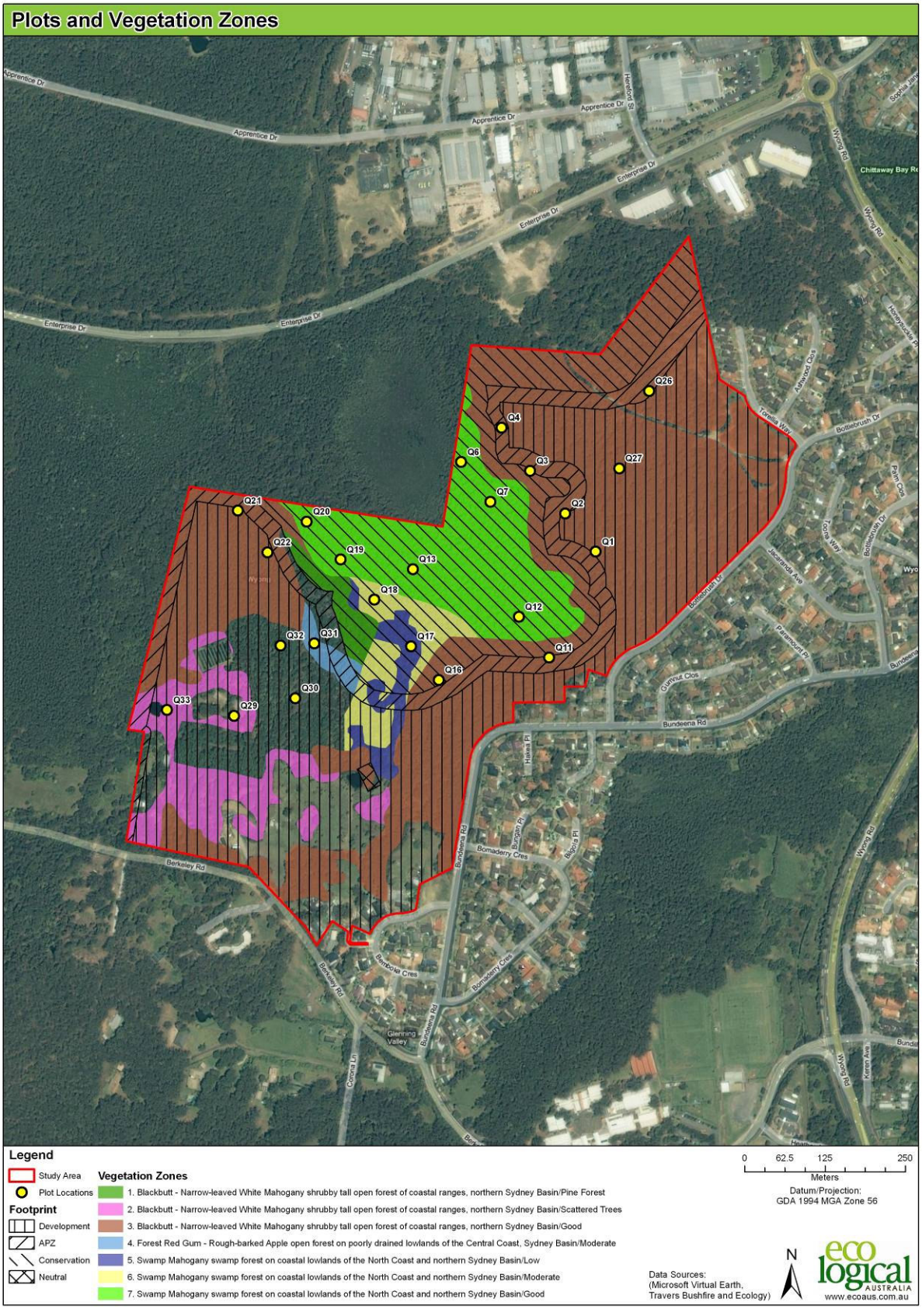

Figure 4: Plots and Vegetation Zones

2.5 LANDSCAPE SCORE

2.5.1 Native Cover in Landscape

Native vegetation cover within an assessment circle was calculated for the project. The landscape score calculations were completed with a 1,000ha circle, therefore a scaling factor of 1.00 was used in the assessment. The results of the circle assessment are contained in Table 7. A pre development score of 17.0 was allocated, with a post development score of 15 assigned.

Table 7: Native vegetation in assessment circle

	BEFORE DEVELOPMENT		AFTER DEVELOPMENT	
Circle	**Area of Vegetation Within Assessment Circle (ha)**	**Native Vegetation Cover Class (%)**	**Area of Vegetation Within Assessment Circle (ha)**	**Native Vegetation Cover Class (%)**
1 (1,000 ha)	502	51-60%	463	41-50%

2.5.2 Connectivity Value

The current connectivity value of the site was assessed according to Section 3.6.3 of the draft methodology. Firstly, any drainage lines on site were considered to determine if the riparian lines on site are a State, Regional or Local biodiversity link. The site was found to contain no mapped drainage lines within the 1:25,000 state-wide topographic mapping.

Vegetation connectivity was also assessed. It was determined that as the vegetation is in moderate/good condition, is greater than 30ha and has a width greater than 30m the site classifies as a local biodiversity link. This will result in a connectivity score (pre certification) of 6 points.

The connectivity (post certification) was also assessed. Over 14 hectares of vegetation are to be protected within conservation areas, contiguous with areas of native vegetation off site. Therefore, using Table 3 from the draft methodology, a post certification score of 6 points has been allocated for this assessment as the vegetation remaining will be in moderate/good condition, greater than 30ha and have a width greater than 30m the site classifies as a local biodiversity link.

2.5.3 Adjacent Remnant Area

The maximum adjacent remnant area (ARA) was calculated for the proposal in order to determine the score to be allocated for this measure. The site predominantly occurs on the Sydney-Newcastle Coastal Alluvial Plains Mitchell Landscape, which is 62% cleared. The vegetation on site is well connected, and as such has a maximum ARA of 501 hectares. The score allocated, therefore, is 10 points.

2.6 THREATENED SPECIES ASSESSMENT

Travers Bushfire and Ecology conducted comprehensive threatened species surveys on site (Travers Bushfire and Ecology 2010). Several threatened flora and fauna species were recorded on site, with many of the fauna species classified as 'ecosystem' species and therefore not requiring individual species credit calculations (Table 8). The species requiring survey under the Biocertification Methodology are provided in Appendix 3.

Table 8: Threatened species identified within the study area

Species Name	Common Name	Credit Type
Ninox strenua	Powerful Owl	Ecosystem
Pteropus poliocephalus	Grey-headed Flying-fox	Ecosystem
Micronomus norfolkensis	East-coast Freetail Bat	Ecosystem
Miniopterus orianae oceanensis	Eastern Bentwing-bat	Ecosystem
Miniopterus australis	Little Bentwing-bat	Ecosystem
Melaleuca biconvexa	N/A	Species

One species requiring species credits was identified on site, being *Melaleuca biconvexa* (Travers Bushfire and Ecology 2010). The species was located in two areas on the study site, one in the south-western corner of the site, the other in the central part of the site, adjacent to a dam (Figure 5). The exact number of individuals located on the site is to be confirmed shortly by Travers Bushfire and Ecology.

The individuals recorded at 'A' appear to be planted along a driveway, and therefore have been determined not to require species credits although they are being impacted by the proposed development. The individuals at location 'B' fall within a 'neutral' zone, and will therefore not be impacted. This area is likely to become an open space zone (or similar) which, while not directly managed for conservation, will also not be cleared. Therefore these individuals will neither require or generate credits as part of this assessment.

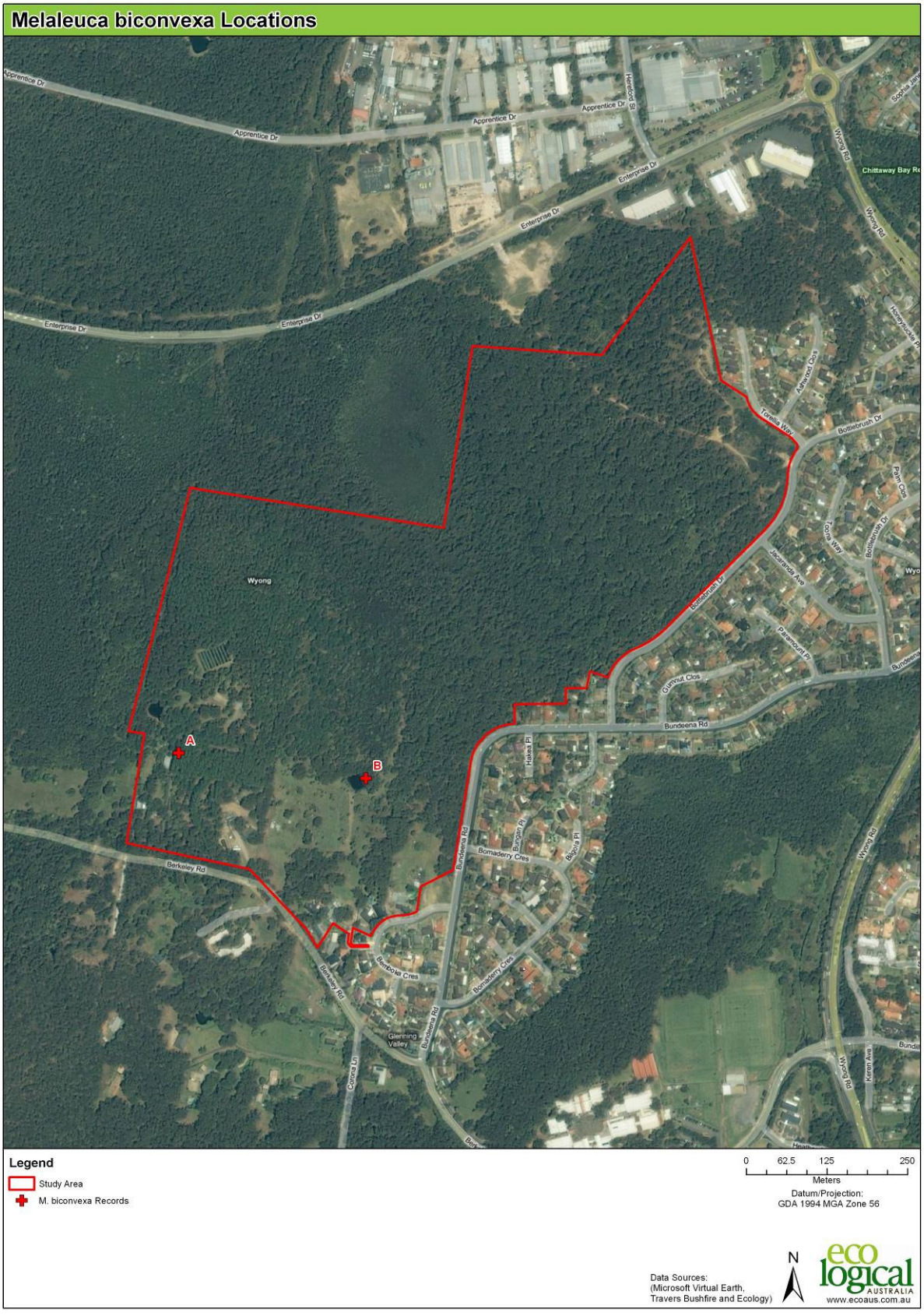

Figure 5: *Melaleuca biconvexa* locations

2.7 RED FLAGS

Several red flags are present within the development and APZ footprint.

In total, 0.8 hectares of red flagged vegetation is impacted by the development (Table 9 and Figure 6). This includes impacts on one Endangered Ecological Community (EEC), being Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin vegetation type) and one vegetation type >70% cleared (Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin).

The condition of the red flagged vegetation is 'moderate' for both vegetation types. No other Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin is present on site, while a further 8.6 hectares of Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin is present within the proposed conservation area and significantly more in the adjacent SEPP14 wetland.

Table 9: Red flagged vegetation

Biometric Vegetation Type	Red Flag	Reason	Area in Development (ha)	Area in APZ (ha)	Total (ha)
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin vegetation type	Yes	EEC	0.4	0.1	0.5
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Yes	>70% Cleared	0.15	0.15	0.3
Total	**N/A**	**N/A**	**0.55**	**0.25**	**0.8**

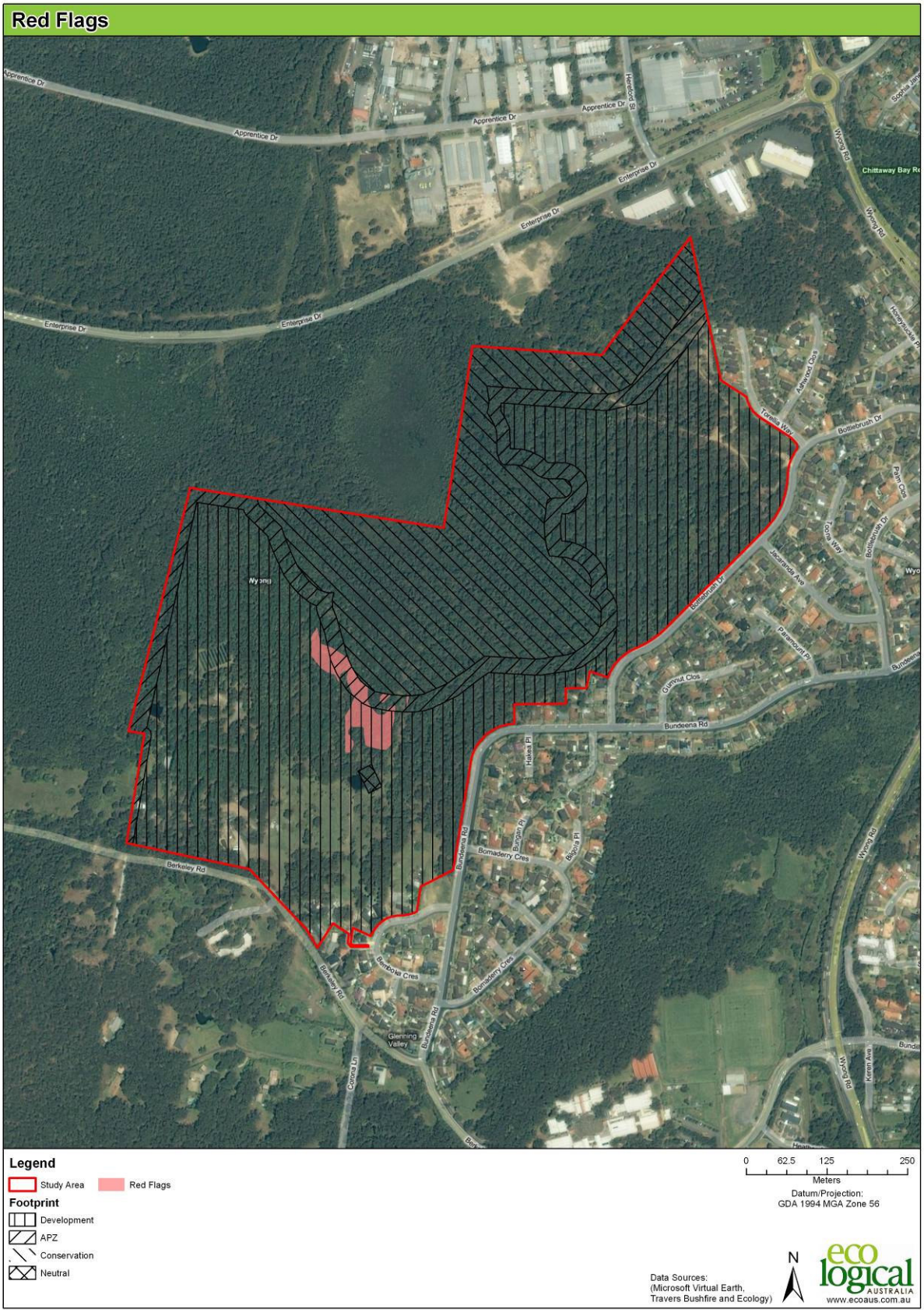

Figure 6: Red Flags

2.8 CREDIT CALCULATIONS

Credit calculations have been completed for ecosystem and species credits.

2.8.1 Ecosystem Credits

Ecosystem credits have been calculated for the impact caused by the proposed development and for the area identified for conservation. As differing levels of conservation security and funding generate different credit amounts, and as the final management requirements for the conservation lands have not yet been determined, the credit calculations have been performed for all offsetting options.

In total, 1,098 credits are required for the land proposed to be developed (Table 10), with the largest number of credits required by the Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin community (1,057 credits). This is followed by Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin (30 credits) and Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin (11 credits).

When assessing the conservation areas, three credit amounts are generated depending on the final management, security and funding of the offset area as described in section 7 of the draft methodology. In total, should the conservation lands be set aside in a funded/managed offset, 119 credits will be generated, while a managed offset will generate 107 credits. As the land is currently zoned Environmental Protection, a planning scheme does not satisfy the offsetting requirements of the methodology, and would therefore generate 0 credits.

The proposed conservation area therefore does not meet the improve or maintain test and an additional 979-1,098 credits are required.

Table 10: Final ecosystem credit results

Vegetation type name	Credits Required	Total credits created as funded/managed offset (100% Credit Allocation)	Total credits created as managed offset (90% Credit Allocation)	Total credits created as planning scheme offset (25% Credit Allocation)*
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	1,057	47	42	0
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	11	0	0	0
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	30	73	66	0
Total	**1,098**	**119**	**107**	**0**

* As the site is already zoned Environmental Protection, a planning scheme offset on-site will not generate credits.

2.8.2 Species Credits

As the *Melaleuca biconvex* individuals are either planted (Population A), or within a neutral zoning (Population B), species credits are not required or generated by this proposal.

2.9 CREDIT PROFILES

A credit profile is the set of attributes that are used to characterise ecosystem or species credits. The credit profile forms part of the rules for using ecosystem credits to offset the impacts on land proposed to be Biocertified. The rules ensure that the vegetation impacted by the land proposed for Biocertification is offset within the same vegetation formation, is at least as cleared as the vegetation being impacted and contains the same predicted threatened species impacted by the proposal.

The credit profile for ecosystem credits is made up of three main components, being:

1) The offset must be achieved within a CMA subregion which contains the same predicted threatened species impacted;

2) The offset must be achieved within vegetation types which contain the same predicted threatened species impacted AND have a percent cleared value equal to or greater than the vegetation type being cleared; and

3) The offset area class must be the same, or better, than the offset area class impacted.

Table 11 provides the credit profile details for each of the vegetation types impacted by the proposal. One vegetation type impacted can be offset within two vegetation types and CMAs (Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin), whilst the other vegetation types are limited to only being offset with the same vegetation type as being impacted (Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin and Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin).

Table 11: Credit profile

Vegetation type name	% Cleared in HCR CMA	Vegetation Class	Offset Area Class	CMA Subregions Able to Receive Offset	Vegetation Types Able to Receive Offset
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	20%	North Coast Wet Sclerophyll Forests	Class 1	**Hunter Central Rivers CMA** Karuah Manning Wyong Macleay Hastings	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	75%	Coastal Floodplain Wetlands	Class 1	**Hunter Central Rivers CMA** Karuah Manning Wyong	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	60%	Coastal Swamp Forests	Class 1	**Hunter Central Rivers CMA** Karuah Manning Wyong	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin

2.10 ADDITIONAL OFFSET REQUIRED

As the proposal is in credit deficit it will require off-site offsets in order to pass the improve or maintain test under the Biocertification methodology. The final size of the off-site offset will be determined by the management of both the on-site and off-site offset. Under the methodology different levels of offset security, management and funding generate differing levels of credits, including:

- Funded and managed offsets, such as Biobank sites or transfer to National Park- 100% credit generation.
- Permanently managed offsets, such as conservation agreements, trust agreements and in perpetuity Property Vegetation Plans (PVPs)- 90% credit generation (i.e. offset is required to be 10% larger).
- Planning scheme offsets, such as E2 zoned land- 25% credit generation (i.e. offset is required to be 4 times larger). Can only be used if land is not currently zoned Environmental Protection.

The additional offset required, under each scenario, is outlined in Table 12.

Should only planning scheme offsets be used, such as an E2 zoning, a large off-site offset will be required, totalling 550 hectares. This includes 529 hectares for Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin, 6 hectares for Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin and 15 hectares for Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin.

Should only managed offsets be used to offset the proposed development, an offset in the order of 142 hectares will be required. This includes 140 hectares for Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin and 2 hectares of Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin. Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin would be in credit surplus and therefore have no off-site offset requirement.

Finally, should a funded and managed offset be used an offset in the order of 127 hectares will be required. This includes 126 hectares for Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin and 1 hectare of Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin. Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin would be in credit surplus and therefore have no off-site offset requirement.

Table 12: Additional offset required for ecosystem credits

On Site Offset Management	Vegetation Type	Off Site Offset Management- Additional Offset Required (ha*)		
		Planning Scheme Offset	Managed Offset	Funded and Managed Offset
Planning Scheme Offset	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	529	144	131
	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	6	2	1
	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	15	2	2
	Total	**550**	**148**	**134**
Managed Offset	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	508	140	127
	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	6	2	1
	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	0	0	0
	Total	**514**	**142**	**128**
Funded and Managed Offset	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	505	139	126
	Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	6	2	1
	Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	0	0	0
	Total	**511**	**141**	**127**

*Assumes 8 credits per hectare are generated at the offset site in moderate to good condition

3 References

DECC (2008a) Biobanking Assessment Methodology. NSW Department of Environment and Climate Change, Sydney.

DECC (2008b) Threatened Species Profile Database (TSPD). NSW Department of Environment and Climate Change, Sydney. http://www.environment.nsw.gov.au/biobanking/biobankingtspd.htm

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

DECCW (2010) Draft Biodiversity Biocertification Assessment Methodology. NSW Department of Environment, Climate Change and Water, Sydney.

Travers Bushfire and Ecology (2010) Ecological Constraints Analysis- Bundeena Road Glenning Valley (REF: A10031F).

Glossary of Biobanking & Biocertification Terminology

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

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 (≤100m for woody vegetation and ≤30m 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.

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.

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.

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.

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.

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

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, the assessment of indirect impacts of the development, and the assessment of the direct impacts of the development.

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 (biobanking) 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.

low-condition vegetation (biocertification) Woody native vegetation with native over-storey percent foliage cover less than 50% 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**.**

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.

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.

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 (≤100m from for woody vegetation and ≤30m 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 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.

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 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.

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.

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 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 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).

zone *see* **vegetation zone**.

Appendix 1

LANDSCAPE TG VALUE

Veg Type Name	CommonName	ScientificName	Tg
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	0.75
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Eastern False Pipistrelle	Falsistrellus tasmaniensis	0.45
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Eastern Freetail-bat	Mormopterus norfolkensis	0.45
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Eastern Pygmy-possum	Cercartetus nanus	0.5
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Glossy Black-cockatoo	Calyptorhynchus lathami	0.55
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Golden-tipped Bat	Kerivoula papuensis	0.38
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Greater Broad-nosed Bat	Scoteanax rueppellii	0.45
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Grey-headed Flying-fox	Pteropus poliocephalus	0.93
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Koala	Phascolarctos cinereus	0.83
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Large-footed Myotis	Myotis adversus	0.38
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Little Bentwing-bat	Miniopterus australis	0.75
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Long-nosed Potoroo	Potorous tridactylus	0.75
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Masked Owl	Tyto novaehollandiae	0.33
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Powerful Owl	Ninox strenua	0.33

Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Regent Honeyeater	Xanthomyza phrygia	0.75
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Spotted-tailed Quoll	Dasyurus maculatus	0.35
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Squirrel Glider	Petaurus norfolcensis	0.45
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Stephens' Banded Snake	Hoplocephalus stephensii	0.3
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Swift Parrot	Lathamus discolor	0.6
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Yellow-bellied Glider	Petaurus australis	0.43
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin	Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	0.45
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin			0.531428571
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	0.5
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Bush Stone-curlew	Burhinus grallarius	0.38
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	0.75
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Eastern False Pipistrelle	Falsistrellus tasmaniensis	0.45
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Eastern Freetail-bat	Mormopterus norfolkensis	0.45
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Eastern Pygmy-possum	Cercartetus nanus	0.5
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Glossy Black-cockatoo	Calyptorhynchus lathami	0.55
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Golden-tipped Bat	Kerivoula papuensis	0.38
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Greater Broad-nosed Bat	Scoteanax rueppellii	0.45
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Grey-headed Flying-fox	Pteropus poliocephalus	0.93
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Koala	Phascolarctos cinereus	0.83
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Large-footed Myotis	Myotis adversus	0.38
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Little Bentwing-bat	Miniopterus australis	0.75

Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Long-nosed Potoroo	Potorous tridactylus	0.75
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Regent Honeyeater	Xanthomyza phrygia	0.75
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Rose-crowned Fruit-dove	Ptilinopus regina	0.75
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Spotted-tailed Quoll	Dasyurus maculatus	0.35
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Squirrel Glider	Petaurus norfolcensis	0.45
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Stephens' Banded Snake	Hoplocephalus stephensii	0.3
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Superb Fruit-dove	Ptilinopus superbus	0.75
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Swift Parrot	Lathamus discolor	0.6
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Yellow-bellied Glider	Petaurus australis	0.43
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin	Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	0.45
Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin			0.56
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	0.5
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Bush Stone-curlew	Burhinus grallarius	0.38
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Eastern False Pipistrelle	Falsistrellus tasmaniensis	0.45
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Eastern Freetail-bat	Mormopterus norfolkensis	0.45
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Eastern Pygmy-possum	Cercartetus nanus	0.5
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Glossy Black-cockatoo	Calyptorhynchus lathami	0.55
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Golden-tipped Bat	Kerivoula papuensis	0.38
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Greater Broad-nosed Bat	Scoteanax rueppellii	0.45
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Grey-headed Flying-fox	Pteropus poliocephalus	0.93

Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Koala	Phascolarctos cinereus	0.83
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Large-footed Myotis	Myotis adversus	0.38
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Little Bentwing-bat	Miniopterus australis	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Long-nosed Potoroo	Potorous tridactylus	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Regent Honeyeater	Xanthomyza phrygia	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Rose-crowned Fruit-dove	Ptilinopus regina	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Spotted-tailed Quoll	Dasyurus maculatus	0.35
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Squirrel Glider	Petaurus norfolcensis	0.45
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Stephens' Banded Snake	Hoplocephalus stephensii	0.3
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Superb Fruit-dove	Ptilinopus superbus	0.75
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Swift Parrot	Lathamus discolor	0.6
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Yellow-bellied Glider	Petaurus australis	0.43
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin	Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	0.45
Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin			0.56

Appendix 2

PLOT DATA

Vegetation Zone 1

Vegetation Type- Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin **Ancillary Code-** Pine Forest

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q30	8	8	0	5	1	8	65	0	1	7
Q32	23	8	12	10	1	15	40	0	1	2

Vegetation Zone 2

Vegetation Type- Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin **Ancillary Code-** Scattered Trees

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q29	24	10	8	70	1	10	19	0	1	0
Q33	25	15	4	70	2	15	10	0	1	0

Vegetation Zone 3

Vegetation Type- Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin **Ancillary Code-** Good

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q1	28	35	35	5	1	60	3	2	1	12
Q2	27	30	30	3	8	30	0	3	1	18
Q3	32	25	35	15	10	20	1	1	1	5
Q4	33	26	40	10	10	20	1	0	1	7
Q11	32	20	40	3	8	35	0	2	1	6
Q16	41	43	35	20	10	35	0	1	1	11
Q21	39	31	20	40	5	25	18	0	1	2
Q22	31	30	25	30	10	50	10	0	1	0
Q26	40	29	20	60	20	15	1	2	1	1
Q27	38	29	25	8	35	15	0	2	1	1

Vegetation Zone 4

Vegetation Type- Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin **Ancillary Code-** Moderate

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q31	34	18	30	30	3	20	16	0	1	0

Vegetation Zone 5

Vegetation Type- Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin **Ancillary Code-** Low

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q17	20	5	15	8	2	8	80	0	1	7

Vegetation Zone 6

Vegetation Type- Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin **Ancillary Code-** Moderate

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q18	18	5	25	20	2	40	25	0	1	13

Vegetation Zone 7

Vegetation Type- Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin **Ancillary Code-** Good

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Q6	21	15	35	1	0	85	0	3	1	30
Q7	20	9	40	1	0	90	0	2	1	6
Q12	18	13	30	2	0	80	0	1	1	4
Q13	36	20	50	15	8	65	0	2	1	3
Q19	20	21	30	30	2	60	0	1	1	4
Q20	17	14	15	5	0	75	0	3	1	10

Appendix 3

SPECIES REQUIRING SURVEY

The following species were identified by the Biobanking credit calculator as requiring survey.

		Survey Months											
Common Name	**Species Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Adam's emerald dragonfly	Archaeophya adamsi												
Dense Cord-rush	Baloskion longipes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wallum Froglet	Crinia tinnula	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				Yes
Leafless Tongue Orchid	Cryptostylis hunteriana	Yes	Yes									Yes	Yes
White-flowered Wax Plant	Cynanchum elegans	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rough Double Tail	Diuris praecox							Yes	Yes				
Black-necked Stork	Ephippiorhynchus asiaticus	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eucalyptus parramattensis subsp. parramattensis population, Wyong and Lake Macquarie local government areas	Eucalyptus parramattensis subsp. parramattensis - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Small-flower Grevillea	Grevillea parviflora subsp. parviflora	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Giant Burrowing Frog	Heleioporus australiacus	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Pale-headed Snake	Hoplocephalus bitorquatus	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Comb-crested Jacana	Irediparra gallinacea	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Black Bittern	Ixobrychus flavicollis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green and Golden Bell Frog	Litoria aurea	Yes	Yes	Yes					Yes	Yes	Yes	Yes	Yes
Green-thighed Frog	Litoria brevipalmata	Yes	Yes	Yes							Yes	Yes	Yes

		Survey Months											
Common Name	**Species Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Square-tailed Kite	Lophoictinia isura	Yes	Yes	Yes						Yes	Yes	Yes	Yes
Parma Wallaby	Macropus parma	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maundia triglochinoides	Maundia triglochinoides	Yes	Yes	Yes								Yes	Yes
Biconvex Paperbark	Melaleuca biconvexa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grove's Paperbark	Melaleuca groveana	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stuttering Barrred Frog	Mixophyes balbus	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Giant Barred Frog	Mixophyes iteratus	Yes	Yes	Yes	Yes	Yes					Yes	Yes	Yes
Large-footed Myotis (Breeding Habitat)	Myotis adversus (Breeding Habitat)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Osprey	Pandion haliaetus	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Planigale	Planigale maculata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grey-headed Flying-fox (Breeding Habitat)	Pteropus poliocephalus (Breeding Habitat)	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Black-eyed Susan	Tetratheca juncea							Yes	Yes	Yes	Yes	Yes	Yes

ecological AUSTRALIA

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