Vegetation Zone: 4

Vegetation Type: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands, Moderate to Good

Condition: M/G Ancillary Code: Trees

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
A	31	27	6	54	0	36	2	1	1	86	356637	6716726	56
BRGYBMGT1	11	18	0	0	0	14	68	1	1	11	357114	6719063	56
BRGYBMGT2	18	16	0	14	0	28	56	0	1	35	357962	6717174	56

Vegetation Zone: 5

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Condition: Low Ancillary Code:

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
A	19	0.8	0	30	0	6	72	0	0	0	345757	6713952	56
B	8	0.8	0	12	0	6	84	0	0	0	345300	6714036	56
MGLQ1	20	0.8	0	28	0	16	56	1	0	0	347617	6711603	56

Vegetation Zone: 6

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast, Moderate to Good,

Condition: M/G Ancillary Code: Native Pasture

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
B	23	0.8	0	48	0	16	28	0	1	0	355560	6708534	56
C	10	0.8	0	86	0	34	20	0	1	0	356932	6714683	56
E	17	0.8	0	80	0	30	34	0	1	12	357703	6714342	56
MGMGNP1	13	0.8	0	26	0	8	64	0	1	0.5	347211	6717029	56
MGMGNP2	14	0.8	0	10	0	34	54	0	1	0	348335	6715248	56
MGMGNP3	9	0.8	0	50	0	2	48	1	1	0	356765	6710846	56

Vegetation Zone: 7

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Condition: M/G Ancillary Code: Trees

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
B	27	20.5	0	68	0	70	8	3	1	49	344282	6717822	56
E	31	27	0	32	0	24	14	0	1	20	355509	6708571	56
MGMGT1	31	11.5	0	32	0	26	42	2	1	0	350604	6709645	56
A	30	21	0	58	0	22	18	2	1	41	345287	6717529	56
C	20	12.5	0	44	2	24	26	1	1	19	354956	6708526	56
D	30	16	0	30	0	26	0	2	1	15	355795	6709352	56

Vegetation Zone: 8

Vegetation Type: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands

Condition: M/G Ancillary Code: Trees

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
TWSSMGT1	30	0	0	52	0	8	28	0	1	39	357820	6718145	56
TWMGT2	42	4.5	0	50	0	20	28	0	1	40	357709	6718087	56

Vegetation Zone: 9

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: Low Ancillary Code:

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
A	15	0.6	0	4	0	0	98	0	0	4	343516	6714840	56
WBL1	9	0.6	0	4	0	4	92	0	0	0	343930	6714521	56
WBL2	6	0.6	0	16	0	0	84	1	0	0	341568	6715676	56

Vegetation Zone: 10

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: M/G Ancillary Code: Native Pasture

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
A	16	0.6	0	70	0	2	36	0	0.66	0.5	344409	6716970	56
B	20	0.6	0	88	0	30	36	0	0.66	0	343761	6717537	56
C	22	0.6	0	98	0	66	24	0	0.66	0.5	344824	6717432	56
WBMGNP1	10	0.6	0	4	0	2	88	0	0.66	0	345677	6711480	56
WBMGNP2	3	0.6	0	4	0	0	96	1	0.66	0	344836	6714218	56

Vegetation Zone: 11

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: M/G Ancillary Code: Trees

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
A	36	14.5	0	80	0	54	8	0	1	21	344161	6717781	56
WBMGT1	32	8.7	0.5	44	0	20	38	1	1	10	345546	6712570	56
WBMGT2	14	13	0	58	0	2	40	1	1	0	342148	6715139	56

Appendix 2: Species Predicted on Site

Common Name	Scientific Name	Surveyed on Site?	Found on Site?
Barking Owl	*Ninox connivens*	Yes	No
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Yes	No
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Yes	Yes
Bush Stone-curlew	*Burhinus grallarius*	Yes	No
Diamond Firetail	*Stagonopleura guttata*	Yes	Yes
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Yes	No
Flame Robin	*Petroica phoenicea*	Yes	No
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Yes	Yes
Grey-headed Flying-fox	*Pteropus poliocephalus*	Yes	No
Koala	*Phascolarctos cinereus*	Yes	No
Scarlet Robin	*Petroica boodang*	Yes	Yes
Speckled Warbler	*Pyrrholaemus saggitatus*	Yes	Yes
Spotted-tailed Quoll	*Dasyurus maculatus*	Yes	No
Swift Parrot	*Lathamus discolor*	Yes	No
Turquoise Parrot	*Neophema pulchella*	Yes	Yes
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Yes	Yes

In addition to the species predicted to occur by the Biobanking Credit Calculator, the following threatened species were also recorded (but not predicted to occur).

- Hooded Robin (*Melanodryas cucullata cucullata*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Common Bentwing-bat (*Miniopterus schreibersii*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Eastern Cave Bat (*Vespadelus troughtoni*).

Appendix 3: Site Value Scores

Vegetation Zone: 1

Vegetation Type: Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion

Condition: M/G Ancillary Code: Native Pasture

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	2	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	2	0	1
Exotic plant cover	1	0	1
Number of trees with hollows	1	1	1
Over-storey regeneration	3	0	1
Total length of fallen logs	1	0	1
Site Value	**33**	**4**	**18**

Vegetation Zone: 2

Vegetation Type: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Condition: Low Ancillary Code:

Site Attribute	Current Score	Score for Temporary Loss Areas
Native plant species richness	1	1
Native over-storey cover	0	0
Native mid-storey cover	0	0
Native ground cover (grasses)	0	0
Native ground cover (shrubs)	0	0
Native ground cover (other)	0	0
Exotic plant cover	0	0
Number of trees with hollows	0	0
Over-storey regeneration	0	0
Total length of fallen logs	0	0
Site Value	**5**	**5**

Vegetation Zone: 3

Vegetation Type: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Condition: Good Ancillary Code: Native Pasture

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	1	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	1	0	1
Exotic plant cover	1	0	1
Number of trees with hollows	1	1	1
Over-storey regeneration	0	0	0
Total length of fallen logs	0	0	0
Site Value	**13**	**4**	**12**

Vegetation Zone: 4

Vegetation Type: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Condition: M/G Ancillary Code: Trees

2Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	2	1	2
Native over-storey cover	3	1	1
Native mid-storey cover	1	1	1
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	2	0	1
Exotic plant cover	1	0	1
Number of trees with hollows	1	1	1
Over-storey regeneration	3	0	1
Total length of fallen logs	2	0	1
Site Value	**51**	**14**	**30**

Vegetation Zone: 5

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Condition: Low Ancillary Code:

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	1	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	1	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	3	0	1
Exotic plant cover	0	0	0
Number of trees with hollows	1	1	1
Over-storey regeneration	0	0	0
Total length of fallen logs	0	0	0
Site Value	**14**	**5**	**12**

Vegetation Zone: 6

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Condition: Good Ancillary Code: Native Pasture

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	1	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	2	0	1
Exotic plant cover	1	0	1
Number of trees with hollows	1	1	1
Over-storey regeneration	3	0	1
Total length of fallen logs	0	0	0
Site Value	**29**	**5**	**19**

Vegetation Zone: 7

Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Condition: M/G Ancillary Code: Trees

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	2	1	2
Native over-storey cover	3	1	1
Native mid-storey cover	0	0	0
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	1	0	1
Native ground cover (other)	1	0	1
Exotic plant cover	2	0	1
Number of trees with hollows	3	2	2
Over-storey regeneration	3	0	1
Total length of fallen logs	1	0	1
Site Value	**71**	**19**	**40**

Vegetation Zone: 8

Vegetation Type: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands

Condition: M/G Ancillary Code: Trees

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	2	1	2
Native over-storey cover	1	1	1
Native mid-storey cover	0	0	0
Native ground cover (grasses)	3	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	3	0	1
Exotic plant cover	2	0	1
Number of trees with hollows	0	0	0
Over-storey regeneration	3	0	1
Total length of fallen logs	1	0	1
Site Value	**33**	**7**	**22**

Vegetation Zone: 9

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: Low Ancillary Code:

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	1	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	1	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	1	0	1
Exotic plant cover	0	0	0
Number of trees with hollows	1	1	1
Over-storey regeneration	0	0	0
Total length of fallen logs	0	0	0
Site Value	**10**	**4**	**10**

Vegetation Zone: 10

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: M/G Ancillary Code: Native Pasture

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	1	0	1
Native over-storey cover	0	0	0
Native mid-storey cover	0	0	0
Native ground cover (grasses)	2	0	1
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	2	0	1
Exotic plant cover	1	0	1
Number of trees with hollows	1	1	1
Over-storey regeneration	2	0	1
Total length of fallen logs	0	0	0
Site Value	**21**	**4**	**16**

Vegetation Zone: 11

Vegetation Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Condition: M/G Ancillary Code: Trees

Site Attribute	Current Score	Score for Permanent Loss Areas	Score for Temporary Loss Areas
Native plant species richness	2	1	2
Native over-storey cover	2	1	2
Native mid-storey cover	3	1	3
Native ground cover (grasses)	2	0	2
Native ground cover (shrubs)	0	0	0
Native ground cover (other)	2	0	2
Exotic plant cover	2	0	2
Number of trees with hollows	1	1	1
Over-storey regeneration	3	0	3
Total length of fallen logs	1	0	1
Site Value	**53**	**14**	**30**

Appendix 4: Credit Report

BioBanking
Biodiversity Banking and Offsets Scheme

Biobanking Credit Report

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

Date of report: 05/04/2011 Time: 09:06 Tool Version: 1.2

Development Details

Proposal ID: 0032/2011/0005

Development Name: Sapphire Wind Farm Indicative Biobanking Assessment

Development Location:

Development Address:

CMA: Border Rivers/Gwydir

Proponent Name: Wind Prospect

Proponent Address:

Proponent Phone:

Assessor Name: Darren James

Assessor Address: PO Box 12 Sutherland NSW 1499

Assessor Phone: 02 9536 8618

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**

Black Cypress Pine - Tumbledown Gum - Narrow leaved Ironbark open forest of northern parts of the Nandewar Bioregion

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

NSW GOVERNMENT Environment, Climate Change & Water

☐ 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

An application for a red flag determination is required for the following red flag items:

Red Flag	Reason
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland	Vegetation type being > 70% cleared; Vegetation type contains an endangered ecological community;
Mallee Gum - Broad-leaved Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast	Vegetation type being > 70% cleared;
White Box grassy woodland of the Namoi and Brigalow Belt South Bioregions	Vegetation type being > 70% cleared; Vegetation type contains an endangered ecological community;
Border Thick-tailed Gecko	Area impact greater than that allowed;

The application for a red flag determination should address the criteria set out in section A.3 of the BioBanking Assessment Methodology. A BioBanking Statement cannot be issued unless the determination is approved.

Page 3 of 4[illegible] Date of report [illegible] Time [illegible] Tool Version 1.2

Ecosystem Credits

Vegetation Type	Area (ha)	Credits Required	Red Flag
Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion [BR110]	1.3	23	No
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands [BR116]	6.6	119	Yes
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands [BR116]	1.0	35	Yes
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands [BR116]	4.0	34	Yes
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands [BR116]	0.5	12	Yes
Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands [BR116]	5.5	18	No
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	42.9	744	Yes
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	53.6	1,874	Yes
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	31.5	329	Yes
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	24.1	649	Yes
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	6.7	70	No
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	17.7	185	No
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	26.1	334	No
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	15.5	146	Yes
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast [BR153]	22.8	355	Yes
Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands [BR227]	1.1	33	No

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	4.7	64	Yes
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	2.9	63	Yes
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	3.5	67	Yes
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	4.0	123	Yes
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	3.2	30	No
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	1.1	4	No
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	6.1	95	Yes
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)	2.4	60	Yes

Credit Profiles

Group: 1 Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion

Ecosystem credits: 23 credits

Total area of vegetation(s): 1.3 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: 10%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Binghi Plateau	Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion ([illegible])
Bundarra Downs (Part A)	Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South Bioregion ([illegible])
Deepwater Downs	[illegible] south western New England Tablelands ([illegible])
Eastern Nandewars (Part B)	[illegible] Bioregion (BR223)
Glen Innes-Guyra Basalts	White Box - White Cypress Pine - [illegible] Nandewar Bioregion (BR236)
Inverell Basalts	White Cypress Pine - [illegible] forest of the Nandewar and Brigalow Belt South Bioregions ([illegible])
Moredun Volcanics	
Nandewar Northern Complex	

Peel	White Cypress Pine - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion (BR245)
Severn River Volcanics	
Tingha Plateau	

Central West

CMA Sub-Region(s)	Veg Type(s)
Pilliga	Long-leaved Box - Red Box - Red Stringybark sheltered open forest of the NSW South Western Slopes Bioregion (Benson 287) (CW149)
	Mugga Ironbark - Inland Grey Box - pine tall woodland of the NSW South Western Slopes Bioregion (Benson 217) (CW155)
	Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion (CW156)
	Narrow-leaved Ironbark - Cypress pine shrubby woodland of the Brigalow Belt South Bioregion (CW163)
	Slaty Gum woodland of the slopes of the southern Brigalow Belt South Bioregion (CW191)
	White Box - Tumbledown Gum woodland on fine-grained sedimentary rocks of the NSW central western slopes (Benson 270) (CW212)
	White Box shrubby open forest on fine grained sediments on steep slopes in the Mudgee region of the of central western slopes of NSW (Benson 273) (CW217)

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin (HU378)
Karuah Manning	
Kerrabee	
Upper Hunter	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Narrow-leaved Ironbark grassy woodland of the Brigalow Belt South Bioregion (NA164)
	Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South Bioregion (NA165)
	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion (NA2[illegible])
	White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions (NA229)
	White Cypress Pine - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion (NA2[illegible])

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Western New England Blackbutt shrubby open forest of the New England Tablelands (NR277)
Clarence Lowlands	
Clarence Sandstones	
Ebor-Dorrigo Plateau	
Wongwibinda Plateau	

Group: 2 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Ecosystem credits: 119 credits

Total area of vegetation(s): 6.6 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: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR116)
Glen Innes-Guyra Basalts	
Moredun Volcanics	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA113)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR115)
Clarence Lowlands	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Clarence Sandstones	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2[illegible]) (NR165)
Stanthorpe Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR158)
Wongwibinda Plateau	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR217)
	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR227)
	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR229)
	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR265)

Group: 3 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Ecosystem credits: 35 credits

Total area of vegetation(s): 1 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: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part 3)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR119)
Glen Innes-Guyra Basalts	
Moredun Volcanics	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA113)

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Clarence Lowlands	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Clarence Sandstones	[illegible] Box open forest of the New England Tableland Bioregion (Benson 2000) (NR102)
Stanthorpe Plateau	Manna Gum - Rough-barked Apple - Yellow Box [illegible] woodland/open forest of the New England Tablelands and North Coast (NR186)
Wongwibinda Plateau	New England Peppermint grassy woodland [illegible] of the New England Tablelands (NR214)
	Snow Gum - Black Sallee grassy open forest of the New England Tablelands (NR[illegible])
	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR[illegible])
	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)

Group: 4 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Ecosystem credits: 34 credits

Total area of vegetation(s): 4 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: 10%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR1[illegible])
Glen Innes-Guyra Basalts	
Moredun Volcanics	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA1[illegible])

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR110)
Clarence Lowlands	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Clarence Sandstones	[illegible] Box open forest of the New England Tableland Bioregion (Benson 2001) (NR162)
Stanthorpe Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR196)
Wongwibinda Plateau	New England Peppermint grassy woodland [illegible] of the New England Tablelands (NR216)
	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR229)
	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR230)
	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)

Group: 5 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Ecosystem credits: 12 credits

Total area of vegetation(s): 0.5 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: 10%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR138)
Glen Innes-Guyra Basalts	
Moredun Volcanics	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA113)

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Clarence Lowlands	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Clarence Sandstones	[illegible] Box open forest of the New England Tableland Bioregion (Benson 2000) (NR192)
Stanthorpe Plateau	Manna Gum - Rough-barked Apple - Yellow Box [illegible] of the New England Tablelands and North Coast (NR196)
Wongwibinda Plateau	New England [illegible] grassy woodland [illegible] of the New England Tablelands (NR214)
	Snow Gum - Black Sallee grassy [illegible] of the New England Tablelands [illegible]
	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR250)
	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)

Group: 6 Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands

Ecosystem credits: 18 credits

Total area of vegetation(s): 5.5 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: 0%	**Minimum area: 5 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR138)
Glen Innes-Guyra Basalts	
Moredun Volcanics	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA113)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Clarence Lowlands	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Clarence Sandstones	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2008) (NR152)
Stanthorpe Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR180)
Wongwibinda Plateau	New England Peppermint [illegible] grassy woodland [illegible] of the New England Tablelands (NR214)
	Snow Gum - Black Sallee grassy open forest of the New England Tablelands (NR228)
	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR229)
	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)

Group: 7 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 744 credits

Total area of vegetation(s): 42.9 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: 25 ha**	

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part 3)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR118)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2008) (BR142)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

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Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528) Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529) Ribbon Gum - [illegible] grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands (HN573)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU5[illegible])
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU597)
[illegible]	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (HU599)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA1[illegible]) Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA1[illegible]) Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA1[illegible])

Northern Rivers

CMA Sub-Region(s)

Armidale Plateau

Carrai Plateau

Colonial

Chiselhill

Clarence Lowlands

Clarence Sandstones

Coffs Coast & Escarpment

Comboyne Plateau

Dalhousie

Ebor Basalts

Glen Innes Basalts (Part A)

Gwydir Foothills

Macleay Gorges

Macleay Hastings

Nulla Nulla

Northern Hinterland North

Rocky River Gorges

Stanthorpe Plateau

Walcha Plateau

Wongwibinda Plateau

Woodenbong

Veg Type(s)

Black Sallee grassy woodland of the New England Tablelands (NR112)

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR124)

Rusty Box open forest of the New England Tableland Bioregion (Benson 2001) (NR102)

Manna Gum - Ribbon-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR130)

New England Peppermint grassy woodland on basalt and fine-grained sediments of the New England Tablelands (NR211)

Yellow Gum - Black Sallee grassy open forest of the New England Tablelands (NR213)

Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR259)

Yellow Box - Grey Box - Red Gum woodlands of the central western parts of the New England Tablelands (NR283)

Group: 8 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 1,874 credits

Total area of vegetation(s): 55.6 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: 25 ha**	

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3. CMA subregion & vegetation types

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR115)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 208) (BR147)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR165)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the southern tablelands, South Eastern Highlands (HN548)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU615)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU597)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 40) (HU609)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

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Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA1[illegible])
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA1[illegible])
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA14[illegible])

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR12[illegible])
Cataract	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2006) (NR1[illegible])
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR1[illegible])
Clarence Lowlands	New England Peppermint grassy woodland [illegible] the New England Tablelands (NR2[illegible])
Clarence Sandstones	Snow Gum - Black Sallee grassy [illegible] of the New England Tablelands (NR2[illegible])
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR229)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodlands of the central southern parts of the New England Tablelands (NR28[illegible])
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 9 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 329 credits

Total area of vegetation(s): 31.5 ha

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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: 10%		**Minimum area: 25 ha**	

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR110)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2061) (BR142)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands (HN573)

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Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU507)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (HU599)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA119)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA146)

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR124)
Coalcroft	Ribbony Box open forest of the New England Tableland Bioregion (Benson 200[illegible]) (NR1[illegible])
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR1[illegible])
Clarence Lowlands	New England Peppermint grassy woodland [illegible] the New England Tablelands (NR21[illegible])
Clarence Sandstones	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR2[illegible])
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the southern New England Tablelands and North Coast (NR2[illegible])
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 10 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 649 credits

Total area of vegetation(s): 24.1 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: 10%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 25 ha**

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3. CMA subregion & vegetation types

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR115)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2001) (BR147)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the southern tablelands, South Eastern Highlands (HN[illegible])

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU597)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson [illegible]) (HU[illegible])
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

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Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA110)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA148)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodlands of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Cataract	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2006) (NR165)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR180)
Clarence Lowlands	New England Peppermint grassy woodland on acid rocks of the southern half of the New England Tablelands (NR214)
Clarence Sandstones	Snow Gum - Black Sallee grassy open forest of the New England Tablelands (NR237)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR239)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodlands of the central southern parts of the New England Tablelands (NR282)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 11 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 70 credits

Total area of vegetation(s): 6.7 ha

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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: 25 ha**	

3. CMA subregion & vegetation types

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR110)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2008) (BR142)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands (HN573)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU547)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley ([illegible]) (HU599)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA108)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA146)

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Coleroot	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2001) (NR165)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR190)
Clarence Lowlands	New England Peppermint grassy woodland [illegible] of the New England Tablelands (NR214)
Clarence Sandstones	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR249)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the southern New England Tablelands and North Coast (NR250)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 12 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 185 credits

Total area of vegetation(s): 17.7 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: 10%	**Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR1[illegible])
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2008) (BR14[illegible])
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR165)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the southern tablelands, South Eastern Highlands (HN[illegible])

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU615)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU607)
Karuah Manning	River Red Gum - Yellow Box riparian woodland of the Hunter Valley (Benson 47) (HU[illegible])
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

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CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA117)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA148)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR124)
Cataract	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2006) (NR160)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR180)
Clarence Lowlands	New England Peppermint grassy woodland on granite ... of the New England Tablelands (NR216)
Clarence Sandstones	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR237)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR229)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodlands of the central southern parts of the New England Tablelands (NR282)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 13 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 334 credits

Total area of vegetation(s): 26.1 ha

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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: 0%		**Minimum area: 5 ha**	

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR110)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Table and Bioregion (Benson 2006) (BR142)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands (HN573)

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Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU507)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (HU599)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA179)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA146)

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Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Cataract	Ribbony Box open forest of the New England Tableland Bioregion (Benson 2008) (NR192)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR196)
Clarence Lowlands	New England Peppermint grassy woodland on [illegible] of the New England Tablelands (NR214)
Clarence Sandstones	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR249)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the southern New England Tablelands and North Coast (NR250)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodland of the central western parts of the New England Tablelands (NR283)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 14 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 146 credits

Total area of vegetation(s): 15.5 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: 0%	**Minimum area: 5 ha**

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3. CMA subregion & vegetation types

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR115)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodland of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2001) (BR147)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR165)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the southern tablelands, South Eastern Highlands (HN[illegible])

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU615)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU597)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 4?) (HU[illegible])
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Wollemi Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

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CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA117)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA148)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodlands of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR124)
Cataract	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2004) (NR160)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR194)
Clarence Lowlands	New England Peppermint grassy woodland on [illegible] of the New England Tablelands (NR216)
Clarence Sandstones	Snow Gum - Black Sallee grassy [illegible] of the New England Tablelands (NR237)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the eastern New England Tablelands and North Coast (NR239)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodlands of the central southern parts of the New England Tablelands (NR282)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 15 Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast

Ecosystem credits: 355 credits

Total area of vegetation(s): 22.8 ha

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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: 0%		**Minimum area: 5 ha**	

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (BR110)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (BR121)
Moredun Volcanics	Fuzzy Box open forest of the New England Tableland Bioregion (Benson 2006) (BR142)
Northeast Forest Lands	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (BR163)
Tenterfield Plateau	

Hawkesbury/Nepean

CMA Sub-Region(s)	Veg Type(s)
Yengo	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)
	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin (HN529)
	Ribbon Gum - Yellow Box grassy woodland on undulating terrain of the eastern tablelands, South Eastern Highlands (HN573)

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Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (HU515)
Hunter	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the North Coast and New England Tablelands (HU587)
Karuah Manning	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42) (HU599)
Liverpool Range	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NA110)
	Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tablelands (NA118)
	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NA146)

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Northern Rivers CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Black Sallee grassy woodland of the New England Tablelands (NR113)
Carrai Plateau	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tablelands (NR127)
Cataract	Ribbony Box open forest of the New England Tableland Bioregion (Benson 2001) (NR182)
Chaelundi	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR190)
Clarence Lowlands	New England Peppermint grassy woodland [illegible] the New England Tablelands (NR214)
Clarence Sandstones	Snow Gum - Black Sallee grassy woodland of the New England Tablelands (NR2??)
Coffs Coast & Escarpment	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest of the southern New England Tablelands and North Coast (NR239)
Comboyne Plateau	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)
Dalmorton	
Ebor Basalts	
Glen Innes-Guyra Basalts (Part A)	
Guy Fawkes	
Macleay Gorges	
Macleay Hastings	
Nightcap	
Northeast Forest Lands	
Rocky River Gorge	
Stanthorpe Plateau	
Walcha Plateau	
Wongwibinda Plateau	
Woodenbong	

Group: 16 Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands

Ecosystem credits: 33 credits

Total area of vegetation(s): 1.1 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: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Bendemeer White Gum - Silvertop Stringybark grassy open forest of the Kaputar area and southern New England Tableland edge of the Nandewar Bioregion (BR104)
Glen Innes-Guyra Basalts	Broad-leaved Stringybark - Mountain Gum - Apple Box open forest of the New England Tablelands (BR122)
Moredun Volcanics	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (BR124)
Northeast Forest Lands	McKie's Stringybark - New England Blackbutt - Rough-barked Apple grassy open forest of the Northern Tablelands (BR163)
Tenterfield Plateau	Mountain Gum - Broad-leaved Stringybark shrubby open forest of the eastern New England Tablelands (BR169)
	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tablelands (BR170)
	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (BR173)
	New England Blackbutt grassy open forest of the eastern New England Tablelands (BR174)
	New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (BR175)
	New England stringybarks - peppermint open forest of the New England Tablelands (BR177)
	Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands (BR227)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Ellerston	Broad-leaved Stringybark - Mountain Ribbon Gum - Messmate open forest of escarpment ranges of the North Coast and New England Tablelands (HU518)
Hunter	Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556)
Karuah Manning	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (HU577)
Liverpool Range	
Macleay Hastings	
Pilliga	
Tomalla	
Upper Hunter	
Wollemi (Part A)	
Wollemi (Part B)	
Wyong	
Yengo	

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Namoi

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (NA133)
Peel	McKie's Stringybark - New England Blackbutt - Rough-barked Apple grassy open forest of the New England Tablelands (NA153)
Walcha Plateau	Mountain Gum - Broad-leaved Stringybark shrubby open forest of the eastern New England Tablelands (NA158)
	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tablelands (NA166)
	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (NA167)
	New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (NA172)
	New England stringybarks - peppermint open forest of the New England Tablelands (NA174)
	Rough-barked Apple - Silvertop Stringybark - Manna Gum shrub/grass open forest of the southern Nandewar Bioregion (NA186)
	Yellow Box - Broad-leaved Stringybark shrubby open forest of the New England Tablelands (NA228)

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Northern Rivers	
CMA Sub-Region(s)	**Veg Type(s)**
Armidale Plateau Carrai Plateau Cataract Chaelundi Clarence Lowlands Clarence Sandstones Dalmorton Ebor Basalts Glen Innes-Guyra Basalts (Part A) Glen Innes-Guyra Basalts (Part B) Guy Fawkes Macleay Gorges Nightcap Northeast Forest Lands Rocky River Gorge Round Mountain Stanthorpe Plateau Upper Manning Walcha Plateau Wongwibinda Plateau Woodenbong	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (NR105) New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (NR213) New England stringybark - peppermint open forest of the New England Tablelands (NR215)

Group: 17 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 64 credits

Total area of vegetation(s): 4.7 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: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part 3) Glen Innes-Guyra Basalt	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR190) White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter Karuah Manning Kerrabee Wyong	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU651)

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CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau Clarence Lowlands Clarence Sandstones Stanthorpe Plateau Wongwibinda Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR148) New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR214) Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR203)

Group: 18 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 63 credits

Total area of vegetation(s): 2.9 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: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR150)
Glen Innes-Guyra Basalt	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR186)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR181)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR280)
Stanthorpe Plateau	
Wongwibinda Plateau	

Group: 19 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 67 credits

Total area of vegetation(s): 3.5 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: 10%	**Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR150)
Glen Innes-Guyra Basalts	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU651)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR184)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR211)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)
Stanthorpe Plateau	
Wongwibinda Plateau	

Group: 20 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 123 credits

Total area of vegetation(s): 4 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: 10%	**Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR150)
Glen Innes-Guyra Basalts	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU651)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR184)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR211)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR263)
Stanthorpe Plateau	
Wongwibinda Plateau	

Group: 21 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 30 credits

Total area of vegetation(s): 3.2 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: 10%	**Minimum area: 25 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR190)
Glen Innes-Guyra Basalts	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA229)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR148)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR211)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR263)
Stanthorpe Plateau	
Woolgoolga-Dorrigo Plateau	

Group: 22 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 4 credits

Total area of vegetation(s): 1.1 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: 0%	**Minimum area: 5 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR150)
Glen Innes-Guyra Basalts	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR[illegible])
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR[illegible])
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR[illegible])
Stanthorpe Plateau	
Wongwibinda Plateau	

Group: 23 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 95 credits

Total area of vegetation(s): 6.1 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: 0%	**Minimum area: 5 ha**

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR150)
Glen Innes-Guyra Basalt	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA226)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR146)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR211)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR203)
Stanthorpe Plateau	
Wongwibinda Plateau	

Group: 24 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Ecosystem credits: 60 credits

Total area of vegetation(s): 2.4 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: 0%		**Minimum area: 5 ha**	

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

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars (Part B)	Inland Grey Box tall grassy woodland on clay soils in the Brigalow Belt South and Nandewar Bioregions (Benson 81) (BR190)
Glen Innes-Guyra Basalts	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (BR240)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)
Karuah Manning	
Kerrabee	
Wyong	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Peel	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions (NA228)

Northern Rivers

CMA Sub-Region(s)	Veg Type(s)
Armidale Plateau	Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast (NR184)
Clarence Lowlands	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tablelands (NR217)
Clarence Sandstones	Yellow Box - Grey Box - Red Gum woodland of the central eastern parts of the New England Tablelands (NR283)
Stanthorpe Plateau	
Wongwibinda Plateau	

Species Credits

Species credits are required for 1 species.

Border Thick-tailed Gecko	**Underwoodisaurus sphyrurus**
Number of species credits required:	**249**
Extent of impact:	18.7 ha
Identification method:	Survey
Impact on red flag area?	Yes
Reason for red flag area:	An impact greater than that allowed.

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Appendix J: Biobank Local Benchmark Report

REQUEST FOR APPROVAL TO USE LOCAL BENCHMARK DATA

Sapphire Wind Farm

Prepared for
Wind Prospect CVWP Pty Ltd

22 February 2011

DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Request for approval to use Local Benchmarks Data – Sapphire Wind Farm
Project Number	10SYDECO-0056
File location	G:\Synergy\Projects\10SYDECO\10SYDECO-0056 Sapphire Wind Farm Part 3A\Report\Local Benchmarks report
Prepared by	NS, AF, TH, PR
Approved by	RH
Status	Final
Version Number	1
Last saved on	22 February 2011
Cover photo	*Chrysocephalum apiculatum* (top left), *Wahlenbergia gracilis* (top right), Sapphire landscape (centre) (photo credit: AF, Eco Logical Australia).

This report should be cited as 'Eco Logical Australia 2011. Request for approval to use Local Benchmark Data - *Sapphire Wind Farm*. Prepared for Wind Prospect CWP Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Wind Prospect CWP Pty Ltd.

Contents

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Abbreviations

ABBREVIATION	DESCRIPTION
BAMCCOM	Biobanking Assessment Methodology and Credit Calculator Operational Manual
BSMP	Biobank Site Management Plan
CMA	Catchment Management Authority
DECCW	NSW Department of Environment, Climate Change and Water
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
LGA	Local Government Area
Local area	Within 10 km radius of the site
LPMA	Land and Property Management Authority (formerly Department of Lands)
NPWS	National Parks and Wildlife Service (part of DECCW)
RBVT	Revised Biometric Vegetation Types
TSC Act	NSW *Threatened Species Conservation Act 1995*
Wind Prospect	Wind Prospect CWP Pty Ltd

1 Introduction

Wind Prospect CWP Pty Ltd (Wind Prospect) is currently finalising an Environmental Assessment Report for the proposed Sapphire Wind Farm (ELA in prep). The study area is located 18 km west of Glen Innes and 28 km east of Inverell, on the New England Tablelands of New South Wales (NSW), mainly within the Glen Innes - Guyra Basalts sub-region of the Border Rivers Gwydir CMA and a very small portion in the Severn Rivers subregion (Figure 1).

The project is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* as a critical infrastructure project. The Department of Planning has issued Director-General's requirements for the environmental assessment that include a requirement to assess impacts to biodiversity values and offset any residual impacts that cannot be avoided, minimised or mitigated using "improve or maintain" principles.

Wind Prospect proposes to address this requirement using the Biobanking Assessment Methodology to "inform" the quantum of offset required, however, a formal Biobank Assessment and Credit Report is not being undertaken.

Section 2.11.2 and 3.4.3 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (BAMCCOM) allows the use of "certified local data", including local benchmark data, where the Director-General of the Department of Environment, Climate Change and Water (DECCW) certifies that they more accurately reflect local environmental conditions than the data in the Biobanking databases. The use of certified local data is subject to a number of conditions:-

- Use of certified local data must be approved by the Director-General before a biobanking statement or agreement is approved.
- The applicant must provide justification for the use of local data as part of the Biobanking Assessment report for the development proposal.
- Benchmark can be obtained from reference sites or published data.
- If local benchmark data are developed, they must be derived from reference site measurements of the same vegetation type in a relatively unmodified condition as indicated in the criteria listed in section 3.4.3 of the BAMCCOM (Section 2 of this report).

This report has been prepared by Eco Logical Australia for Wind Prospect CWP for the Sapphire Wind Farm project and addresses each of these requirements.

The request for use of local data is for the purpose of the Wind Farm only and not other projects in the region.

Local benchmark data have been collected in accordance with the requirements outlined in section 3.4.3 of the BAMCCOM (refer to section 5 of this report), justification for the use of local benchmark data has been provided (Section 3) and the data have been collected by accredited Biobank assessors and a vegetation mapping/condition expert.

Assessor Name: Nathan Smith (formerly ELA now Niche Consulting)

Assessor Number: 0047

Vegetation Expert: Peter Richards (formerly ELA now a self-employed ecological consultant)

Peter Richards is a highly experienced conservation ecologist who has extensive experience in ecological survey and assessment at both landscape-scale and finer scale. Through twenty-five years of work with the Royal Botanic Gardens, Sydney, the NSW National Parks and Wildlife Service, State Forests of NSW and private enterprise, Peter has acquired an excellent knowledge of NSW threatened flora and fauna, native vegetation and ecological processes, particularly of the NSW North Coast, New England Tablelands and Nandewar bioregions. He has been involved with a number of key Government broad-scale natural resource assessment projects including Comprehensive Regional Assessments (CRAs) and regional Wilderness assessments. Peter has submitted a number of scientific articles to peer-reviewed journals, and is also the author or co-author of several contributions to the Flora of New South Wales.

Peter possesses a diverse range of technical skills including systematic and targeted flora and fauna survey, habitat assessment, vegetation classification and mapping, data collation and analysis and GIS-based spatial analysis. Peter has undertaken numerous systematic and targeted vegetation and flora surveys across the abovementioned bioregions. He has participated on a variety of government expert panels in reviewing native vegetation information for the 'Biometrics' vegetation database, threatened flora ecological information for the Biobanking assessment tool, allocation of native vegetation types to threatened flora and fauna species profiles, trialling the 'PVP assessment tool' for use by CMA vegetation officers, and analysis of vegetation data towards a classification of native vegetation of the Northern Rivers CMA. Peter also contributed a classification of native vegetation communities of the western New England Tablelands and Nandewar bioregions to the Botanic Gardens Trust's NSW Vegetation Classification and Assessment database (NSWVCA).

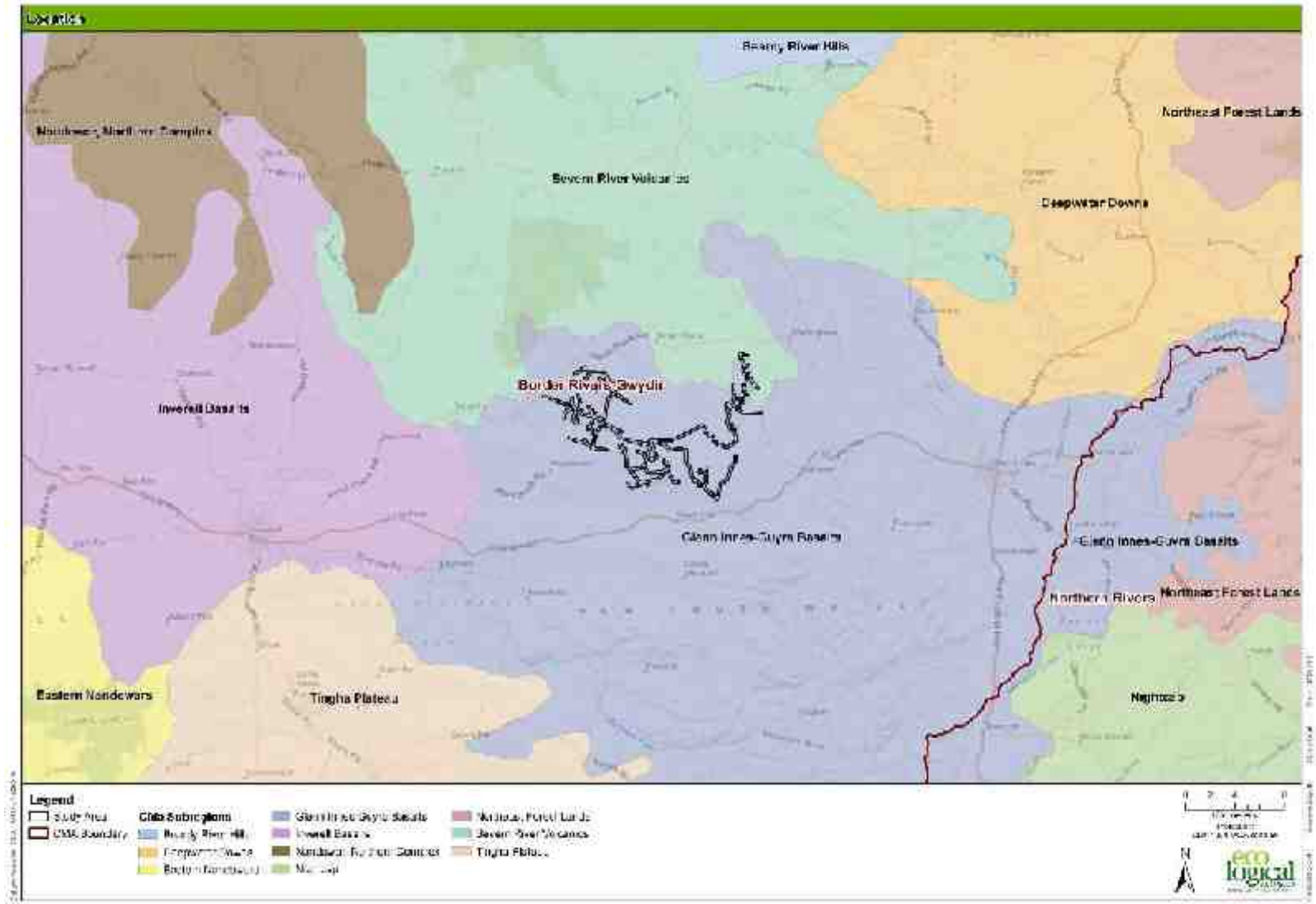


Figure 1: Location of Study Area and CMA sub-region boundaries

2 Criteria & Method for Developing Local Benchmarks

The following criteria (listed in section 3.4.3 of the BAMCCOM) must be addressed when developing benchmarks from local reference sites:-

Locating reference sites

Reference sites must have little modification relative to other vegetation in the region, as indicated by:-

- 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,
- dieback not in excess of normal senescence,
- no evidence of very recent major perturbation such as fire or flood,
- not subject to high frequency burning, and
- evidence of recruitment of native species.

The BAMCCOM states that "*it may be difficult to find totally unmodified sites in a landscape, particularly in highly cleared regions or during periods of extended drought. Vegetation in relatively unmodified condition can be found in some travelling stock routes and reserves, national parks and nature reserves, state forests (especially Flora Reserves), cemeteries, roadsides and commons. Appropriate reference sites may sometimes exist on the development site or the biobank site. Reference sites can occur in small remnants, such as narrow roadsides and cemeteries. Different reference sites can be used to collect benchmark data on different condition attributes*".

Numbers of reference plots

To encompass the variation in benchmark condition, a minimum of three reference transects/plots for each variable should be measured at reference sites for each vegetation type, with more transects/plots being desirable.

Field methods for measuring vegetation condition variables on reference sites

The methods for recording data from reference plots are identical to the methods for recording data for Site Value, as outlined in Appendix 2 of the BAMCCOM. An Excel spreadsheet (Local Benchmark Calculator.xls) for calculating local benchmarks can also be downloaded from the DECCW website.

Determining a benchmark from a local reference site

The data from all reference plots for a specific assessment are then used to develop the local benchmark for that vegetation type.

Local benchmarks are entered into the credit calculator by the assessor in Step 5. The information sources used to develop the local benchmark must be provided to DECCW as part of the impact assessment. If the source is a local reference site, then the assessor should provide a copy of the site attribute data and a description of the site as part of the Biobanking Assessment Report.

Developing the benchmark

The data from all reference sites and transects/plots need to be entered into the Local Benchmark Calculator.xls for a specific development or biobank site (available for download from the BioBanking website). Once the data have been entered into the spreadsheet, the benchmark values are automatically calculated. These benchmarks then need to be copied into the credit calculator at *Step 5b* as part of data entry for the Site Value assessment. A copy of the data and other supporting information used to generate the benchmark should be submitted as part of the application for the biobanking agreement or statement.

3 Justification for the use of Local Benchmark Data

Section 2.11.2 of the BAMCCOM states that "*the applicant must provide justification for the use of local data as part of the Biobanking Assessment report for the development proposal*". Justification for the use of local data to inform benchmarks for the vegetation types present at the Sapphire study area is provided below.

The benchmarks in Version 1.1 of the BAMCCOM for the Border Rivers Gwydir CMA Revised Biometric Vegetation Types (RBVTs) are provided only at the vegetation class level of Keith (2004), and not for the individual RBVTs within the CMA. Since the collection of local floristic data has not been undertaken at the RBVT scale, the use of existing BAMCCOM benchmarks does not allow for a realistic assessment of relative condition of the subject vegetation types.

Most Keith vegetation classes, including those in the subject area, are represented by multiple vegetation types and the benchmarks at the class level are accordingly broad enough to encompass the full range of natural condition states of all of the vegetation types that are grouped within a single class. They are, therefore, not an entirely accurate reflection of the range of natural condition values for any one particular vegetation type and can lead to either an over- or under-estimation of site value scores. A comparison of the benchmark data collected for each vegetation type in the study area with the current benchmarks for the corresponding broad vegetation class (Tables 3,5,7,9,11 and 13 in chapter 6 following) clearly reveals this trend.

The use of local reference plots enables the generation of benchmarks that are specific, and therefore more relevant, to each vegetation type within the locality.

4 Location & Description of Reference Sites

Reference sites were chosen to reflect uncleared local vegetation in as near a natural, undisturbed state as possible. The Sapphire region has a long agricultural history of grazing and cropping, making finding totally unmodified sites difficult.

The sites selected as local reference sites were mainly from a Travelling Stock Reserve (TSR) along Kings Plains Road and on freehold land where vegetation has not been significantly cleared (Figure 2).

Eleven plots are located within the Kings Plains Road TSR, located between the study area and Kings Plains National Park, one within Kings Plain National Park and six within freehold land.

Three replicate plots were collected within each of the 6 vegetation types impacted by the Wind Farm proposal (i.e. 18 plots in total).

Site selection was largely influenced by the relative absence of previous disturbance.

Reference sites showed no evidence of recent major disturbance from fire, frequent burning regimes, flooding, and minimal or no evidence of timber harvesting, firewood collection, soil disturbance, or dieback (in excess of normal senescence). This statement is corroborated by the abundance of tree hollows and fallen timber as shown in the results for each plot in Tables 2-13.

Exotic weed cover was low relative to other vegetation in the region, and there was no evidence of recent trampling or grazing by introduced herbivores.

The reference sites in the TSR have not been subject to pasture improvement, and species richness/diversity was high. The vegetation on freehold land was in a similar condition.

There is no evidence to suggest that native herbivores, such as Swamp Wallabies and Eastern Grey Kangaroos, are overabundant in the area. Natural recruitment of native plant species was evident at each of the sites chosen for local benchmarks plots.

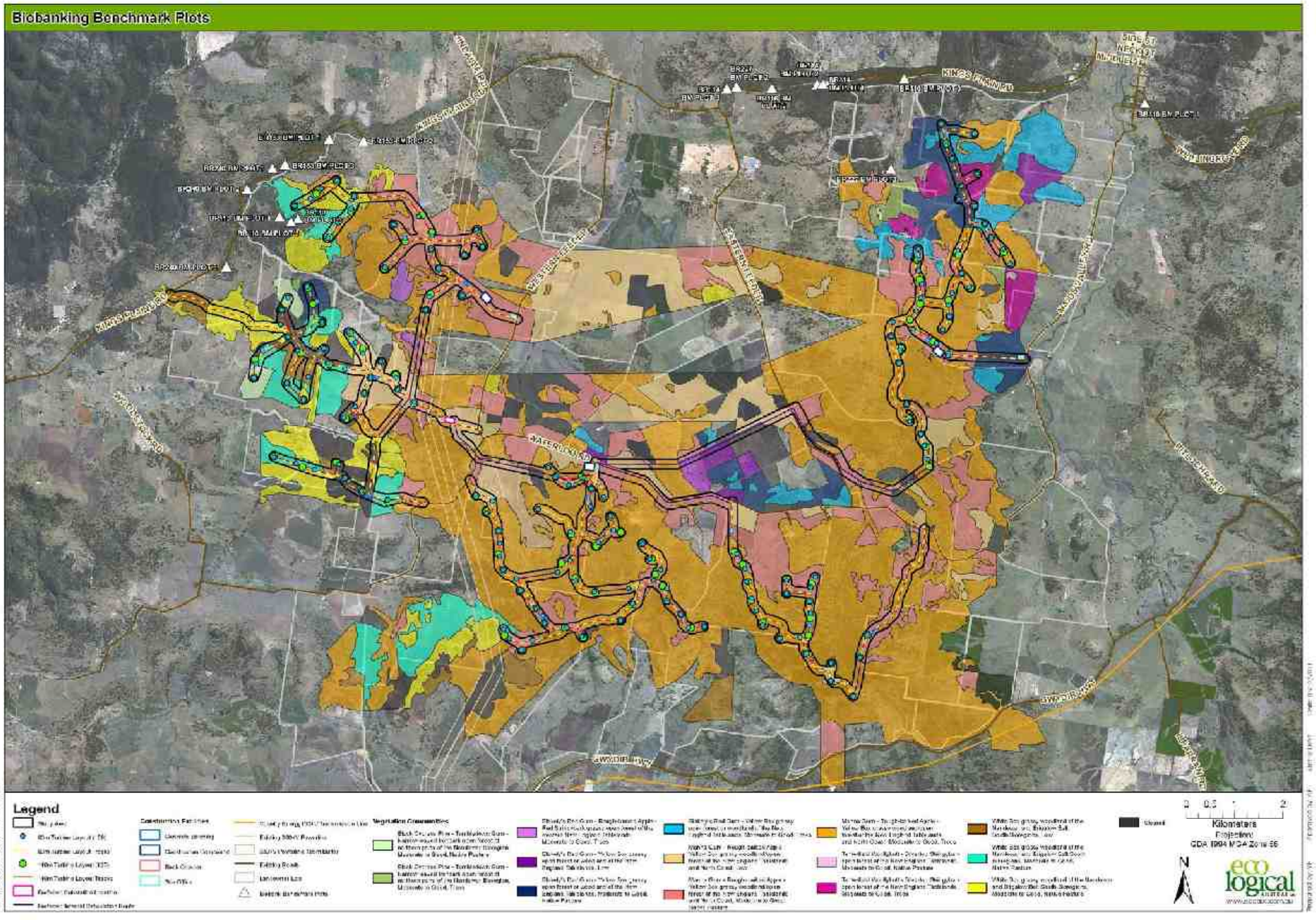


Figure 2. Location of local benchmark plots

5 Methods

Six Border Rivers – Gwydir CMA Revised Biometric Vegetation Types (RBVTs) have been mapped throughout the study area and broader locality as part of the Environmental Assessment report (ELA in prep) (Figure 2). They are outlined in Table 1 along with their EEC equivalents.

Table 1 Revised Biometric Vegetation Types and EEC Equivalents mapped at proposed Sapphire Wind Farm study area

Revised Biometric Vegetation Type	TSC Act EEC	EPBC Act EEC
BR110: Black Cypress Pine – Tumbledown Gum – Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion	-	-
BR114: Blakely's Red Gum – Rough-barked Apple – Red Stingybark grassy open forest of the Western New England Tablelands		
BR116: Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tablelands	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) – ***Critically endangered on EPBC Act***
BR153: Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast	Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	-
BR227: Tenterfield Woollybutt – Silvertop Stringybark open forest of the New England Tablelands	-	-
BR240: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) – ***Critically endangered on EPBC Act***

Local benchmark data have been collected for each of these six vegetation types.

The method used in collecting local benchmark data is as described in Appendix 2 of the BAMCCOM and summarised in Table 2:-

Table 2 BioBanking attributes subject to local benchmark variation.

Attribute	Assessment Method	Subject to Local Benchmark Variation
Native Plant Species Richness (Number of Species)	20m X 20m plot	Yes
Native Over-storey Cover (Tallest woody stratum – Trees in this case)	Percent Foliage Cover at 10 points along a 50m transect	Yes
Native Mid-storey Cover (Shrubs and tree regeneration between 1m and the Over-storey)	Percent Foliage Cover at 10 points along a 50m transect	Yes
Native Ground Cover (Grasses) (Native grasses below 1m)	Percent frequency of grasses at 50 points along the 50m transect (i.e. every 1m)	Yes
Native Ground Cover (Shrubs) (Native shrubs below 1m)	Percent frequency of shrubs at 50 points along the 50m transect (i.e. every 1m)	Yes
Native Ground Cover Other (Native herbaceous dicots, monocots, ferns, lilies, orchids, sedges and rushes. Fungi, lichens and bryophytes not included)	Percent frequency of native 'other' at 50 points along the 50m transect (i.e. every 1m)	Yes
Exotic Plant Cover (Exotic plants are vascular plants not native to Australia)	Over-storey and mid-storey weeds - Percent Foliage Cover at 10 points along a 50m transect Ground cover weeds - Percent frequency of grasses at 50 points along the 50m transect (i.e. every 1m)	No
Number of Trees with Hollows	Number of living and dead trees with hollows within 50m X 20m plot	Yes
Length of Fallen Logs	The total length of logs at least 10 cm in diameter and at least 0.5 m long	Yes
Over-storey Regeneration	The proportion of over-storey species present in the zone that are regenerating (i.e. with diameter at breast height < 5 cm)	No

Local Benchmark data were collected during May 2009 by Nathan Smith and Peter Richards. In total, 18 plots were completed for the six biometric vegetation types (Figure 2).

Field Data sheets for all plots are included in Appendix A and a summarised list of all species recorded in Appendix B.

The local benchmark calculator.xls was used to generate local benchmarks (Results included in Tables 2-13 and raw data in Appendix C).

These benchmarks are proposed for use, subject to Director-General DECCW approval, in Step 5b of the Biobanking Credit calculator for the Site Value assessment (DECC 2009).

6 Local Benchmark Data Results

6.1 BR110: BLACK CYPRESS PINE – TUMBLEDOWN GUM – NARROW-LEAVED IRONBARK OPEN FOREST

BR110 was an open forest type largely associated with acid volcanic outcrops in the locality (Figure 3).

BR110 was dominated by *Eucalyptus dealbata* (Tumbledown Gum) and *E. crebra* (Narrow-leaved Ironbark), while *Callitris endlicheri* (Black Cypress Pine) was present mostly as juvenile regrowth. *Eucalyptus laevopinea* (Silvertop stringybark) was present as a co-dominant tree species while *Notelaea microcarpa* (Native Olive), *Monotoca scoparia*, *Lespedeza juncea* subsp. *sericea* and *Indigofera australis* (Australian Indigo) were occasionally present as shrubs. A variety of native herbs and grasses dominated the ground layer and included species such as *Aristida ramosa* (Purple Wiregrass), *Bothriochloa macra* (Red Grass), *Poa sieberiana* (Snow Grass), *Calotis cuneata* (Mountain Burr-Daisy), *Desmodium varians* (Slender Tick-trefoil), *Geranium solanderi* (Native Geranium) and *Wahlenbergia communis* (Tufted Bluebell).

BR110 does not equate to any EEC as listed on the TSC or EPBC Acts.

Table 3 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR110.

Keith Formation & Class: Dry sclerophyll forests (shrubby sub-formation) - Northern Tableland Dry Sclerophyll Forests					
Vegetation Type: Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion					
Veg Type ID: BR110	**Current Benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Revised Local Benchmark**
20m x 20m Plot					
Native plant species	30	46	40	43	≥43
50m transect					
Native over-storey cover	25-40	21	20	23.5	20-23
Native mid-storey cover	6-25	0	0	2	*0-2
Native ground cover (grasses)	20-30	62	64	58	59-64
Native ground cover (shrubs)	3-10	2	0	0	0-2
Native ground cover (other)	3-5	58	30	34	31-53
50m x 20m plot					
Number of trees with hollows	2	9	5	8	≥8
Total length of fallen logs	20	210	234	220	≥220
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 4 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR110 BM PLOT 1	343449	6717327
BR110 BM PLOT 2	343686	6717214
BR110 BM PLOT 3	343829	6717284

6.2 BR114: BLAKELY'S RED GUM – ROUGH-BARKED APPLE – RED STRINGYBARK GRASSY OPEN FOREST

BR114 was an open forest type and was associated with a single acid volcanic outcrop within the study area (Figure 3).

Within the study area, BR114 was dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *E. macrorhyncha* (Red Stringybark). *Acacia terminalis* (Sunshine Wattle), *N. microcarpa* and *L. juncea* subsp. *sericea* were occasionally present as shrubs. The ground layer was dominated by a variety of native herbs and grasses that were in common with BR110.

BR114 does not equate to an EEC as listed on the TSC or EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 5 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR114.

Keith Formation & Class: Grassy Woodlands - New England Grassy Woodlands					
Vegetation Type: Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest of the western New England Tablelands					
Veg Type ID: BR114	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	25	36	40	51	≥40
50m transect					
Native over-storey cover	6-25	24.5	30	33	26-32
Native mid-storey cover	0-5	6	0	1.5	*0-5
Native ground cover (grasses)	30-40	50	24	44	28-49
Native ground cover (shrubs)	3-10	8	4	0	1-7
Native ground cover (other)	3-5	24	16	32	18-30
50m x 20m plot					
Number of trees with hollows	1	6	4	4	≥4
Total length of fallen logs	15	266	125	53	≥125
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 6 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR114 BM PLOT 1	354676	6720081
BR114 BM PLOT 2	354560	6720073
BR114 BM PLOT 3	352692	6719983

Figure 3. Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest.

Figure 4. Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest

6.3 BR116: BLAKELY'S RED GUM – YELLOW BOX GRASSY OPEN FOREST OR WOODLAND

Within the study area BR116 was present as an open forest type or woodland and was associated with the basalt geology within the study area (Figure 4).

Within the study area, BR116 was dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *E. melliodora* (Yellow Box). *Acacia implexa* (Hickory Wattle), *Exocarpos cupressiformis* (Native Cherry) and *Lespedeza juncea* subsp. *sericea* were only present as a sparse layer of shrubs at the benchmark plots. The ground layer of this RBVT was dominated by a variety of herbs and grasses including *Aristida* spp., *Asperula conferta* (Common Woodruff), *Carex inversa* (Knob Sedge), *Cymbopogon refractus* (Barbed Wire Grass), *Desmodium varians* (Slender Tick-trefoil), *Wahlenbergia communis* (Tufted Bluebell) and *Themeda australis* (Kangaroo Grass).

BR116 equates to the Box – Gum Woodland EEC as listed on the TSC and EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 7 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR116.

Keith Formation & Class: Grassy Woodlands - New England Grassy Woodlands					
Vegetation Type: Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest of the western New England Tablelands					
Veg Type ID: BR116	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	25	39	38	39	≥39
50m transect					
Native over-storey cover	6-25	21.5	20	21	20-21
Native mid-storey cover	0-5	0	0	1	*0-1
Native ground cover (grasses)	30-40	48	42	44	42-47
Native ground cover (shrubs)	3-10	0	2	0	*0-2
Native ground cover (other)	3-5	24	12	20	14-23
50m x 20m plot					
Number of trees with hollows	1	6	3	5	≥5
Total length of fallen logs	15	95	73	57	≥73
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 8 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR116 BM PLOT 1	361334	6719672
BR116 BM PLOT 2	353624	6719994
BR116 BM PLOT 3	356357	6720186

6.4 BR153: MANNA GUM – ROUGH-BARKED APPLE – YELLOW BOX GRASSY WOODLAND/OPEN FOREST

Within the study area BR153 was present as an open forest type or woodland and was specifically associated with the basalt geology within the study area (Figure 5).

Within the study area, BR153 was dominated by *Eucalyptus viminalis* (Ribbon/Manna Gum) and *Angophora floribunda* (Rough-barked Apple) with *E. melliodora* (Yellow Box) less common. Shrubs were largely absent from this RBVT within the study area and the ground layer was dominated by a similar variety of herbs and grasses to BR116.

BR153 equates to the Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion as listed on the TSC Act. There is no equivalent EEC listing on the EPBC Act for this RBVT.

Biometric benchmark comparison to local benchmark

Table 9 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR153.

Keith Formation & Class: Grassy Woodlands - Tableland Clay Grassy Woodlands					
Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast					
Veg Type ID: BR153	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	23	38	31	38	≥38
50m transect					
Native over-storey cover	6-25	18.5	12	21.5	13-21
Native mid-storey cover	0-5	0	0	0	*0-0
Native ground cover (grasses)	30-40	80	62	72	64-78
Native ground cover (shrubs)	0	8	10	2	3-10
Native ground cover (other)	3-5	16	0	16	3-16
50m x 20m plot					
Number of trees with hollows	1	0	1	4	≥1
Total length of fallen logs	15	146	31	133	≥133
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 10. Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR153 BM PLOT 1	344474	6718932
BR153 BM PLOT 2	345182	6718891
BR153 BM PLOT 3	343563	6718406

Figure 5. Blakely's Red Gum - Yellow Box grassy open forest or woodland.

Figure 6. Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest.

6.5 BR227: TENTERFIELD WOOLLYBUTT – SILVERTOP STRINGYBARK OPEN FOREST

BR227 was an open forest type and was associated with acid volcanic outcrops within the locality (Figure 6).

Within the study area, BR227 was dominated by *Eucalyptus banksii* (Tenterfield Woollybutt), a stringybark *E. subtilior* and *E. crebra*. The shrub layer was largely removed, however *Indigofera australis* (Australian Indigo) and *Lespedeza juncea* subsp. *sericea* were occasionally present. The ground layer was typical of the RBVTs associated with acid volcanics as previously described for BR110 and BR114.

BR227 does not equate to an EEC as listed on the TSC or EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 11 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR227.

Keith Formation & Class: Dry sclerophyll forests (shrub/grass sub-formation) - New England Dry Sclerophyll Forests					
Vegetation Type: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands					
Veg Type ID: BR227	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	33	53	35	49	≥49
50m transect					
Native over-storey cover	25-40	30.5	18.5	15.5	16-28
Native mid-storey cover	6-25	4	2	0	*0-4
Native ground cover (grasses)	18-20	12	36	84	17-74
Native ground cover (shrubs)	3-10	14	18	4	6-17
Native ground cover (other)	3-5	8	18	18	10-18
50m x 20m plot					
Number of trees with hollows	2	4	3	0	≥3
Total length of fallen logs	20	80	364	157	≥157
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 12 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR227 BM PLOT 1	344012	6726149
BR227 BM PLOT 2	352897	6720021
BR227 BM PLOT3	356086	6718319

6.6 BR240: WHITE BOX GRASSY WOODLAND

BR240 was present as a woodland type and was associated with the basalt geology largely in the western part of the study area (Figure 7).

Within the study area, BR240 was dominated by *Eucalyptus albens* (White Box) with *A. floribunda* as an associated species. Shrubs were largely absent while the ground layer was typical of the other units associated with basalt geology, BR116 and BR153. Clearing and grazing were substantial within this RBVT within the study area. Some areas retained some resilience with a variety of native grasses and herbs present but for the most part BR240 was degraded due to soil disturbance (tilling and pasture improvement) and subsequent weed invasion.

BR240 equates to the Box – Gum Woodland EEC as listed on the TSC and EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 13 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR240.

Keith Formation & Class: Grassy Woodlands - Western Slopes Grassy Woodlands					
Veg Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions					
Veg Type ID: BR240	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	23	40	47	33	≥40
50m transect					
Native over-storey cover	6-25	26	18	25	19-26
Native mid-storey cover	0-5	0	20	0	*0-16
Native ground cover (grasses)	30-40	66	62	76	63-74
Native ground cover (shrubs)	0	0	0	6	0-5
Native ground cover (other)	3-5	6	18	14	8-17
50m x 20m plot					
Number of trees with hollows	1	3	2	2	≥2
Total length of fallen logs	30	144	58	24	≥58

Note:
* Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.

Table 14 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR240 BM PLOT 1	343300	6718331
BR240 BM PLOT 2	342777	6717896
BR240 BM PLOT 3	342354	6716288

Figure 7.Tenterfield Woollybutt – Silvertop Stringybark open forest.

Figure 8. White Box grassy woodland.

References

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

ELA (In Prep) Sapphire Wind Farm Ecological Assessment. . Eco Logical Australia, NSW.

Keith, D. 2004. *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT.* NSW Department of Environment and Conservation, Hurstville.

Appendix A: Reference site field data sheets

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 110_BM Plot 1

Ref Site ID	172	Recorders	N. Smith P. Richards	Date	4 May 09
GPS datum	GDA 94	Easting *	343449	Northing*	6717327

874m

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	NUB TDG BCP 110_BM		
Ancillary Code (Usually condition description)	Benchmark		
Condition (Low or Mod-Good)	Mod-Good	Habitat Features (rocks etc)	Hollows, ground logs, rocks

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 46		
50m Transect – 10 Points	Native over-storey cover (%)	30, 10, 10, 20, 25, 20, 10, 20, 30, 35	210 Sum / 10	21 %
	Native mid-storey cover (%)	0	Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	Double score out of 50 to get %	62 %
	Native ground cover (hits/50 points) – shrubs	1	Double score out of 50 to get %	2 %
	Native ground cover (hits/50 points) – other	𝍸 𝍸 𝍸 𝍸 𝍸 IIII	Double score out of 50 to get %	58 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) 0	Sum / 10	Sum exotic % cover
		Midstorey (10 points) 0	Sum / 10	
		Ground (50 points) 1	Double score	2 %
20m x 50m Quadrat	Number of trees with hollows	9		
	Total length fallen logs >10cm width (m)	210 m		
Whole Veg. Zone	Over-storey regeneration	Species: Euc. crieb. Euc. leuco Euc. deal.	Regenerating (ie. saplings)? E. crebra E. deal.	Proportion 0.66

dB 138 110 BM Plot 1

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. crebra	Bidens pilosa
2	E. laevopinea	Hypo radic
3	E. dealbata	Sonchus
4	Lespedeza juncea	Medicago
5	Notelaea micro	Trifolium
6	Indigofera australis	
7	Echinopogon caesp.	
8	Microlaena stip	
9	Desm brach	OPTIONAL
10	Dich repens	
11	Asperula conferta	
12	Cheilanthes sieberi	
13	Geranium	
14	Calotis	
15	Poa sieb	OPTIONAL
16	Cymbo refracta	
17	Glycine sp. 1	
18	Brachyscome microcarpa	
19	Carex inversa	
20	Dichelachne micrantha	
21	Wahlenbergia	OPTIONAL
22	Hibb obovatifolia	
23	Aristida ramosa	
24	Austrodanthonia	
25	Veronica plebeia (calycina?)	
26	Vernonia cinerea	
27	Hypericum gramineum	OPTIONAL
28	Opercularia diphylla	
29	Oxalis sp.	
30	Vittadinia	
31	Glycine sp 2	
32	Asperula conferta	
33	Goodenia panic	OPTIONAL
34	Monotoca	
35	Melichrus urceolatus	
36	Exocarpos	
37	Panicum	
38	Bothriochloa	
39	Brunoniella	OPTIONAL
40	Cyperus	
41	Chamaesyce	
42	Viola betonicifolia	
43	Sigesbeckia	
44	Desmodium varians	
45	~~Liliaceae~~ Arthropodium	OPTIONAL
46	Galium	
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 122 110_BM Plot1

Modification Type	Code				NOTES
Firewood collection and tidying up	1	R	O	NR	
Grazing and trampling	1	C	O	R	
Soil disturbance	0				
Canopy dieback	0				
Dense regrowth post-disturbance	0				
Weeds	1	R	O	R	
Timber harvesting	1	C	O	R	
Fire damage	0				
Flood damage	0				
Storm damage	0				
Feral herbivores	0				
Other indicative type	0				

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 110_BM Plot 2

Ref Site ID	167	Recorders	PR/NS	Date	4/5/09
GPS datum		Easting *	343686	Northing*	6717244

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat 898

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	BCP, NC18, TDG. 110_BM		
Ancillary Code (Usually condition description)	BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	Rocks Logs Hollows

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 40		
50m Transect – 10 Points	Native over-storey cover (%)	15 15 15 15 20 20 30 30 15 25	200 Sum / 10	20 %
	Native mid-storey cover (%)	- - - - - - - - - -	Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	Double score out of 50 to get %	64 %
	Native ground cover (hits/50 points) – shrubs	—	Double score out of 50 to get %	0 %
	Native ground cover (hits/50 points) – other	𝍸 𝍸 𝍸	Double score out of 50 to get %	30 %
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstorey (10 points) 0	Sum / 10	Sum exotic 0 % cover
		Midstorey (10 points) 0	Sum / 10	
		Ground (50 points) 𝍸 III	Double score	16 %
20m x 50m Quadrat	Number of trees with hollows	5		
	Total length fallen logs >10cm width (m)	234m		
Whole Veg. Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?	Proportion
		E. dealbata	Y	~~0.5~~
		E. cebra	N	
		E. laevopinea	N	0.33

dB 139. 110 8m Platz

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Eu. deal.	Hypochaeris rad.
2	" lanc.	Rubus sp.
3	" crebra.	Medicago.
4	Euc. melli.	Petrorhagia nant.
5	Notelaea	Lepidium sp.
6	Gahnia	Sonchus oleran.
7	Micro.	Trifolium sp.
8	Bursaria	Conyza sp.
9	Hibbertia	OPTIONAL
10	Wahlen.	
11	Siegesbeck.	
12	Desmodium brachy.	
13	" gran.	
14	Geranium Lon.	
15	Panicum sp. 1	OPTIONAL
16	Rytidosperma sp. 1	
17	Austrodanth. sp. 1	
18	Aristida ram.	
19	~~Tetrarrhena~~	
20	Pteris sp. 1	
21	Plantago deb.	OPTIONAL
22	Aspl. conf.	
23	Oxalis	
24	Cheilanthes	
25	Brachyscome micro	
26	Eragrostis brownii	
27	Dich. rep.	OPTIONAL
28	Hypericum gram.	
29	Daucus glach.	
30	Carex inversa.	
31	Vernonia cin.	
32	Opere. dich.	
33	Lomandra fil.	OPTIONAL
34	Veronica pleb.	
35	Calocephalus sp.	
36	Dianella sp.	
37	Einadia ~~sp~~ nutans.	
38	Lissanthe strig.	
39	Unidentified grass. Poa sp. ✓	OPTIONAL
40	Lom. multi.	
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 167 40_BM Plot 2

Modification Type	Code	NOTES
Firewood collection and tidying up	2 C O R	
Grazing and trampling	1 C O R	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	2 C O R	
Timber harvesting	0	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type		

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. HOBM Plot 3

Ref Site ID	166	Recorders	NS/PK	Date	4/5/09
GPS datum	GDA 94	Easting *	343828	Northing*	6717284

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat.

elev. 895m

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	–	BB, TSG, NLB . HO_BM.	
Ancillary Code (Usually condition description)	BENCHMARK		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	Logs, rocks, hollows, stags.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here:	43		
50m Transect – 10 Points	Native over-storey cover (%)	20/20/20/20/15/20/20/30/30/30	Sum / 10	23.5 %	
	Native mid-storey cover (%)	5/5/–/–/5/5/–/–/–/–	Sum / 10	2 %	
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses *	𝍸 𝍸 𝍸 𝍸 𝍸 ||||	Double score out of 50 to get %	58 %	
	Native ground cover (hits/50 points) – shrubs	!	Double score out of 50 to get %	0 %	
	Native ground cover (hits/50 points) – other	𝍸 𝍸 𝍸 ||	Double score out of 50 to get %	34 %	
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) 0	Sum / 10	Sum exotic 0 % cover	
		Midstorey (10 points) 0	Sum / 10		
		Ground (50 points) 𝍸	Double score	10 %	
20m x 50m Quadrat	Number of trees with hollows	𝍸 ||| 8			
	Total length fallen logs >10cm width (m)	220m			
Whole Veg Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?	Proportion	
		E. dealbata	Y		
		E. crebra			
		E. leucoxylon			

110 BM Plot 3

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc crebs.	Bidens.
2	" deal.	Trifolium repens.
3	" ~~[illegible]~~ leucopinea.	Hypochaeris rad.
4	~~" melliodora~~ E. melliodora	Medicago. sp.
5	Ac. implexa.	
6	" term.	
7	Jacksonia scop.	
8	Dich micr.	
9	Echino caes.	OPTIONAL
10	Micro.	
11	Wahlenbergia.	
12	~~Dipodium [illegible]~~	
13	Brachyscome	
14	Zornia	
15	Poranthera	OPTIONAL
16	Cheilanthes	
17	Operc. diph.	
18	Glycine.	
19	Desmodium granit.	
20	~~Trif~~ Plantago debile	
21	Hibbertia obtus.	OPTIONAL
22	Hypericum gramineum.	
23	Daucus glochidiatus.	
24	Sigesbeckia orientalis.	
25	Oxalis	
26	Veronica	
27	Swainsona	OPTIONAL
28	Lomandra sp. confert.	
29	" multi.	
30	Aristida	
31	Geranium	
32	Austrodanthonia sp. 1	
33	Bothriochloa	OPTIONAL
34	Hovea lin.	
35	Melichrus.	
36	Hardenbergia	
37	Desmod. brachy.	
38	Eragrostis sp. (prob. brownii)	
39	~~Euphorbia sp~~ Euchiton spp.	OPTIONAL
40	Poranthera sp.	
41	Veronica cine.	
42	Notelaea.	
43	Asperula conferta	
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 166 40 BM Plot 3

Modification Type	Code	NOTES
Firewood collection and tidying up	1 C O O	
Grazing and trampling	1 B O R	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 C O R	
Timber harvesting	1 B O O	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other Indicative type		

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

240 BM Plot 1

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. Plot 1

Ref Site ID	202	Recorders	NS + LC	Date	7/5/09
GPS datum		Easting *	343300	Northing*	6718331

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	240 BM		
Ancillary Code (Usually condition description)	BENCHMARK.		
Condition (Low or Mod-Good)	Mod-Good!	Habitat Features (rocks etc)	Logs + hollows Stags.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 40	
50m Transect – 10 Points	Native over-storey cover (%)	10, 10, 40, 40, 30, 0, 40, 40, 30, 20 (260) Sum / 10	26 %
	Native mid-storey cover (%)	— Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ||| (33) Double score out of 50 to get %	66 %
	Native ground cover (hits/50 points) – shrubs	— Double score out of 50 to get %	0 %
	Native ground cover (hits/50 points) – other	||| (3) Double score out of 50 to get %	6 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) — 0 Sum / 10 Midstorey (10 points) — 0 Sum / 10 Ground (50 points) 0 Double score	Sum exotic % cover 0 %
20m x 50m Quadrat	Number of trees with hollows	3	
	Total length fallen logs >10cm width (m)	144	
Whole Veg. Zone	Over-storey regeneration	Species: E. albens; A. [illegible] — Regenerating (ie. saplings)?: ✓; ✓	Proportion: 1.0

240 BM Plot 1.

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. albens.	Rosa rubig.
2	Themeda.	Verbena rigida.
3	Plantago deb.	Trifolium camp.
4	Ac. dcanoi	Bidens pil.
5	Mentha diemenica.	
6	Swainsona galegifolia.	
7	Viola bet.	
8	Dichelach. micr.	
9	Both. macra.	OPTIONAL
10	Glycine cland.	
11	Poa sieb.	
12	Sorghum leiac.	
13	Dich. sp. A.	
14	Veronica caly.	
15	Carex inv.	OPTIONAL
16	Oxalis per.	
17	Wahlenbergia.	
18	Euchiton sp.	
19	Dianella rev. var. ven.	
20	Dipodium sp.	
21	Pim. curv.	OPTIONAL
22	Hydrocot. lax.	
23	Glycine taba.	
24	Aristida lepto.	
25	Geranium	
26	Acaena ovina	
27	Senecio quad.	OPTIONAL
28	Chamaesyce sp.	
29	Ajuga aust.	
30	Dianella long.	
31	Desm brachy.	
32	Notelaea micro.	
33	Poly japan.	OPTIONAL
34	Senecio hisp.	
35	Cynoglossum sp.	
36	Cheilan. laus.	
37	Lissinia levis	
38	Cymbo ref.	
39	Lom. moll.	OPTIONAL
40	Arg. flori	
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 202 Plot 1 (24a_BM).

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 R 0 R	
Timber harvesting	2 C 0 NR	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

240 BM Plot 2

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. Plot 2

Ref Site ID	196	Recorders	NS / PR	Date	6/5/09
GPS datum		Easting *	342777	Northing*	6717896

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Photo: 100 - 0293

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	240 BM		
Ancillary Code (Usually condition description)	BM		
Condition (Low or Mod-Good)		Habitat Features (rocks etc) *	hollows, ground timber

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 47											
50m Transect – 10 Points	Native over-storey cover (%)	20	20	30	15	10	15	25	20	15	10	Sum / 10	18 %
	Native mid-storey cover (%)	0	0	0	0	0	20	25	15	10	20	Sum / 10	9 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 I										Double score out of 50 to get %	62 %
	Native ground cover (hits/50 points) – shrubs											Double score out of 50 to get %	0 %
	Native ground cover (hits/50 points) – other	𝍸 IIII										Double score out of 50 to get %	18 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) 0										Sum / 10	Sum exotic 0% cover
		Midstorey (10 points) 0										Sum / 10	
		Ground (50 points) III										Double score	6 %
20m x 50m Quadrat	Number of trees with hollows	2											
	Total length fallen logs >10cm width (m)	58m											
Whole Veg. Zone	Over-storey regeneration	Species										Regenerating (ie. saplings)?	Proportion
		E. albens										Y	
		A. floribunda										Y	1
		E. macrorhyncha										Y	
		E. melliodora										Y	

240 BM Plot 2

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. albens	Bidens
2	Stypelia viridis	Picris hieracioides
3	Lespedeza juncea	Taraxacum
4	Hibbertia obtusif.	Hypochaeris
5	Vittadinia	Conyza
6	Wahlenbergia	Heliotropium
7	Dich repens	Vicia
8	Brachyscome microcarpa	Medic
9	Aristida	Euchlaena OPTIONAL
10	Poa	
11	Austrostipa	
12	Geranium sp.	
13	Glycine sp 2	
14	Lotus australis	
15	Scleranthus	OPTIONAL
16	Swainsona	
17	Dichanthium sericeum	
18	Bothriochloa macra	
19	Chrysopogon	
20	Acaena	
21	Viola betonicifolia	OPTIONAL
22	Pultenaea retusa	
23	~~Rhodanthe~~ Leucochrysum	
24	Cymbopogon	
25	E. macrorhyncha	
26	Notelaea microcarpa	
27	Angophora floribunda	OPTIONAL
28	Acacia deanei	
29	Pimelea curviflora	
30	Melaleuca plebeia	
31	Hypericum gramineum	
32	Veronica plebeia	
33	Calotis	OPTIONAL
34	Cymbonotus lawsonianus	
35	Carex inversa	
36	Hydrocotyle	
37	Lomandra multiflora	
38	Dichelachne micrantha	
39	Olearia elliptica	OPTIONAL
40	Desmodium gunnii	
41	Desm brachypodum	
42	Dianella caerulea	
43	Lagenifera	
44	Eriadia	
45	Glycine sp. 2	OPTIONAL
46	Dillwynia	
47	Themeda	
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 196 Plot 2 (240_BM)

Modification Type	Code				NOTES
Firewood collection and tidying up	1	B	O	NR	
Grazing and trampling	1	C	O	NR	
Soil disturbance	0				
Canopy dieback	0				
Dense regrowth post-disturbance	0				
Weeds	1	C	O	R	
Timber harvesting	1	B	O	NR	
Fire damage	0				
Flood damage	0				
Storm damage	0				
Feral herbivores	0				
Other indicative type					

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

240 BM Plot 3

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. Plot 3

Ref Site ID	195	Recorders	NS/PR	Date	6/5/09
GPS datum		Easting *	342354	Northing*	6716284

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	240 (BM)		
Ancillary Code (Usually condition description)	Benchmark.		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	logs, hollows, Stags.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 33			
50m Transect – 10 Points	Native over-storey cover (%)	20, 30, 40, 40, 30, 30, 15, 5, 20, 20 = (260)	Sum / 10	25 %	
	Native mid-storey cover (%)		Sum / 10	%	
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	38	Double score out of 50 to get %	76 %	
	Native ground cover (hits/50 points) – shrubs	3	Double score out of 50 to get %	6 %	
	Native ground cover (hits/50 points) – other	7	Double score out of 50 to get %	14 %	
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) 0 Sum / 10 Midstorey (10 points) 0 Sum / 10 Ground (50 points) 1 (2) Double score		Sum exotic % cover 2 %	
20m x 50m Quadrat	Number of trees with hollows	2			
	Total length fallen logs >10cm width (m)	24 m			
Whole Veg. Zone	Over-storey regeneration	Species: E. albens	Regenerating (ie. saplings)? ✓	Proportion 1/1 (1.0)	

240 BM Plot 3

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. albens	Medicago
2	Ar. dearei	Rosa rubig.
3	Natelaea	Sonchus ol.
4	Lespedeza	
5	Austrostipa scab.	
6	Poa sieb.	
7	Cymbo ref.	
8	Bichanth. seric.	
9	Cheilanthes sieberi	OPTIONAL
10	Aristida ram.	
11	Rubus parvifolius	
12	Chloris ventric.	
13	Bothriochloa	
14	Wahlenbergia	
15	Daucus gloch.	OPTIONAL
16	Austrodanth.	
17	Glycine	
18	Oxalis per.	
19	Plantago debile	
20	Hydrocotyle	OPTIONAL
21	Phyllanthus	
22	Pratia	
23	Acaena	
24	Geranium	
25	Pim. curv.	
26	Themeda aust.	
27	Asperula conf.	OPTIONAL
28	Microtheca	
29	Spartothamnella juncea	
30	Leucochrysum (?)	
31	Carex inv.	
32	Eremopt. deb	OPTIONAL
33	Rostellularia	
34		
35		
36		
37		
38		OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number 195 (240 – BM) 6/5/09 Plot 3.

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 R 0 R	
Timber harvesting	1 C 0 NR	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.: 153_BM Plot 1

Ref Site ID	WI 204	Recorders	NS + LC	Date	7/5/09
GPS datum		Easting *	344474	Northing*	6718932

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	153 BM		
Ancillary Code (Usually condition description)	BENCHMARK		
Condition (Low or Mod-Good)	———	Habitat Features (rocks etc)	LOGS & BOULDERS, STARTS CREEK IN VICINITY

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 38			
50m Transect – 10 Points	Native over-storey cover (%)	20, 40, 30, 20, 5, 20, 0, 0, 10, 40	(185)	Sum / 10	18.5 %
	Native mid-storey cover (%)	———		Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	(40)	Double score out of 50 to get %	80 %
	Native ground cover (hits/50 points) – shrubs	1111 (Saplings of Aug. floris?)	(4)	Double score out of 50 to get %	8 %
	Native ground cover (hits/50 points) – other	𝍸 111	(8)	Double score out of 50 to get %	16 %
50m Transect – 10 points + 50 points	Exotic plant cover: Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) ——— Sum / 10 Midstorey (10 points) ——— Sum / 10 Ground (50 points) 1111	(4)	Double score	Sum exotic % cover: 8 %
20m x 50m Quadrat	Number of trees with hollows	0			
	Total length fallen logs >10cm width (m)	146			
Whole Veg. Zone	Over-storey regeneration	Species: E. vim; A. floris	Regenerating (ie. saplings)? ✓ ✓		Proportion: 1/1 (1.0)

153 BM Plot 1

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. vim	Picris sp.
2	A. flori.	Rosa rubig.
3	Les. junc.	Trif. camp.
4	Hyp. conf.	Conyza.
5	~~Po~~ Poa sieb.	Hypericum perf.
6	Acaena ovin.	Cirsium vulgare.
7	Sorghum leiocl.	Pasp. dil.
8	Viola betonic.	Hypo rad.
9	Austrodanth. racem.	OPTIONAL
10	Pycnosorus glob.	
11	Bauerus glob.	
12	Plantago deb.	
13	Bulbine sp.	
14	Swainsona galeg.	OPTIONAL
15	Panicum queens.	
16	Senec. quad.	
17	Wahlen. comm.	
18	Oxalis per.	
19	Ajuga aust.	
20	Galium sp.	OPTIONAL
21	Microseris lanceolatus.	
22	Pim. curv.	
23	Dian. rev.	
24	Both. macra.	
25	Micro. stip.	
26	Senec. sp. E	OPTIONAL
27	Imperata	
28	Rubus parv.	
29	Dian. long.	
30	Carex inv.	
31	Themeda aust.	
32	Dichel. micr.	OPTIONAL
33	Rhodanthe.	
34	Phyllanthus virg.	
35	Des. brachy.	
36	Scleranthus	
37	Cynoglossum sp.	
38	Dipodium sp.	OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number 204 . 153_BM Plot 1

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B O R	
Timber harvesting	0	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 153_BM Plot 2

Ref Site ID	205	Recorders	NS + LC	Date	7/5/09
GPS datum		Easting *	345182	Northing*	6718891

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	153 BM		
Ancillary Code (Usually condition description)			
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 31		
50m Transect – 10 Points	Native over-storey cover (%)	0 | 20 | 30 | 20 | 10 | 20 | 10 | 0 | 10 | 0	Sum / 10	12 %
	Native mid-storey cover (%)	–	Sum / 10	– %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 |	Double score out of 50 to get %	62 %
	Native ground cover (hits/50 points) – shrubs	𝍸 |	Double score out of 50 to get %	10 %
	Native ground cover (hits/50 points) – other		Double score out of 50 to get %	– %
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points)	Sum / 10	Sum exotic % cover
		Midstorey (10 points)	Sum / 10	
		Ground (50 points) 1	Double score	2 %
20m x 50m Quadrat	Number of trees with hollows	1		
	Total length fallen logs >10cm width (m)	31m		
Whole Veg. Zone	Over-storey regeneration	Species: Euc vim/melli/blak Acac. flo.	Regenerating (ie. saplings)?	Proportion 4/4

153 BM Plot 2

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. viminalis	Rosa rubiginosa
2	E. melliodora	Paspalum dilatatum
3	E. blakelyi	Taraxacum officinale
4	Angophora floribunda	Hypochaeris radicata
5	Lomandra juncea	Cirsium vulgare
6	Sorghum leiocladum	
7	Themeda australis	
8	Eucalyptus sp.	
9	Austrodanthonia	OPTIONAL
10	Plantago debilis	
11	Senecio quadridentatus	
12	Bothriochloa macra	
13	Carex inversa	
14	Poa sieberiana	
15	Oxalis perennans	OPTIONAL
16	Glycine tabacina	
17	Pycnosorus globosus	
18	Acacia oxyg	
19	Wahlenbergia communis	
20	Glycine clandestina	
21	Geranium solandri	OPTIONAL
22	Eucalyptus sp.	
23	Panicum	
24	Soleranthus biflorus	
25	Vittadinia cuneata	
26	Brachycome sp.	
27	Lomandra multiflora	OPTIONAL
28	Asperula conferta	
29	Phyllanthus virgatus	
30	Viola betonicifolia	
31	Elymus scaber	
32		OPTIONAL
33		
34		
35		
36		
37		
38		OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number WP205 153_BM Plot 2

Modification Type	Code				NOTES
Firewood collection and tidying up	1	R	O	NR	
Grazing and trampling	0				
Soil disturbance	0				
Canopy dieback	0				
Dense regrowth post-disturbance	0				
Weeds	1	R	O	R	
Timber harvesting	1	R	O	O	
Fire damage	0				
Flood damage	0				
Storm damage	0				
Feral herbivores	0				
Other Indicative type					

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 153_BM Plot 3

Ref Site ID	HP203	Recorders	NS + LC	Date	7/5/09
GPS datum		Easting *	343564	Northing*	6718406

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	153 BM		
Ancillary Code (Usually condition description)	BENCHMARK.		
Condition (Low or Mod-Good)	~~Mod-Good~~	Habitat Features (rocks etc) *	deep gully nearby Logs, stags, hollows.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 38			
50m Transect – 10 Points	Native over-storey cover (%)	30, 20, 10, 25, 30, 20, 0, 10, 40, 30 (25 15 15 15 185)	215	Sum / 10	21.5%
	Native mid-storey cover (%)			Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 I	(36)	Double score out of 50 to get %	72 %
	Native ground cover (hits/50 points) – shrubs	I	(1)	Double score out of 50 to get %	2 %
	Native ground cover (hits/50 points) – other	𝍸 III	(8)	Double score out of 50 to get %	16 %
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points)	0	Sum / 10	Sum exotic % cover
		Midstorey (10 points)	1	Sum / 10	
		Ground (50 points)	0	Double score	%
20m x 50m Quadrat	Number of trees with hollows	4			
	Total length fallen logs >10cm width (m)	133 m			
Whole Veg. Zone	Over-storey regeneration	Species: ~~E. [illegible]~~ E. viminalis; A. floribunda	Regenerating (ie. saplings)? ✓ ✓		Proportion 2/2 (1.0)

153 Boy Plot 3

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. viminalis	Rosa rubiginosa
2	Acacia implexa	Picris hieracioides
3	Notelaea microcarpa var. micro.	Hypo rad.
4	Villarsia sieberi	
5	Swainsona galegifolia	
6	Sorghum leiocladum	
7	Themeda australis	
8	Both. mac.	OPTIONAL
9	" biloba. (V)	
10	Des varians.	
11	Pim. curv.	
12	Carex inv.	
13	~~Swainsona~~	
14	Senec quad.	OPTIONAL
15	Dichanth. seric.	
16	Vigtia concolor.	
17	Dichondra sp. A.	
18	Glycine cland.	
19	Dianella rev.	
20	Lespedeza juncea	OPTIONAL
21	Erem. deb.	
22	Geranium sp.	
23	Elymus scaber.	
24	Acaena ovina.	
25	Asp. conf.	
26	Arist. pers.	OPTIONAL
27	Sorghum leiocl.	
28	Ranunculus lap.	
29	Arq. flori	
30	Plant deb.	
31	Oxalis per.	
32	Wahlen. grac.	OPTIONAL
33	Rumex brownii	
34	Glycine tab.	
35	Dian. long.	
36	Thesium aust. (V)	
37	Vitt. cun.	
38	Euchiton sp.	OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number 203 153_BM Plot 3

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B 0 R	
Timber harvesting	0	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.

114_BM Plot 1

Ref Site ID	223	Recorders	NS/LC	Date	11/5/09
GPS datum		Easting *	354675	Northing*	6720084

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	114 Blakely / Acmena / Red Stringy		
Ancillary Code (Usually condition description)	114_BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)*	Logs, hollows, stags, Artificial perching.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 36		
50m Transect – 10 Points	Native over-storey cover (%)	30, 20, 10, 40, 20, 30, 30, 30, 20, 15 = (245)	Sum / 10	24.5 %
	Native mid-storey cover (%)	20, 10, 10, 20 = (60)	Sum / 10	6 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 𝍸 = (25)	Double score out of 50 to get %	50 %
	Native ground cover (hits/50 points) – shrubs	𝍸 = (4)	Double score out of 50 to get %	8 %
	Native ground cover (hits/50 points) – other	𝍸 𝍸 11 = (12)	Double score out of 50 to get %	24 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) ____ Sum / 10 Midstorey (10 points) ____ Sum / 10 Ground (50 points) ____ Double score		Sum exotic % cover %
20m x 50m Quadrat	Number of trees with hollows	6		
	Total length fallen logs >10cm width (m)	266		
Whole Veg. Zone	Over-storey regeneration	Species E. blakei E. subtilis E. banksii E. crebra Ang. flavi	Regenerating (ie. saplings)? ✓ ✓ ✓ ✓ ✓	Proportion 1.0

2B . 114 BM Plot 1

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. blakelyi	Bidens pilosa
2	E. subtilior	Conyza bonariensis
3	E. banksii	
4	E. crebra	
5	Angophora floribunda	
6	Leptospermum brevipes	
7	Lissanthe strigosa	
8	Calotis cuneifolia	OPTIONAL
9	Glycine clandestina	
10	Aristida personata	
11	Austrodanthonia sp.	
12	Wahlenbergia communis	
13	Echinopogon caespitosus	
14	Dianella revoluta	OPTIONAL
15	Lomandra multiflora	
16	Cymbonotus lawsonianus	
17	Dichelachne micrantha	
18	Carex inversa	
19	Goodenia bellidifolia	
20	Cymbopogon refractus	OPTIONAL
21	Lomandra longifolia	
22	Vernonia cinerea	
23	Opercularia aspera	
24	Lespedeza juncea	
25	Juncus pallida	
26	Themeda australis	OPTIONAL
27	Eragrostis leptostachya	
28	Juncus usitatus	
29	Acacia ulicifolia	
30	Poa sieberiana	
31	Ajuga australis	
32	Fimbristylis dichotoma	OPTIONAL
33	Microlaena stipoides	
34	Desmodium gunnii	
35	Melichrus urceolatus	
36	Vittadinia cuneata	
37		
38		OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number 223 (114_BM)  Plot 1

Modification Type	Code	NOTES
Firewood collection and tidying up	1 R O R	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 R O R	
Timber harvesting	1 0 0 0	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	—	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.

114_BM Plot 2

Ref Site ID	219	Recorders	NS/LC	Date	11/5/09
GPS datum		Easting *	354 560	Northing*	6720073

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	114 Blakely R. gum / Rough-barked Apple / Red Stringy.		
Ancillary Code (Usually condition description)	114_BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	Litter, logs, hollows, stags.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here:	40		
50m Transect – 10 Points	Native over-storey cover (%)	40, 30, 20, 40, 20, 20, 30, 40, 40, 20	300	Sum / 10	30 %
	Native mid-storey cover (%)			Sum / 10	%
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	IIII IIII II	(12)	Double score out of 50 to get %	24 %
	Native ground cover (hits/50 points) – shrubs	II	(2)	Double score out of 50 to get %	4 %
	Native ground cover (hits/50 points) – other	IIII III	(8)	Double score out of 50 to get %	16 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstorey (10 points)		Sum / 10	Sum exotic % cover
		Midstorey (10 points)		Sum / 10	0 %
		Ground (50 points)		Double score	
20m x 50m Quadrat	Number of trees with hollows	4			
	Total length fallen logs >10cm width (m)	125 m			
Whole Veg. Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?		Proportion
		E. melli	✓		1.0
		Ang. flori	✓		
		Euc. sieb.	✓		
		Euc. mel.	✓		

dB. 114 BM Plot 2

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. blakelyi	
2	Euc. michiana	
3	Euc. banksii	
4	Angophora floribunda	
5	Melichrus urceolatus	
6	Calotis lappulacea	
7	Echinopogon caespitosus	
8	Dichelachne micrantha	
9	Aristida personata	OPTIONAL
10	Austrodanthonia	
11	Wahlenbergia communis	
12	Hypericum gramineum	
13	Oxalis	
14	Viviella rev.	
15	Hardenbergia violacea	OPTIONAL
16	Opercularia aspera	
17	Lissanthe strigosa	
18	Lomax umbellata	
19	Themeda australis	
20	Cymbopogon refractus	
21	Vernonia cinerea	OPTIONAL
22	Cymbonotus lawsonianus	
23	Carex inversa	
24	Fimbristylis dichotoma	
25	Brachyloma daphnoides	
26	Haloragis heterophylla	
27	Ajuga australis	OPTIONAL
28	Microlaena stipoides	
29	Indigofera australis	
30	Aristida vagans	
31	Glycine	
32	Eragrostis leptostachya	
33	Leucopogon muticus	OPTIONAL
34	Acacia implexa	
35	Poa sieberiana	
36	Juncus usitatus	
37	Mueller a eucalyptoides	
38	Lomandra longifolia	
39	Billardiera scandens	OPTIONAL
40	Lomandra multiflora	
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 219

354560 6720873 (114_BM) Plot 2

Modification Type	Code	NOTES
Firewood collection and tidying up	1 R D R	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 R D R	
Timber harvesting	0	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 114_BM Plot 3

Ref Site ID	255	Recorders	NS/LL	Date	13/8/09
GPS datum		Easting *	352692	Northing*	6719983

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	114_BM		
Ancillary Code (Usually condition description)	—		
Condition (Low or Mod-Good)	BENCHMARK	Habitat Features (rocks etc)	Logs, Hollows, stags

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 51		
50m Transect – 10 Points	Native over-storey cover (%)	30, 40, 10, 20, 20, 50, 50, 40, 40, 40 = (330)	Sum / 10	33 %
	Native mid-storey cover (%)	0, 0, 0, 5, 0, 0, 0, 0, 10, 0 = (15)	Sum / 10	1.5 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	22	Double score out of 50 to get %	44 %
	Native ground cover (hits/50 points) – shrubs	0	Double score out of 50 to get %	0 %
	Native ground cover (hits/50 points) – other	16	Double score out of 50 to get %	32 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstorey (10 points) 0 Sum / 10 Midstorey (10 points) 6 Sum / 10 Ground (50 points) 0 Double score		Sum exotic % cover 0 %
20m x 50m Quadrat	Number of trees with hollows	4		
	Total length fallen logs >10cm width (m)	53		
Whole Veg. Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?	Proportion 100 % (1.0)

114 BM Plots

114 Blakely/Angophora/Stringy (BM3) wp 235 13/5/09 352692 7119983

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. blakely	Rosa rubiginosa
2	E. nicholii	Conyza bonariensis
3	E. bridgesiana	Hypochaeris radicata
4	Angophora floribunda	Bidens pilosa
5	Olearia sp. aff. elliptica	Cirsium vulgare
6	Acacia filicifolia	Lolium sp.
7	Hardenbergia violacea	Verbascum virgatum
8	Themeda australis	Plantago lanceolata
9	Pultenaea microphylla	Hirschfeldia incana
10	Cymbopogon refractus	
11	Echinopogon caespitosus	
12	Opercularia aspera	
13	Lomandra multiflora	
14	Aristida	OPTIONAL
15	Senecio	
16	Dianella revoluta	
17	Microlaena stipoides	
18	Lissanthe strigosa	
19	Goodenia bellidifolia	
20	Glycine tabacina	OPTIONAL
21	Oplismenus undulatifolius	
22	Dianella longifolia	
23	Juncus usitatus	
24	Lepidosperma juncea	
25	Hypericum gramineum	
26	Aotearoa ovina	OPTIONAL
27	Poa sieberiana	
28	Desmodium varians	
29	Brachycome sp.	
30	Calotis cuneifolia	
31	Joycea pallida	
32	Senecio prenanthoides	OPTIONAL
33	Daucus glochidiatus	
34	Hydrocotyle peduncularis	
35	Luzula sp.	
36	Bursaria spinosa	
37	Carex inversa	
38	Desmodium gunnii	OPTIONAL
39	Pichonia sp. A	
40	Fimbristylis dichotoma	
41	Elymus scaber	
42	Lomandra longifolia	
43	Hovea heterophylla	
44	Melichrus urceolatus	OPTIONAL
45	Wahlenbergia communis	
46	Ajuga australis	
47	Euchiton sp.	
48	Chrysocephalum apiculatum	
49	Gonocarpus tetragynus	
50	Geranium sp.	OPTIONAL
51	Sporobolus creber	
52		

M Plot Modification Table: Plot Number 235 (114_BM Plot3)

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B O R	
Timber harvesting	1 B O R	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.

116_BM Plot 1

Ref Site ID	217	Recorders	NS/CC	Date	11/5/09
GPS datum		Easting *	361334	Northing*	6719672

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	116 Blakely's Red Gum / Yellow Box		
Ancillary Code (Usually condition description)	116_BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 39		
50m Transect – 10 Points	Native over-storey cover (%)	20, 40, 20, 20, 30, 10, 5, 20, 20, 30	215 Sum / 10	21.5%
	Native mid-storey cover (%)	———	Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	卌 卌 卌 卌 |||| (24)	Double score out of 50 to get %	48 %
	Native ground cover (hits/50 points) – shrubs	———	Double score out of 50 to get %	0 %
	Native ground cover (hits/50 points) – other	卌 卌 || (12)	Double score out of 50 to get %	24 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points)	Sum / 10	Sum exotic % cover
		Midstorey (10 points)	Sum / 10	
		Ground (50 points)	Double score	0 %
20m x 50m Quadrat	Number of trees with hollows	6		
	Total length fallen logs >10cm width (m)	95m		
Whole Veg. Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?	Proportion
		E. bridg.	✓	1.0
		E. mell	✓	
		E. blake	✓	
		A. flori	✓	

dB . 116 BM Plot 1

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	blakelyi	Sonchus oleraceus
2	melliodora	Hypochaeris radicata
3	...is quinquefaria	Plantago lanceolata
4	...lla revoluta	Rosa rubiginosa
5	...is lappulacea	Cirsium vulgare
6	...anche nuisa	Solanum nigrum
7	...australis	Hypochaeris glabra
8	...odanthonia sp	Lactuca serriola
9	...beriana	Cotoneaster sp.
10	...pogon refractus	Conyza bonariensis
11	...tis leptostachya	
12	...lus urceolatus	
13	...tan sp	
14	...es sieberi	OPTIONAL
15	...pogon caespitosus	
16	...a bellidifolia	
17	...chne micrantha	
18	...cephalum apiculatum	
19		
20	...clandestina	OPTIONAL
21	...usitatus	
22	laevis	
23	longifolia	
24	...a gramineum	
25	...a multiflora	
26	...endlicheri	OPTIONAL
27	candollei	
28		
29	urceolatus	
30	australis	
31	...gis	
32	...lidiatum	OPTIONAL
33	...tenuistifolia	
34	...n sp.	
35	...thusoniana	
36	A	
37		
38	sp. stipoides	OPTIONAL
39		
40		
41		
42		
43		
44		OPTIONAL
45		
46		
47		
48		
49		
50		OPTIONAL
51		
52		

M Plot Modification Table: Plot Number 217 (116_BM) Plot 1

Modification Type	Code	NOTES
Firewood collection and tidying up	1 C O R	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 C O R	
Timber harvesting	1 B O O	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type		

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 117

116_BM Plot 2

Ref Site ID	220	Recorders	NS/LC	Date	11/5/09
GPS datum		Easting *	353623	Northing*	6719994

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	116 Blakelys / Yell. Box		
Ancillary Code (Usually condition description)	116_BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	Stags, logs, hollows, litter, dense grass

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 38											
50m Transect – 10 Points	Native over-storey cover (%)	10	20	30	20	10	10	20	30	30	20	Sum / 10	20 %
	Native mid-storey cover (%)	–	–	–	–	–	–	–	–	–	–	Sum / 10	– %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸										Double score out of 50 to get %	42 %
	Native ground cover (hits/50 points) – shrubs	1										Double score out of 50 to get %	2 %
	Native ground cover (hits/50 points) – other	𝍸 1										Double score out of 50 to get %	12 %
50m Transect – 10 points + 50 points	Exotic plant cover Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstorey (10 points)										Sum / 10	Sum exotic % cover
		Midstorey (10 points)										Sum / 10	
		Ground (50 points) 𝍸										Double score	10 %
20m x 50m Quadrat	Number of trees with hollows	3											
	Total length fallen logs >10cm width (m)	73m											
Whole Veg. Zone	Over-storey regeneration	Species						Regenerating (ie. saplings)?					Proportion
		E.c blakelyi						2/2					=1
		E. melliodora											

dB . 116 BM Plot 2

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Eve-mellidora	Rosa rubiginosa
2	E. blakelyi	Plantago lanceolata
3	Lespedeza juncea	Sonchus oleraceus
4	Epacris corymbiformis	Eragrostis curvula
5	Themeda australis	Juncus bufonius
6	Acacia ovita	Bidens pilosa
7	Sorghum leiocladum	Hypochaeris radicata
8	Echinopogon ovatus	Conyza bonariensis
9	Poa sieberiana	OPTIONAL
10	Carex inversa	
11	Dianella revoluta	
12	Juncus usitatus	
13	Aristida species	
14	Dichelachne micrantha	
15	Cymbopogon refractus	OPTIONAL
16	Glycine clandestina	
17	Aotus ericoides	
18	Desmodium varians	
19	Oreomyrrhis aspera	
20	Wahlenbergia	
21	Veronica calycina	OPTIONAL
22	Scleranthus biflorus	
23	Geranium	
24	Viola betonicifolia	
25	Calotis lappulacea	
26	Elymus scaber	
27	Lomandra multiflora	OPTIONAL
28	Dianella longifolia	
29	Lomandra filiformis	
30	Richardia sp. A	
31	Ajuga australis	
32	Acacia implexa	
33	Goodenia bellidifolia	OPTIONAL
34	Fimbristylis dichotoma	
35	Haloragis heterophylla	
36	Euchiton sp.	
37	Ranunculus lappaceus	
38	Arthropodium	
39		OPTIONAL
40		
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 220 (116_BM) Plot 2

Modification Type	Code	NOTES
Firewood collection and tidying up	1 O O R	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B O R	
Timber harvesting	1 B O O	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type		

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.

116_BM P6+3

Ref Site ID	218	Recorders	NS/LC	Date	11/5/09
GPS datum		Easting *	356357	Northing*	6720186

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

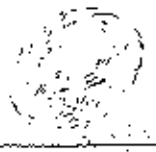
Biometric Vegetation Type (Create a standard short version)	116 – Blakely's Red Gum / Yellow Box		
Ancillary Code (Usually condition description)	116_BM		
Condition (Low or Mod-Good)	BM	Habitat Features (rocks etc)	

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 39											
50m Transect – 10 Points	Native over-storey cover (%)	30	30	30	20	10	20	20	30	10	10	Sum / 10	21 %
	Native mid-storey cover (%)	–	–	5	–	–	5	–	–	–	–	Sum / 10	1 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 𝍸 II										Double score out of 50 to get %	44%
	Native ground cover (hits/50 points) – shrubs											Double score out of 50 to get %	– %
	Native ground cover (hits/50 points) – other	𝍸 𝍸										Double score out of 50 to get %	20%
50m Transect – 10 points + 50 points	Exotic plant cover * Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points)										Sum / 10	Sum exotic % cover
		Midstorey (10 points)										Sum / 10	
		Ground (50 points)										Double score	– %
20m x 50m Quadrat	Number of trees with hollows	5											
	Total length fallen logs >10cm width (m)	57m											
Whole Veg. Zone	Over-storey regeneration	Species: Euc. blakelyi; E. melliodora; E. michiana; E. macrorhyncha										Regenerating (ie. saplings)? 4/4	Proportion = 1

dB 116 BM Plot3

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc blakelyi	Rosa rubiginosa
2	E. melliodora	Paspalum dilatatum
3	Acacia filicifolia	Conyza bonariensis
4	Hardenbergia violacea	Petrorhagia nanteuilii
5	Dianella revoluta	Bidens pilosa
6	Carex inversa	
7	Juncus usitatus	
8	Lespedeza juncea	
9	Glycine clandestina	OPTIONAL
10	Echinopogon caespitosus	
11	Aristida	
12	Lissanthe strigosa	
13	Austrodanthonia sp.	
14	Eragrostis leptostachya	
15	Cymbopogon refractus	OPTIONAL
16	Glycine tabacina	
17	Lomandra longifolia	
18	Daucus glochidiatus	
19	Poa sieberiana	
20	Microlaena stipoides	
21	Bothriochloa macra	OPTIONAL
22	Daviesia genistifolia	
23	Arthropodium	
24	Geranium	
25	Cynoglossum	
26	Viola betonicifolia	
27	Senecio hispidulus	OPTIONAL
28	Calotis lappulacea	
29	Vernonia cinerea	
30	Lomandra multiflora	
31	Bursaria spinosa	
32	Dichondra sp. A	
33	Goodenia bellidifolia	OPTIONAL
34	Scleranthus biflorus	
35	Austrodanthonia racemosa	
36	Desmodium varians	
37	Sorghum leiocladum	
38	Eucalyptus mckieana	
39	Mentha satureioides	OPTIONAL
40		
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

TSC Act (margin note beside row 38)

M Plot Modification Table: Plot Number 218 (116_BM)  Plot 3

Modification Type	Code	NOTES
Firewood collection and tidying up	1 C O R	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B O R	
Timber harvesting	1 B O R	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

227 BM Plot 1

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No.

227_BM Plot 1

Ref Site ID	WP 222	Recorders	NS/LC	Date	11/5/09
GPS datum		Easting *	344013	Northing*	6726149

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	227_BM		
Ancillary Code (Usually condition description)	—		
Condition (Low or Mod-Good)	BENCHMARK	Habitat Features (rocks etc)	WATER, LOGS, HOLLOWS, ROCK

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here:	53		
50m Transect – 10 Points	Native over-storey cover (%)	20, 20, 30, 20, 30, 35, 20, 40, 30, 20	(305)	Sum / 10	30.5%
	Native mid-storey cover (%)	10, 20, 10	(40)	Sum / 10	4 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	IIII	(6)	Double score out of 50 to get %	12 %
	Native ground cover (hits/50 points) – shrubs	IIII II	(7)	Double score out of 50 to get %	14 %
	Native ground cover (hits/50 points) – other	IIII	(4)	Double score out of 50 to get %	8 %
50m Transect – 10 points + 50 points	Exotic plant cover – Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points)		Sum / 10	Sum exotic % cover
		Midstorey (10 points)		Sum / 10	0 %
		Ground (50 points)		Double score	
20m x 50m Quadrat	Number of trees with hollows	4			
	Total length fallen logs ≥10cm width (m)	80 m			
Whole Veg. Zone	Over-storey regeneration	Species	Regenerating (ie. saplings)?		Proportion
		E. crebra	✓		(1.0)
		E. tenuirii	✓		
		A. floribunda	✓		
		B. mel.	✓		
		E. salut.	✓		

dB . 227 BM P6f1

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. crebra	Hypo. rad.
2	" mckiana	Cyclo. lepto.
3	" subtilliar	Vulp. rigida.
4	" banksii	Hypo. glabra
5	Ac. nerifolia.	Cirsium vulgare.
6	Grev. lann.	
7	Pult. foliosa	
8	Monot. scop.	OPTIONAL
9	Westrin. eremicola	
10	Lomar. long.	
11	Cymbo. ref.	
12	Aris. pers.	
13	Dich. micr.	
14	Dian. rev.	OPTIONAL
15	Dich. sericeum.	
16	Ajuga aust.	
17	Desm. var.	
18	Hydroc. laxi.	
19	Scutellaria hum.	
20	Daucus glach.	OPTIONAL
21	Oxalis sp.	
22	Lagen. sp.	
23	Eucharium sp.	
24	Asp. conf.	
25	Cymbo. laws.	
26	Lom multi.	OPTIONAL
27	Geranium sp.	
28	Brachycome proc.	
29	Viola betan.	
30	Galium gaud.	
31	Lesped. juncea.	
32	Ang. flavi.	OPTIONAL
33	Hardem. viol.	
34	Styph. trif.	
35	Alac. box.	
36	Dillwynia phyll.	
37	Platys. ert.	
38	Wahlen. comm.	OPTIONAL
39	Leuco. urtic.	
40	Melich. urc.	
41	Indig. aust.	
42	Pers. cora.	
43	Joycea pallida.	
44	Ento. stricta.	OPTIONAL
45	Cyperus grac.	
46	Lepido. lat.	
47	Senec. sp.	
48	Echino caes.	
49	Vitt. cun.	
50	Xanthorrhoea johns.	OPTIONAL
51	Lepto. brev.	
52	Chrysoc. apic.	

Pterostylis sp.

M Plot Modification Table: Plot Number 222 (227_BM) Plot 1

Modification Type	Code	NOTES
Firewood collection and tidying up	0	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	1 B O NR	
Weeds	1 B O R	
Timber harvesting	0	
Fire damage	2 C O NR	
Flood damage	0	
Storm damage	0	
Feral herbivores	1 B O R	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 227_BM Plot 2

Ref Site ID	221	Recorders	NJ/LC	Date	11/5/09
GPS datum		Easting *	352897	Northing*	6720024

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	227 Tenterfield Woolly Butt		
Ancillary Code (Usually condition description)	227_BM		
Condition (Low or Mod-Good)	BM	Habitat Features * (rocks etc)	Logs, hollows, stags

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 35			
50m Transect – 10 Points	Native over-storey cover (%)	15, 15, 5, 10, 5, 5, 10, 40, 40, 40	(185)	Sum / 10	18.5%
	Native mid-storey cover (%)	20	(20)	Sum / 10	2 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	𝍸 𝍸 𝍸 III	(18)	Double score out of 50 to get %	36 %
	Native ground cover (hits/50 points) – shrubs	𝍸 II	(9)	Double score out of 50 to get %	18 %
	Native ground cover (hits/50 points) – other	𝍸 IIII	(9)	Double score out of 50 to get %	18 %
50m Transect – 10 points + 50 points	Exotic plant cover - Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) _____ Sum / 10 Midstorey (10 points) _____ Sum / 10 Ground (50 points) _____ Double score			Sum exotic % cover 0 %
20m x 50m Quadrat	Number of trees with hollows	3			
	Total length fallen logs >10cm width (m)	364			
Whole Veg. Zone	Over-storey regeneration	Species E. bank E. blake E. caliz. E. crebra	Regenerating (ie. saplings)? ✓ ✓ ✓		Proportion 1.0

dB. 227_BM Plot 2

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	Euc. banksii	Hypochaeris radicata
2	E. blakelyi	Conyza bonariensis
3	E. caliginosa	Eragrostis curvula
4	E. crebra	
5	Cassinia quinquefaria	
6	Cheilanthes sieberi	
7	Micrantha stipoides	
8	Dichelachne micrantha	
9	Cymbopogon refractus	OPTIONAL
10	Calotis cuneifolia	
11	Melichrus urceolatus	
12	Hibbertia obtusifolia	
13	Glycine clandestina	
14	Wurmbea sp.	
15	Brachycome procumbens	OPTIONAL
16	Eulalia cespitosa	
17	Lomandra longifolia	
18	Dianella revoluta	
19	Lachnagrostis filiformis	
20	Geranium	
21	Senecio	OPTIONAL
22	Lissanthe strigosa	
23	Goodenia bellidifolia	
24	Hardenbergia violacea	
25	Austrodanthonia	
26	Euc. subtilior	
27	Chrysocephalum apiculatum	OPTIONAL
28	Carex sp.	
29	Indigofera australis	
30	Opercularia aspera	
31	Themeda australis	
32	Aristida	
33	Haloragis heterophylla	OPTIONAL
34	Lespedeza juncea	
35	Astrotricha virgata	
36		
37		
38		
39		OPTIONAL
40		
41		
42		
43		
44		
45		OPTIONAL
46		
47		
48		
49		
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 221 (227_BM) Plot 2

Modification Type	Code	NOTES
Firewood collection and tidying up	2 C O NR	
Grazing and trampling	0	
Soil disturbance	0	
Canopy dieback	0	
Dense regrowth post-disturbance	0	
Weeds	1 B O R	
Timber harvesting	2 C O NR	
Fire damage	0	
Flood damage	0	
Storm damage	0	
Feral herbivores	0	
Other indicative type	0	

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Eco Logical Australia - Biobank plot data sheet

Start a new sheet for each plot

Site Sheet No. 227_BM Plot 3

Ref Site ID	225	Recorders	NS / LC	Date	12/5/09
GPS datum		Easting *	356086	Northing*	6718319

* Record from Easting and Northing from the end of the 50m transect which also has the 20m quadrat

Vegetation Zone Identification

Biometric Vegetation Type (Create a standard short version)	227_BM (Tenterfield WB / Silver Stringy)		
Ancillary Code (Usually condition description)	—		
Condition (Low or Mod-Good)	—	Habitat Features (rocks etc)	Logs, Hollows, Stags.

20m x 20m Quadrat	Number of native plant species	Use species list over page (full Id is not required) Write no. natives here: 49		
50m Transect – 10 Points	Native over-storey cover (%)	20, 20, 30, 20, 30, 10, 10, 0, 0, 5 = 155	Sum / 10	15.5 %
	Native mid-storey cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0, 0 = 0	Sum / 10	0 %
50m Transect – 50 Points	Native ground cover (hits/50 points) – Grasses	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ II = 42	Double score out of 50 to get %	84 %
	Native ground cover (hits/50 points) – shrubs	II = 2	Double score out of 50 to get %	4 %
	Native ground cover (hits/50 points) – other	~~IIII~~ IIII = 9	Double score out of 50 to get %	18 %
50m Transect – 10 points + 50 points	Exotic plant cover Sum exotic cover (%) from (a) overstorey + (b) midstorey + (c) ground cover	Overstory (10 points) — Ø Sum / 10 Midstorey (10 points) — Ø Sum / 10 Ground (50 points) I = 1 Double score		Sum exotic % cover 2 %
20m x 50m Quadrat	Number of trees with hollows	0		
	Total length fallen logs >10cm width (m)	157 m		
Whole Veg Zone	Over-storey regeneration	Species: E. subtilior; E. mellio; E. banksii	Regenerating (ie. saplings)? ✓; ✓; ✓	Proportion: 1.0

E. mckiana . ✓

dB 227 BM Plot 3

	Natives (20m Quadrat)	Exotics (20m Quadrat)
1	E. subtillior	Cirsium vulg.
2	E. banksii	Conyza bon.
3	Eu. mellio.	Eragr. curvula.
4	Mel. ere.	Hypo. ~~rad~~ glabra.
5	Acacia filic.	Rosa rubig.
6	Dillwyn. sieb.	Lactuca s.
7	Goodt. hell	
8	Hard. viol.	OPTIONAL
9	Vern. cin.	
10	Galium gaud.	
11	Micro. stip.	
12	Echino caes.	
13	Calotis cun.	
14	Operc. asp.	OPTIONAL
15	Elyc. cland.	
16	Desm. var.	
17	Dich. micr.	
18	Austrodanth. rac.	
19	Cymbo. ref.	
20	Hibbertia obtus.	OPTIONAL
21	Pimelia sep. ang. x	
22	Indigof. aust.	
23	Lom. long.	
24	Angena sp.	
25	Dian. long.	
26	Austrodanth. sp. 2	OPTIONAL
27	Ajuga aust.	
28	Wahlen. comm.	
29	Aristida pers.	
30	Trachymene inc.	
31	Euc. nck.	
32	Lagenifera sp.	OPTIONAL
33	Glycine tabacina.	
34	Fimbry. dich.	
35	Erag. lepto	
36	Dod. visc. sphat.	
37	Dichondra sp. A	
38	Lis. strig.	OPTIONAL
39	Arist. vag.	
40	Chrysoc. apic.	
41	Geranium sp.	
42	Euchiton sp.	
43	Bothrio decip.	
44	Hovea lat.	OPTIONAL
45	Brachycome sp.	
46	Cheilanthes sieb.	
47	Lom. multi.	
48	Them. aust.	
49	Paranth. micro.	
50		
51		OPTIONAL
52		

M Plot Modification Table: Plot Number 225 (227_BM Plot 3)

Modification Type	Code				NOTES
Firewood collection and tidying up	1	B	0	NR	
Grazing and trampling	0				
Soil disturbance	0				
Canopy dieback	1	0	0	R	
Dense regrowth post-disturbance	0				
Weeds	1	B	0	R	
Timber harvesting	1	B	0	NR	
Fire damage	1	B	0	NR	
Flood damage	0				
Storm damage	0				
Feral herbivores	0				
Other indicative type	0				

Severity codes	Frequency codes	Evidence codes	Age codes
0 = No evidence	A = n/a (i.e. absent)	O = Observation	R = Recent (<3 years)
1 = Light	B = Rare	P = Personal communication	NR = Not recent
2 = Moderate	C = Occasional		O = Old
3 = Severe	D = Frequent		

Appendix B: Reference plot floristic data

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Acacia buxifolia	Box-leaved Wattle													x					
Acacia deanei	Green Wattle																x	x	x
Acacia filicifolia	Fern-leaved Wattle						x		x							x			
Acacia implexa	Hickory Wattle			x		x		x					x						
Acacia neriifolia	Silver Wattle													x					
Acacia terminalis	Sunshine Wattle			x															
Acacia ulicifolia	Prickly Moses				x														
Acaena ovina							x	x			x	x	x				x	x	x
Ajuga australis	Austral Bugle				x	x	x	x		x	x			x		x	x		
Amyema spp.																x			
Angophora floribunda	Rough-barked Apple				x	x	x				x	x	x	x			x	x	
Aristida leptopoda	White Speargrass																x		
Aristida ramosa	Purple Wiregrass	x	x																x
Aristida ramosa var. *speciosa*					x	x							x	x		x			
Aristida spp.				x			x	x	x	x					x			x	
Aristida vagans	Threeawn Speargrass					x									x	x			
Arthropodium spp.		x						x	x										
Asperula conferta	Common Woodruff	x	x	x				x			x	x	x	x					x
Austrodanthonia racemosa									x		x					x			
Austrodanthonia spp.		x	x	x	x	x			x	x		x			x	x			x
Austrostipa scabra	Speargrass																		x
Austrostipa spp.																		x	
Bidens pilosa	Cobbler's Pegs	x	x	x	x		x	x									x	x	
Bidens subalternans	Greater Beggar's Ticks						x												
Billardiera scandens	Appleberry					x													
Bothriochloa biloba													x						
Bothriochloa decipiens var. *decipiens*																x			
Bothriochloa macra	Red Grass	x	x	x					x		x	x	x				x	x	x
Brachyloma daphnoides	Daphne Heath					x													
Brachyscome microcarpa		x	x															x	
Brachyscome procumbens														x	x				
Brachyscome spp.				x			x					x				x			
Bursaria spinosa	Native Blackthorn		x				x		x										
Callitris endlicheri	Black Cypress Pine									x									
Calotis cuneata	Mountain Burr-Daisy	x					x												
Calotis cuneifolia	Purple Burr-Daisy				x										x	x		x	
Calotis lappulacea	Yellow Burr-daisy					x		x	x	x									

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Carex inversa	Knob Sedge	x	x		x	x	x	x			x	x	x		x		x	x	
Cassinia laevis	Cough Bush									x							x		
Cassinia quinquefaria										x					x				
Chamaesyce spp.		x															x		
Cheilanthes sieberi		x	x	x						x					x	x			x
Chloris ventricosa	Tall Chloris																		x
Choretrum candollei	White Sour Bush									x									
Chrysocephalum apiculatum	Common Everlasting						x			x				x	x	x			
Cirsium vulgare	Spear Thistle						x			x	x	x		x		x			
Conyza bonariensis	Flaxleaf Fleabane		x		x		x	x		x					x	x		x	
Conyza spp.											x								
Cotoneaster spp.										x									
Cyclospermum leptophyllum	Slender Celery													x					
Cymbonotus lawsonianus	Bear's Ear				x	x				x				x			x	x	
Cymbopogon refractus	Barbed Wire Grass	x	x		x	x	x	x	x	x				x	x	x	x	x	x
Cynoglossum spp.									x	x	x						x		
Cyperus gracilis	Slender Flat-sedge	x												x					
Daucus glochidiatus	Native Carrot		x	x			x		x	x	x			x					x
Daviesia genistifolia	Broom Bitter Pea								x	x									
Desmodium brachypodum	Large Tick-trefoil	x	x	x							x						x	x	
Desmodium gunnii	Slender tick trefoil		x	x	x		x											x	
Desmodium varians	Slender Tick-trefoil	x					x	x	x				x	x		x			
Deyeuxia spp.										x									
Dianella caerulea	Blue Flax-lily											x						x	
Dianella longifolia							x	x			x		x			x	x		
Dianella revoluta					x	x	x	x	x	x	x		x	x	x		x		
Dianella spp.			x																
Dichanthium sericeum	Queensland Bluegrass												x	x				x	x
Dichelachne micrantha	Shorthair Plumegrass	x		x	x	x	x	x		x	x			x	x	x	x	x	
Dichondra repens	Kidney Weed	x	x															x	
Dichondra sp. A							x	x	x	x			x			x	x		
Dillwynia phylicoides														x					
Dillwynia sieberi													x			x		x	
Dipodium spp.											x						x		
Dodonaea viscosa subsp. *spatulata*																x			
Echinopogon caespitosus	Bushy Hedgehog-grass	x	x	x	x	x	x	x	x	x				x	x	x		x	
Einadia nutans	Climbing Saltbush		x															x	
Elymus scaber							x	x				x	x						
Entolasia stricta	Wiry Panic													x					
Eragrostis brownii	Brown's Lovegrass		x	x															
Eragrostis curvula	African Lovegrass							x							x	x			
Eragrostis leptostachya	Paddock Lovegrass				x	x			x	x						x			
Eremophila debilis	Amulla												x						x

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Eucalyptus albens	White Box																x	x	x
Eucalyptus banksii	Tenterfield Woollybutt				x	x								x	x	x			
Eucalyptus blakelyi	Blakely's Red Gum				x	x	x	x	x	x		x			x				
Eucalyptus bridgesiana	Apple Box						x												
Eucalyptus caliginosa	Broad-leaved Stringybark														x				
Eucalyptus crebra	Narrow-leaved Ironbark	x	x	x	x									x	x				
Eucalyptus dealbata	Tumbledown Red Gum	x	x	x															
Eucalyptus laevopinea	Silver-top Stringybark	x	x	x															
Eucalyptus macrorhyncha	Red Stringybark																	x	
Eucalyptus mckieana (vulnerable)	McKie's Stringybark					x	x		x					x		x			
Eucalyptus melliodora	Yellow Box		x	x				x	x	x		x				x			
Eucalyptus subtilior					x									x	x	x			
Eucalyptus viminalis	Ribbon Gum										x	x	x						
Euchiton spp.				x			x	x		x	x	x	x	x		x	x	x	
Exocarpos cupressiformis	Native Cherry	x						x											
Fimbristylis dichotoma	Common Fringe-sedge				x	x	x	x								x			
Galium aparine	Goosegrass	x																	
Galium gaudichaudii	Rough Bedstraw						x							x		x			
Geranium solanderi	Native Geranium	x	x									x							
Geranium spp.				x			x	x	x		x		x	x	x	x	x	x	x
Glycine clandestina		x			x			x	x	x		x	x		x	x	x	x	
Glycine spp.			x	x															x
Glycine tabacina	Glycine	x				x	x		x			x	x			x	x	x	
Gonocarpus tetragynus							x												
Goodenia bellidifolia					x		x	x	x	x					x	x			
Goodenia paniculata		x																	
Grevillea ramosissima subsp. *ramosissima*	Fan Grevillea													x					
Haloragis heterophylla						x		x							x				
Hardenbergia violacea	False Sarsaparilla			x		x	x		x					x	x	x			
Heliotropium spp.																		x	
Hibbertia obtusifolia	Hoary guinea flower	x	x	x											x	x		x	
Hovea heterophylla							x									x			
Hovea linearis				x															
Hydrocotyle laxiflora	Stinking Pennywort													x			x		
Hydrocotyle peduncularis							x												
Hydrocotyle spp.																		x	x
Hypericum gramineum	Small St John's Wort	x	x	x		x	x			x								x	
Hypericum perforatum	St. Johns Wort										x								
Hypochaeris glabra	Smooth Catsear									x				x		x			
Hypochaeris radicata	Catsear	x	x	x			x	x		x	x	x	x	x	x			x	
Imperata cylindrica var. *major*	Blady Grass										x								
Indigofera australis	Australian Indigo	x				x								x	x	x			
Jacksonia scoparia	Dogwood			x															

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Joycea pallida	Silvertop Wallaby Grass				x		x							x					
Juncus bufonius	Toad Rush							x											
Juncus usitatus					x	x	x	x		x									
Lachnagrostis filiformis															x				
Lactuca serriola	Prickly Lettuce									x						x			
Lagenophora stipitata	Blue Bottle-daisy													x		x		x	
Lepidium spp.			x																
Lepidosperma laterale														x					
Leptospermum brevipes					x									x					
Lespedeza juncea subsp. *sericea*		x	x		x		x	x			x	x	x	x	x			x	x
Leucochrysum albicans																		x	x
Leucopogon muticus	Blunt Beard-heath					x								x					
Lissanthe strigosa	Peach Heath				x	x	x		x						x	x			
Lolium perenne	Perennial Ryegrass						x												
Lomandra confertifolia				x															
Lomandra filiformis	Wattle Matt-rush							x											
Lomandra longifolia	Spiny-headed Mat-rush				x	x	x		x	x				x	x	x			
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush		x	x	x	x	x	x	x	x		x		x		x	x	x	
Lotus australis	Australian Trefoil																	x	
Luzula spp.							x								x				
Medicago spp.		x	x	x														x	
Melichrus urceolatus	Urn Heath	x		x	x	x	x			x				x	x	x			
Mentha diemenica	Slender Mint																x		
Mentha satureioides	Native Pennyroyal								x										
Mentha spp.																		x	
Micrantheum ericoides																			x
Microlaena stipoides		x	x	x	x	x	x		x	x	x				x	x			
Microseris lanceolata											x								
Monotoca scoparia		x												x					
Muellerina eucalyptoides						x													
Notelaea microcarpa	Native Olive	x	x	x									x				x	x	x
Olearia elliptica	Sticky Daisy Bush																	x	
Olearia sp. aff. *elliptica*							x												
Opercularia aspera	Coarse Stinkweed				x	x	x	x							x	x			
Opercularia diphylla		x	x	x															
Oxalis perennans		x	x	x		x					x	x	x	x			x		x
Oxalis spp.										x									
Panicum queenslandicum	Yadbila Grass	x	x								x	x							
Paspalum dilatatum	Paspalum										x	x							
Persoonia cornifolia														x					
Petrorhagia nanteuilii			x																
Phyllanthus spp.																			x
Phyllanthus virgatus											x	x							

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Picris hieracioides	Hawkweed Picris												x					x	
Picris spp.			x								x								
Pimelea curviflora											x		x				x	x	x
Pimelea neo-anglica	Poison Pimelea															x			
Plantago debilis			x	x							x	x	x				x		x
Plantago lanceolata	Lamb's Tongues						x	x		x									
Platysace ericoides														x					
Poa sieberiana		x			x	x	x	x	x	x	x	x					x	x	x
Poa spp.			x																
Polygala japonica																	x		
Polygala spp.				x															
Pomax umbellata						x													
Poranthera microphylla																x			
Poranthera spp.		x		x															
Pratia concolor	Poison Pratia												x						x
Pterostylis spp.														x					
Pultenaea foliolosa														x					
Pultenaea retusa																		x	
Pycnosorus globosus											x	x							
Ranunculus lappaceus	Common Buttercup							x											
Ranunculus repens	Creeping Buttercup												x						
Rhodanthe spp.											x								
Rosa rubiginosa	Sweet Briar						x	x		x	x	x	x			x	x		
Rostellularia spp.																			x
Rubus parvifolius	Native Raspberry										x								x
Rumex brownii	Swamp Dock												x						
Sarga leiocladum								x	x		x	x	x				x		
Scleranthus biflorus								x	x		x	x						x	
Scutellaria humilis	Dwarf Skullcap													x					
Senecio hispidulus	Hill Fireweed								x								x		
Senecio prenanthoides							x				x								
Senecio quadridentatus	Cotton Fireweed										x	x	x				x		
Senecio spp.							x			x				x	x				
Sigesbeckia orientalis subsp. *orientalis*	Indian Weed	x	x	x															
Solanum nigrum	Black-berry Nightshade									x									
Sonchus oleraceus	Common Sowthistle	x	x					x		x									
Spartothamnella juncea																			x
Sporobolus creber	Slender Rat's Tail Grass						x												
Styphelia triflora	Pink Five-Corners													x					
Styphelia viridis																		x	
Swainsona galegifolia	Smooth Darling Pea										x		x				x	x	
Swainsona spp.				x															
Taraxacum officinale	Dandelion											x						x	

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Themeda australis	Kangaroo Grass				x	x	x	x		x	x	x	x		x	x	x	x	x
Thesium australe (vulnerable)	Austral Toadflax												x						
Trachymene incisa										x						x			
Trifolium campestre	Hop Clover										x						x		
Trifolium repens	White Clover	x	x	x															
Verbascum virgatum	Twiggy Mullein						x												
Verbena rigida var. *rigida*	Veined Verbena													x			x		
Vernonia cinerea		x	x	x	x	x			x							x			
Veronica calycina	Hairy Speedwell							x									x		
Veronica plebeia	Trailing Speedwell	x	x	x														x	
Vicia sativa																		x	
Viola betonicifolia	Native Violet	x						x	x		x	x		x			x	x	
Vittadinia cuneata	Fuzzweed	x			x								x	x				x	
Wahlenbergia communis	Tufted Bluebell	x	x	x	x	x	x	x		x	x	x		x		x	x	x	x
Wahlenbergia gracilis	Sprawling Bluebell												x						
Westringia eremicola	Slender Westringia													x					
Xanthorrhoea johnsonii														x					
Zornia dictyocarpa var. dictyocarpa				x															

Appendix C: Local Benchmark Calculator Spreadsheet

BioBanking Benchmark Calculator

Data entry: Local reference sites

To develop the benchmark, enter your transect/plot data that is collected from the reference sites. The benchmark will be generated automatically. The benchmark can then be transcribed manually into the Credit Calculator at *Step 5b: Enter Vegetation Transect/Plot Information* by selecting the *Edit Benchmarks* button.

Locating local reference sites and the field methods for measuring the vegetation condition variable must be made in accordance with the guidelines set out in section 3.4.3 and Appendix 2 of the Operational Manual.

Where a local reference site has been used to develop a benchmark for a biobank assessment, a copy of the site attribute data, description of the site and any other information that supports the local benchmark must be submitted to DECC as part of the application for the biobanking statement or agreement.

Vegetation formation	Dry Sclerophyll Forests (Shrubby)
Vegetation class	Northern Tablelands Dry Sclerophyll Forests
Vegetation type	BCP - TDG - NLIB O/F of Northern Nandewar

50-m transect	**Benchmarks**			**Plots** 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Native plant species	≥		43	46	40	43																	
Native over-storey cover	20	to	23	21	20	23.5																	
Native mid-storey cover	0	to	2	0	0	2																	
Native ground cover (grasses)	59	to	64	62	64	58																	
Native ground cover (shrubs)	0	to	2	2	0	0																	
Native ground cover (other)	31	to	53	58	30	34																	
50m x 20m plot																							
Number of trees with hollows	≥		8	9	5	8																	
Total length of fallen logs	≥		220	210	234	220																	

	Median	10th percentile	90th percentile
Native plant species	43	40.6	45.4
Native over-storey cover	21	20.2	23
Native mid-storey cover	0	0	1.6
Native ground cover (grasses)	62	58.8	63.6
Native ground cover (shrubs)	0	0	1.6
Native ground cover (other)	34	30.8	53.2

Number of trees with hollows	8	5.6	8.8
Total length of fallen logs	220	212	231.2

BioBanking Benchmark Calculator

Data entry: Local reference sites

To develop the benchmark, enter your transect/plot data that is collected from the reference sites. The benchmark will be generated automatically. The benchmark can then be transcribed manually into the Credit Calculator at *Step 5b: Enter Vegetation Transect/Plot Information* by selecting the *Edit Benchmarks* button.

Locating local reference sites and the field methods for measuring the vegetation condition variable must be made in accordance with the guidelines set out in section 3.4.3 and Appendix 2 of the Operational Manual.

Where a local reference site has been used to develop a benchmark for a biobank assessment, a copy of the site attribute data, description of the site and any other information that supports the local benchmark must be submitted to DECC as part of the application for the biobanking statement or agreement.

Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Vegetation type	BR 114 - E. blake, A. flori, E. macro grassy OF of the western NE Tableland

50-m transect	**Benchmarks**			**Plots** 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Native plant species	≥		40	36	40	51																	
Native over-storey cover	26	to	32	24.5	30	33																	
Native mid-storey cover	0	to	5	6	0	1.5																	
Native ground cover (grasses)	28	to	49	50	24	44																	
Native ground cover (shrubs)	1	to	7	8	4	0																	
Native ground cover (other)	18	to	30	24	16	32																	
50m x 20m plot																							
Number of trees with hollows	≥		4	6	4	4																	
Total length of fallen logs	≥		125	266	125	53																	

	Median	10th percentile	90th percentile
Native plant species	40	36.8	48.8
Native over-storey cover	30	25.6	32.4
Native mid-storey cover	1.5	0.3	5.1
Native ground cover (grasses)	44	28	48.8
Native ground cover (shrubs)	4	0.8	7.2
Native ground cover (other)	24	17.6	30.4

Number of trees with hollows	4	4	5.6
Total length of fallen logs	125	67.4	237.8

BioBanking Benchmark Calculator

Data entry: Local reference sites

To develop the benchmark, enter your transect/plot data that is collected from the reference sites. The benchmark will be generated automatically. The benchmark can then be transcribed manually into the Credit Calculator at *Step 5b: Enter Vegetation Transect/Plot Information* by selecting the *Edit Benchmarks* button.

Locating local reference sites and the field methods for measuring the vegetation condition variable must be made in accordance with the guidelines set out in section 3.4.3 and Appendix 2 of the Operational Manual.

Where a local reference site has been used to develop a benchmark for a biobank assessment, a copy of the site attribute data, description of the site and any other information that supports the local benchmark must be submitted to DECC as part of the application for the biobanking statement or agreement.

Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Vegetation type	BR 116 - E. blakelyi, YB grassy OF or woodland of the NE Tableland

50-m transect	**Benchmarks**			**Plots** 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Native plant species	≥	39		39	38	39																	
Native over-storey cover	20	to	21	21.5	20	21																	
Native mid-storey cover	0	to	1	0	0	1																	
Native ground cover (grasses)	42	to	47	48	42	44																	
Native ground cover (shrubs)	0	to	2	0	2	0																	
Native ground cover (other)	14	to	23	24	12	20																	
50m x 20m plot																							
Number of trees with hollows	≥	5		6	3	5																	
Total length of fallen logs	≥	73		95	73	57																	

	Median	10th percentile	90th percentile
Native plant species	39	38.2	39
Native over-storey cover	21	20.2	21.4
Native mid-storey cover	0	0	0.8
Native ground cover (grasses)	44	42.4	47.2
Native ground cover (shrubs)	0	0	1.6
Native ground cover (other)	20	13.6	23.2

Number of trees with hollows	5	3.4	5.8
Total length of fallen logs	73	60.2	90.6

BioBanking Benchmark Calculator

Data entry: Local reference sites

To develop the benchmark, enter your transect/plot data that is collected from the reference sites. The benchmark will be generated automatically. The benchmark can then be transcribed manually into the Credit Calculator at *Step 5b: Enter Vegetation Transect/Plot Information* by selecting the *Edit Benchmarks* button.

Locating local reference sites and the field methods for measuring the vegetation condition variable must be made in accordance with the guidelines set out in section 3.4.3 and Appendix 2 of the Operational Manual.

Where a local reference site has been used to develop a benchmark for a biobank assessment, a copy of the site attribute data, description of the site and any other information that supports the local benchmark must be submitted to DECC as part of the application for the biobanking statement or agreement.

Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Vegetation type	WB Grassy Woodland of the Nandewar and Brigalow Belt

50-m transect	**Benchmarks**			**Plots** 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Native plant species	≥		40	40	47	33																	
Native over-storey cover	19	to	26	26	18	25																	
Native mid-storey cover	0	to	16	0	20	0																	
Native ground cover (grasses)	63	to	74	66	62	76																	
Native ground cover (shrubs)	0	to	5	0	0	6																	
Native ground cover (other)	8	to	17	6	18	14																	
50m x 20m plot																							
Number of trees with hollows	≥		2	3	2	2																	
Total length of fallen logs	≥		58	144	58	24																	

	Median	10th percentile	90th percentile
Native plant species	40	34.4	45.6
Native over-storey cover	25	19.4	25.8
Native mid-storey cover	0	0	16
Native ground cover (grasses)	66	62.8	74
Native ground cover (shrubs)	0	0	4.8
Native ground cover (other)	14	7.6	17.2

Number of trees with hollows	2	2	2.8
Total length of fallen logs	58	30.8	126.8

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Appendix K: EPBC Significance Assessments

CRITICALLY ENDANGERED ECOLOGICAL COMMUNITIES

Box Gum Woodland

Both BRGYB and WB are characteristic of the CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* listed under the EPBC Act - more commonly known as Box Gum Woodland (BGW). Areas mapped as Moderate/Good condition BRGYB and WB reflect the listed BGW community, however areas mapped as Low condition do not retain sufficient integrity to be considered the CEEC. BGW is present primarily in the lower lying parts of the study area.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

a) reduce the extent of an ecological community

The proposal involves the permanent removal of up to 20.29 ha of Moderate/Good condition BGW, with an additional 15.44 ha of temporary clearance for roads, reticulation and construction facilities (total 35.73 ha). This removal comprises 10.82 ha of remnant woodland and 24.91 ha of derived native grassland/native pasture. This represents only 2.2 % of the BGW mapped within the project site.

b) fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

Road and transmission lines form necessary components of the infrastructure supporting a wind farm, and these features, coupled with the actual turbine layout, form a linear study area with potential to cause fragmentation of the landscape. However, avoidance measures have been implemented to minimise impacts on the ecological integrity of the site, while maintaining the engineering and economic feasibility of the wind farm. Access has been designed around current tracks and roads present within the study area to minimise additional vegetation clearance; turbines have been placed in cleared or treeless areas, to minimise tree clearance; turbines have largely been placed in woodland areas where groundlayer disturbance has previously taken place; and the reticulation has been placed underground and within the road footprint where possible to allow for temporary rather than permanent disturbance. Reticulation will pass overhead across gullies and waterways to reduce impacts.

The proposed fragmentation is relatively narrow, does not occur in one consolidated stand, is unlikely to impact on dispersal mechanisms for the BGW and will not prevent fauna movement between stands of vegetation.

c) adversely affect habitat critical to the survival of an ecological community

Habitat critical to the survival of the community includes habitat that is necessary for the long-term maintenance of the ecological community, or recovery of the ecological community. Given that only

2.2 % of the BGW mapped within the project site will be cleared, the proposal is unlikely to prevent the recovery of the ecological community or long-term maintenance of BGW within the project site and the locality. The proposal is not considered to adversely affect critical habitat. Furthermore, no critical habitat for BGW has been declared on the Register of Critical Habitat in NSW.

d) modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The study area is primarily located on ridge tops and, therefore, is largely not affected by the surrounding streams. Conversely, the proposal is not likely to significantly affect flooding or flow regimes for the study area. There may be small and localised alterations of surface water drainage patterns, in the form of an increase in run-off in areas where the ground within the construction area will be compacted, gravelled or concreted. Soil erosion and run-off control measures will be implemented as part of the mitigation measures undertaken for the proposal to avoid indirect impacts adjacent areas.

e) cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example, through regular burning or flora or fauna harvesting

The risk of fire with wind farms is inherently low (CFA 2007). A low risk is associated with malfunctioning turbine bearings, inadequate crankcase lubrication, cable damage during rotation, electrical shorting or arcing occurring in transmission and distribution facilities (CFA 2007). The location of wind turbines away from tall vegetation in the study area minimises the risk of fire. The existing fire regime within the study area is not expected to change as a result of the proposed development. As an aside, the proposal may result in improved access for firefighting appliances in case of a bushfire within the project site, due to the construction of roads within the study area.

The site is grazed primarily by sheep and cattle. Due to extended drought, stocking rates were not heavy at the time of survey. Grazing pressure and management varies across the landscape, and the proposal is considered unlikely to exacerbate over-grazing at the site and may, in fact, contribute to a more sustainable grazing regime through the mitigation measures proposed in some parts of the site. In the absence of fire, grazing can be an important form of disturbance to prevent the accumulation of biomass that may not be favourable to some native flora species. Grazing will be periodically removed during construction, but should be reintroduced post-construction. Rotational periods of grazing and spelling help to foster healthy native pastures in the absence of fire.

Outside of the 10.82 ha of remnant woodland and 24.91 ha of derived native grassland/native pasture that is proposed to be cleared, the proposal is not expected to cause a substantial change in the species assemblage.

f) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established, or**

Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These measures comprise:

- piling of soil that may contain seeds of exotic species at least 50 m away from the creeks, drainage lines and other areas of native vegetation, where possible, to prevent spread into adjacent areas of ecological significance during rainfall or wind events;
- all machinery, equipment and vehicles are to be washed down before entering and leaving a site;
- topsoil recovery will be undertaken in areas that have a high proportion of native vegetation and few weeds in the ground layer of vegetation;
- it should be ensured that any soil, rubble etc imported to the site is certified that it is free of weeds and weed seed;
- revegetation with locally native endemic species characteristic of the cleared vegetation type, recommended an aggressive coloniser such as *Austrostipa* spp. is used;
- weed management measures implemented to control perennial weed grasses;
- management of stock access during periods of vegetation and soil disturbance to prevent weed spread; and,
- all onsite staff and contractors will be made aware of noxious weeds present at the site and ways to prevent their spread.

    - **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**

The proposal does not involve the regular release of chemicals or pollutants into areas occupied by the community. However, mitigation measures are in place for contained hazardous materials that are required during the construction and operation of the wind farm:

- hazardous materials must be stored on or off-site in specific lay-down/storage areas, and will be handled and stored according to regulatory requirements and Australian Standards AS1940; and,
- the transformer as part of the collector substation may contain upwards of 20,000 litres of oil. Provisions will be made as part of the design for containment of any oil which may leak or spill. Prevention and containment of any potential spills will be described in detail in the EMP.

g) interfere with the recovery of an ecological community.

Given that the proposal will require the removal of only 2.2 % of all BGW mapped within the project site, the proposal is not expected to interfere with the recovery of the ecological community. Furthermore, as the proposed vegetation removal is scattered along narrow linear corridors, rather than one consolidated stand, it is unlikely to interfere with the recovery of the community in the long-term under favourable climatic conditions and sustainable land management.

FLORA

***Acacia pubifolia* (Velvet Wattle)**

Acacia pubifolia is an erect or spreading tree that grows 3-8 m high with golden yellow flowers and dark-grey bark. The leaves are hairy and feel like velvet. Its flowers are clustered together in a long tube or spike 2 - 5 cm long (DECCW 2011b) and appear during September-November (DSEWPC 2011b).

This species is confined to the Darling Downs, between Glen Aplin and Wallangarra, in south-eastern Qld and to northern NSW, where it is less common (Orchard & Wilson 2001).

In NSW, it is known from two disjunct localities:

1) Torrington State Recreation Area, north-west of Emmaville in the south-western portion of the reserve. There is one dense but small population along Gulf Rd, and scattered mature plants along the lower portion of Carpet Snake Fire Trail (Clarke *et al.* 1998; Copeland & Hunter 1999). 2) On private property near Warrabah NP, about 60 km west of Armidale. In consultation with the landholder, the NSW NPWS has fenced off the population and is monitoring its progress (Creamer 1999). This population consists of 95 plants (P. Metcalfe 1999, pers.comm. in Copeland & Hunter 1999).

This species generally grows on rocky granite hillsides, in sandy, stony or loamy soil in eucalypt-scrub woodland or *Eucalyptus-Callitris* forest (Orchard & Wilson 2001). In NSW it is recorded growing in shrubby woodland on granite (Clarke *et al.* 1998). The population near Warraba is in partially cleared country (Copeland & Hunter 1999). Within the study area, potential habitat occurs in woodland communities (DECCW 2011b), and within the study area would be associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Surveys for this species were undertaken during the 27 – 30 October 2008, 20 – 29 September 2010 and 13 – 15 October 2010 survey period. However, it was not recorded within the study area.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **Key source populations either for breeding or dispersal;**

Acacia pubifolia has not been recorded within the study area and, therefore, the proposal is not expected to lead to a long-term decrease in the size of a population.

- **Populations that are necessary for maintaining genetic diversity, and/or;**

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to impact on a poplation of this species necessary for maintaining genetic diversity.

- **populations that are near the limit of the species range;**

Acacia pubifolia has not been recorded in the study area. Furthermore, the known distribution of *Acacia pubifolia* extends to the north and south of the project site in two locations: Torrington State Recreation Area located south of the study area; and, on private property near Warrabah NP which is north of the study area. Any potential habitat for *Acacia pubifolia* within the study area is not at the limit of its known distribution.

b) reduce the area of occupancy of an important population;

Acacia pubifolia has not been recorded within the study.

c) fragment an existing important population into two or more populations;

Acacia pubifolia has not been recorded within the study area and, therefore, the proposal will not fragment an important population.

d) adversely affect habitat critical to the survival of a species;

Potential habitat for this species will be removed in linear strips (for turbines, access tracks and the associated ancillary structures required for the running of the wind farm). As a worst case scenario, the area of vegetation permanently lost is 75.36 ha along with a temporary impact to 37.11 ha of potential habitat, totalling 112.47 ha. However, this potential habitat does not constitute habitat critical to the survival of a species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population as no individuals were recorded within the study area. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Acacia pubifolia* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

  The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of an important population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The action will permanently remove up to 75.36 ha of potential habitat for *Acacia pubifolia* and temporarily remove up to 37.11 ha of potential habitat. No individuals of *Acacia pubifolia* have been detected during the ecological surveys and, therefore, removal of potential habitat is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Control measures will be implemented to ensure that impacts to habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are detailed in Table 17 of the Ecological Assessment.

h) introduce disease that may cause the species to decline, or

No diseases are known that threaten *Acacia pubifolia*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act. Furthermore, as a worst case scenario, the action will only remove 1.8 % of potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Astrotricha roddii* (Rod's Star Hair)**

Astrotricha roddii is an upright, sparsely-branched shrub 1 - 3 m tall. The shiny, narrow leaves are 11-18 cm long and 1-2.5 cm wide with long pointed tips and hairy underside. The stems are covered with dense woolly hairs. The dull purplish flowers grow on stems up to 40 cm long, and appear during October-February. Rod's Star Hair is thought to be only short-lived, with a life-span of possibly less than 10 years (DECCW 2011b).

Astrotricha roddii occurs in NSW in the Ashford area north of Inverell, including Kwiambal and Kings Plains National Parks, Severn River Nature Reserve and Severn River State Forest, and has also been recorded at one site in southern Queensland (DECCW 2011ba). *Astrotricha roddii* was not recorded at the site but has the potential to occur and is known from previous records in the locality. *Astrotricha roddii* usually grows in low dry woodland and shrublands on granite and acid volcanic outcrops, often in rock crevices (DECCW 2011b). Potential habitat occurs in woodland communities (DECCW 2011b), and within the study area is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Astrotricha roddii is listed as an endangered species under the EPBC Act. The proposal will affect potential habitat.

Vegetation surveys and targeted surveys were conducted across the proposed development footprint in suitable habitat during October-December 2008, September-October 2010 and January 2011, during the species' known flowering period. This species was not recorded on the site.

Vegetation will be removed in linear strips (for turbines, access tracks and the associated ancillary structures required for the running of the wind farm). As a worst case scenario, the area of vegetation to be cleared consists of a permanent loss of 75.36 ha and a temporary impact to 37.11 ha of potential habitat, totalling 112.47 ha. This loss of potential habitat is contiguous with similar vegetation mapped within the study area (amounting to 894.79 ha) and mapped within the project site (amounting to 6319.57 ha). The amount of potential habitat proposed to be impacted represents 12.6 % of the potential habitat mapped within the study area, and only 1.8 % of potential habitat mapped within the project site. Furthermore, only a fraction of the potential habitat mapped within the study area is likely to consistently support the low levels of disturbance and high species richness characteristic of habitat for this species. For these reasons, the proposal is unlikely to substantially reduce the amount of potential habitat for this species present in the project site.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to lead to a long-term decrease in the size of a population.

b) reduce the area of occupancy of the species;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will permanently remove up to 112.47 ha of potential habitat for *Astrotricha roddii* and 37.11 ha will be temporarily removed. However, this potential habitat does not constitute habitat critical to the survival of a species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population. The study area is unlikely to be used for dispersal of *Astrotricha roddii*, as no individuals were recorded within the study area. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Astrotricha roddii* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

  The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will permanently remove up to 75.36 ha of potential habitat for *Astrotricha roddii* and temporarily remove up to 37.11 ha of potential habitat. However, no individuals of *Astrotricha roddii* have been detected during the ecological surveys, therefore, removal of this habitat is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Although no individuals of *Astrotricha roddii* were detected, control measures will be implemented to ensure that impacts to potential habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Astrotricha roddii*. The action is not expected to introduce any disease to the study area.

i) interfer substantially with the recovery of the species.

As the study area does not currently support any *Astrotricha roddii* individuals, the potential habitat present within the study area is unlikely to be critical for the recovery of the species. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Bothriochloa biloba* (Lobed Blue Grass)**

Bothriochloa biloba, is an erect or decumbent grass to 1 m high. It is known from the Darling Downs district in Queensland, south along the western slopes of the Great Dividing Range to North Star, Warialda, Bingara and Merriwa in NSW (Quinn *et al.*, 1995; NSW Scientific Committee, 2004). It also occurs west to Dubbo and around the Hunter Valley (Quinn *et a*l., 1995). This species occurs within the Hunter– Central Rivers, Central West, Namoi, Northern Rivers and Border Rivers–Gwydir (NSW) and Border Rivers Maranoa–Balonne and Condamine (Queensland) Natural Resource Management Regions.

Bothriochloa biloba grows in cleared eucalypt forests and relict grassland, often dominated by Purple Wiregrass (*Aristida ramosa*), Red-leg Grass (*Bothriochloa macra*), Red Grass (*B. decipiens*), Queensland Bluegrass (*Dicanthium sericeum*) or *Austrostipa aristiglumis* (Bean, 1999). Dense stands of Lobed Blue-grass have been recorded in Windmill Grass (*Chloris truncata*) Grassland in the north-western slopes of NSW (Hunter, 2003). *Bothriochloa biloba* prefers heavier-textured soils such as brown or black clay soils (Quinn *et al*., 1995; Bean, 1999).

Surveys for this species were undertaken during the 1 – 3 December 2008, 10 – 14 January 2011 and 17 – 21 January 2011 suvrey periods and this species was recorded on site during the December 2008 surveys.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

Approximately 9,372 individuals of *Bothriochloa biloba* were recorded within the study area. However, none would be impacted by the proposal and management measures would be implemented to prevent indirect impacts. Therefore, the proposal would not lead to a long-term decrease in the size of a population of *Bothriochloa biloba*.

b) reduce the area of occupancy of the species;

The proposal would not impact on the *Bothriochloa biloba* within the study area. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

The population of *Bothriochloa biloba* present within the study area would not be fragmented by the proposal.

d) adversely affect habitat critical to the survival of a species;

The proposal will not impact on known habitat for this species. Of the 1569.45 ha of potential habitat within the study area, 122.21 ha (8 %) would be permanenetly removed and 103.93 ha (6 %) temporaily disturbed for the proposal. Given no known habitat would be impacted and the area of potential habitat to be impacted is small compared to the amount within the study area, it is unlikely that the habitat to be impacted is critical to the survival of this species. Futhermore, management measures would be implemented during construction to prevent indirect impacts on any habitat from runoff and sedimentation.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of known habitat for this species and approximately 1569.45 ha of potential habitat is present within the study area. Therefore, it is unlikely that the proposal would disrupt any dispersal mechnisms.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The proposal will not remove areas of known habitat for this species and approximately 1569.45 ha of potential habitat is present within the study area. Therefore, it is unlikely that the proposal impact on the dispersal mechnisms responsible for the long term maintenance of the species;

- **To maintain genetic diversity and long-term evolutionary development;**

  The proposal will not remove areas of known habitat for this species and, therefore, will not impact on the maintenance of the long-term genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting *Bothriochloa biloba* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site and that the areas of potential habitat are unlikely to be used for the reintroduction of populatins of the recovery of the species as the are on land used for agriculture and grazing.;

  The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will not impact on known habitat for this species. In addition, 1569.45 ha of potential habitat is present within the study area of which 122.21 ha (8 %) would be permanenetly removed andd 103.93 ha (6 %) temporaily disturbed for the proposal. Given no known habitat would be directly impacted and the area of potential habitat to be impacted is small compared to the amount within the study area, it is unlikely that the habitat loss would lead to a decline of the species. Futhermore, management measures would be implemented during construction to prevent indirect impacts on any habitat from runoff and sedimentation.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Bothriochloa biloba*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

The proposal will not remove areas of known habitat for this species and approximately, 1569.45 ha of potential habitat is present within the study area. Therefore, it is unlikely that the proposal would substantially interfere with the recovery of the species.

***Digitaria porrecta* (Finger Panic Grass)**

Digitaria porrecta is a loosely tufted perennial growing to 60 cm tall. It has grey leaves, 2–3 mm wide, with sharp hairs along the middle. The flowers are clustered together along a stalk in a cylinder shape. These flower clusters, which appear in late summer (mid January to late February), spread stiffly from the flowering stem, with the lower flower clusters arranged in a whorl of four to six, each up to 30 cm long. It seeds from March to April but also reproduces vegetatively by dying back to the tussock base, from which it resprouts in summer (DECCW 2011b). *Digitaria porrecta* occurs in NSW and Queensland. This species occurs within the Border Rivers–Gwydir, Namoi and Central West Natural Resource Management Regions. It is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran. It largely occurs on private land (DECCW 2011b). *Digitaria porrecta* usually occurs in grasslands on extensive basaltic plains, and in undulating woodlands and open forests with an underlying basaltic geology. It usually occurs on dark and fine textured soils with some degree of seasonal cracking (Leigh et al. 1984; Halford 1995). It also persists in disturbed habitats, such as fallow paddocks, but its capability to maintain a viable population is unknown (Halford 1995) (DEWHA 2008).

Digitaria porrecta is listed as an Endangered species listed under the EPBC Act.

Vegetation surveys and target surveys were conducted across the proposed development footprint in suitable habitat during January 2011, during the species' known flowering period.

This species has not been recorded within the study area, however potential habitat occurs in woodland communities (DECCW 2011b), and within the study area is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to lead to a long-term decrease in the size of a population.

b) reduce the area of occupancy of the species;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will permanently remove up to 122.78 ha of potential habitat for *Digitaria porrecta* and temporarily remove up to 104.47 ha of potential habitat. However, this potential habitat does not constitute habitat critical to the survival of a species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population. The study area is unlikely to be used for dispersal of *Digitaria porrecta*, as no individuals were recorded within the study area. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Digitaria porrecta* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will permanently remove up to 122.78 ha of potential habitat for *Digitaria porrecta* and temporarily remove up to 104.47 ha of potential habitat. However, no individuals of *Digitaria porrecta* have been detected during the ecological surveys, therefore removal of this habitat is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Although no individuals of *Digitaria porrecta* were detected, control measures will be implemented to ensure that impacts to potential habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Digitaria porrecta*. The action is not expected to introduce any disease to the study area.

i) interfer substantially with the recovery of the species.

As the study area does not currently support any *Digitaria porrecta* individuals, the potential habitat present within the study area is unlikely to be critical for the recovery of the species. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Dichanthium setosum* (Bluegrass)**

Dichanthium setosum is an erect perennial tussock grass that grows less than one metre in height (DECCW 2011b). Its distribution is concentrated in the northern tablelands of NSW and north-western slopes, however it has been recorded as far west as Narrabri on the NSW western plains, and in Queensland as far north as Rockhampton. *Dichanthium setosum* occurs in woodland communities (DECCW 2011b), and within the study area is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Dichanthium setosum is listed as Vulnerable under the EPBC Act.

The surveys identified *Dichanthium setosum* in five localities within the study area (Figure 9); one large patch outside the development footprint in the Wellingrove cluster; two small patches within the Sapphire cluster adjacent to the turbine layout and an internal reticulation route; and one relatively large patch at the western edge of the Swan Vale cluster which, although immediately adjacent to the proposed study area, will be avoided during construction.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **Key source populations either for breeding or dispersal;**

  The population of *Dichanthium setosum* is unlikely to be a key source population for dispersal, given the species is scattered throughout the district.

- **Populations that are necessary for maintaining genetic diversity, and/or;**

  Little is known of the genetic mechanisms of *Dichanthium setosum*, however given the magnitude of the number of individuals estimated to be present within the study area alone is in the thousands, it is not expected that the population is necessary for maintaining genetic diversity of the species.

- **populations that are near the limit of the species range;**

  The population is not at the limit of the geographical range of a species, as the known distribution of *Dichanthium setosum* extends west to Narrabri and north into south-east Queensland (DECCW 2011b).

Therefore, the population within the study area is not expected to constitute an important population. Furthermore, the action will not directly affect any plants of *Dichanthium setosum*. All plants within the study area have been avoided. Therefore a long-term decrease is not anticipated.

b) reduce the area of occupancy of an important population;

As detailed in part a), the population of *Dichanthium setosum* within the study area does not constitute an important population under the EPBC Act.

c) fragment an existing important population into two or more populations;

As detailed in part a), the population of *Dichanthium setosum* within the study area does not constitute an important population under the EPBC Act.

d) adversely affect habitat critical to the survival of a species;

The action will permanently remove up to 122.78 ha of potential habitat for *Dichanthium setosum* and temporarily remove up to 104.47 ha of potential habitat. However, this potential habitat does not constitute habitat critical to the survival of a species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The proposal will not remove habitat critical to the long-term maintenance of the species. As a worst case scenario, the action will only remove 2.6% of the potential habitat mapped within the project site. This leaves ample potential habitat available for the long-term maintenance of the species;

- **To maintain genetic diversity and long-term evolutionary development;**

  Little is known of the genetic mechanisms of *Dichanthium setosum*, however given the magnitude of the number of individuals estimated to be present within the study area alone is in the thousands, it is not expected that the population is necessary for maintaining genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Dichanthium setosum* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of an important population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The action will not directly affect any plants of *Dichanthium setosum*, as all plants adjacent to the study area have been avoided. The action will permanently remove up to 122.78 ha of potential habitat for *Dichanthium setosum* and temporarily remove up to 104.47 ha of potential habitat. However, given this represents 2.6 % of potential habitat mapped within the study area, this is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Control measures will be implemented to ensure that impacts to habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are detailed in Table 17 of the Ecological Assessment.

h) introduce disease that may cause the species to decline, or

No diseases are known that threaten *Dichanthium setosum*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

Areas not currently supporting patches of *Dichanthium setosum* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Diuris pedunculata* (Small Snake Orchid)**

Diuris pedunculata is a small yellow orchid with two drooping side petals on a flowering stem less than 10 cm tall, and flowers between August and October.

Diuris pedunculata is endemic to NSW. Its original distribution was scattered extensively along the Great Dividing Range from Queensland to the Hawkesbury River, but is now primarily found on the northern tablelands (DECCW 2011b).

Diuris pedunculata prefers moist areas (Rouse 2003; Woolcock & Woolcock 1984), and has been found growing in open areas of dry sclerophyll forests with grassy understories, in riparian forests (including gallery rainforests), swamp forests, in sub-alpine grasslands and herbfields. The study area falls within the known altitude range of the species (DECCW 2011b), and although it has not been recorded within the study area, however potential habitat occurs in woodland communities (DECCW 2011b), and within the study area is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Diurus pedunculata is listed as an Endangered species under the EPBC Act.

Vegetation surveys and target surveys were conducted across the proposed development footprint in suitable habitat during October 2008 and September-October 2010, during the species' known flowering period. Surveys were also timed when known populations of *Diuris pedunculata* were flowering. This species was not recorded on the site.

Vegetation will be removed in linear strips (for turbines, access tracks and the associated ancillary structures required for the running of the wind farm). As a worst case scenario, the area of vegetation to be cleared consists of a permanent loss of 122.78 ha and a temporary impact to 104.47 ha of potential habitat, totalling 227.25 ha. This loss of potential habitat is contiguous with similar vegetation mapped within the project site (amounting to 8856.66 ha). The amount of potential habitat proposed to be impacted represents only 2.6 % of potential habitat mapped within the project site. Furthermore, only a fraction of the potential habitat mapped within the study area is likely to consistently support the low levels of disturbance and high species richness characteristic of habitat for this species.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to lead to a long-term decrease in the size of a population.

b) reduce the area of occupancy of the species;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will permanently remove up to 122.78 ha of potential habitat for *Diuris pedunculata* and temporarily remove up to 104.47 ha of potential habitat. However, this potential habitat does not constitute habitat critical to the survival of a species. Furthermore, only a fraction of the potential habitat mapped within the study area is likely to consistently support the low levels of disturbance and high species richness characteristic of habitat for this species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

The proposal will not remove areas of habitat that are necessary to the dispersal of the population. The study area is unlikely to be used for dispersal of *Diuris pedunculata*, as no individuals were recorded within the study area. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

Areas not currently supporting patches of *Diuris pedunculata* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will permanently remove up to 122.78 ha of potential habitat for *Diuris pedunculata* and temporarily remove up to 104.47 ha of potential habitat. However, no individuals of *Diuris pedunculata* have been detected during the ecological surveys, therefore removal of this habitat is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Although no individuals of *Diuris pedunculata* were detected, control measures will be implemented to ensure that impacts to potential habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Diuris pedunculata*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

As the study area does not currently support any *Diuris pedunculata* individuals, the potential habitat present within the study area is unlikely to be critical for the recovery of the species. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

Eucalyptus mckieana (McKies's Stringybark)

Eucalyptus mckieana is a medium sized eucalypt with red-brown fibrous bark and is confined to the rain shadow on the western side of the northern tablelands of NSW between Bendemeer in NSW and Stanthorpe in southern Queensland. *Eucalyptus mckieana* is most commonly found on gently sloping or flat site, on poor sandy loams, forming a grassy open forest in association with a suite of other eucalypt species (DECCW 2011a).

Vegetation surveys and targeted surveys were undertaken across the development footprint in areas of suitable habitat during October, November and December 2008, April and May 2009, September, October and December 2010, and January 2011.

The existing records of *Eucalyptus mckieana* were previously considered for inclusion into the turbine corridor. However, the final design has excluded this area from the development footprint, and thus these ten trees will not be affected by the development.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

Ten *Eucalyptus mckieana* were recorded within the study area. However, none would be impacted by the proposal and management measures would be implemented to prevent indirect impacts. Furthermore, the proposed impacts are a distance from the population of this species known from within the study area. Therefore the proposal would not lead to a long-term decrease in the size of a population of *Eucalyptus mckieana*.

b) reduce the area of occupancy of the species;

The proposal would not impact on the *Eucalyptus mckieana* within the study area. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

The current population of *Eucalyptus mckieana* present within the study area would not be fragmented by the proposal.

d) adversely affect habitat critical to the survival of a species;

The proposal will not impact on known habitat for this species. Approximately 73.71 ha of habitat *Eucalyptus mckieana* is present within the project site of which only potential habitat in the form of native pasture (1.31 ha) would be impacted. Given no known habitat would be impacted and the area potential habitat to be impacted is small compared to the amount within the study area and project site, it is unlikely that the habitat to be impacted is critical to the survival of this species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

The proposal will not impact on known habitat for this species. Approximately 73.71 ha of habitat *Eucalyptus mckieana* is present within the project site of which only potential habitat in the form of native pasture (1.31 ha, 2 %) would be impacted. Therefore, it is unlikely that the proposal would disrupt any dispersal mechnisms.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The proposal will not impact on known habitat for this species. Approximately 73.71 ha of habitat *Eucalyptus mckieana* is present within the project site of which only potential habitat in the form of native pasture (1.31 ha, 2 %) would be impacted. Therefore, it is unlikely that the proposal impact on the dispersal mechnisms responsible for the long term maintenance of the species;

- **To maintain genetic diversity and long-term evolutionary development;**

  The proposal will not remove areas of known habitat for this species and therefore will not impact on the maintenance of the long-term genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

  The proposal will not impact on known habitat for this species and the 1.31 ha of native pasture that may provide potential habitat and are to be removed are unlikely to be critical for the recovery of the species. The areas of potential habitat are unlikely to be used for the reintroduction of populatins of the recovery of the species as the are on land used for agriculture and grazing.;

  The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will not impact on known habitat for this species. Approximately 73.71 ha of habitat *Eucalyptus mckieana* is present within the project site of which only potential habitat in the form of native pasture (1.31 ha, 2 %) would be impacted. . Given no known habitat would be impacted and the area potential habitat to be impacted is small compared to the amount within the study area and is native pasture, it is unlikely that the habitat loss would lead to a decline of the species.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Eucalyptus mckieana*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

The proposal will not impact on known habitat for this species. Approximately 73.71 ha of habitat *Eucalyptus mckieana* is present within the project site of which only potential habitat in the form of native pasture (1.31 ha, 2 %) would be impacted. Therefore, it is unlikely that the proposal would substantially interfere with the recovery of the species.

***Eucalyptus nicholii* (Narrow-leaved Black Peppermint)**

Eucalyptus nicholii is a tree growing to 15-20 m tall with thick, fibrous, grey to grey-brown, longitudinally furrowed rough bark over its trunk and branches. Adult foliage is dull greenish grey and narrowly lanceolate, with flowers in clusters of seven (DECCW 2011b).

The species is confined to the New England Tablelands of NSW, where it occurs largely on private property from north of Tenterfield to Nundle (DECCW 2011b). It occurs in grassy or sclerophyll woodland communities and within the study area is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Eucalyptus nicholii is listed as Vulnerable under the TSC Act.

There is potential for *Eucalyptus nicholii* to occur within areas of woodland and derived grassland. Vegetation surveys and target surveys were conducted across the proposed development footprint in suitable habitat during October, November and December 2008, April & May 2009, and September, October and December 2010, and January 2011. No individuals were recorded during the surveys.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

No individuals of *Eucalyptus nicholii* were recorded within the study area. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted it is unlikely that the proposal would lead to a long-term decrease in the size of a populatin of this species.

b) reduce the area of occupancy of the species;

Eucalyptus nicholii was not identified within the study area. Therefore, the proposal will not reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

No individuals of *Eucalyptus nicholii* were recorded within the study area and, therefore, fragmentation of populations would not occur.

d) adversely affect habitat critical to the survival of a species;

No individuals of *Eucalyptus nicholii* were recorded within the study area. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted it is unlikely that the proposal would lead to a long-term decrease in the size of a populatin of this species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not impact on any indiviudals of this species. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted it is unlikely that the proposal would disrupt any dispersal mechnisms.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The proposal will not impact on any indiviudals of this species. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted, it is unlikely that the proposal will impact on the dispersal mechnisms responsible for the long-term maintenance of the species;

- **To maintain genetic diversity and long-term evolutionary development;**

  The proposal will not remove areas of known habitat for this species and, therefore, will not impact on the maintenance of the long-term genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

  The study area supports potential haitat for this species of which only a very small portion would be impacted. The areas of potential habitat are unlikely to be used for the reintroduction of populatins of the recovery of the species as they are on land used for agriculture and grazing;

  The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will not impact on any known habitat for this species. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary

impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted and that the amount of habitat to be impacted is small in comparision to that remaining within the study area, it is unlikely that the proposed clearance would lead to a decrease in the availability or quality of habitat for this species such that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Eucalyptus nicholii*. The proposal is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

The proposal will not impact on any known habitat for this species. The total area of potential habitat for *Eucalyptus nicholii* within the study area is 1581.91 ha. An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha of potential habitat and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha of potential habitat and a temporary impact to 213.71 ha of potential habitat. Given no known habitat is to be impacted and that the amount of habitat to be impacted is small in comparision to that remaining within the study area, it is unlikely that the proposal would substantially interfere with the recovery of the species.

***Picris evae* (Hawkweed)**

Picris evae is an erect annual herb growing 1.3–1.7 m high, with linear, variable, stalkless leaves, sparsely covered with split-ended hairs (that mostly grow around the base of the plant) and small yellow flower heads (DECCW 2011b).

Picris evae has been recorded across the northern tablelands from Oxley Park near Tamworth, to Elsmore (east of Inverell) and its distribution extends into south-east Queensland (DECCW 2011b).

Picris evae occurs in sclerophyll open woodland with a grassy understorey composed of *Dichanthium* spp.. Associated canopy species include *Eucalyptus melliodora*, *E. crebra*, *E. populnea*, *E. albens*, *Angophora subvelutina*, *Allocasuarina torulosa*, and *Casuarina cunninghamiana* (Holzapfel, 1994), and within the study area is associated with the Black Cypress Pine – Tumbledown Gum – Narrow-leaved Ironbark open forest, Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest and White Box grassy woodland communities.

Vegetation surveys and targeted surveys were conducted across the proposed development footprint in potential habitat during October-December 2008, September-October and December 2010 and January 2011, during the species' known flowering period. No individuals of *Picris evae* were detected during the ecological survey.

Picris evae is listed as a Vulnerable species under the EPBC Act.

An action is likely to have a significant impact on an vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to lead to a long-term decrease in the size of an important population.

b) reduce the area of occupancy of an important population;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to reduce the area of occupancy of an important population.

c) fragment an existing important population into two or more populations;

No populations were detected during targeted surveys of the study area within areas of potential habitat. Therefore, the proposal is not expected to fragment an existing important population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will permanently remove up to 75.36 ha of potential habitat for *Picris evae* and temporarily remove up to 37.11 ha of potential habitat. However, this potential habitat does not constitute habitat critical to the survival of a species. Furthermore, only a fraction of the potential habitat mapped within the study area is likely to consistently support the low levels of disturbance and high species richness characteristic of habitat for this species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population. The study area is unlikely to be used for dispersal of *Picris evae*, as no individuals were recorded within the study area. As a worst case scenario, the action will only remove 1.8% of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

  Given no individuals were detected within or adjacent to the study area, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Picris evae* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 1.8 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a important population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will permanently remove up to 75.36 ha of potential habitat for *Picris evae* and temporarily remove up to 37.11 ha of potential habitat. However, no individuals of *Picris evae* have been detected during the ecological surveys, therefore removal of this habitat is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

Although no individuals of *Picris evae* were detected, control measures will be implemented to ensure that impacts to potential habitat for the threatened species are minimised. Measures to

avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are outlined in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten *Picris evae*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

As the study area does not currently support any *Picris evae* individuals, the potential habitat present within the study area is unlikely to be critical for the recovery of the species. As a worst case scenario, the action will only remove 1.78 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Thesium australe* (Austral Toadflax)**

Thesium australe is a small, straggling herb to 40 cm tall and is found in very small populations and within NSW is scattered throughout the east of the state, from the northern to southern tablelands. *Thesium australe* occurs in grassland or grassy woodland, often in damp sites in association with Kangaroo Grass (*Themeda australis*) (DECCW 2011b).

Thesium australe is listed as a Vulnerable species under the EPBC Act.

Within the study area, the species is associated with the Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest, Blakely's Red Gum – Yellow Box grassy open forest, Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest, Tenterfield Woollybutt - Silvertop Stringybark open forest, White Box grassy woodland communities and derived grassland.

Approximately 7,350 individuals were recorded across the study area including in the southern portion of the Sapphire cluster just west of the current powerline and north east of the site at a number of locations within the Wellingrove Cluster (Figure 9). The proposed layout has been modified to ensure that all known individuals will not be directly impacted and mitigation measures will be implemented to prevent indirect impacts.

An 80m turbine layout with 12 m roads would result in a permanent loss of 122.78 ha and a temporary impact to 104.47 ha of potential habitat. A 100m turbine layout with 12 m roads would result in a permanent loss of 116.95 ha and a temporary impact to 96.76 ha of potential habitat.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **Key source populations either for breeding or dispersal;**

  The population of *Thesium australe* is unlikely to be a key source population for dispersal, given records of the species are scattered throughout the district.

- **Populations that are necessary for maintaining genetic diversity, and/or;**

  Little is known of the genetic mechanisms of *Thesium australe*, however given the magnitude of the number of individuals estimated to be present within the study area alone is in the thousands, it is not expected that the population is necessary for maintaining genetic diversity of the species.

- **populations that are near the limit of the species range;**

  The population is not at the limit of the geographical range of a species, as the known distribution of *Thesium australe* extends to eastern Victoria and south-eastern Queensland (DECCW 2011b).

Therefore, the population within the study area is not expected to constitute an important population. Furthermore, the action will not directly affect any plants of *Thesium australe*. All

plants within the study area have been avoided, therefore a long-term decrease is not anticipated.

b) reduce the area of occupancy of an important population;

As detailed in part a), the population of *Thesium australe* within the study area does not constitute an important population under the EPBC Act.

c) fragment an existing important population into two or more populations;

As detailed in part a), the population of *Thesium australe* within the study area does not constitute an important population under the EPBC Act.

d) adversely affect habitat critical to the survival of a species;

All known populations and individuals of the species will be avoided. The action will permanently remove up to 122.78 ha of potential habitat for *Thesium australe* and temporarily remove up to 104.47 ha of potential habitat. However, surveys of the impacted areas did not detect the species in any of this potential habitat. This potential habitat does not constitute habitat critical to the survival of the species.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  The proposal will not remove areas of habitat that are necessary to the dispersal of the population. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for dispersal;

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The proposal will not remove habitat critical to the long-term maintenance of the species. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the long-term maintenance of the species;

- **To maintain genetic diversity and long-term evolutionary development;**

  Little is known of the genetic mechanisms of *Thesium australe*. However, given the magnitude of the number of individuals estimated to be present within the study area alone is in the thousands and that no individuals will be impacted, it is unlikely that the habitat to be removed if critical for maintaining the genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

  Areas not currently supporting patches of *Thesium australe* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of an important population;

This is not applicable to a flora species.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The action will not directly affect any plants of *Thesium australe*, as all plants adjacent to the study area have been avoided. The action will permanently remove up to 122.78 ha of potential habitat for *Thesium australe* and temporarily remove up to 104.47 ha of potential habitat. However, given this represents 2.6 % of potential habitat mapped within the study area, this is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Control measures will be implemented to ensure that impacts to habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are detailed in Table 17.

h) introduce disease that may cause the species to decline, or

No diseases are known that threaten *Thesium australe*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

Areas not currently supporting patches of *Thesium australe* are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 2.6 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

THREATENED FAUNA

***Anthochaera phrygia* (Regent Honeyeater)**

Regent Honeyeater is a striking black and yellow honeyeater with a curved bill and a wingspan of 30cm. Adults are 20 - 24 cm long, and have a characteristic patch of dark pink or cream-coloured facial-skin around the eye. The call is a soft metallic bell-like song, and birds are most vocal in the non-breeding season (November to July) (DECCW 2011b). Preferred habitat is temperate woodland and open forest of the inland slopes of south-east Australia (DECCW 2011b).

The range of Regent Honeyeater has contracted dramatically in the last 30 years, to between north-east Victoria and south-east Queensland. Only three known key breeding populations remain, at Chiltern (NE Vic), Capertee Valley (NSW central highlands), and Bundarra-Barraba (NSW north-western slopes). The distribution is patchy, and mainly confined to breeding areas and surrounding patchy woodlands, however on occasional years flocks are recorded foraging in coastal woodlands and forests (DECCW 2011b).

Regent Honeyeater is listed as an Endangered species under the EPBC Act. It is also listed as a Migratory species under the EPBC Act, and is included in the Japan-Australia Migratory Bird Agreement (JAMBA).

The April 2009 and May 2009 survey periods coincided with the survey periods for the Regent Honeyeater. However, this species was not recorded.

There were no records of Regent Honeyeater on the Birds Australia data search (2009) although there is a historical record on the DECCW database (1968), approximately 1 km to the south of the site and a more recent record (1994) along Wellingrove Road, 7 km to the north east of the study area. It is worth noting that the Birds Australia survey effort in the area is considerable with a number of survey records having been submitted over many years.

Areas of potential habitat for Regent Honeyeater are shown in Figure 9. Within the project site, 6331.11 ha of potential habitat have been mapped. The removal of potential habitat will constitute 103.16 ha based on the 100 m turbine option, or 112.47 ha based on the 80 m turbine option.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

As detailed above, Regent Honeyeater was not recorded within the study area during the ecological surveys, and Regent Honeyeater has not been recorded within the local area since 1994. The study area only provides habitat that may periodically be used for foraging by the Regent Honeyeater. Therefore, the action is not expected to lead to a long-term decrease in the size of a population.

b) reduce the area of occupancy of the species;

As detailed above, Regent Honeyeater is not known to currently occupy the study area or the local area. The study area only provides habitat that may periodically be used for foraging by the Regent Honeyeater. A relatively small amount of habitat is proposed to be removed, and vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

As detailed above, no populations of Regent Honeyeater have been detected within the study area during the ecological surveys, and this species has not been recorded within the local area since 1994. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will remove up to 112.47 ha of potential habitat for Regent Honeyeater. However, this potential habitat does not constitute habitat critical to the survival of a species, as it represents habitat used only periodically for foraging, and is not known breeding habitat.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  Sapphire is not a known breeding site for this species and given the transitory and migratory nature of this species, it is likely to only be used periodically for foraging. As a worst case scenario, the action will only remove 1.45 % of the potential habitat mapped. This leaves ample potential habitat available within the project site for foraging and movement, and large amounts of additional habitat is likely to exist beyond the study area on adjacent lands and more broadly within the region. The proposal will not remove areas of habitat that are necessary to the foraging, breeding, roosting or movement of the species.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  As detailed above, Sapphire is not a known breeding site for this species and given the transitory and migratory nature of this species, it is likely to only be used periodically for foraging. As a worst case scenario, the action will only remove 1.45 % of the potential habitat mapped, leaving ample potential habitat available within the local area for foraging and movement, The potential habitat present is not necessary for the long-term maintenance of the species or essential pollinators.

- **To maintain genetic diversity and long-term evolutionary development;**

  Regent Honeyeater numbers are estimated to be between 800 and 2000 individuals remaining in the wild (DSEWPAC 2009). Habitat forming key linkages for migration, and known breeding locations are necessary for maintaining sustainable populations. However, given the potential habitat within the study area does not provide either of these functions, and is likely to only be used periodically as foraging habitat, the potential habitat present is not necessary for maintaining genetic diversity of the species;

- **For the reintroduction of populations or recovery of the species;**

Areas not currently supporting breeding populations of Regent Honeyeater are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site available for foraging. As a worst case scenario, the action will only remove 1.45 % of the potential habitat mapped. This leaves ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

Sapphire is not a known breeding site for this species and given the transitory and migratory nature of this species, it is likely to only be used periodically for foraging.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will remove up to 112.47 ha of potential habitat for Regent Honeyeater. However, no records of Regent Honeyeater have been ever been made within the study area, and no records of Regent Honeyeater within the local area have been made since 1994, despite bird survey effort in the area. Furthermore, the project site and local area provide ample available foraging habitat in similar or better condition than that within the study area. Therefore, removal of a relatively small amount of potential habitat within the study area is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Feral animals can have a detrimental impact on Regent Honeyeater through predation by species such as feral Cats and the European Red Fox. The proposal is considered unlikely to contribute to increasing feral animal activity across the project site and instead may assist with the management of these species. Landholders currently implement feral animal control programs across the site, particularly around lambing/calving time, and an increased income to landholders within the district may result in more funding available for baiting programs or other control measures which can be expensive.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten Regent Honeyeater. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

No records of Regent Honeyeater have been made within the local area since 1994, despite bird survey effort in the area. Furthermore the project site and local area provide ample available foraging habitat in similar or better condition than that within the study area. This leaves ample potential habitat available for the recovery of the species.

***Dasyurus maculatus maculatus* (SE mainland population) (Spot-tailed Quoll)**

The Spot-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECCW 2011b), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECCW 2011b). Maternal den sites include logs with cryptic entrances, rock outcrops, windrows and burrows (Environment Australia 2000).

Spot-tailed Quoll is listed as an Endangered species under the EPBC Act.

Infra-red cameras were placed across the study area during May 2009 and September 2010 over a total of 65 camera nights. No records of Spot-tailed Quoll were made during the current survey, nor was any evidence of Spot-tailed Quoll dens or latrine sites detected. Spot-tailed Quoll has been recorded once within the local area (a 10 km radius of the study area) in 2006, when an incidental sighting was made on the south side of the Gwydir Highway. Spot-tailed Quoll habitat mapped within the study area comprises 894.79 ha of woodland. The proposed loss of potential habitat for Spot-tailed Quoll within the study area comprises permanent removal of up to 75.36 ha of woodland habitat and the temporary loss of 37.11 ha of woodland habitat.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

As detailed above, no records of Spot-tailed Quoll were made during the current survey, nor was any evidence of Spot-tailed Quoll dens or latrine sites detected. Spot-tailed Quoll has been recorded once within the local area (a 10 km radius of the study area) in 2006, when an incidental sighting was made on the south side of the Gwydir Highway. Preferred habitat for the species includes large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines. The habitat at Sapphire is considered to be marginal for the species given the drainage lines are largely cleared of vegetation and the understorey is relatively sparse. A relatively small amount of potential habitat is proposed to be removed, representing only 12.6 % of potential habitat within the study area and 1.8 % of potential habitat mapped within the project site. Vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. The proposal will avoid tree clearance through siting of turbines in previously cleared areas where possible. Hollow-bearing trees will be retained where possible, and logs will be retained and installed as fauna habitat following construction. For these reasons, the action is not expected to lead to a long-term decrease in the size of any populations utilising the study area.

b) reduce the area of occupancy of the species;

As detailed above, no records of Spot-tailed Quoll were made during the current survey and it has been recorded only once within the local area. A relatively small amount of habitat is proposed to be removed, representing only 12.6 % of potential habitat within the study area and 1.8 % of potential habitat mapped within the project site. The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common (DECCW 2011b). At Sapphire, this species is not at the limit of its known distribution. Therefore, the proposal is not expected to reduce the area of occupancy of the species at a local or national scale.

c) fragment an existing population into two or more populations;

As detailed above, no records of Spot-tailed Quoll were made during the current survey and it has been recorded only once within the local area. Vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will remove up to 112.47 ha of potential habitat for Spot-tailed Quoll. However, this potential habitat is unlikely to constitute habitat critical to the survival of a species given it is marginal and extensive areas of potential habitat will remain within the project site (6331.11).

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  This species is known to forage over a wide area of up to 750 hectares for females and 3500 hectares for males. Preferred habitat for the species includes large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines. The habitat within the study area is considered to be marginal for the species given the drainage lines are largely cleared of vegetation and the understorey is relatively sparse. Areas of more suitable habitat occur outside the study area on the south-east upper slopes of Mount Buckley, where the shrub cover of *Bursaria spinosa* (Sweet Bursaria) is significantly higher, however large areas of their preferred habitat type are more commonly found in denser forest on the eastern side of the Great Dividing Range. The removal of 112.47 ha of potential habitat still avoids 98% of the potential habitat mapped within the project site available for foraging, breeding, roosting and movement. The proposal will not remove areas of habitat that are likely to be critical to the survival of the species.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  As detailed above, the habitat within the study area is considered to be marginal for the species and better habitat is being avoided and retained outside of the impact area. The removal of 112.47 ha of potential habitat leaves ample potential habitat available within the local area for foraging and movement, as large amounts of additional habitat occur outside within the project site and local area. The potential habitat present is unlikely to be necessary for the long-term maintenance of the species.

- **To maintain genetic diversity and long-term evolutionary development;**

  As detailed above, the habitat within the study area is considered to be marginal for the species and better habitat is being avoided and retained outside of the impact area. The removal of 112.47 ha of potential habitat leaves ample potential habitat available within the local area for breeding and movement of Quolls. The potential habitat present is unlikely to be necessary for maintaining genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

As detailed above, the habitat within the study area is considered to be marginal for the species and better habitat is being avoided and retained outside of the impact area. Of the potential habitat mapped within the project area, 98% will be avoided and be available for the reintroduction of populations or the recovery of the species.

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

Spot-tailed Quolls breed from April to July each year, with dens in hollow logs, tree hollows, rock outcrops or caves. The low-lying rock outcrops within the study area do not provide suitable habitat for dens, and there are no caves present within the study area. The only suitable habitat for Spot-tailed Quoll nests within the study area are fallen hollow logs or tree hollows. Given the marginal nature of the potential habitat within the study area, it is unlikely that the study area would be preferred breeding habitat for the Spot-tailed Quoll. Hollow-bearing trees will be retained where possible, and logs will be or relocated to continue to function as fauna habitat following construction. Any disturbance to hollow-bearing trees or logs will require a pre-clearance survey to be undertaken in accordance with a tree clearing protocol. An ecologist will be present on site during clearing to capture and re-release fauna (where appropriate). The project is not expected to disrupt the breeding cycle of any population.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

Preferred habitat for the species includes large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines, and as such records of Spot-tailed Quoll are significantly higher on the eastern slopes of the Great Dividing Range. The habitat at Sapphire is considered to be marginal for the species given the drainage lines are largely cleared of vegetation and the understorey is relatively sparse. The action will remove up to 112.47 ha of marginal potential habitat for Spot-tailed Quoll, which represents only 12.6 % of potential habitat within the study area and 1.78 % of potential habitat mapped within the project site. Vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. The proposal will avoid tree clearance through siting of turbines in previously cleared areas where possible. Hollow-bearing trees will be retained where possible, and logs will be or relocated to continue to function as fauna habitat following construction. Therefore, removal of a relatively small amount of potential habitat within the study area is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Feral animals can have a detrimental impact on Spot-tailed Quoll through predation by species such as feral Cats and the European Red Fox. The proposal is considered unlikely to contribute to increasing feral animal activity across the project site and instead may assist with the management of these species. Landholders currently implement feral animal control programs across the site, particularly around lambing/calving time, and an increased income to

landholders within the district may result in more funding available for baiting programs or other control measures which can be expensive. That said, landholders should consider the accidental poisoning of Spot-tailed Quoll when planning baiting programs. It is best to avoid placement of baits within the best areas of Quoll habitat within the project site (that is, slopes and drainage lines on the south-east slopes of Mount Buckley with a relatively dense shrub layer).

h) introduce disease that may cause the species to decline, or

Epidemic diseases, such as parasitic protozoans, are known to be passed from Cats to the Quolls (DECCW 2011b). The action is not expected to increase cat numbers within the study area or project site, and is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

One record of Spot-tailed Quoll was made in the local area in 2006, however no records were made during the ecological assessment, nor were any dens or latrine sites detected. Furthermore, the potential habitat within the study area represents marginal habitat for Spot-tailed Quoll based on their preference for densely vegetated drainage lines in open forest communities. The proposed removal of 112.47 ha of woodland represents only 1.78 % of potential habitat within the project site, and this still allows for ample potential habitat available for the recovery of the species, particularly given that Spot-tailed Quoll population records appear to be concentrated around the eastern slopes of the Great Dividing Range in open forest communities that are relatively undisturbed compared to the woodland within the study area.

***Lathamus discolor* (Swift Parrot)**

The Swift Parrot breeds in Tasmania between September and January and migrates to the mainland in autumn, where it forages on profuse flowering eucalypts (Blakers *et al.* 1984; Schodde and Tidemann 1986). Hence on the mainland, autumn and winter flowering eucalypts are an important food source for this species and include *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark), and *E. albens* (White Box).

Another food source is lerp, a carbohydrate exudate of insects that feed on eucalypt phloem through leaf surfaces (Smales 2005). Commonly used lerp infested trees include *E. microcarpa* (Inland Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt).

These resources may be very localised, eruptive and highly variable from one year to another. As a consequence, Swift Parrots appear to be very mobile, even nomadic, during the course of a given winter and their mainland distribution may differ considerably between years (Smales 2005).

In NSW, the Swift Parrot mostly occurs on the coast and south west slopes, but its range extends from Victoria and the eastern parts of South Australia to south-east Queensland (DECCW 2011b). The population estimates in 2005 estimated fewer than 2000 birds remaining (Smales 2005).

Swift Parrot is listed as an endangered species under the EPBC Act. It is also listed as a marine species, due to its migratory path over Bass Strait.

The April 2009 and May 2009 survey periods coincided with the survey periods for the Swift Parrot. Swift Parrot was not recorded at the site and there are no database records for the species within a 10 km radius of the study area. The species is predicted to occur in the Glenn Innes-Guyra Basalts CMA subregion and has the potential to occur at the site given the presence of winter-flowering eucalypts including *Eucalyptus blakelyi* Blakely's Red Gum, *E. laevopinea* Silvertop Stringybark, *E. albens*, *E. dealbata* Tumbledown Red Gum and *E. crebra* Narrow-leaved Ironbark.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of a population;

As detailed above, no records of Swift Parrot were made during the current survey. Swift Parrot has never been recorded within the local area (a 10 km radius of the study area), despite bird survey effort on many occasions in the past. Therefore, the action is not expected to lead to a long-term decrease in the size of a population.

b) reduce the area of occupancy of the species;

As detailed above, no records of Swift Parrot were made during the current survey. Swift Parrot has never been recorded within the local area (a 10 km radius of the study area), despite bird survey effort on many occasions in the past. The study area supports 1594.62 ha of potential habitat for Swift Parrot in the form of vegetation communities containing autumn/winter flowering eucalypts. Of this amount, 123.64 ha (7.8 % of study area) will be permanently cleared and 104.92 ha (6.6 % of study area) will be temporarily cleared within the study area. Vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

c) fragment an existing population into two or more populations;

As detailed above, no individuals or populations of Swift Parrot have ever been detected within 10 km of the study area. Therefore, the proposal is not expected to fragment an existing population into two or more populations.

d) adversely affect habitat critical to the survival of a species;

The action will involve the permanent removal of 123.64 ha (7.8 % of study area) of potential habitat and 104.92 ha (6.6 % of study area) of temporary clearance. However, this potential habitat does not constitute habitat critical to the survival of a species, as it represents habitat used only periodically for foraging, and is not known breeding habitat.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

Sapphire is not a known breeding site for this species and given the transitory and migratory nature of this species, it is likely to only be used periodically for foraging. The removal of 11.93 ha of potential habitat leaves ample potential habitat available within the local area for foraging and movement, as large amounts of additional habitat is likely to exist beyond the study area on adjacent lands and elsewhere within the region. The proposal will not remove areas of habitat that are necessary to the foraging, breeding, roosting or movement of the species.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

As detailed above, Sapphire is not a known breeding site for this species and given the transitory and migratory nature of this species, it is likely to only be used periodically for foraging. The action will involve the permanent removal of 123.64 ha (7.8 % of study area) of potential habitat and 104.92 ha (6.6 % of study area) of temporary clearance. This leaves ample potential habitat available within the project site (6331.11 ha) for foraging and movement, as large amounts of additional habitat is exists beyond the study area within the project site and elsewhere within the region. The potential habitat present is not necessary for the long-term maintenance of the species.

- **To maintain genetic diversity and long-term evolutionary development;**

Habitat forming key linkages for migration, and known breeding locations are necessary for maintaining sustainable populations of Swift Parrot. However, given the potential habitat within the study area does not provide either of these functions, and is likely to only be used periodically as foraging habitat, the potential habitat present is not necessary for maintaining genetic diversity of the species.

- **For the reintroduction of populations or recovery of the species;**

Swift Parrots breed in Tasmania from September to January and utilise winter-flowering gums on the mainland each year. Areas not known to support migrating or foraging groups of Swift Parrot are unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site and local area available for foraging. Swift Parrots breed

in Tasmania from September to January and utilise winter-flowering gums on the mainland each year. .

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of a population;

Swift Parrots breed between September and January each year in Tasmania, utilising tree hollows in *Eucalyptus globulus* (Tasmanian Blue Gum). Given the transitory and migratory nature of this species, the study area is likely to only be used periodically for foraging.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The action will remove up to 228.56 ha of potential habitat for Swift Parrot. However, no records of Swift Parrot have been ever been made within 10 km of the study area, despite bird survey effort in the area. Furthermore, the project site (6331.11 ha) and local area provide ample available foraging habitat in similar or better condition than that within the study area. Therefore, removal of a relatively small amount of potential habitat within the study area is unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a endangered species becoming established in the endangered species' habitat;

Feral animals can have a detrimental impact on Swift Parrot through predation by species such as feral Cats and the European Red Fox. The proposal is considered unlikely to contribute to increasing feral animal activity across the project site and instead may assist with the management of these species. Landholders currently implement feral animal control programs across the site, particularly around lambing/calving time, and an increased income to landholders within the district may result in more funding available for baiting programs or other control measures which can be expensive.

h) introduce disease that may cause the species to decline, or

No diseases are known to threaten Swift Parrot. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

No records of Swift Parrot have ever been made within 10 km of the study area. Furthermore, the project site and local area provide ample available foraging habitat in similar or better condition than that within the study area. This leaves ample potential habitat available for the recovery of the species.

***Nyctophilus corbeni* (South-eastern Long-eared Bat)**

The species has a preference for semi-arid areas. However, they have been recorded in the high rainfall areas of south-western Australia (Churchill 1998). In South Australia this species has been associated with a range of mallee species, and found to the fringes of the treeless Nullarbor Plain (Duncan *et al.* 1999). In northern NSW, this species is thought to prefer structurally complex forest as foraging habitat, and breeding and sheltering is in tree hollows (Environment Australia 2000). The species has had a recent name change from *N. timoriensis* to *N. corbeni*.

South-eastern Long-eared Bat is listed as Vulnerable under the EPBC Act as *N. timoriensis*.

Nyctophilus spp calls were detected on the site at three locations within the study area. The calls of *Nyctophilus* spp. are difficult to tell apart. In some cases calls were identified as 'possible' calls to species level. However in most cases, they were identified as *Nyctophilus* spp. which may include *N. geoffroyi*, *N. gouldi* or *N. corbeni*. Thus, *N. corbeni* has the potential to occur within the Sapphire study area and its presence has been assumed.

Areas of woodland provide potential habitat for this species. Of the 882.33 ha of habitat present across the study site, up to approximately 74.79 ha of this will be permanently removed and 36.57 ha will be temporarily cleared. Combined, the proposed 111.36 ha of impact represents 8.5 % of the habitat within the study area and approximately 4.1 % of the potential habitat mapped within the project site. Extensive areas of potential habitat are present in the areas around the study area (e.g. 6221.84 ha of mapped within the project site) and throughout the locality.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **Key source populations either for breeding or dispersal;**

  Nyctophilus corbeni has not been recorded within the study area. Assuming it is present in the study area, it is unlikely that the proposal would impact on a key source population given the broad range of distribution of *Nyctophilus corbeni,* the mobile nature of the species and the large amount of habitat present throughout the project site (882.33 ha).

- **Populations that are necessary for maintaining genetic diversity, and/or;**

  Little is known of the genetic mechanisms of *Nyctophilus corbeni*, however given the broad range of distribution of the species, and that the stronghold for the species is the Pilliga scrub, should a population be present at Sapphire is unlikely to be necessary in maintaining genetic diversity of the species. Furthermore, it is unlikely that the proposal would impact on this species or its habitat such that the population would be placed at risk of extinction and its contribution to the genetic diversity of the species lost.

- **Populations that are near the limit of the species range;**

  Overall, the distribution of the south-eastern form of *Nyctophilus corbeni* coincides approximately with the Murray Darling Basin, with the Pilliga Scrub region being the distinct stronghold for this species (DECCW 2011b). At Sapphire, this species is not at the limit of its known distribution.

For these reasons, any populations within the study area are not considered to be an important population, and therefore the action will not lead to a long-term decrease in the size of an important population.

b) reduce the area of occupancy of an important population;

As outlined above, a population of *Nyctophilus corbeni* within the study area does not constitute an important population.

c) fragment an existing important population into two or more populations;

As outlined above, a population of *Nyctophilus corbeni* within the study area does not constitute an important population.

d) adversely affect habitat critical to the survival of a species;

e) Areas of woodland provide potential habitat this species. Of the 882.33 ha of habitat present across the study site, up to approximately 74.79 ha of this will be permanently removed and 36.57 ha will be temporarily cleared. Combined, the proposed 111.36 ha of impact represents 8.5 % of the habitat within the study area and approximately 4.1 % of the potential habitat mapped within the project site. Extensive areas of potential habitat are present in the areas around the study area (e.g. 6221.84 ha of mapped within the project site) and throughout the locality.

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  It is not certain that records of *Nyctophilus* spp. within the study area represent a population of *Nyctophilus corbeni*. However, assuming *Nyctophilus corbeni* does occur within the study area, it is unlikely that the removal of a small amount of the potential habitat (111.36 ha) compared to that present within the project site (6221.84 ha) would be critical to the survival of the species. The species has a broad distribution across the Murray-Darling Basin, and the stronghold for the species is the Pilliga scrub habitat. As a worst case scenario, the project will remove 4.1 % of the potential habitat mapped within the project site. Given extensive areas of habitat will remain, the range and preferred habitat of the species and the amount of similar potential habitat present within the project site it is unlikely that the habitat proposed for clearance would limit the availability of resources for the species at Sapphire and hence critical to the survival of the species.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

  The action is unlikely to be necessary for the long-term maintenance of the species for similar reasons outlined in the response above, including the uncertainty of a present population, the habitat preference for Pilliga scrub communities, and the abundance of potential habitat present outside of the study area.

- **To maintain genetic diversity and long-term evolutionary development;**

  Little is known of the genetic mechanisms of *Nyctophilus corbeni*. The project is expected to impact 4.1 % of the potential habitat that was mapped within the project site during the ecological assessment. However, it is not expected that any population within the study area that may be necessary for maintaining genetic diversity of the species would be significantly impact particularly given *Nyctophilus corbeni* has an extensive range and has been recorded across the Murray-Darling Basin.

- **For the reintroduction of populations or recovery of the species;**

  As a worst case scenario, the action will only remove 4.1 % of the potential habitat mapped within the project site, leaving ample potential habitat available for the recovery of the species.

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

f) disrupt the breeding cycle of an important population;

As outlined above, a population of *Nyctophilus corbeni* within the study area is unlikely to constitute an important population.

g) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposed removal of 4.1 % of potential habitat mapped within the project site is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, especially given *Nyctophilus corbeni* has been recorded across the Murray-Darling Basin, and the stronghold for the species is the Pilliga scrub.

h) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Introduced predators were not identified as a threat to *Nyctophilus corbeni* in the Action Plan for Australian Bat.

Nonetheless, the proposal is considered unlikely to contribute to increasing feral animal activity across the project site and instead may assist with the management of these species. Landholders currently implement feral animal control programs across the site, particularly around lambing/calving time, and an increased income to landholders within the district may result in more funding available for baiting programs or other control measures which can be expensive.

i) introduce disease that may cause the species to decline, or

The Action Plan for Australian Bats does not identify any diseases that threaten *Nyctophilus corbeni*. The action is not expected to introduce any disease to the study area.

j) interfere substantially with the recovery of the species.

As a worst case scenario, the action will only remove 4.1 % of the potential habitat mapped within the project site. This leaves ample potential habitat available for the recovery of the species.

***Underwoodisaurus sphyrurus* (Border Thick-tailed Gecko)**

Found only on the tablelands and slopes of northern NSW and southern Queensland, reaching south to Tamworth and west to Moree (DECCW 2011B). Most common in the granite country of the New England Tablelands (DECCW 2011B). Rocky hills with dry open eucalypt forest or woodland (DECCW 2011B). Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter (DECCW 2011B). These Geckos are active at night and shelter by day under rock slabs, in or under logs, and under the bark of standing trees.

Border Thick-tailed Gecko is listed as Vulnerable under the EPBC Act.

One record of Border Thick-tailed Gecko is present to the north-west of the study area in Kings Plains National Park in 1997 although this species was not recorded wihtint he study area during the current surveys. Habitat for the Border Thick-tailed Gecko is present in isolated patches across the study area, in areas of potential and marginal potential habitat. Mapping is based on the following:

- Potential – granite or basalt, dense canopy, rocky outcrops and / or fallen timber
- Marginal potential – granite or basalt, agricultural land, limited rocky out crops fallen timber

The Border Thick-tailed Gecko shows a preference for steep rocky or scree slopes, especially granite although there are recent records from basalt and metasediment slopes and flats. This species favours forest and woodland areas with boulders, rock slabs, fallen timber, deep leaf litter and often a dense tree canopy that helps create a sparse understorey. They have been recorded in areas that were cleared for agriculture in the past (DECCW 2011b). It is likely that the majority of the study area is extremely marginal habitat for the Border Thick-tailed Gecko as woody debris is sparse and the understorey in most areas is grassy. Those areas mapped as potential are more likely to support this species should it be present at the site as they support either rocky outcrops or fallen timber and also a dense canopy.

The majority of the habitat mapped as marginal habitat is likely to be extremely marginal habitat for this species as it would primarily support a grassy understory with scattered woody debris and has been mapped as a precaution given that this species has been recorded in disturbed areas such as those cleared for agriculture in the past. This species is likely to be largely restricted to rocky outcrop areas particularly on granite soils and areas where there are rocky outcrops and leaf litter.

This species was not detected during the targeted surveys undertaken. However, due to suitable habitat on site there remains a low probability that the species may occur. As a worst-case scenario (80 m layout), 18.73 ha of potential habitat and 49.65 ha of marginal potential habitat will be impacted, which represents 14.71 % of potential habitat (127.29 ha within the study area) and 11.26 % of marginal potential habitat (440.78 ha within the study area) within the study area respectively. Furthermore, this represents 1.6 % of total potential habitat (1,183.58 ha) and 1.2 % of total marginal potential habitat mapped (4,033.67 ha).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) lead to a long-term decrease in the size of an important population of a species;

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- **Key source populations either for breeding or dispersal;**

  While the likely occurrence of this species is low, given the narrow range of distribution of the Border Thick-tailed Gecko, the majority of potential habitat across the study area is extremely marginal and that populations appear to be fragmented, if this species were present at the site it is likely to represent an important population.

- **Populations that are necessary for maintaining genetic diversity, and/or;**

  Little is known of the genetic mechanisms of *Border Thick-tailed Gecko*, however given the narrow range of distribution of the species, and that the stronghold for the species is the New England tablelands, any population should it be present is likely to necessary for maintaining genetic diversity of the species.

- **Populations that are near the limit of the species range;**

  The Border Thick-tailed Gecko has a very limited distribution, only occurring on the tablelands and slopes of northern NSW and southern Queensland, reaching south to Tamworth and west to Moree and is most common in the granite country of the New England Tablelands. It occurs at sites ranging from 500 to 1000m elevation. Populations are apparently fragmented, with over 50 discrete sites currently known that are separated by at least 2 km (DECCW 2011b).

  Sapphire is within the altitudinal range of the species, as the site is between 750-1100m AHD. The western limit of the species distribution is approximately 160 km to the west (Moree) and the southern limit is 160 km south at Tamworth. Therefore Sapphire is close to, but not at the limit of the species' known distribution. However, given the small distribution of the species within the cool highland granite belt of New England, any location within the species distribution is likely to be close to the edge of its range.

Therefore, any population of Border Thick-tailed Gecko within the study area could comprise an important population. As no individuals were recorded during the current surveys, the size of such a population is unknown. Habitat removal will impact any populations present through a reduction in sheltering, foraging and breeding opportunities. However, the amount of habitat removal across the site (1.6 % of potential habitat mapped) is relatively low. Targeted searches of potential habitat will be undertaken prior to clearing, with any species found relocated to undisturbed areas of potential habitat. Therefore, a long-term decrease in any important population is not expected.

b) reduce the area of occupancy of an important population;

As outlined above, any population of Border Thick-tailed Gecko could constitute an important population given its limited distribution and that the species' stronghold is the New England Tablelands. Therefore, any habitat removal has the potential to reduce the area of occupancy of the population. Habitat removal will impact any populations present through a reduction in sheltering, foraging and breeding opportunities. However, given the relatively low amount of habitat removal across the site (1.6 % of potential habitat mapped), potential impacts to a population of Border Thick-tailed Gecko are not considered to be significant.

c) fragment an existing important population into two or more populations;

As outlined above, any population of Border Thick-tailed Gecko could constitute an important population given its limited distribution and that the species' stronghold is the New England Tablelands. As no individuals were recorded during the current surveys, the size and distribution range of such a population is unknown. It is possible that where the study area bisects areas of rocky outcrops, an important population may be fragmented into two or more populations. Targeted searches of potential habitat will be undertaken prior to clearing, with any species found relocated to undisturbed areas of potential habitat, however this will not avoid the fact that the clearing proposed may fragment an important population.

d) adversely affect habitat critical to the survival of a species;

The amount of habitat removal has been calculated by differentiating between potential and marginal potential habitat within the study area. As a worst-case scenario (80 m layout), 18.73 ha of potential habitat and 49.65 ha of marginal potential habitat will be impacted, which represents 14.71 % of potential habitat (127.29 ha within the study area) and 11.26 % of marginal potential habitat (440.78 ha within the study area) within the study area respectively. Furthermore, this represents 1.6 % of total potential habitat (1,183.58 ha) and 1.2 % of total marginal potential habitat mapped (4,033.67 ha).

Habitat critical to the survival of a species refers to areas that are necessary:

- **For activities such as foraging, breeding, roosting, or dispersal;**

  No populations are known within the study area, however if Geckos are present, only the potential habitat within the study area is likely to be necessary for activities such as foraging, breeding, roosting and dispersal. As a worst case scenario, the action will only remove 18.73 ha of h potential habitat. An impact to 1.6% of potential habitat mapped locally is unlikely to be habitat that is necessary for the survival of the species, given the extent of habitat present throughout the study area and including Kings Plains National Park.

- **For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species such as pollinators);**

- No populations are known within the study area, however if Geckos are present, only the potential habitat within the study area is likely to be necessary for the long-term maintenance of the species. As a worst case scenario, the action will only remove 18.73 ha of potential habitat. An impact to 1.6% of potential habitat mapped locally is unlikely to be habitat that is essential for the survival of the species, given the extent of habitat present throughout the study area and including Kings Plains National Park.

- **To maintain genetic diversity and long-term evolutionary development;**

  Little is known of the genetic mechanisms of *Border Thick-tailed Gecko*, however given the project is expected to impact on such a small amount of 1.6 % of the potential habitat that was mapped locally during the ecological assessment and that pre-

clearance surveys will be conducted, it is not expected that this area would impact on a population required for maintaining genetic diversity of the species..

- **For the reintroduction of populations or recovery of the species;**

  As the study area is not known to support any populations of Border Thick-tailed Gecko, the 18.73 ha of potential habitat that is proposed to be removed is unlikely to be critical for the recovery of the species, given the vast amount of potential habitat within the project site. As a worst case scenario, the action will only remove 1.6 % of the potential habitat mapped locally, leaving ample potential habitat available for the recovery of the species;

The potential habitat proposed to be removed does not constitute habitat identified in a recovery plan for the species, habitat critical for that species, or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

e) disrupt the breeding cycle of an important population;

As outlined above, any Geckos utilising habitat within the study area are likely to form part of an important population. However, little is known of their breeding cycle. Although no Geckos were recorded during the ecological assessment, it is not possible to discount the possibility that this cryptic species inhabits some of the potential habitat within the study area. If any habitat utilised by Geckos is cleared during the proposed action, it is assumed that it may disrupt the breeding cycle of at least some individuals belonging to an important population.

f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As the study area is not known to support any populations of *Border Thick-tailed Gecko*, the 18.73 ha of potential habitat that is proposed to be removed is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Furthermore, pre-clearance surveys will be conducted and this species is known to occur within Kings Plains National Park.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Control measures will be implemented to ensure that impacts to habitat for the threatened species are minimised. Measures to avoid the spread of weeds will be implemented from pre-construction works, throughout construction and operation until decommissioning, thereby reducing potential impacts of the proposal to potential habitat for this species. These are detailed in Table 17.

Feral animals can have a detrimental impact on Border Thick-tailed Gecko through predation by species such as feral Cats and the European Red Fox. The proposal is considered unlikely to contribute to increasing feral animal activity across the project site and instead may assist with the management of these species. Landholders currently implement feral animal control programs across the site, particularly around lambing/calving time, and an increased income to landholders within the district may result in more funding available for baiting programs or other control measures which can be expensive.

h) introduce disease that may cause the species to decline, or

No diseases are known that threaten *Border Thick-tailed Gecko*. The action is not expected to introduce any disease to the study area.

i) interfere substantially with the recovery of the species.

As a worst case scenario, the action will only remove 1.6 % of the potential habitat mapped. This leaves ample potential habitat available for the recovery of the species.

MIGRATORY SPECIES

***Anthochaera phrygia (*Regent Honeyeater)**

Regent Honeyeater is listed as a critically endangered species under the TSC Act and an endangered and migratory species under the EPBC Act. A description of the species and distribution in NSW has been included above for threatened species.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

Within the project site, 6331.11 ha of potential foraging habitat has been mapped. Breeding habitat for the Regent Honeyeater is not present within the project site. The removal of potential habitat will constitute 103.16 ha based on the 100 m turbine option, or 112.47 ha based on the 80 m turbine option.

The proposal will not substantially increase fragmentation in the area which would isolate areas of important habitat for the species, particularly given Regent Honeyeater is migratory, forages widely and the amount of vegetation that would be directly impacted comprises only a small portion of vegetation throughout the study area (12.6 %) and an even smaller portion of vegetation within the project site (1.8 %).

The impacts in terms of disturbance to potential habitat for Regent Honeyeater within the project site are likely to be negligible given they forage widely, with the species capable of making large regional movements in the order of hundreds of kilometres (DECCW 2011b). The species is likely be present infrequently while migrating or foraging. Further, only the minimal amount of clearing will be required, which represents a small amount comparative to the amount of habitat present within the project site. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

The study area is unlikely to support an important population of this species as it is unlikely that an ecologically significant proportion of the population would occur at Sapphire given the paucity of records and this species would not breed at the site. Habitat present at the site is unlikely to be critical to the lifecycle of the species and it is not at the limit of the range for this species. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on Regent Honeyeater in the locality. The species suffers from competition from larger aggressive honeyeaters, particularly Noisy Miners (*Manorina melanocephala*), Noisy Friarbirds (*Philemon corniculatus*) and Red Wattlebirds (*Anthochaera carunculata*). It is unlikely that the proposal would not lead to an increase in the incidence of these species in the project site.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

It is unlikely that the study area would support an ecological significant proportion of Regent Honeyeater given the paucity of records, they do not breed at the site and it is likely that they only periodically visit the site during migration. The closest known key breeding area in NSW is located to the south west of the site in the Bundarra-Barraba region (DECCW 2011a). The site could be used as a foraging resource for this population although there are few records within the locality.

The amount of foraging habitat that would be removed represents a small proportion of the foraging habitat in the project site and the locality, with impacted habitat unlikely to supply large quantities of nectar resources for the species. Regent Honeyeaters would be able to continue using resources remaining within and outside of the project site.

The proposal may affect the lifecycle of the Regent Honeyeater changes to migration through accidental strike with the turbines during operation of the wind farm. However, the study area is not known to occur along any key migratory pathways for the species and therefore the changes of strike are considered extremely low. Therefore, it is unlikely that the proposal would seriously disrupt the lifecycle of an ecologically significant portion of the Regent Honeyeater population.

***Apus pacificus* (Fork-tailed Swift)**

The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (DSEWPAC 2011b).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) **Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;**

The proposal involves the permanent removal of up to approximately 140.72 ha of potential habitat for this species. Further, approximately 148.05 ha will be temporarily cleared within the project site. This includes areas of woodland, grassland and areas cleared

However, the majority of clearance impacts will occur in previously cleared open grassy areas which provide limited habitat for this species and the majority of vegetation within the project site will be retained. The proposal will not substantially increase fragmentation in the area which would isolate areas of important habitat for the species, particularly given the Fork-tailed Swift forages aerially over both wooded and open areas. The amount of vegetation that would be directly impacted comprises only a small portion of vegetation throughout the study area (15.3 %) and an even smaller portion of vegetation within the project site (2.9 %).

The study area is unlikely to support an important population of this species as it is unlikely that an ecologically significant proportion of the population would occur at Sapphire given the habitat is not critical to the lifecycle of the species and the species in not at the limit of its range. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;**

The proposal would not result in the establishment of an invasive species that is harmful to Fork-tailed Swifts.

c) **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.**

An ecologically significant proportion of the population is unlikely to be present at Sapphire which would support only foraging habitat for this aerial species which does not breed in Australia. Therefore, the proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of Fork-tailed Swift.

The removal and fragmentation of vegetation in the project site would be unlikely to affect the species, which forages aerially over a range of habitats including cleared areas. It is unlikely that the turbines would result in changes to migration and foraging behaviour or increase the mortality rates of the

species through bird strike given the measures taken to minimise the risk of bird strike from the wind turbines and the height at which Fork-tailed Swifts generally forage in Australia (DSEWPAC 2011b).

***Ardea alba* (Great Egret)**

The Great Egret has been reported in a wide range of wetland habitats, for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial habitats. The species may retreat to permanent wetlands or coastal areas when other wetlands are dry (DSEWPAC 2011b).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) **substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;**

The study area provides marginal habitat for this species which is likely only to be used following heavy rainfall. No wetlands are present within the study area and therefore it is unlikely that the study area would support an important population of this species.

The impacts in terms of disturbance to potential habitat for the Great Egret within the project site are likely to be negligible given they forage widely, with the species capable of making large regional movements in the order of hundreds of kilometres (DECCW 2011b). Further, only the minimal amount of clearing will be required, which represents a small amount comparative to the amount of habitat present within the project site. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) **Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;**

The proposal would not result in the establishment of an invasive species that is harmful to Great Egret.

c) **Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.**

The proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of Great Egret as the study area supports only marginal habitat for this species which is only likely to use the site following heavy rainfall events.

***Ardea ibis* (Cattle Egret)**

The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare (DSEWPAC 2011b).

The species often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock. The Cattle Egret has also been observed foraging in rubbish tips. It is becoming more frequent in drier regions; consuming the ticks of livestock in the absence of other food sources. This inland spread is believed to be due to the construction of artificial waterways (DSEWPAC 2011b). The Cattle Egret roosts in trees, or amongst ground vegetation in or near lakes and swamps. It has also been recorded roosting near human settlement and industrial areas in Murwillumbah, NSW (DSEWPAC 2011b).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) **substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;**

The study area in unlikely to support an important population of this species as the project site may provide occasional foraging habitat for the species following heavy rainfall periods, but would be unlikely to provide permanent foraging or breeding habitat for the species. The proposal could remove some of this potential, occasional foraging habitat given the majority of clearance impacts will occur in previously cleared open grassy areas. However, the impacts in terms of disturbance to potential habitat for Cattle Egret within the project site are likely to be negligible given they forage widely, with the species capable of making large regional movements. The species is likely be present infrequently while migrating or foraging. Further, only the minimal amount of clearing will be required, which represents a small amount comparative to the amount of habitat present within the project site. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;**

The proposal would not result in the establishment of an invasive species that is harmful to Cattle Egret.

c) **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.**

The proposal is unlikely support an ecologically significant proportion of the population of Cattle Egret given this species is only likely to be present in the study area opportunistically following rain periods. The majority of potential foraging habitat would be retained in the project site.

***Hirundapus caudactus* (White-throated Needletail)**

In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Given they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats, and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes (DSEWPAC 2011b).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The proposal involves the permanent removal of up to approximately 140.72 ha of potential habitat for this species. Further, approximately 148.05 ha will be temporarily cleared within the project site. This includes areas of woodland, grassland and areas cleared

However, the majority of clearance impacts will occur in previously cleared open grassy areas which provide limited habitat for this species and the majority of vegetation within the project site will be retained. The proposal will not substantially increase fragmentation in the area which would isolate areas of important habitat for the species, particularly given White-throated Needletails forage aerially over both wooded and open areas. The amount of vegetation that would be directly impacted comprises only a small portion of vegetation throughout the study area (15.3 %) and an even smaller portion of vegetation within the project site (2.9 %).

The study area is unlikely to support an important population of this species as it is unlikely that an ecologically significant proportion of the population would occur at Sapphire given the habitat is not critical to the lifecycle of the species and the species not at the limit its range. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The proposal would not result in the establishment of an invasive species that is harmful to White-throated Needletails.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An ecologically significant proportion of the population is unlikely to be present at Sapphire which would support only foraging habitat for this aerial species which does not breed in Australia. Therefore, the proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of White-throated Needletail.

The removal and fragmentation of vegetation in the project site would be unlikely to affect the species, which forages aerially over a range of habitats including cleared areas. It is unlikely that the turbines would result in changes to migration and foraging behaviour or increase the mortality rates of the species through bird strike given the measures taken to minimise the risk of bird strike from the wind turbines and the height at which White-throated Needletails generally forage in Australia (at “cloud level”, over 1000 m above the ground) (DSEWPAC 2011b).

***Lathamus discolor* (Swift Parrot)**

Swift Parrot is listed as an endangered species under the TSC Act and an endangered and migratory species under the EPBC Act. A description of the species and distribution in NSW has been included above for threatened species.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

No records of Swift Parrot were made during the current survey. Swift Parrot has never been recorded within the local area (a 10 km radius of the study area), despite bird survey effort on many occasions in the past. The study area supports 1594.62 ha of potential habitat for Swift Parrot in the form of vegetation communities containing autumn/winter flowering eucalypts. Of this amount, 123.64 ha (7.8 % of study area) will be permanently cleared and 104.92 ha (6.6 % of study area) will be temporarily cleared within the study area. Vegetation removal is to occur in linear fingers within clusters rather than one consolidated stand. Therefore, the proposal is not expected to reduce the area of occupancy of the species.

The proposal will not substantially increase fragmentation in the area which would isolate areas of important habitat for the species. The impacts in terms of disturbance to potential habitat for Swift Parrot within the project site are likely to be negligible given they forage widely, with the species capable of making large regional movements in the order of hundreds of kilometres (DSEWPAC 2011b). The species is likely to be present infrequently while foraging, therefore the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on Swift Parrot in the locality.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal may affect the lifecycle of the Swift Parrot through changes to foraging behavior resulting from removal of foraging habitat and changes to migration through accidental strike with the turbines during operation of the wind farm. No breeding habitat would be impacted as the Swift Parrot breeds in Tasmania.

The amount of foraging habitat that would be impacted represents a small proportion of the habitat in the project site and the locality. Swift Parrots would be able to continue using resources remaining within and outside of the project site. Further, wind turbines are solid, opaque structures and the risks posed by moving rotors are generally within the height range of between 30 and 120 metres above the ground. Swift Parrot generally forages within the height of the trees in which they feed. It is thus considered unlikely that the types of collision situations that the parrot presently encounters in urban environments will exist at wind farms. Further, issues associated with the impacts of turbines on birds have been addressed in the layout design to minimise the risk of bird strike where possible.

Given the availability of remaining habitat in the project site, with measures taken to minimise the risk of bird strike from the wind turbines, the proposed works are unlikely to seriously disrupt the lifecycle of a Swift Parrot population.

***Merops ornatus* (Rainbow Bee-eater)**

The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches (DSEWPAC 2011b).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The proposal involves the permanent removal of up to approximately 140.72 ha of potential habitat for the species. Further, approximately 148.05 ha will be temporarily cleared within the project site. This includes areas of woodland, grassland and areas cleared

However, the majority of clearance impacts will occur in previously cleared open grassy areas and the majority of vegetation in the project site will be retained. The proposal will not substantially increase fragmentation in the area which would isolate areas of important habitat for the species, particularly given Rainbow Bee-eaters can make large regional movements across the continent and beyond. The amount of vegetation that would be directly impacted comprises only a small portion of vegetation throughout the study area (15.3 %) and an even smaller portion of vegetation within the project site (2.9 %).

The study area is unlikely to support an important population of this species as it is unlikely that an ecologically significant proportion of the population would occur at Sapphire, given the habitat is not critical to the lifecycle of the species and the species is not at the limit of its range. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The proposal would not result in the establishment of an invasive species that is harmful to Rainbow Bee-eater. The species is threatened by Cane Toads, but the proposal would not introduce Cane Toads to the project site.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal would impact on potential foraging and breeding habitat for the Rainbow Bee-eater. However, the amount of foraging and breeding habitat that would be impacted represents a small portion of vegetation throughout the study area (15.3 %) and an even smaller portion of vegetation within the project site (2.9 %). Rainbow Bee-eaters would be able to continue using resources remaining within and outside of the project site.

The proposal may affect the lifecycle of the Rainbow Bee-eater through changes to foraging behavior resulting from removal of foraging habitat and changes to migration through accidental strike with the

turbines during operation of the wind farm. Rainbow Bee-eater populations in southern Australia migrate to northern Australia from February to April, returning to their southern breeding grounds in September and October (DSEWPAC 2011b). However, the impacts of turbines on birds appear to be dependent on a number of factors including proximity to water, migratory pathways, proximity to bird concentrations and forested areas. Given there are no major waterbodies within the study area and that the Rainbow Bee-eater would generally fly at a moderate height whilst on the site, it is the potential for strike from turbines is considered moderate to low. Furthermore, the study area is unlikely to support an ecologically significant proportion of the population as this species has not been recorded at the site.

Given the availability of remaining habitat in the project site, the proposed works are unlikely to seriously disrupt the lifecycle of a Rainbow Bee-eater population.

Appendix L: Example of Environmental Management Plan Framework

This Environmental Management Plan Framework has been prepared by Wind Prospect CWP.

STATEMENT OF COMMITMENTS

The Statement of Commitments (SoC) is a review of all management and mitigation measures mentioned in previous chapters of the Environmental Assessment (EA) that will be managed by the Proponent. The framework for the SoC is displayed in Figure 16, and comprises an Environmental Management Plan (EMP) that combines the Construction Environmental Management Plan (CEMP) and the Operational Environmental Management Plan (OEMP). Within both of these plans there are a number of sub-plans to assist in the amelioration, management and mitigation of environmental impacts from the construction and operational phases of the Project.

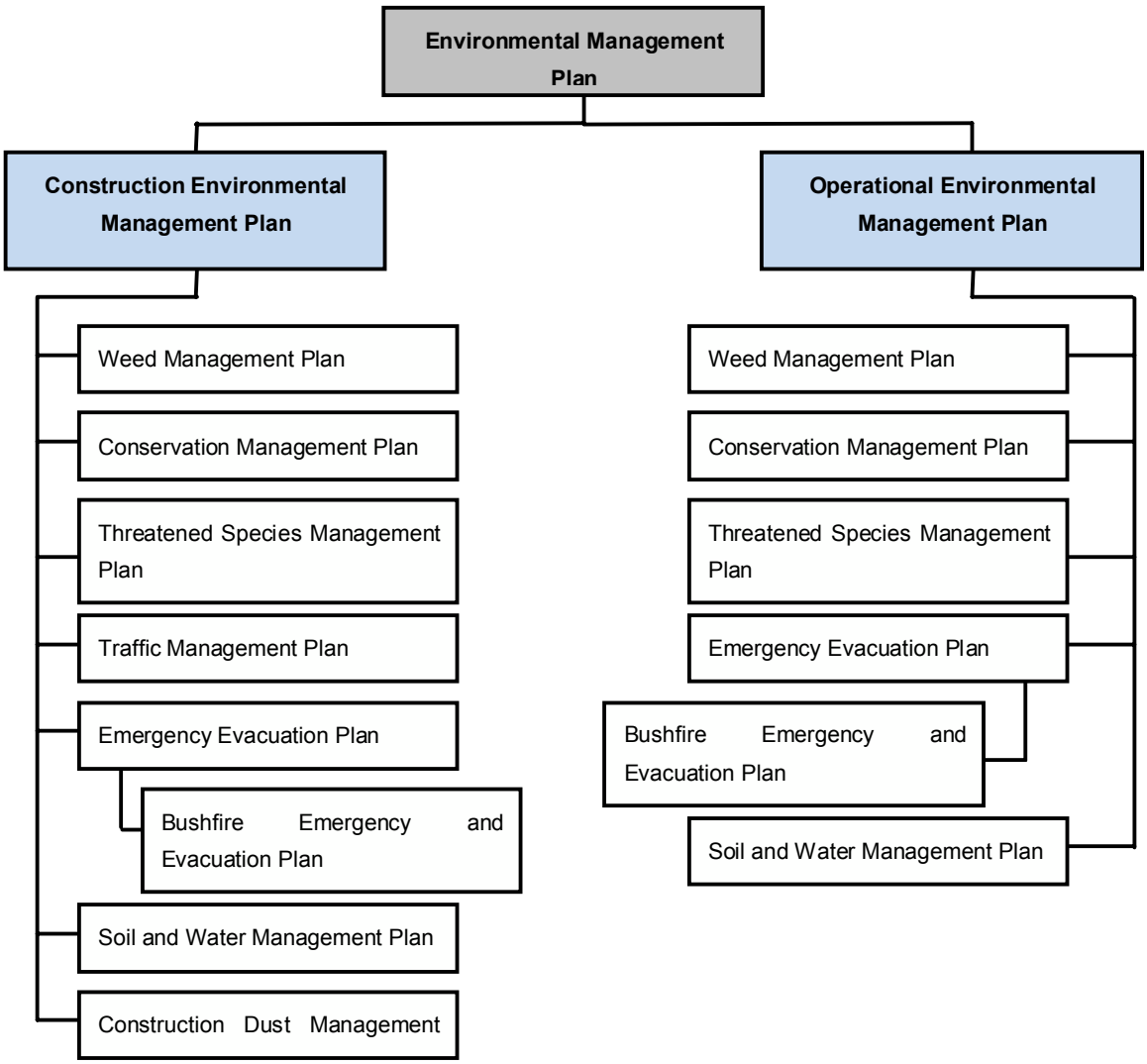

Figure 16: Environmental Management Plan Framework

Management Plans

Below is an overview of each of the plans and how each relates to the overall scheme of ameliorating, mitigating and managing identified environmental impacts in this EA during the construction and operational phases of the Project.

CEMP: The main aim of the CEMP will be to ameliorate, mitigate and manage any identified environmental impacts during the construction phase of the Project. This will be done through controlling, training and monitoring measures. The CEMP will cover a number of other plans, creating a working environmental plan during construction.

OEMP: The main aim of the OEMP will be to ameliorate, mitigate and manage any identified environmental impacts during the operation phase of the Project. This will be done by combining, where feasible, with the CEMP and adding additional mitigation and management strategies for operational environmental impacts. The OEMP will cover a number of other plans, creating a working environmental plan during operation.

Weed Management Plan: The main aim of this plan will be to stop the spread of weeds during both the construction and operation phase of the Project. This will involve areas of the Project that will have soil disturbance and vegetation clearance, vehicle and machinery movement between sites, importation of soil, rocks and revegetation. By implementing a Weed Management Plan into both the CEMP and OEMP, the spread of weeds can be mitigated and managed.

Conservation Management Plan: The main aim of this plan is to limit vegetation clearance/disturbance during the construction phase of the Project and monitor fauna during the operational phase of the Project. This plan will involve the movement of vehicles and machinery between sites, damage to surrounding tree roots, vegetation clearance, smothering of vegetation by dust particles, accidental capture/injury/death to fauna and temporary removal of fauna habitat. By implementing the Conservation Management Plan into both the CEMP and OEMP, vegetation clearance/disturbance and the impact on fauna can be ameliorated, mitigated and managed.

Cultural Heritage Management Protocol: The main aim of this protocol is to limit the impact on Cultural Heritage items found during the construction and operational phase of the Project. By implementing the Cultural Heritage Management Protocol into the CEMP and OEMP the impact on Cultural Heritage items can be ameliorated, mitigated and managed.

Traffic Management Plan: The main aim of this plan is to minimise risk from increased traffic on the roads in the Project site during the construction phase of the Project. This plan will involve the movement of vehicles and machinery between sites and the haulage process. By implementing the Traffic Management Plan into the CEMP the impact of increased traffic on the roads can be ameliorated, mitigated and managed.

Emergency Evacuation Plan: The main aim of this plan is to provide an effective and suitable emergency evacuation plan for use on-site during the construction and operational phase of the Project. This plan will consist of plans for activities occurring during construction and maintenance activities and if a fire or bushfire were to occur in/around the Project Site. By implementing the Emergency Evacuation Plan into the CEMP and OEMP all emergency evacuations will be carried out in an effective and suitable manner decreasing the risk of injury and damage.

Bushfire Emergency and Evacuation Plan: The main aim of this plan is to provide planned and orderly evacuation plans to construction and maintenance employees, visitors and landowners in the event of a bushfire impacting the Project site during the construction and operational phases of the Project. This plan will be a sub-plan under the Emergency Evacuation Plan. By implementing the Bushfire Emergency and Evacuation Plan into the CEMP and OEMP the plan will be able to provide planned and orderly instructions to all impacted persons decreasing the risk of injury.

Soil and Water Management Plan: The main aims of this plan are to minimise loss of water quality and changes in the hydraulic regime during the construction and operational phases of the Project. This plan will involve soil disturbance, erosion events from surface run-off and disturbance of water resources in the Project site. By implementing the Soil and Water Management Plan into the CEMP and OEMP, water quality and hydraulic regimes will be ameliorated, mitigated and managed.

Construction Dust Management Plan: The main aim of this plan is to minimise the generation and spread of dust during the construction phase of the Project. T his plan will involve vehicle and machinery movement and activities on dry and windy days. By implementing the Construction Dust Management Plan into the CEMP, dust generation will be able to be mitigated and managed.

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