

Preliminary Overview of Independent Assessments of *Wirradale & Mt Lindesay* Offset Mapping

Updated Amended Version with Additional Survey Sites

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1. Introduction and Methodology

1.1 Previous Independent Inspections

North West Ecological Services spent two days inspecting the vegetation of *Wirradale* and *Mt Lindesay* properties on the 7th and 9th of January 2013. That investigation targeted six areas mapped as White Box – Stringybark Grassy Woodland occurring at elevations above 930 m. In addition the vegetation viewable from the Mt Lindesay road was also viewed for potential correlation with the critically endangered White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Grassland Ecological Community (White Box CEEC) listed under the *Environmental Protection and Biodiversity Conservation Act 1999*. Within this inspection 30 sites were inspected. Less than half of the sites were primarily herbaceous and only four sites may have contained the requisite dominant species for the CEEC however it was determined that these stands would fall outside of the determination based on other selection criteria. The study further concluded that even if and where such small CEEC occurrences may be found that the compositional differences between sites from the project area (approximately 300 m altitude) and these properties (above 930 m) would not make a comparable offset.

A further investigation of 13 sites was undertaken by The Envirofactor (Hawes 2013) on the 26th of August 2013 within four mapped locations of White Box – Stringybark Grassy Woodland.

Approximately 180 ha was investigated of which only one site approximately 1 ha in size was found to conform to the CEEC with two other small areas of approximately 0.5 ha each. This preliminary investigation suggested that no areas of White Box – Stringybark Grassy Woodland consistent with the CEEC listing occurred within the four remnants mapped as such by Cumberland Ecology.

However during the traverses approximately 2 ha of woodland potentially conforming to the CEEC were seen.

1.2 Current Independent Inspection

This current investigation conducted a review of the accuracy of the current mapping of *Wirradale* and *Mt Lindesay* properties on the 24th of January 2014 and on the 4th of March 2014. This investigation was carried out within the same sub-sampled areas as the previous two independent investigations with the inclusion of additional areas to the north. Areas searched concentrated on communities mapped as Box Gum Woodland (CEEC) subtypes (Fig 1). A total of 80 rapid data points (RPD) were placed in order to assess the accuracy of current mapping. These sites were placed approximately every 300 m during meanders in order not to bias placement. The location of each

RPD was recorded using a GPS. The information collected included at least the three dominant flora species in each definable stratum; if that many occurred. These species were scored individually for their percentage cover and the total cover of each stratum was also recorded. At each RPD four photographs were taken in an East, South, West and Northerly direction.

1.3 Determination of Mapping Accuracy

The sites from the previous two investigations along with the sites placed during this current one have been combined in order to assess the accuracy of the current proposed mapping. Sites have been grouped into suggested Plant Community Types by dominants. In total 125 sites were available for mapping verification. All sites were compared against the currently mapped types.

1.4 Caveat

This current investigation and the previous two inspections should be seen only as preliminary and proper and accurate determination of accuracy of the proposed mapping should include a more thorough investigation across the whole proposed offset site. This should include both RPD and Full Floristic Survey sites which also record the structural characteristics necessary to properly determine the CEEC occurrence based on the selection criteria given within its determination. An accurate independent investigation should also include statistical analysis of floristics using standard and approved methodology and mapping should be done using ADS40 imagery if this is available.

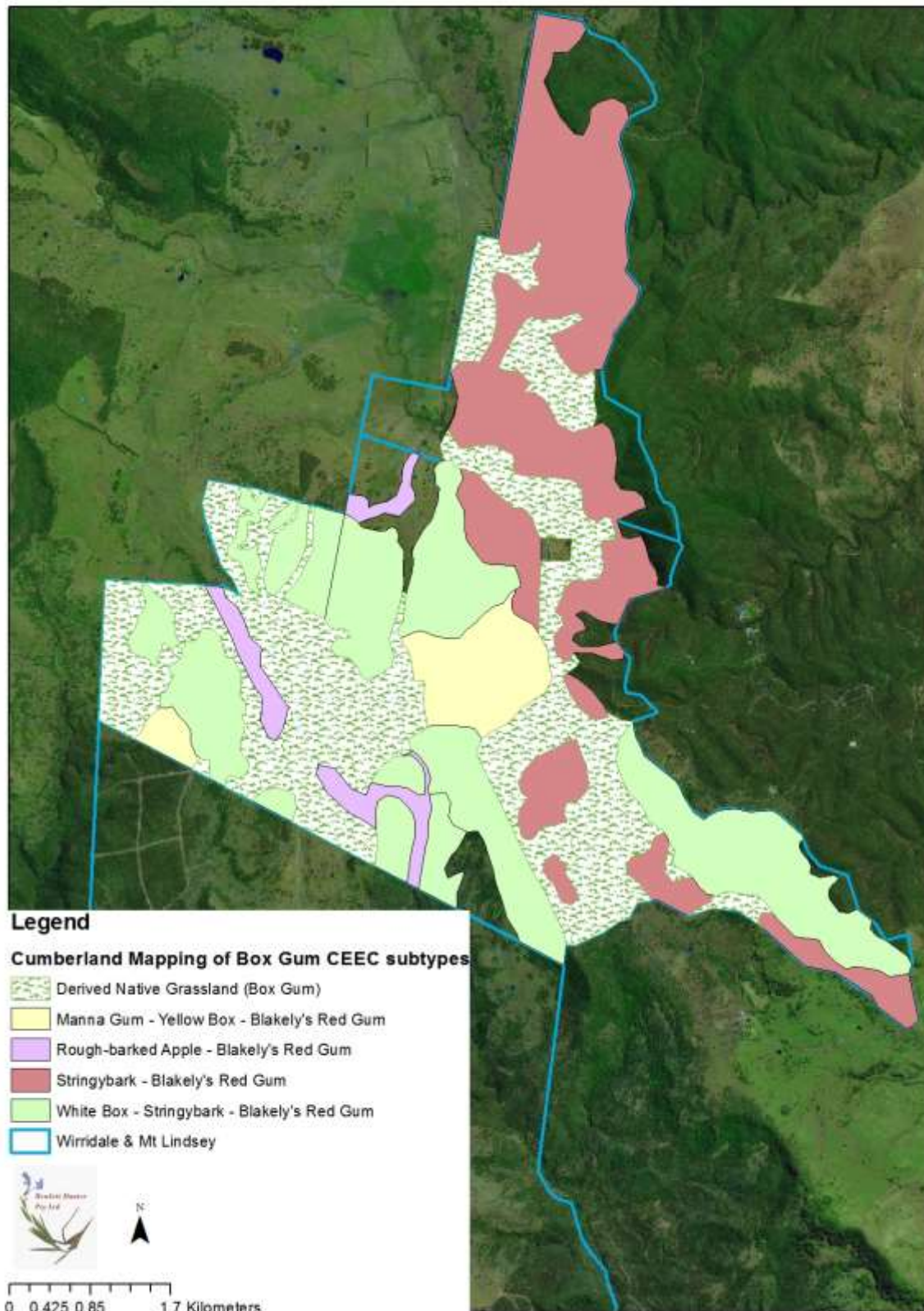


Fig. 1: Sub-area sampled within the *Wirradale* and *Mt Lindesay* properties and the approximate current mapping drafted by Cumberland Ecology of types considered to be Box Gum Woodland (CEEC).

2. Results & Discussion

Of the 125 sites available two were found to occur outside the current boundaries of the properties under investigation and were removed, thus 123 sites were available for testing mapping accuracy, all of which occurred within the mapped Box Gum Woodland CEEC subtypes (Fig 1). Of the 123 sites within the boundary of the study area only four (3.3%) were considered to match the current mapping (Fig 2). Thus, upfront the current mapping of communities within the site is extremely poor and is largely a misrepresentation of what is present on the ground. Surprisingly the most dominant overstorey species within the site included in decreasing order *Eucalyptus laevopinea* (Silver-top Stringybark), *Eucalyptus bridgesiana* (Apple Box), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus andrewsii* (Western New England Blackbutt), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus elliptica* (Round-leafed Gum), *Eucalyptus viminalis* (Manna Gum), *Eucalyptus prava* (Orange Gum), *Eucalyptus banksii* (Tenterfield Woollybutt), *Eucalyptus albens* (White Box), *Eucalyptus macrorhyncha* (Red Stringybark) and *Eucalyptus dalrympleana* (Mountain Gum) (Appendix D). The Community types currently mapped include (Fig 1):

Derived Native Grassland (from Box Gum Woodland)

Manna Gum - Yellow box - Blakely's Redgum open forest

Roughbarked Apple - Blakely's Red gum riparian grassy woodland

Stringybark - Blakely's Redgum grassy open forest

White box - Stringybark grassy woodland

Yellow box - Blakely's Redgum grassy woodland

None of these community types list the most of the more frequent and dominant species such as *Eucalyptus bridgesiana*, *Eucalyptus andrewsii*, *Eucalyptus prava*, *Eucalyptus elliptica*, *Eucalyptus macrorhyncha* or *Eucalyptus dalrympleana*. If these species are some of the most dominant within the location several should be represented within the definitions of the types found. Based on the currently mapped types given by Cumberland Ecology one would assume that many of the least frequent overstorey species (*Eucalyptus viminalis*, *Eucalyptus albens*) are in fact the most common and dominant which they were not. Furthermore the communities listed by Cumberland Ecology as occurring are primarily herbaceous and grass dominant woodland communities, however, a majority of the communities found within the site were shrub dominated and or forest community types with

dense mid storeys of *Olearia viscidula* (Daisy Bush) and *Olearia elliptica* (Sticky Daisy) (Appendix D & E).

The independent survey sites were allocated by the author to six general Plant Community Types (PCTs) that most closely aligned to the species found and which have been suggested to occur within the Namoi and Border Rivers/Gwydir Catchments (Fig 2).

Hawes (2013) and this current study collected information in a similar fashion (a total of 93 sites). Although Cumberland Ecology mapped extensive areas dominated by White Box – Stringybark – Blakely’s Red Gum Grassy Woodland, White Box (*Eucalyptus albens*) was comparatively rare and only found in six sites out of the 68 sites sampled within that unit. Within the extensive areas mapped as Stringybark – Red Gum Grassy Woodland by Cumberland Ecology this investigation found that only two sites out of 33 actually contained Blakely’s Red Gum. Nine sites were placed within Manna Gum – Yellow Box – Blakely’s Red Gum Grassy Woodland mapped by Cumberland Ecology, yet no manna gum was found within any of the sites investigated within this unit.

A total of 17 sites out of the 123 placed (13.8%) within mapped Box Gum CEEC subtypes were found to contain the requisite species that may allow their inclusion within this threatened community. However, proper determination would need to include an assessment by the placement of a 20 x 50 m reference site and also meeting the other required selection criteria given within the determination. This process was not done during this investigation. Thus some of these sites may yet fall outside of the criteria for inclusion after further investigation.

There are approximately 1900 ha of wooded Box Gum Woodland CEEC subtypes mapped by Cumberland Ecology within the area chosen for testing map validity during this and previous investigations. Based on the locations of sites visited (123 within the offset areas) and the notes taken on the vegetation between survey sites it is estimated that potentially 100 ha of currently wooded Box Gum CEEC occurs in the same area. This estimation equates to approximately 5% of the area suggested by Cumberland Ecology in their mapping.

3. Conclusions

It is the inescapable conclusion based on the sampling of 123 sites that the extent of the CEEC mapped by Cumberland Ecology is vastly overstated. These current results suggest that mapping accuracy may be as low as 3%. Based on the results reviewed herein, the on-ground extent of this critically endangered ecological community is approximately 5% of the area mapped as such by Cumberland Ecology. If these results are typical for the whole offset area it could be assumed that

only approximately 200 ha of CEEC maybe present within the offset properties however a thorough on ground investigation would be required to confirm or deny this estimate across the entire offset area. Overall the mapping of all communities may be in error as much as the error found for the CEEC. The findings of Hawes (2014) that only small isolated patches of CEEC occur within the site are generally upheld from the observations and sampling conducted within this investigation, however some large stands were noted during the second day of survey (4th of March 2014). Throughout the study site the main reasons for the CEEC not occurring is that most of the sample sites did not, and would not, have had any of the requisite species as dominants (i.e. White Box, Blakely's Red Gum or Yellow Box). In many locations these species if they did occur were minor components but never dominants or subdominants. Furthermore most locations were shrub dominated systems including areas dominated by White Box and or Yellow Box/Red Gum which would exclude them from the CEEC. Lastly there is a requirement for sites to be both of a minimum size with a minimum requisite number of understorey species present (Appendix C).

It is also the opinion of the author that any remnant of White box CEEC found at/or near the altitudinal limit of this community (approximately 800-1000 m a.s.l.) will not be representative of the CEEC as found in and around Maules Creek at 300-400 m a.s.l. What minor areas of CEEC that may occur within the designated offset are not likely to contain the same species composition as the White box CEEC community that may be cleared in Leard State Forest.

It is highly recommended that a thorough independent investigation is undertaken to properly verify the extent of CEEC within the offset areas and to properly map all the communities within the offset. It is clear from this preliminary investigation that the mapping of all community types by Cumberland Ecology is likely to be erroneous, not just the CEEC. Such an investigation should include both full floristic and rapid sites, analysis and the use of high definition imagery such as ADS40. It is highly likely that the results of such an investigation will significantly reduce the amount of CEEC mapped, but may also include further small areas not currently mapped as such.

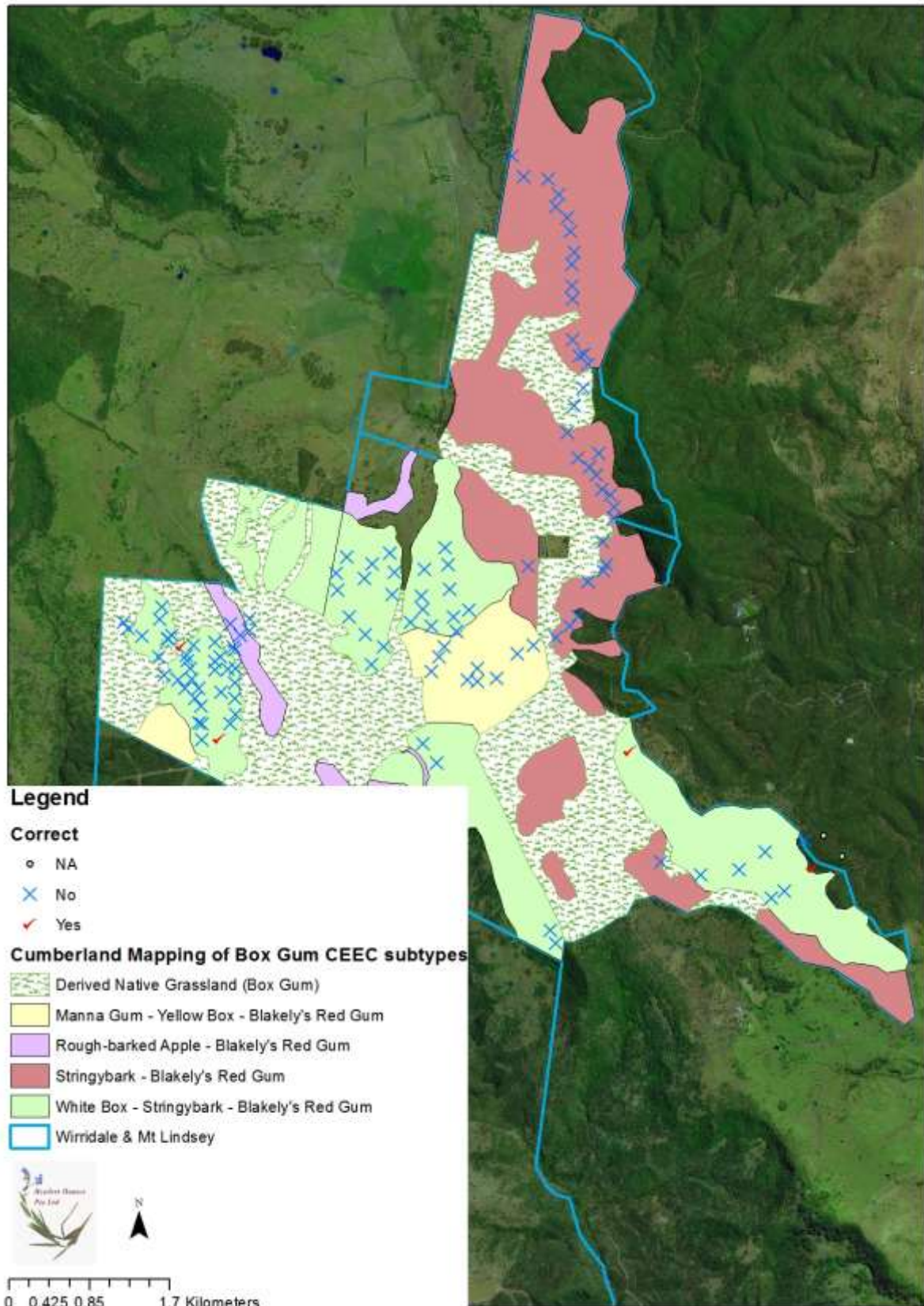


Fig. 2: Locations of 125 independent reference sites overlaid across the Cumberland Ecology mapping of Communities discussed as defining Box Gum Woodland Types (CEEC). X – Indicate site did not match the mapped type; ticks – indicate site did match the overlaying mapped type.

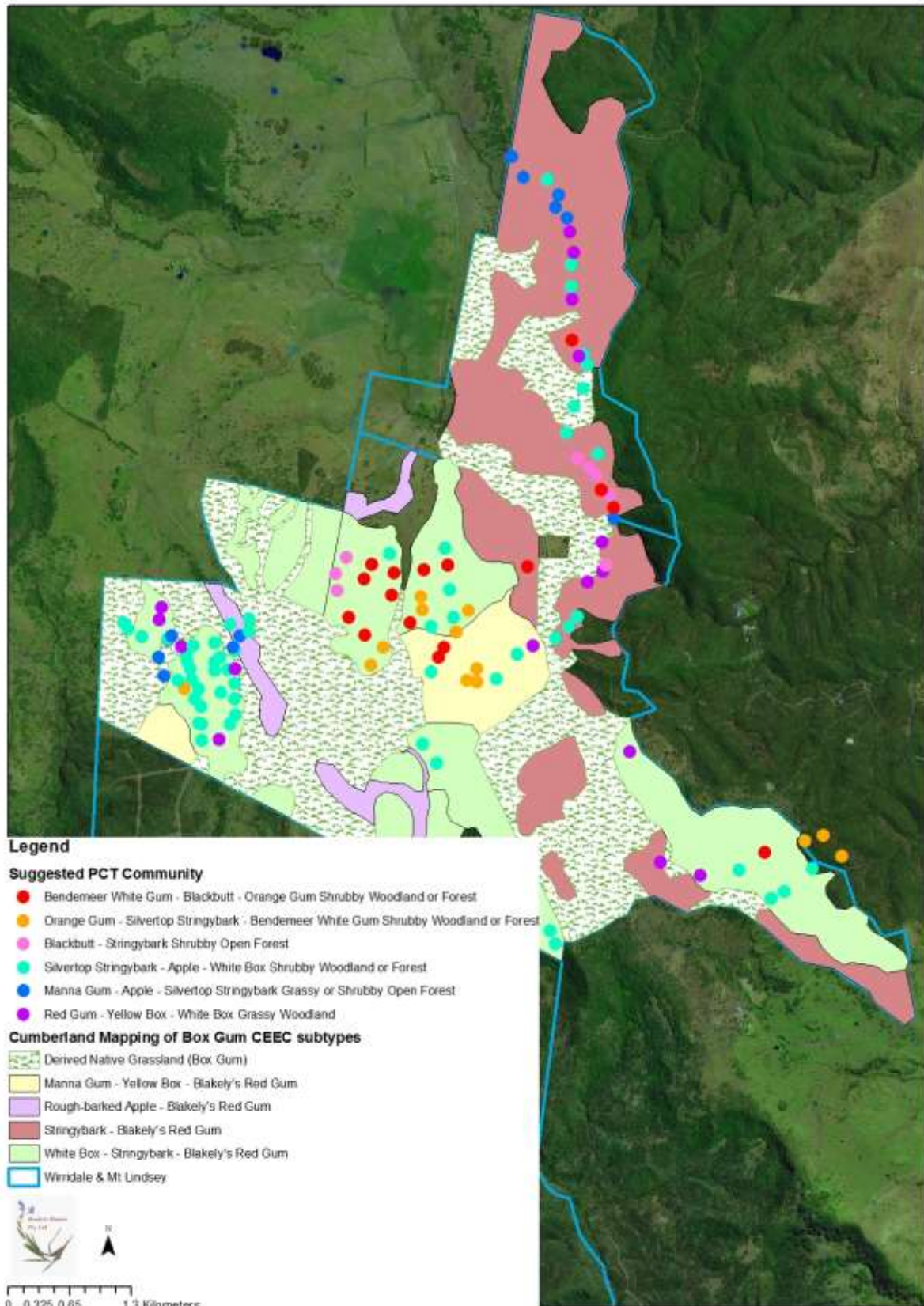


Fig. 3: Suggested Plant Community Types based on on-ground recording of dominant species within Rapid Survey Sites overlaid onto Cumberland Ecology mapping of the survey verification zone.

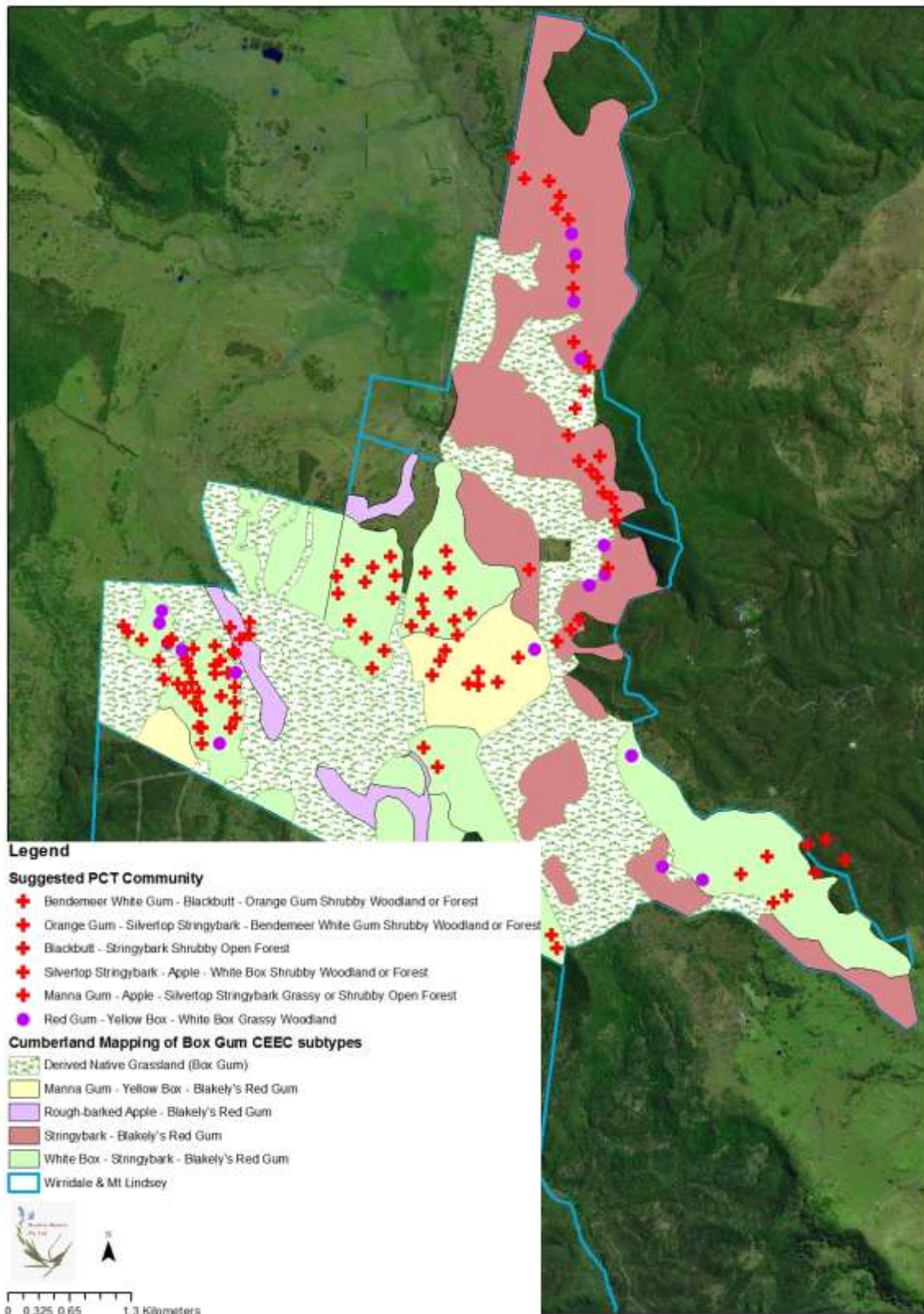


Fig. 4: Potential sites that may on further inspection constitute Box Gum CEEC. Note that some of these positive locations only account for one continuous hectare; others may fall out of the CEEC determination for other reasons upon further field verification. Note only Box Gum CEEC differentiated all other community types share the same symbol.

References

Hawes, W. (2013) Results of Field Assessment of Four Areas Mapped as White Box – Stringybark Grassy Woodland on the Offset Properties *Wirradale* and *Mt Lindesay*. Unpublished Report.

Hunter, J.T. (2014) *Preliminary Overview of Independent Assessments of Wirradale & Mt Lindesay Offset Mapping*. Unpublished Report to North West Ecological Services.

North West Ecological Services (2013) Results from Field Assessment of Maules Creek Coal Offset properties *Wirradale & Mt Lindesay*, targeting sections of vegetation mapped as White Box – Stringybark Grassy Woodland. Unpublished Report.

Appendix A

General site information recorded by Dr J. Hunter 24th January 2014 and the 4th of March 2014.

Site	Date	Datum	Zone	Easting	Northing	Altitude	OS Min H	OS H Max	OS C Min	OS C Max	MS H Min	MS H Max	MS C Min	MS C Max	US H Min	US H Max	US C Min	US C Max	PCT
1143	24/01/2014	94	56	236059	6640037	990	12	15	30	45	1	3	20	30	0.1	0.6	40	50	572
1144	24/01/2014	94	56	235894	6639864	955	14	20	40	50	1	3	10	20	0.1	0.6	30	40	572
1145	24/01/2014	94	56	235934	6639636	930	10	16	25	30	1	3	10	15	0.1	0.6	70	80	572
1146	24/01/2014	94	56	235937	6639484	925	12	16	35	45	1	3	10	15	0.1	0.3	10	20	563
1147	24/01/2014	94	56	235942	6639316	920	8	14	40	50	1	3	10	15	0.1	0.4	30	40	563
1148	24/01/2014	94	56	235958	6639146	944	10	16	30	40	1	3	10	15	0.1	0.5	10	15	563
1149	24/01/2014	94	56	235911	6639043	964	12	16	30	35	1	4	40	50	0.1	0.7	30	40	563
1150	24/01/2014	94	56	235805	6638874	973	6	12	30	40	1	5	5	10	0.1	0.6	50	60	599
1151	24/01/2014	94	56	235614	6638861	944	6	10	40	50	1	4	3	8	0.1	0.8	20	30	563
1152	24/01/2014	94	56	235604	6639034	948	12	16	30	40	1	3	15	25	0.1	0.5	50	60	563
1153	24/01/2014	94	56	235571	6639033	956	12	16	25	35	1	5	35	45	0.1	0.5	40	50	563
1154	24/01/2014	94	56	235517	6639293	940	12	18	35	45	1	4	50	60	0.1	0.5	30	40	563
1155	24/01/2014	94	56	235410	6639391	933	6	10	40	50	1	5	40	50	0.1	0.5	20	30	550
1156	24/01/2014	94	56	235332	6639482	923	15	18	35	45	1	4	20	30	0.1	0.5	30	40	563
1157	24/01/2014	94	56	235181	6639525	921	5	12	15	20	1	3	10	15	0.1	0.5	40	50	572
1158	24/01/2014	94	56	235114	6639716	926	15	22	30	40	1	3	10	15	0.1	0.7	50	60	572
1159	24/01/2014	94	56	235239	6639945	946	18	24	30	40	1	3	10	15	0.1	0.6	30	40	572
1160	24/01/2014	94	56	235349	6639841	960	8	14	15	30	1	4	10	15	0.1	0.5	50	60	599
1161	24/01/2014	94	56	235474	6639857	970	9	16	30	40	1	3	15	20	0.1	0.5	40	50	563
1162	24/01/2014	94	56	244778	6639994	980	8	15	30	40	1	3	15	20	0.1	0.8	30	40	563
1163	24/01/2014	94	56	244719	6640058	967	12	16	15	20	1	3	5	10	0.1	0.7	30	40	563
1164	24/01/2014	94	56	235850	6640099	977	12	20	40	50	1	3	20	30	0.1	0.4	20	30	563

Overview of Offset Mapping

Site	Date	Datum	Zone	Easting	Northing	Altitude	OS Min H	OS H Max	OS C Min	OS C Max	MS H Min	MS H Max	MS C Min	MS C Max	US H Min	US H Max	US C Min	US C Max	PCT
1165	24/01/2014	94	56	236056	6640168	997	12	16	30	40	1	3	15	20	0.1	0.5	50	60	563
1166	24/01/2014	94	56	238007	6639708	950	12	20	35	45	1	3	30	40	0.1	0.7	30	40	563
1167	24/01/2014	94	56	238081	6639867	957	18	25	35	45	1	3	40	50	0.1	0.5	40	50	530
1168	24/01/2014	94	56	238134	6639983	964	18	24	40	50	1	3	30	40	0.1	0.5	20	30	530
1169	24/01/2014	94	56	238257	6640147	995	8	14	35	45	1	2	30	40	0.1	0.5	20	30	530
1170	24/01/2014	94	56	238257	6640147	1,009.00	8	15	40	50	1	2	15	25	0.1	0.4	10	15	550
1171	24/01/2014	94	56	238369	6640380	1,013.00	8	15	40	50	1	3	30	40	0.1	0.3	15	20	550
1172	24/01/2014	94	56	243972	6640880	994	12	20	35	40	1	2.5	30	40	0.1	0.6	50	60	530
1173	24/01/2014	94	56	238126	6640848	946	8	18	40	50	0.5	2	20	25	0.1	0.5	30	40	530
1174	24/01/2014	94	56	237881	6640789	940	10	15	40	50	1	2	5	10	0.1	0.5	10	15	530
1175	24/01/2014	94	56	237566	6640742	944	10	15	40	50	1	2	20	30	0.1	0.5	15	20	530
1176	24/01/2014	94	56	237319	6640813	963	10	15	40	50	1	2	20	30	0.1	0.5	15	20	530
1177	24/01/2014	94	56	237048	6640878	986	14	18	40	50	1	2.5	15	25	0.1	0.3	5	10	530
1178	24/01/2014	94	56	236947	6640701	998	14	20	35	45	1	3	25	35	0.1	0.5	20	30	558
1179	24/01/2014	94	56	236975	6640517	999	14	20	35	45	1	2.5	15	25	0.1	0.6	20	30	558
1180	24/01/2014	94	56	237111	6640245	959	12	18	30	40	1	2	20	30	0.1	0.4	5	15	530
1181	24/01/2014	94	56	237289	6640063	946	14	20	40	50	1	2	20	30	0.1	0.4	30	40	530
1182	24/01/2014	94	56	237372	6639754	958	12	16	35	45	1	2.5	25	35	0.1	0.3	10	15	550
1286	4/03/2014	94	56	238392	6639640	983	8	15	40	50	1	2	40	40	0.1	0.5	30	40	550
1287	4/03/2014	94	56	238499	6639635	977	8	15	40	50	1	4	25	35	0.1	0.8	40	50	550
1288	4/03/2014	94	56	238701	6639673	981	10	18	45	55	1	4	15	25	0.1	0.3	15	25	563
1289	4/03/2014	94	56	238496	6639774	980	8	15	30	40	1	2.5	20	30	0.1	0.5	15	25	550
1290	4/03/2014	94	56	238911	6639945	973	8	16	35	45	1	2	35	45	0.1	0.3	25	35	563
1291	4/03/2014	94	56	239073	6640046	955	12	18	35	45	1	4	10	15	0.1	0.5	60	70	599
1292	4/03/2014	94	56	239304	6640143	969	8	15	40	50	1	2	60	70	0.1	0.5	10	20	563
1293	4/03/2014	94	56	239446	6640265	953	8	15	30	40	1	2.5	20	30	0.1	0.5	50	60	563
1294	4/03/2014	94	56	239530	6640377	942	10	18	40	50	1	2	40	50	0.1	0.3	20	30	563

Overview of Offset Mapping

Site	Date	Datum	Zone	Easting	Northing	Altitude	OS Min H	OS H Max	OS C Min	OS C Max	MS H Min	MS H Max	MS C Min	MS C Max	US H Min	US H Max	US C Min	US C Max	PCT
1295	4/03/2014	94	56	239613	6640753	917	10	16	35	45	1	2	2	2	0.1	0.6	70	80	599
1296	4/03/2014	94	56	239613	6640753	917	16	24	35	45					0.1	0.6	70	80	599
1297	4/03/2014	94	56	239772	6640871	911	6	12	30	40	1	2	5	10	0.1	0.4	70	80	599
1298	4/03/2014	94	56	239803	6640943	911	8	14	40	50	0.5	2	40	50	0.1	0.5	40	50	558
1299	4/03/2014	94	56	239751	6641185	902	8	16	45	55	0.5	1	10	15	0.1	0.6	30	40	599
1300	4/03/2014	94	56	239857	6641441	822	15	25	40	50	1	2	15	40	0.3	1	60	70	572
1301	4/03/2014	94	56	239848	6641552	897	8	16	40	50	1	2	30	40	0.1	0.6	30	40	530
1302	4/03/2014	94	56	239799	6641685	907	15	25	40	50	1	2	10	20	0.1	1	50	60	558
1303	4/03/2014	94	56	239713	6641734	918	15	22	40	50	1	2	50	70	0.1	0.4	10	20	530
1304	4/03/2014	94	56	239646	6641882	927	8	15	40	50	1	2	20	30	0.1	0.8	50	60	558
1305	4/03/2014	94	56	239568	6641963	936	12	16	40	50	1	2	25	35	0.1	0.5	10	20	558
1306	4/03/2014	94	56	239440	6642050	956	10	16	40	50	1	2	20	30	0.1	0.8	30	40	558
1307	4/03/2014	94	56	242655	6646114	975	15	20	40	50	1	2	20	30	0.1	0.5	20	30	563
1308	4/03/2014	94	56	239311	6642318	1,026.00	14	15	40	50	1	2	15	25	0.1	0.8	20	30	563
1309	4/03/2014	94	56	239372	6642605	1,057.00	8	15	30	40	1	3	60	80	0.1	1	70	80	563
1310	4/03/2014	94	56	239456	6642797	1,056.00	8	14	30	40					0.1	0.6	50	60	563
1311	4/03/2014	94	56	239494	6643048	1,044.00	10	15	35	45	1	5	15	25	0.1	0.6	50	60	563
1312	4/03/2014	94	56	239446	6643155	1,027.00	8	15	35	45	1	4	30	40	0.1	0.6	30	40	563
1313	4/03/2014	94	56	239321	6643305	1,010.00	16	24	40	50	1	4	15	20	0.1	0.6	30	40	530
1314	4/03/2014	94	56	241401	6646137	1,036.00	8	15	35	45	1	2	15	20	0.1	0.6	30	40	599
1315	4/03/2014	94	56	239291	6643729	1,007.00	10	18	30	40	1	2	10	15	0.1	0.7	40	50	599
1316	4/03/2014	94	56	239276	6643866	922	10	16	35	45	1	2	30	40	0.1	0.6	30	40	563
1317	4/03/2014	94	56	239270	6644098	976	10	16	35	45	1	2	30	40	0.1	0.6	30	40	563
1318	4/03/2014	94	56	239287	6644232	952	8	14	25	35					0.1	0.6	70	80	599
1319	4/03/2014	94	56	239233	6644449	929	12	20	20	30					0	0.6	70	80	599
1320	4/03/2014	94	56	239196	6644588	900	14	16	25	35					0.1	0.5	70	80	572
1321	4/03/2014	94	56	239066	6644695	901	16	25	35	45					0.4	1	70	80	572

Overview of Offset Mapping

Site	Date	Datum	Zone	Easting	Northing	Altitude	OS Min H	OS H Max	OS C Min	OS C Max	MS H Min	MS H Max	MS C Min	MS C Max	US H Min	US H Max	US C Min	US C Max	PCT
1322	4/03/2014	94	56	239093	6644831	926	12	20	35	45	2	5	10	10	0.1	0.6	60	70	572
1323	4/03/2014	94	56	238964	6644984	963	14	18	40	50	1	2	40	50	0.1	0.6	50	60	563
1324	4/03/2014	94	56	238706	6645000	952	10	18	45	55	1	2.5	15	20	0.1	0.6	10	15	572
1325	4/03/2014	94	56	238575	6645214	948	8	16	25	35	0.5	1.5	15	25	0.1	0.6	70	80	572

Appendix B

Site verification of NWES sites 133 – 291, Hawes sites 1045 – 1057, and Hunter sites 1143 – 1325.

Note that only sites within the offset area have been quantified into mapped units.

Site	Easting	Northing	Community	Correct	Mapped Unit
133	239,412.00	6,637,041.00	563	No	White Box - Stringybark Grassy Woodland
134	239,480.00	6,636,907.00	563	No	White Box - Stringybark Grassy Woodland
136	240,543.00	6,637,824.00	599	No	White Box - Stringybark Grassy Woodland
137	240,972.00	6,637,709.00	599	No	White Box - Stringybark Grassy Woodland
138	241,381.00	6,637,789.00	563	No	White Box - Stringybark Grassy Woodland
139	241,641.00	6,637,989.00	530	No	White Box - Stringybark Grassy Woodland
140	242,059.00	6,638,137.00	550	No	White Box - Stringybark Shrubby Woodland
141	242,249.00	6,638,201.00	550	NA	
142	242,457.00	6,637,994.00	550	NA	
143	242,155.00	6,637,843.00	563	Yes	White Box - Stringybark Shrubby Woodland
144	241,873.00	6,637,587.00	563	No	White Box - Stringybark Grassy Woodland
145	241,736.00	6,637,507.00	563	No	White Box - Stringybark Grassy Woodland
146	240,156.00	6,638,979.00	599	Yes	White Box - Stringybark Grassy Woodland
147	237,764.00	6,640,217.00	530	No	White Box - Stringybark Grassy Woodland
148	237,553.00	6,640,502.00	530	No	White Box - Stringybark Grassy Woodland
149	237,860.00	6,640,501.00	550	No	White Box - Stringybark Grassy Woodland
150	237,880.00	6,640,364.00	550	No	White Box - Stringybark Grassy Woodland
151	237,487.00	6,639,944.00	550	No	White Box - Stringybark Grassy Woodland
152	235,118.00	6,640,242.00	599	No	White Box - Stringybark Grassy Woodland
153	235,103.00	6,640,116.00	599	No	White Box - Stringybark Grassy Woodland
154	235,203.00	6,639,909.00	599	No	White Box - Stringybark Grassy Woodland
155	235,406.00	6,639,746.00	563	No	White Box - Stringybark Grassy Woodland
282	235,414.00	6,639,690.00	563	No	White Box - Stringybark Grassy Woodland
283	235,457.00	6,639,611.00	563	No	White Box - Stringybark Grassy Woodland
284	235,481.00	6,639,496.00	563	No	White Box - Stringybark Grassy Woodland
285	235,555.00	6,639,406.00	563	No	White Box - Stringybark Grassy Woodland
286	235,716.00	6,639,609.00	563	No	White Box - Stringybark Grassy Woodland
287	235,709.00	6,639,699.00	563	No	White Box - Stringybark Grassy Woodland
288	235,768.00	6,639,749.00	563	No	White Box - Stringybark Grassy Woodland
289	235,704.00	6,639,901.00	563	No	White Box - Stringybark Grassy Woodland
290	237,961.00	6,638,943.00	563	No	White Box - Stringybark Grassy Woodland
291	238,113.00	6,638,750.00	563	No	White Box - Stringybark Grassy Woodland
1045	235,964.00	6,639,987.00	572	No	White Box - Stringybark Grassy Woodland
1046	235,916.00	6,639,829.00	563	No	White Box - Stringybark Grassy Woodland
1047	235,857.00	6,639,623.00	563	No	White Box - Stringybark Grassy Woodland
1048	235,794.00	6,639,375.00	563	No	White Box - Stringybark Grassy Woodland
1049	235,589.00	6,639,216.00	563	No	White Box - Stringybark Grassy Woodland

Overview of Offset Mapping

Site	Easting	Northing	Community	Correct	Mapped Unit
1050	235,204.00	6,639,911.00	563	No	White Box - Stringybark Grassy Woodland
1051	234,927.00	6,639,924.00	563	No	White Box - Stringybark Grassy Woodland
1052	237,980.00	6,640,194.00	563	No	White Box - Stringybark Grassy Woodland
1053	238,213.00	6,640,303.00	563	No	White Box - Stringybark Grassy Woodland
1054	238,155.00	6,640,592.00	563	No	White Box - Stringybark Grassy Woodland
1055	238,084.00	6,641,026.00	563	No	White Box - Stringybark Grassy Woodland
1056	237,502.00	6,640,937.00	563	No	White Box - Stringybark Grassy Woodland
1057	237,247.00	6,640,661.00	530	No	White Box - Stringybark Grassy Woodland
1143	236,059.00	6,640,037.00	563	No	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Forest
1144	235,894.00	6,639,864.00	572	No	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Forest
1145	235,934.00	6,639,636.00	599	No	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Forest
1146	235,937.00	6,639,484.00	563	No	White Box - Stringybark Grassy Woodland
1147	235,942.00	6,639,316.00	563	No	White Box - Stringybark Grassy Woodland
1148	235,958.00	6,639,146.00	563	No	White Box - Stringybark Grassy Woodland
1149	235,911.00	6,639,043.00	563	No	White Box - Stringybark Grassy Woodland
1150	235,805.00	6,638,874.00	599	Yes	White Box - Stringybark Grassy Woodland
1151	235,614.00	6,638,861.00	563	No	White Box - Stringybark Grassy Woodland
1152	235,604.00	6,639,034.00	563	No	White Box - Stringybark Grassy Woodland
1153	235,571.00	6,639,033.00	563	No	White Box - Stringybark Grassy Woodland
1154	235,517.00	6,639,293.00	563	No	White Box - Stringybark Grassy Woodland
1155	235,410.00	6,639,391.00	550	No	White Box - Stringybark Grassy Woodland
1156	235,332.00	6,639,482.00	563	No	White Box - Stringybark Grassy Woodland
1157	235,181.00	6,639,525.00	572	No	Derived Native Grassland
1158	235,114.00	6,639,716.00	572	No	Derived Native Grassland
1159	235,239.00	6,639,945.00	572	No	White Box - Stringybark Grassy Woodland
1160	235,349.00	6,639,841.00	599	Yes	White Box - Stringybark Grassy Woodland
1161	235,474.00	6,639,857.00	563	No	White Box - Stringybark Grassy Woodland
1162	234,778.00	6,639,994.00	563	No	Derived Native Grassland
1163	234,719.00	6,640,058.00	563	No	Derived Native Grassland
1164	235,850.00	6,640,099.00	563	No	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Forest
1165	236,056.00	6,640,168.00	563	No	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Forest
1166	238,007.00	6,639,708.00	563	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1167	238,081.00	6,639,867.00	530	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1168	238,134.00	6,639,983.00	530	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1169	238,257.00	6,640,147.00	530	No	White Box - Stringybark Grassy Woodland
1170	238,257.00	6,640,147.00	550	No	White Box - Stringybark Grassy Woodland
1171	238,369.00	6,640,380.00	550	No	White Box - Stringybark Grassy Woodland
1172	238,972.00	6,640,880.00	530	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1173	238,126.00	6,640,848.00	530	No	White Box - Stringybark Grassy Woodland
1174	237,881.00	6,640,789.00	530	No	White Box - Stringybark Grassy Woodland
1175	237,566.00	6,640,742.00	530	No	White Box - Stringybark Grassy Woodland
1176	237,319.00	6,640,813.00	530	No	White Box - Stringybark Grassy Woodland
1177	237,048.00	6,640,878.00	558	No	White Box - Stringybark Grassy Woodland

Overview of Offset Mapping

Site	Easting	Northing	Community	Correct	Mapped Unit
1178	236,947.00	6,640,701.00	558	No	White Box - Stringybark Grassy Woodland
1179	236,975.00	6,640,517.00	558	No	White Box - Stringybark Grassy Woodland
1180	237,111.00	6,640,245.00	530	No	White Box - Stringybark Grassy Woodland
1181	237,289.00	6,640,063.00	530	No	White Box - Stringybark Grassy Woodland
1182	237,372.00	6,639,754.00	550	No	White Box - Stringybark Grassy Woodland
1286	238392	6639640	550	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1287	238499	6639635	550	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1288	238701	6639673	563	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1289	238496	6639774	550	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1290	238911	6639945	563	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1291	239073	6640046	599	No	Manna Gum - Yellow Box - Blakely's Red Gum Open Forest
1292	239304	6640143	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1293	239446	6640265	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1294	239530	6640377	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1295	239613	6640753	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1296	239613	6640753	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1297	239772	6640871	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1298	239803	6640943	558	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1299	239751	6641185	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1300	239857	6641441	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1301	239848	6641552	530	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1302	239799	6641685	558	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1303	239713	6641734	530	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1304	239646	6641882	558	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1305	239568	6641963	558	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1306	239440	6642050	558	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1307	239655	6642114	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1308	239311	6642318	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1309	239372	6642605	563	No	Derived Native Grassland
1310	239456	6642797	563	No	Derived Native Grassland
1311	239494	6643048	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1312	239446	6643155	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1313	239321	6643305	530	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1314	239401	6643137	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1315	239291	6643729	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1316	239276	6643866	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1317	239270	6644098	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1318	239287	6644232	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1319	239233	6644449	599	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1320	239196	6644588	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1321	239066	6644695	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1322	239093	6644831	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1323	238964	6644984	563	No	Stringybark - Blakely's Red Gum Grassy Open Forest

Overview of Offset Mapping

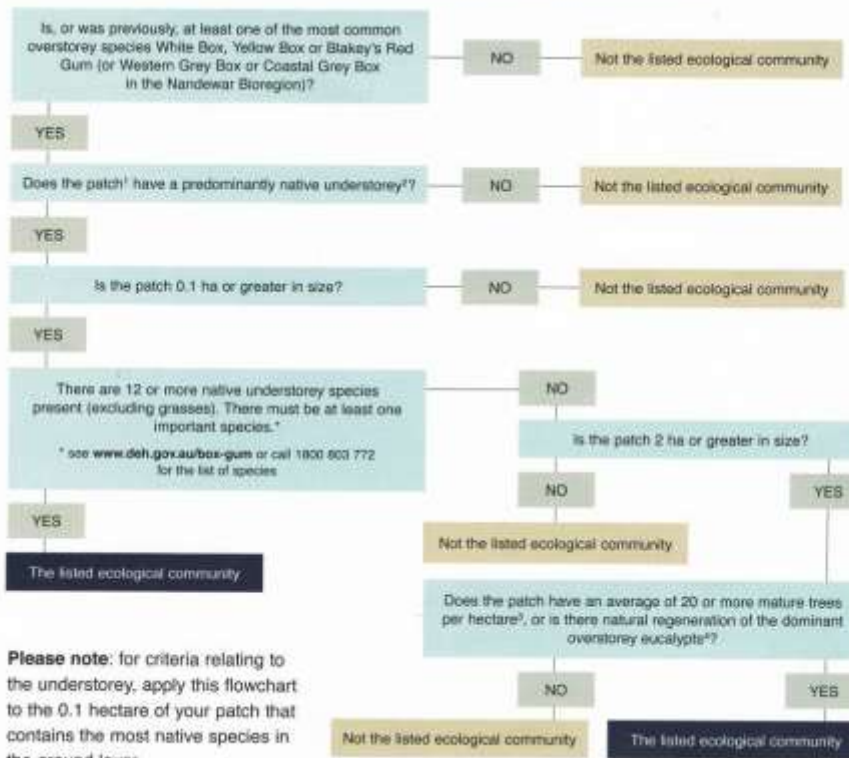
Site	Easting	Northing	Community	Correct	Mapped Unit
1324	238706	6645000	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest
1325	238575	6645214	572	No	Stringybark - Blakely's Red Gum Grassy Open Forest

Appendix C

Minimum condition criteria for the Commonwealth listed White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. (from *White box –Yellow Box – Blakely’s Red Gum grassy woodlands and derived native grasslands*. Nationally threatened species and ecological communities. EPBC Act Policy Statements Department of Environment and Heritage 2006). Box – Gum Woodlands and Derived Grasslands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely’s Red Gum trees. In the Nandewar Bioregion, Grey Box (*Eucalyptus microcarpa* or *Eucalyptus moluccana*) may also be dominant or co-dominant. The tree-cover is generally discontinuous and consists of widely spaced trees of medium height in which the canopies are clearly separated. Associated species and occasionally co-dominant species include but are not restricted to Grey Box, Fuzzy Box, Apple Box, Red Box, Red Stringybark, White Cypress Pine, Black Cypress Pine, Long-leaved Box, New England Stringybark, Brittle Gum, Candlebark, Argyle Apple, Kurrajong and Drooping She-oak. **Note that:** Shrub cover in this ecological community is naturally patchy, and shrubs may be dominant only over a very localised area. Shrub cover should therefore be assessed over the entire remnant, not just in a localised area. A remnant with a significant ground layer of tussock grasses, and where the distribution of shrubs is scattered or patchy, is part of the ecological community. In shrubby woodlands, the dominance of native tussock grasses in the ground layer of vegetation is lost. Therefore, a remnant with a continuous shrub layer, in which the shrub cover is greater than 30%, is considered to be a shrubby woodland and so is not part of the listed ecological community. Remnant attributes, such as shrubbiness, should be measured on a scale of 0.1 hectares or greater.

The flowchart below represents the lowest condition at which patches are included in the listed ecological community. This is not the ideal state of the ecological community. Large patches, those that link remnants in the landscape, those that occur in highly cleared areas, those that contain rare, declining or threatened species, and those that represent the entire range of the ecological community, are important for the long-term future of the ecological community.

Determining if your land has an area of the listed ecological community



Please note: for criteria relating to the understorey, apply this flowchart to the 0.1 hectare of your patch that contains the most native species in the ground layer.

- 1 Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:
 - an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
 - the area over which the understorey is predominantly native.
 Patches must be assessed at a scale of 0.1 ha (1000m²) or greater.
- 2 A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)
- 3 Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.
- 4 Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Appendix D

Summed Cover: at each of the 80 sites surveyed within this current investigation the cover of each of three dominant species from each strata were given an individual cover score. These have been summed over the 80 sites and ranked to assess the most dominant species within the site. The sum of rank has been calculated based on the 80 new sites from this investigation and the 13 sites from Hawes (2014). Within both survey programs the dominant three species from each strata could be ranked with the most dominant at a site being given a score of 3 and the least dominant a score of 1; these have been summed across the 93 sites to assess the most common and dominant species within the study area.

Species	Summed Cover	Taxon	Sum of Rank
<i>Olearia viscidula</i>	943	<i>Olearia viscidula</i>	168
<i>Eucalyptus laevopinea</i>	880	<i>Eucalyptus laevopinea</i>	153
<i>Poa sieberiana</i>	822	<i>Poa sieberiana</i>	137
<i>Eucalyptus bridgesiana</i>	667	<i>Eucalyptus bridgesiana</i>	104
<i>Microlaena stipoides</i>	461	<i>Olearia elliptica</i>	104
<i>Eucalyptus melliodora</i>	430	<i>Eucalyptus melliodora</i>	81
<i>Olearia elliptica</i>	381	<i>Microlaena stipoides</i>	78
<i>Aristida personata</i>	378	<i>Angophora floribunda</i>	68
<i>Pultenaea cuneata</i>	342	<i>Pultenaea cuneata</i>	67
<i>Cymbopogon refractus</i>	310	<i>Aristida personata</i>	65
<i>Eucalyptus andrewsii</i>	268	<i>Dodonaea viscosa</i>	45
<i>Angophora floribunda</i>	230	<i>Cymbopogon refractus</i>	42
<i>Eucalyptus blakelyi</i>	219	<i>Eucalyptus blakelyi</i>	41
<i>Themeda triandra</i>	215	<i>Eucalyptus andrewsii</i>	37
<i>Dodonaea viscosa</i>	191	<i>Aristida caput-medusae</i>	33
<i>Sorghum leiocladum</i>	183	<i>Eucalyptus elliptica</i>	31
<i>Eucalyptus elliptica</i>	176	<i>Eucalyptus viminalis</i>	29
<i>Eucalyptus viminalis</i>	165	<i>Goodenia hederacea</i>	26
<i>Eucalyptus prava</i>	163	<i>Themeda triandra</i>	24
<i>Aristida caput-medusae</i>	120	<i>Eucalyptus prava</i>	23
<i>Eucalyptus banksii</i>	120	<i>Melichrus urceolatus</i>	23
<i>Rytidosperma pallidum</i>	115	<i>Aristida jerichoensis</i>	19
<i>Eucalyptus albens</i>	104	<i>Rosa rubiginosa</i>	19
<i>Lomandra longifolia</i>	92	<i>Eucalyptus albens</i>	16
<i>Aristida jerichoensis</i>	82	<i>Exocarpos cupressiformis</i>	15
<i>Imperata cylindrica</i>	80	<i>Eucalyptus banksii</i>	14
<i>Goodenia hederacea</i>	75	<i>Sorghum leiocladum</i>	14
<i>Eucalyptus macrorhyncha</i>	65	<i>Aristida vagans</i>	13
<i>Melichrus urceolatus</i>	65	<i>Eucalyptus macrorhyncha</i>	12
<i>Poa labillardieri</i>	60	<i>Rytidosperma pallidum</i>	12
<i>Rosa rubiginosa</i>	57	<i>Austrostipa scabra</i>	10
<i>Brachyloma daphnoides</i>	45	<i>Lepidosperma laterale</i>	10

Overview of Offset Mapping

Species	Summed Cover	Taxon	Sum of Rank
<i>Exocarpos cupressiformis</i>	45	<i>Lomandra longifolia</i>	10
<i>Pteridium esculentum</i>	45	<i>Monotoca scoparia</i>	10
<i>Hovea lanceolata</i>	43	<i>Pteridium esculentum</i>	9
<i>Eucalyptus dalrympleana</i>	40	<i>Acaena novae-zelandiae</i>	8
<i>Lepidosperma laterale</i>	33	<i>Hydrocotyle laxiflora</i>	8
<i>Pultenaea foliolosa</i>	32	<i>Brachyloma daphnoides</i>	7
<i>Acaena novae-zelandiae</i>	30	<i>Bursaria spinosa</i>	7
<i>Bothriochloa decipiens</i>	30	<i>Hibbertia obtusifolia</i>	7
<i>Monotoca scoparia</i>	30	<i>Hovea lanceolata</i>	7
<i>Dichondra repens</i>	26	<i>Imperata cylindrica</i>	7
<i>Austrostipa scabra</i>	25	<i>Lomandra multiflora</i>	7
<i>Lomandra multiflora</i>	22	<i>Pimelea neo-anglica</i>	7
<i>Aristida vagans</i>	20	<i>Eucalyptus dalrympleana</i>	6
<i>Echinopogon caespitosus</i>	20	<i>Poa labillardieri</i>	6
<i>Hibbertia obtusifolia</i>	20	<i>Lissanthe strigosa</i>	5
<i>Juncus usitatus</i>	20	<i>Rytidosperma longifolium</i>	5
<i>Rytidosperma longifolium</i>	20	<i>Acacia rubida</i>	4
<i>Olearia rosmarinifolia</i>	18	<i>Desmodium brachypodum</i>	4
<i>Dichelachne micrantha</i>	17	<i>Echinopogon caespitosus</i>	4
<i>Pimelea neo-anglica</i>	16	<i>Leptospermum polygalifolium</i>	4
<i>Acacia rubida</i>	15	<i>Pultenaea foliolosa</i>	4
<i>Desmodium brachypodum</i>	15	<i>Rytidosperma racemosum</i>	4
<i>Leptospermum polygalifolium</i>	15	<i>Callitris glaucophylla</i>	3
<i>Pennisetum alopecuroides</i>	15	<i>Correa reflexa</i>	3
<i>Pultenaea microphylla</i>	15	<i>Dichelachne micrantha</i>	3
<i>Lissanthe strigosa</i>	14	<i>Dichondra repens</i>	3
<i>Carex breviculmis</i>	10	<i>Indigofera adesmiifolia</i>	3
<i>Rytidosperma erianthum</i>	10	<i>Notelaea microcarpa</i>	3
<i>Indigofera adesmiifolia</i>	8	<i>Olearia rosmarinifolia</i>	3
<i>Bursaria spinosa</i>	7	<i>Pultenaea microphylla</i>	3
<i>Notelaea microcarpa</i>	7	<i>Callitris endlicheri</i>	2
<i>Callitris glaucophylla</i>	6	<i>Carex breviculmis</i>	2
<i>Callitris endlicheri</i>	5	<i>Geranium solanderi</i>	2
<i>Correa reflexa</i>	5	<i>Juncus usitatus</i>	2
<i>Dianella caerulea</i>	5	<i>Pennisetum alopecuroides</i>	2
<i>Eucalyptus moluccana</i>	5	<i>Bothriochloa decipiens</i>	1
<i>Gompholobium huegelii</i>	5	<i>Cassinia laevis</i>	1
<i>Hakea eriantha</i>	5	<i>Cheilanthes sieberi</i>	1
<i>Rytidosperma racemosum</i>	5	<i>Dianella caerulea</i>	1
<i>Veronica calycina</i>	5	<i>Dianella revoluta</i>	1
<i>Xanthorrhoea johnsonii</i>	5	<i>Eucalyptus moluccana</i>	1
<i>Pomax umbellata</i>	3	<i>Gompholobium huegelii</i>	1
<i>Cheilanthes sieberi</i>	2	<i>Hakea eriantha</i>	1

Overview of Offset Mapping

Species	Summed Cover	Taxon	Sum of Rank
<i>Geranium solanderi</i>	2	<i>Opercularia diphylla</i>	1
<i>Dianella revoluta</i>	1	<i>Pomax umbellata</i>	1
<i>Opercularia diphylla</i>	1	<i>Rytidosperma erianthum</i>	1
<i>Scutellaria humilis</i>	1	<i>Scutellaria humilis</i>	1
<i>Cassinia laevis</i>	1	<i>Veronica calycina</i>	1
<i>Hydrocotyle laxiflora</i>	1	<i>Xanthorrhoea johnsonii</i>	1

Appendix E

Typical example of each suggested Plant Community Type within the area surveyed during this investigation.



Plate 1. PCT530 Bendemeer White Gum – Blackbutt – Orange Gum Shrubby Woodland.



Plate 2. PCT550 Orange gum – Silvertop Stringybark – Bendemeer White Gum Shrubby Woodland.



Plate 3: PCT558 Western New England Blackbutt – Stringybark Open Forest.



Plate 4. PCT563 Silvertop Stringybark – Apple Box – White Box Shrubby Woodland.



Plate 5. PCT572 Manna Gum – Apple – Silver-top Stringybark Forest



Plate 6. PCT599 Red Gum – Yellow Box – White Box Grassy Woodland.

Appendix E

Previous mapping diagrams from Cumberland Ecology reports.

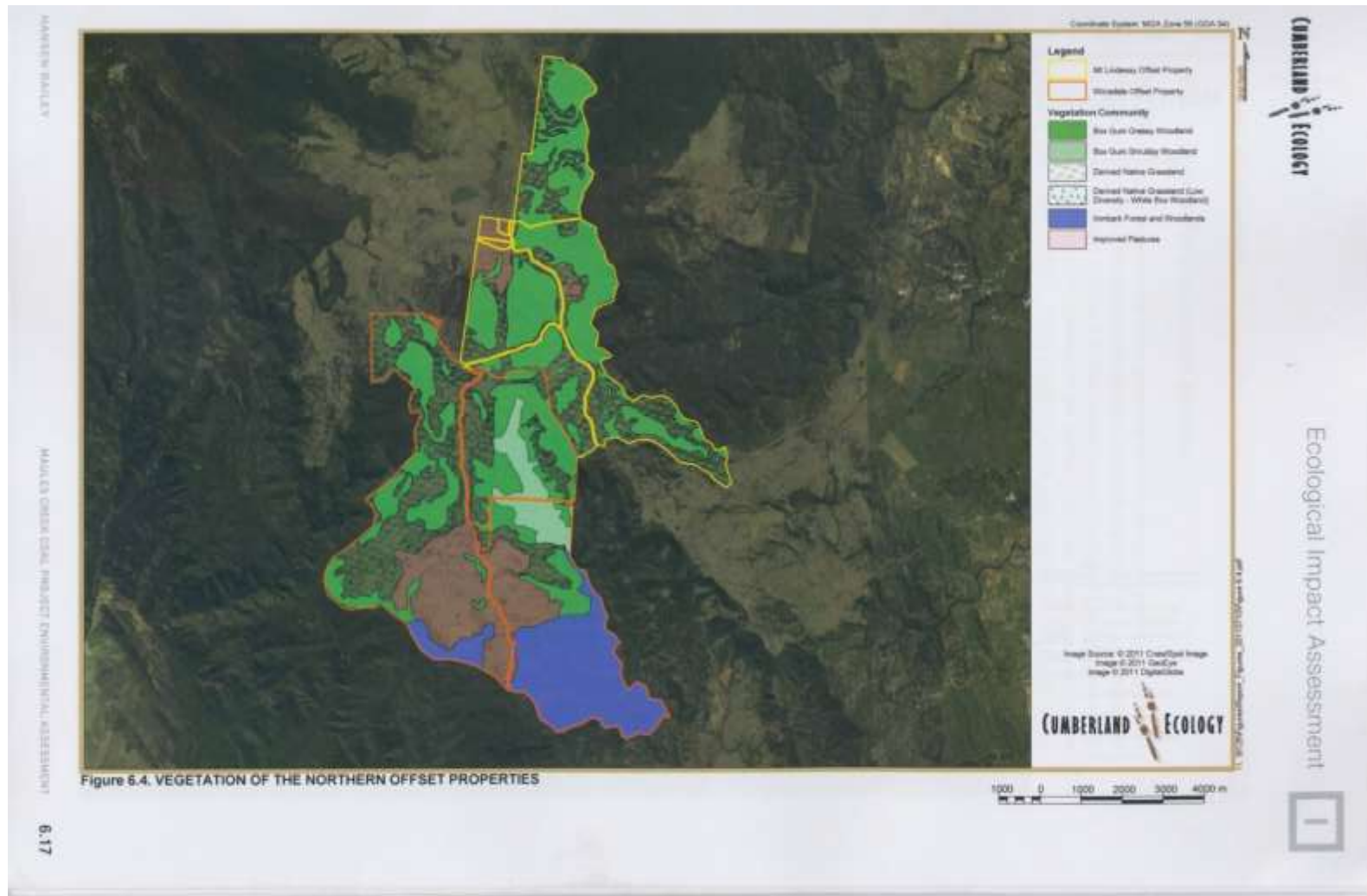


Figure 6.4. VEGETATION OF THE NORTHERN OFFSET PROPERTIES

Initial Environmental Assessment vegetation map July 2011 showing Maules Creek offset properties *Wirradale* and *Mt Lindesay*. Note extent of Box Gum Critically Endangered Ecological Community (CEEC) in green.

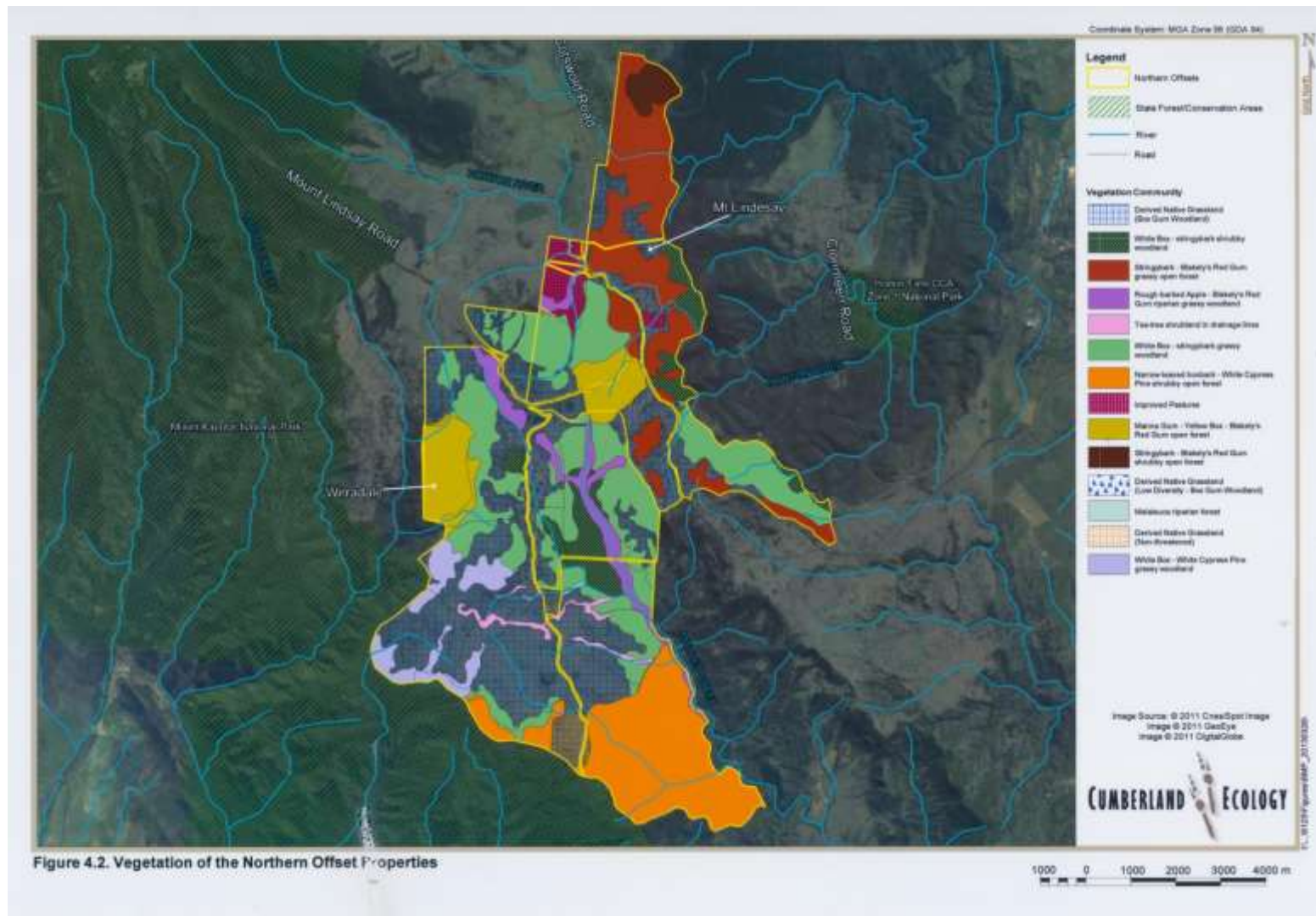


Figure 4.2. Vegetation of the Northern Offset Properties

Biodiversity Management Plan June 2013 vegetation map of the offset properties *Wirradale* and *Mt Lindesay* - note extent of Critically Endangered Ecological Community in green, yellow, brown and pink.