PLANNING PROPOSAL TO BLAYNEY SHIRE COUNCIL

CADIA BIODIVERSITY OFFSET AREAS

CADIA VALLEY OPERATIONS

APRIL 2018

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APPENDICES

Introduction

overview

The purpose of this report is to support a request to rezone two areas of land generally to the south of the Cadia Valley Operations by amending Blayney Local Environmental Plan 2012 (BLEP2012). This will satisfy, in part, the requirements for implementing a conservation offset strategy under condition 41 schedule 3 of the Cadia East Project Approval (CEPA) as specifically modified in modification 7 approved by the delegate to The Minister for Planning on 4 August 2015.

Condition 41, schedule 3 of CEPA as amended reads as follows:

Landscape Management Plan

41. The Proponent shall prepare and implement a Landscape Management Plan for the project to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with OEH, DPI Water and the Councils, and be submitted to the Secretary within 18 months of the date of this approval;
    (b) include:
        (i) the rehabilitation objectives for the site and offset areas;
        (ii) a description of the short, medium, and long term measures that would be implemented to:
            - rehabilitate the site in accordance with the Rehabilitation Strategy (see condition 36);
            - implement the offset strategy; and
            - manage the remnant vegetation and habitat on the site and in the offset areas;
        (iii) detailed performance and completion criteria for the site rehabilitation and implementation of the offset strategy;
        (iv) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:
            - progressively rehabilitating disturbed areas;
            - implementing revegetation and regeneration within the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;
            - investigating ways to salvage and beneficially use resources in areas subject to subsidence (including timber, fauna habitat, seed and soil resources);
            - protecting vegetation and soil outside the disturbance areas;
            - rehabilitating creeks and drainage lines on the site (both inside and outside the disturbance areas);
            - managing potential acid forming material (including ensuring effective isolation of potential acid forming material in rock dumps);
            - managing salinity;
            - conserving and reusing topsoil;
            - undertaking pre-clearance surveys;
            - managing impacts on terrestrial and aquatic fauna (including a Squirrel Glider conservation strategy);
            - landscaping the site to minimise visual impacts;
            - collecting and propagating seed for rehabilitation works;
            - salvaging and reusing material from the site for habitat enhancement;
            - controlling weeds and feral pests, including terrestrial and aquatic species;
            - managing grazing and agriculture on site;
            - controlling access;
            - bushfire management;
            - managing and minimising any potential adverse impacts associated with the final voids; and
            - managing and minimising any adverse socio-economic effects associated with mine closure;

(v) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
(vi) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
(vii) details of who would be responsible for monitoring, reviewing, and implementing the plan.

Condition 41(b)(ii) above requires a description of measures that would be implemented to implement the offset strategy. The *CVO Land and Biodiversity (Landscape) Management Plan* (L&BMP) references a number of measures in the offset strategy, including proposed actions for the rezoning consideration of the offset areas to *E2 Environmental Conservation*. An extract of the L&BMP relating to the implementation of the offset strategy, including rezoning is included in Appendix B.

Blayney Council is the Planning Proposal Authority (PPA) for this proposal by virtue of Section 3.32 of the Environmental Planning & Assessment Act 1979 (The Act.)

This Planning Proposal report is accordingly submitted to Blayney Council in its role as the PPA to consider resolving to rezone the land in accordance with the requirements of the Environmental The Act. The Gateway Determination from NSW Planning will outline any additional information, studies and consultations required.

The report seeks an amendment to BLEP2012 to reflect the offset requirements under the Cadia East Project Approval.

This Planning Proposal has been prepared in accordance with the Department of Planning and Environment's advisory document *A Guide to Preparing Planning Proposals* issued in accordance with former section 55(3) [now 3.33(3)] of The Act. Generally *c*onsistent with Section 3.33(2) of the Act, the Guide requires the Planning Proposal to address the following:

- Part 1 – A statement of the Objectives or Intended Outcomes of the proposed LEP;
- Part 2 – An Explanation of the Provisions that are to be included in the proposed LEP;
- Part 3 – The Justification for those objectives, outcomes and provisions and the process for their implementation;
- Part 4 – Mapping;
- Part 5 – Details of the Community Consultation that is to be undertaken on the Planning Proposal.
- Part 6 – Project Timeline

The Secretary of the Department of Planning and Environment has, under former Section 55 (3) of the EP&A Act, issued requirements regarding specific matters that must be addressed in the Justification for the planning proposal and requires a project timeline to detail the anticipated timeframe for the plan making process for each planning proposal (Part 6.)

LOCATION OF SUBJECT LAND

The two subject areas are located generally south of the Cadia Valley Operations between Panuara Road and the Belubula River (as circled in blue in Figure 1).

Figure 1 Locations of “Stratton Vale” and “Flyers Creek - Belubula River” offset areas

SITE DESCRIPTION

The land proposed to be the subject of an amendment to Blayney Local Environmental Plan 2012 comprises:

"Stratton Vale"

Proposed Lot 202 in the subdivision of Lot 201 DP 1037198 Parish of Carlton as shown in survey plan reference 21175A prepared by Glyndwr Carpenter of Carpenter Collins and Craig dated 8 June 2016

"Flyers Creek – Belubula River"

Proposed Lot 204 in the subdivision of Lot 1422 DP 1168271 Parish of Blake as shown in survey plan reference 21175B prepared by Timothy Collins of Carpenter Collins and Craig dated 22 November 2016.

The subject areas are owned by Cadia Holdings Pty Limited and Contango Agricultural Company Pty Ltd, being wholly owned subsidiaries of Newcrest Mining Limited. Proposed survey plans are reproduced in Appendix A

Part 1 Objectives or Intended Outcomes

The objectives or intended outcomes of this Planning Proposal are to rezone the two subject sites to provide for environmental conservation in association with the Cadia East Project.

The objectives or intended outcomes of this Planning Proposal would be achieved by:

- Amending *Blayney Local Environmental Plan 2012* to include reference to Zone E2 Environmental Conservation in section 2.1 *land use zones;*
- Amending *Blayney Local Environmental Plan 2012*. to insert Zone E2 Environmental Conservation provisions at the end of the Land Use Table;
- Adding reference to zone E2 Environmental Conservation to the Land Zoning Map; and
- Rezoning the subject land from RU1 Primary Production to Zone E2 Environmental Conservation under *Blayney Local Environmental Plan 2012.*

Part 2 Explanation of Provisions

It is proposed by this submission to rezone the lands under BLEP2012 to Zone E2 Environmental Conservation. The following provisions are proposed to amend Blayney Local Environmental Plan 2012 by:

1. Adding reference to *Zone E2 Environmental Conservation* to Part 2.1 Land Use Zones;

2. Adding the following to the Land Use Table after the reference to Zone RE2 Private Recreation:

   Zone E2 Environmental Conservation

   1 Objectives of zone

   - To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.
   - To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

   2 Permitted Without Consent

   Environmental protection works

   3 Permitted With Consent

   Environmental facilities; Flood mitigation works; Roads

   4 Prohibited

   Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Recreation facilities (major); Residential flat buildings; Restricted premises; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3

3. Amending the Land Zoning Map in respect to the two subject lands in accordance with the proposed zoning map shown as Figure 3 in Part 4 below.

Part 3 Justification

Section A – Need for the planning proposal

Q1. Is the planning proposal a result of any strategic study or report?

The planning proposal stems from Cadia East Project Modification 7 which was approved by the Minister for Planning's delegate on 4 August 2015.

Q2. Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

The planning proposal forms one of a number of associated measures to ensure the long-term security of conservation offsets required for the Cadia East Project

Section B – Relationship to strategic planning framework.

Q3. Is the planning proposal consistent with the objectives and actions of the applicable regional, sub-regional or district plan or strategy (including any exhibited draft plans or strategies)?

The *Central West and Orana Regional Plan 2036* was released in June 2017. Direction 13 of the Regional Plan to protect and manage environmental assets states that:

> *The region supports environmental assets and native vegetation communities, many of which are protected through existing legislation. Protecting these values is important for communities and the economic and environmental wellbeing of the region.*

The regional plan identifies areas of high environmental value in Figure 7 – *Environmental Assets.*

The subject lands are identified as containing high environmental value. This planning proposal is consistent with the Regional Plan's proposed action 13.1 to "protect high environmental value assets through local environmental plans."

Q4. Is the planning proposal consistent with a council's local strategy or other local strategic plan?

The *Councils of Blayney Cabonne and Orange City Sub-Regional Rural and Industrial Land Use Strategy* was adopted by Blayney Shire Council in 2010. The Department of Planning & Infrastructure endorsed the strategy on 30 June 2011.

This Sub-Regional Strategy relates to the rural and industrial areas of Blayney Shire. It provides land use recommendations for:

- Agriculture
- Industry
- Residential and rural subdivision

•Natural and scenic environment

•Heritage and culture

The natural and scenic environment recommendations of the Sub-Regional strategy have relevance to this planning proposal.

Section 3.4 of the Sub-Regional Strategy in relation to the natural environment states that:

> *The natural environment provides the basis for the Sub-Region's important agricultural industries and their viability depends on maintaining the natural resource base.*
>
> *Environmental protection zoning could be used to identify, protect and conserve environmentally sensitive lands and their high conservation values.*
>
> *Provision of suitable buffers to development is critical in facilitating appropriate outcomes for natural resources, including groundwater, surface water, remnant vegetation and riparian corridors.*

The guiding principles for the Sub-Regional Strategy include the following:

> Ensure areas of environmental and cultural significance are protected and that land use and development within the Sub-Region is environmentally sustainable.

There are no strategic development areas identified in the Sub-Regional Strategy that are located in, or near, the areas the subject of this planning proposal.

The planning proposal is consistent with *the Councils of Blayney Cabonne and Orange City Sub-Regional Rural and Industrial Land Use strategy.*

Q5. Is the planning proposal consistent with applicable State Environmental Planning Policies?

State Environmental Planning Policy (Rural Lands) 2008 is the only State Environmental Planning Policy which may have relevance to this planning proposal.

Section 7 of State Environmental Planning Policy (Rural Lands) 2008 includes the following Rural Planning Principle:

. . . . (e) the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,

This planning proposal is consistent with the rural planning principles of State Environmental Planning Policy (Rural Lands) 2008.

Q6. Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)?

This planning proposal relates to s117 Direction 2.1 *Environment Protection Zones* issued 1 July 2009.

The objective of s117 Direction 2.1 *Environment Protection Zones* is to protect and conserve environmentally sensitive areas.

Subsection (4) of the Direction states that a planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas.

This planning proposal is consistent with the Direction.

Section C – Environmental, social and economic impact

Q7. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The planning proposal will enhance the quality of ecological communities through conservation measures.

Q8. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The management of the Cadia East offset areas is addressed in the Landscape Management Plan approved by the Department of Planning and Environment and Environment Australia. There are measures to manage environmental weeds and pests within the CVO Land and Biodiversity (Landscape) Management Plan [L&BMP].

The CVO Land and Biodiversity (Landscape) Management Plan can be found in full here:

http://www.cadiavalley.com.au/client_images/1934183.pdf

Section 9 of the CVO Land and Biodiversity (Landscape) Management Plan relates specifically to the Conservation Offsets, which is included in Appendix B to this planning proposal.

There are no other environmental effects as a result of the planning proposal.

Q9. Has the planning proposal adequately addressed any social and economic effects?

Socio-economic effects were addressed in the Cadia East Environmental Assessment in 2009.

The Conservation offset areas are required to be maintained in perpetuity and accordingly natural assets will be conserved over the long term to the benefit of the community.

Section D – State and Commonwealth interests

Q10. Is there adequate public infrastructure for the planning proposal?

Access to the conservation areas for management and maintenance is available via Panuara Road which is adequate.

Q11. What are the views of state and Commonwealth public authorities consulted in accordance with the Gateway determination?

The current version of the CVO Land and Biodiversity (Landscape) Management Plan was approved by the Australian Government's Department of Environment and Energy on 20 December 2016 and by the NSW Department of Planning and Environment on 30 May 2017.

The zoning of the subject land for environmental conservation as approved by the State and Commonwealth Departments is identified as a proposed action in the L&BMP which states that:

> "Submission of Flyers Creek and Stratton Vale offset areas following subdivision plan finalisation of these two areas to Blayney Council for rezoning consideration to Zone E2 *Environmental Conservation*."

Cadia East Project Modification 7 was referred to the Office of Environment and Heritage (OEH), Orange City Council, Cabonne Council and Blayney Council.

None of the Councils objected to the proposed modification.

The Department of Planning and Environment's assessment report regarding Modification 7 stated that:

> "OEH is satisfied that the revised offset strategy is adequate although it recommended that Cadia be required to develop a Biodiversity Management Plan to improve the relatively poor condition of the native vegetation on the Stratton Vale offset site."

Measures to improve the condition of native vegetation within the offset areas are incorporated in the L&BMP.

The Environmental Assessment report for the CVO Biodiversity Offset Modification is reproduced in Appendix C. The Department of Planning and Environment's assessment report for *Cadia East Project Modification 7* can be found at:

https://majorprojects.accelo.com/public/4e543078ce199b08a0d8970dd9af5b58/20150804%20Cadia%20East%20Mod%207%20report.pdf

Part 4. Mapping

The existing and proposed land use zoning under Blayney Local Environmental Plan 2012 are presented below in Figures 2 and 3 respectively.

The offset areas as included in Cadia East Project Approval 06_0295 as modified are included in Appendix A. The survey plans for the two subject offset areas are also provided in Appendix A.

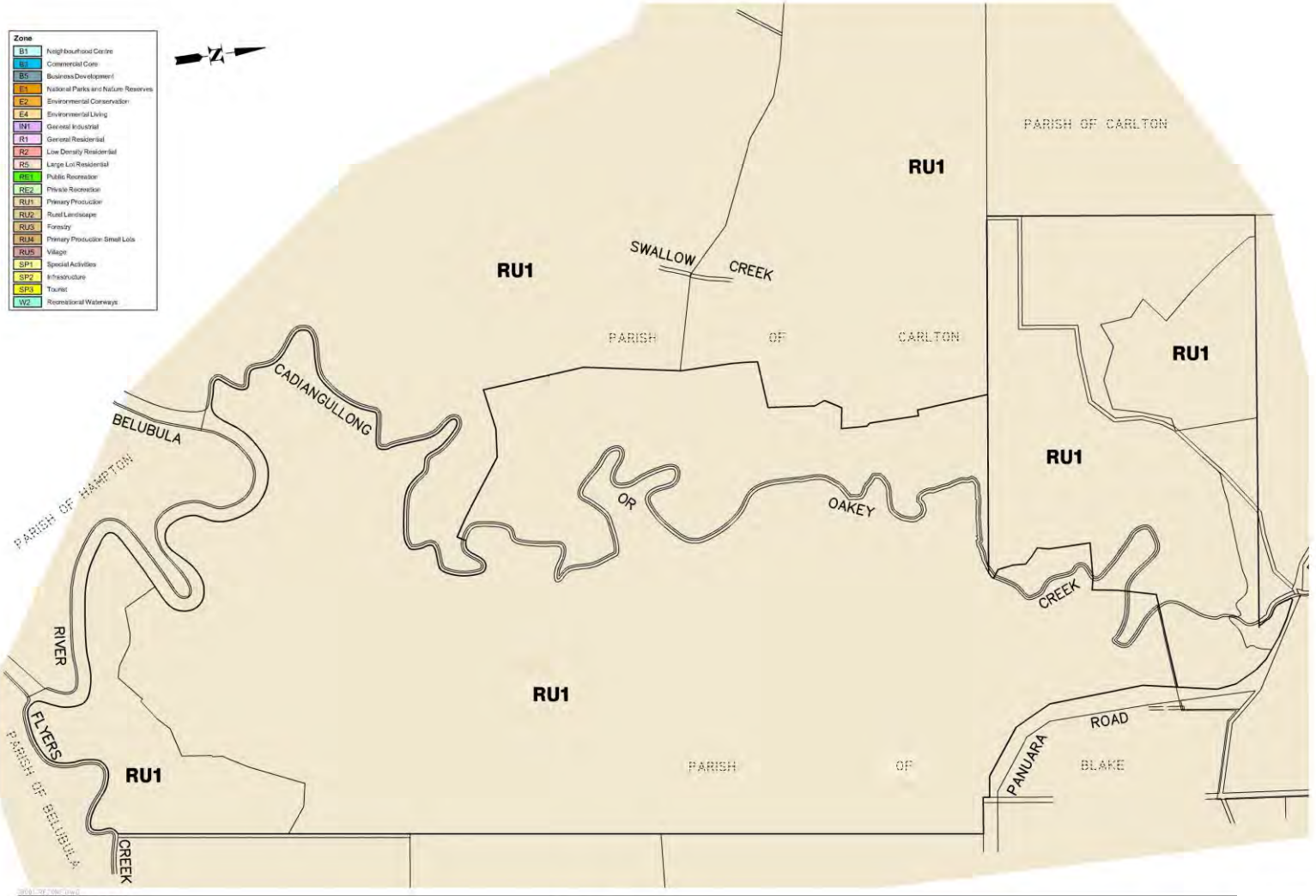
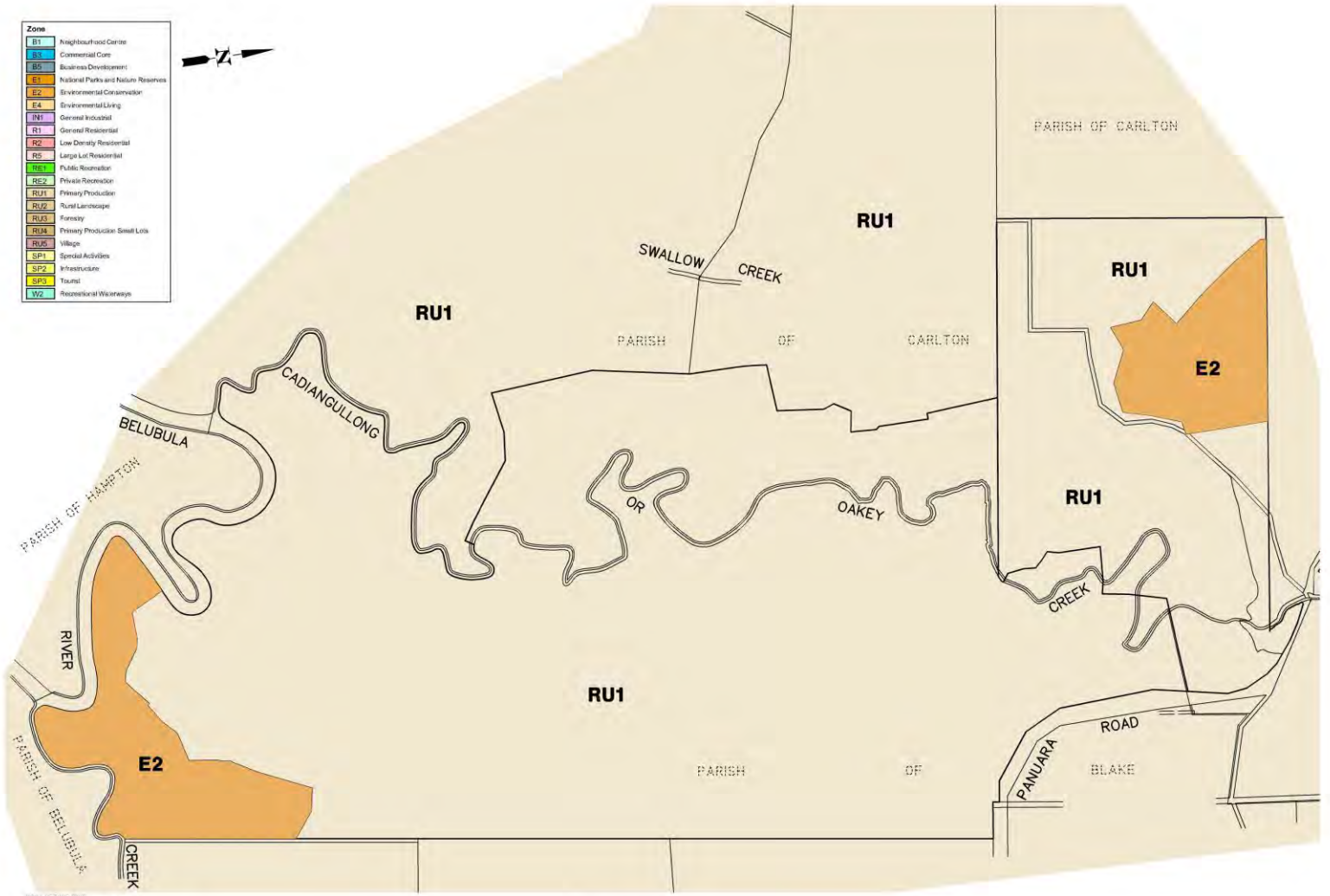


FIGURE 2

EXISTING ZONING & LAND USE PATTERNS



HEATH CONSULTING ENGINEERS

SCALE 1:10,000 (A1)
SCALE 1:20,000 (A3)

FIGURE 3

PROPOSED ZONING & LAND USE PATTERNS

Part 5. Community Consultation

CHPL consulted with the NSW Department of Planning and Environment (DP&E) and the Commonwealth Department of the Environment (DotE) with regard to the proposed Project Modification for the subject biodiversity offset areas in February 2015.

The Department of Planning and Environment also referred the application to the Office of Environment and Heritage (OEH), Orange City Council, Cabonne Council and Blayney Council for comment in 2015.

The Councils did not object to the proposal.

OEH was satisfied that the revised offset strategy was adequate although it recommended that Cadia be required to develop a Biodiversity Management Plan to improve the relatively poor condition of the native vegetation on the Stratton Vale offset site. The offset management strategy in the Cadia land and Biodiversity Management Plan is contained in section 9 of the Plan, and which is included in Appendix B.

The Planning Proposal will be subject to public exhibition and agency consultation as part of the Gateway process. The Gateway determination will specify the community consultation that must be undertaken on the Planning Proposal.

This Planning Proposal is a minor proposal for the following reasons:

- This Planning Proposal provides information to demonstrate that it is consistent with the strategic planning framework.
- Issues pertaining to infrastructure servicing (i.e. road access) are not significant and can be adequately addressed.
- The Planning Proposal is not for a principal LEP.
- The Planning Proposal does not seek to reclassify public land.

Community consultation would involve:

- An exhibition period of 28 days.
- The community is to be notified of the commencement of the exhibition period via a notice in the local newspaper and on Council's website. The notice will:
  - Give a brief description of the objectives or intended outcomes of the planning proposal;
  - Indicate the land affected by the planning proposal;
  - State where and when the planning proposal can be inspected;
  - Provide the name and address for the receipt of submissions; and
  - Indicate the closing date for submissions.
- Written notification to land owners in the vicinity.

During the exhibition period, it is expected that Council would make the following material available for inspection:

- The planning proposal in the form approved for community consultation by the Secretary of the Department of Planning and Environment;
- Any studies (if required) relied upon by the planning proposal.

Electronic copies of relevant exhibition documentation will be made available to the community upon request, free of charge. At the conclusion of the notification and public exhibition period Council staff will consider submissions made in respect of the Planning Proposal and prepare a report to Council.

Conclusion

This Planning Proposal is appropriate for support due to the following:

- It accords with the Cadia East Project Approval 06_0295 as modified (Mod 7) in relation to the securing of biodiversity offsets
- It is consistent with the measures established in the Cadia Land and Biodiversity Management Plan (Version 3 - 15/05/2017) for securing biodiversity areas as approved by the Department of Planning and Environment.
- The information presented in Part 3 above reinforces the consistency of the proposal with the *Sub-Regional Rural and Industrial Land Use Strategy July 2008* and the *Central West and Orana Regional Plan 2036.*

Andrew Wannan
Approvals Manager
Cadia Valley Operations

Appendix A

PLAN SET

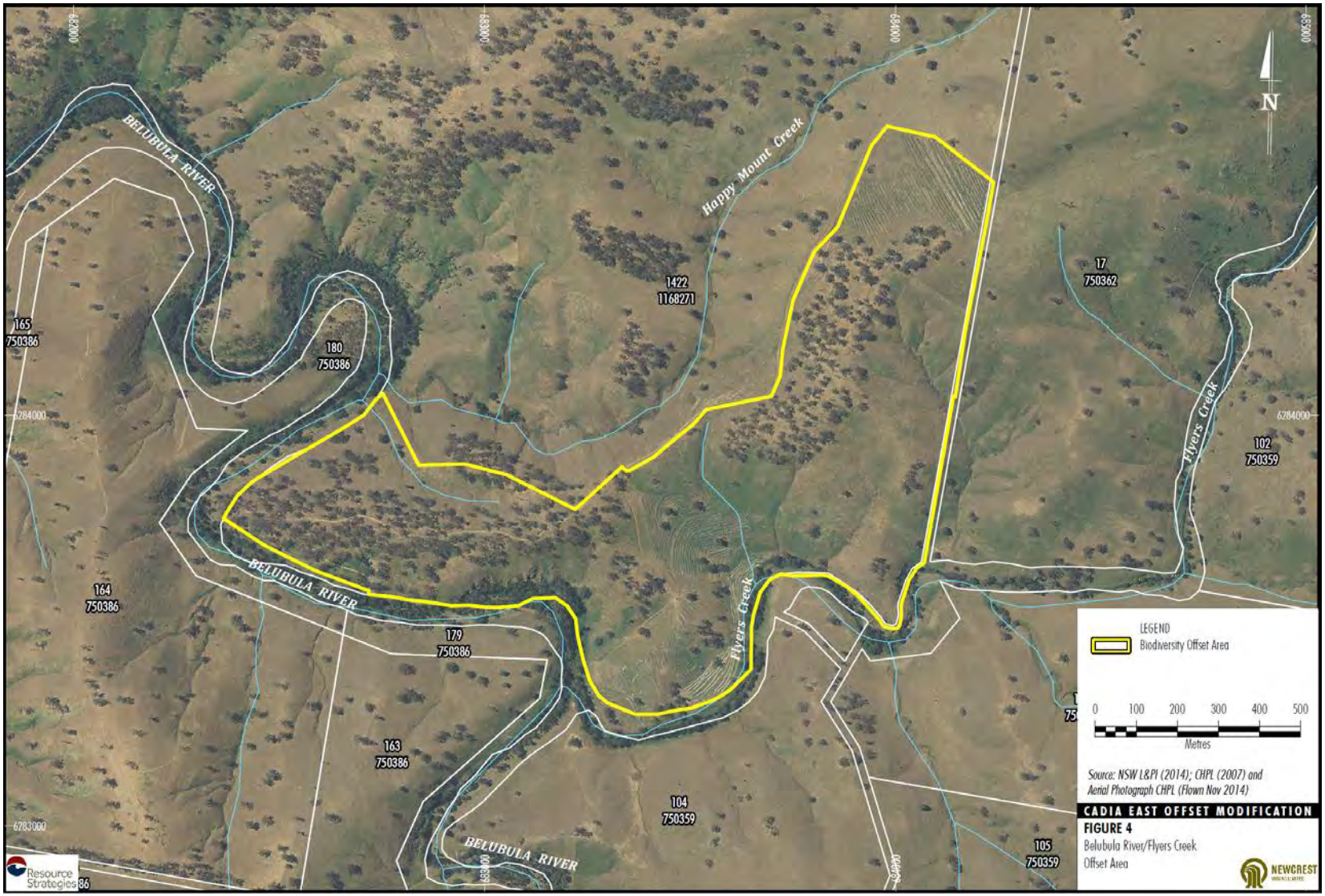


Figure 6.2: Belubula River/Flyers Creek Offset Area

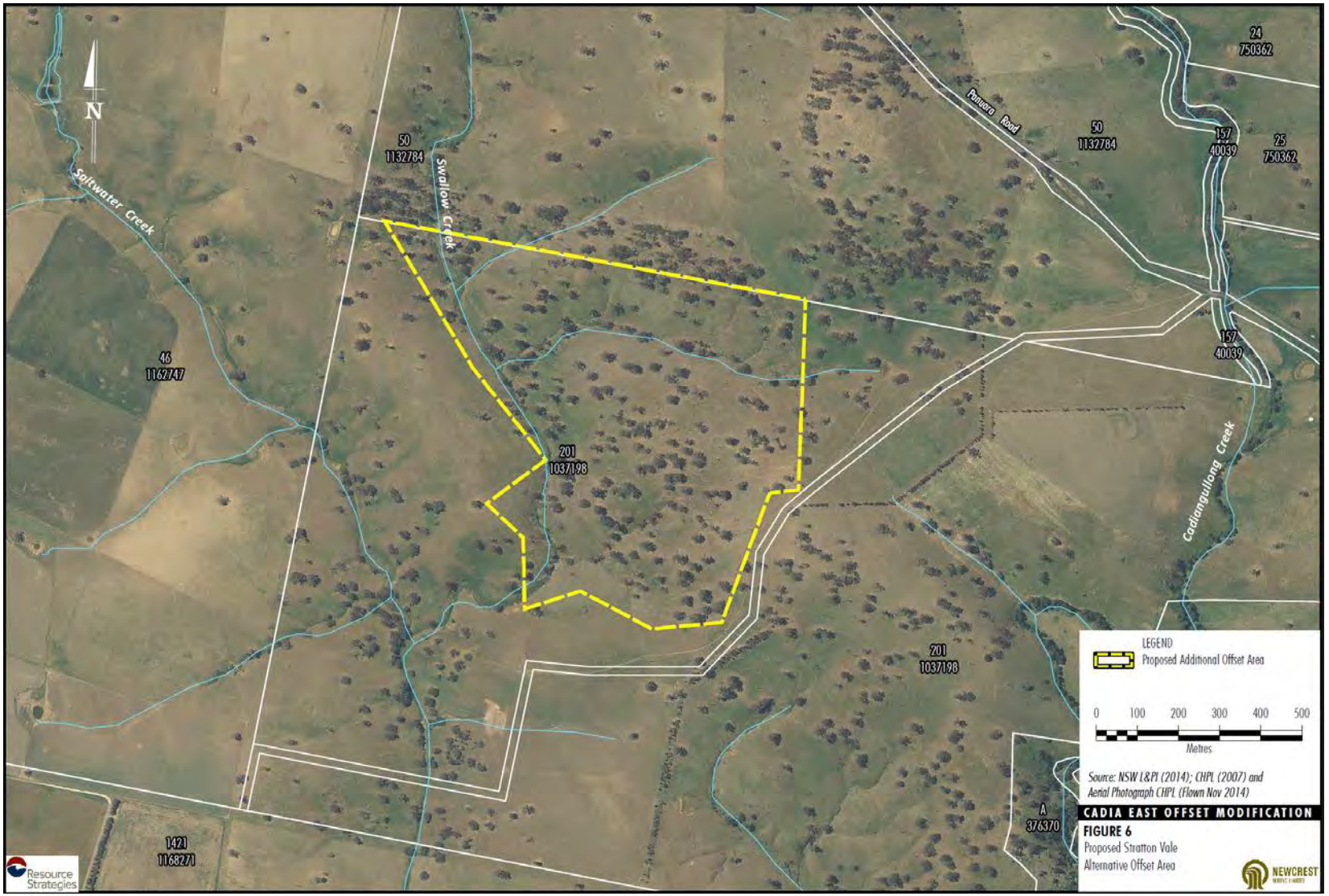
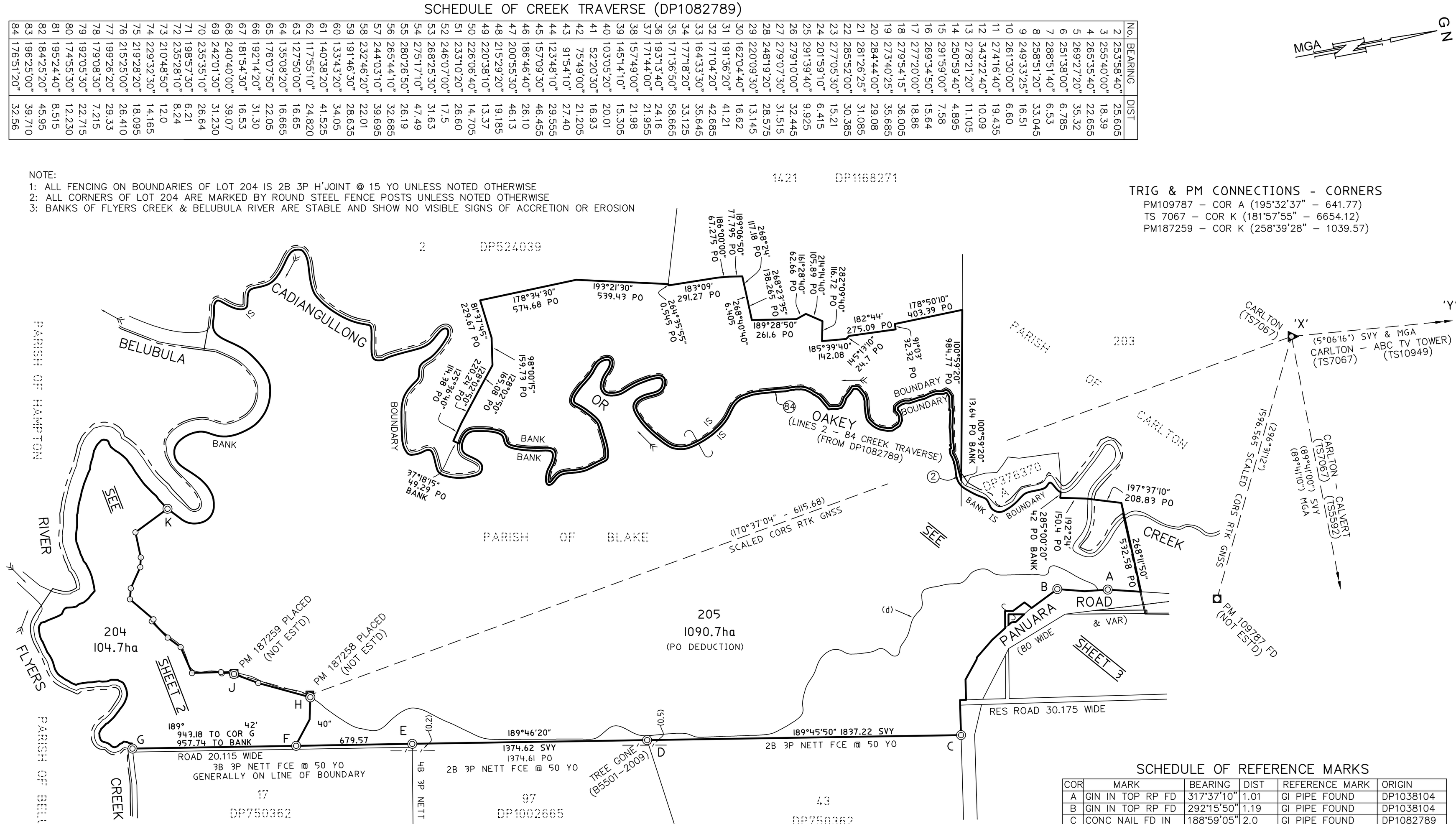


Figure 6.4: Stratton Vale Offset Area

SCHEDULE OF CREEK TRAVERSE (DP1082789)

No.	BEARING	DIST
2	253°58'40"	25.605
3	255°40'00"	18.39
4	265°35'40"	22.655
5	269°27'20"	35.32
6	251°38'00"	6.785
7	288°51'40"	6.53
8	258°51'20"	33.045
9	249°33'25"	16.51
10	261°30'00"	6.60
11	274°16'40"	19.435
12	343°22'40"	10.09
13	278°21'20"	11.105
14	250°59'40"	4.895
15	291°59'00"	7.58
16	269°34'50"	15.64
17	277°20'00"	18.86
18	279°54'15"	36.005
19	273°40'25"	35.685
20	284°44'00"	29.08
21	281°26'25"	31.085
22	285°52'00"	30.385
23	277°05'30"	15.21
24	201°59'10"	6.415
25	291°39'40"	9.925
26	279°10'00"	32.445
27	279°07'30"	31.515
28	248°19'20"	28.575
29	220°09'30"	13.145
30	162°04'40"	16.62
31	191°36'20"	41.21
32	171°04'20"	42.685
33	164°33'30"	35.645
34	177°18'20"	33.125
35	171°36'50"	58.665
36	193°13'40"	24.16
37	171°44'00"	21.955
38	157°49'00"	21.98
39	145°14'10"	15.305
40	103°05'20"	20.01
41	52°20'30"	16.93
42	75°49'00"	21.205
43	91°54'10"	27.40
44	123°48'10"	29.555
45	157°09'30"	46.455
46	186°46'40"	26.10
47	200°55'30"	46.13
48	215°29'20"	19.185
49	220°38'10"	13.37
50	226°06'40"	14.705
51	233°10'20"	26.60
52	246°07'00"	17.5
53	268°25'30"	31.63
54	275°17'10"	47.49
55	280°26'50"	26.19
56	265°44'10"	32.685
57	244°03'10"	39.695
58	232°46'20"	22.01
59	191°46'30"	28.635
60	133°43'20"	34.05
61	140°38'20"	41.525
62	117°55'10"	24.820
63	127°50'00"	16.65
64	135°08'20"	16.665
65	176°07'50"	22.05
66	192°14'20"	31.30
67	181°54'30"	16.53
68	240°40'00"	39.07
69	242°01'30"	31.230
70	235°35'10"	26.64
71	198°57'30"	6.21
72	235°28'10"	8.24
73	210°48'50"	12.0
74	229°32'30"	14.165
75	219°28'20"	18.095
76	215°25'00"	26.410
77	199°26'20"	29.33
78	179°08'30"	7.215
79	192°05'30"	22.715
80	174°55'30"	12.230
81	195°24'40"	8.515
82	184°25'20"	45.95
83	196°25'00"	39.710
84	176°51'20"	32.56

NOTE:
1: ALL FENCING ON BOUNDARIES OF LOT 204 IS 2B 3P H'JOINT @ 15 YO UNLESS NOTED OTHERWISE
2: ALL CORNERS OF LOT 204 ARE MARKED BY ROUND STEEL FENCE POSTS UNLESS NOTED OTHERWISE
3: BANKS OF FLYERS CREEK & BELUBULA RIVER ARE STABLE AND SHOW NO VISIBLE SIGNS OF ACCRETION OR EROSION



M.G.A. COORDINATES
CLAUSE 35(1)(b) & CLAUSE 61(2) OF THE SURVEYING & SPATIAL INFORMATION REGULATION 2012

MARK	EASTING	NORTHING	CLASS	ORDER	METHOD	ORIGIN
PM 109787	684392	6290023	U	U	SCIMS	SCIMS
TS 5592	693253.459	6290792.436	2A	0	SCIMS	SCIMS
TS 7067	682963.518	6290736.071	2A	0	SCIMS	SCIMS
TS 10949	684596.056	6309012.216	C	3	SCIMS	SCIMS
PM 187258	683960.45	6284702.76	-	-	RTK	SURVEY
PM 187259	683784.335	6284290.88	-	-	RTK	SURVEY
SOURCE: SCIMS DATE 7 JUNE 2016						
COMBINED SCALE FACTOR : 0.999891 ZONE 55						

(d): RIGHT OF CARRIAGEWAY OVER TRACK IN USE

NOTE:
1.) LOT 204 SURVEYED BY THEODOLITE.
2.) PART LOT 205 & PM CONNECTIONS SURVEYED BY GNSS

SCHEDULE OF REFERENCE MARKS

COR	MARK	BEARING	DIST	REFERENCE MARK	ORIGIN
A	GIN IN TOP RP FD	317°37'10"	1.01	GI PIPE FOUND	DP1038104
B	GIN IN TOP RP FD	292°15'50"	1.19	GI PIPE FOUND	DP1038104
C	CONC NAIL FD IN TOP FENCE POST	188°59'05"	2.0	GI PIPE FOUND	DP1082789
D	PEG FOUND	279°46'10"	1.105	GI PIPE FOUND	DP1002665
E	PEG FOUND	9°46'20"	1.005	GI PIPE FOUND	B5501–2009
F	PEG AT BASE VORP	283°41'30"	0.795	GI PIPE PLACED	.
G	GIN IN VORP ADP'D	10°19'	4.205	GI PIPE PLACED	.
H	PEG SET	87°44'40"	13.38	PM187258 PLACED	.
J	STEEL FP AT COR	114°43'20"	3.51	PM187259 PLACED	.
K	PEG SET ON BANK	32°43'50"	14.7	GI PIPE PLACED	.

Surveyor: TIMOTHY COLLINS Date of Survey: 22/11/2016 Surveyor's Reference: 21175B	PLAN OF SUBDIVISION OF LOT 1422 DP1168271	LGA: BLAYNEY Locality: PANUARA Subdivision No: Lengths are in metres. Reduction Ratio 1 : 15000	Registered	DP

10 20 30 40 50 60 70 80 90 100 Table of mm

SCHEDULE OF CREEK TRAVERSE

No.	BEARING	DIST	No.	BEARING	DIST
85	271°49'30"	6.695	171	349°42'30"	34.97
86	279°47'00"	15.585	172	345°29'50"	25.83
87	268°16'00"	8.03	173	334°46'20"	15.18
88	194°34'40"	12.96	174	306°29'30"	7.965
89	216°34'40"	14.435	175	304°27'20"	15.72
90	203°58'20"	10.825	176	319°28'50"	9.45
91	196°00'20"	12.455	177	338°32'50"	12.78
92	143°17'00"	2.855	178	8°32'20"	34.505
93	147°07'40"	9.92	179	358°01'20"	24.21
94	169°38'40"	13.255	180	331°33'00"	21.7
95	147°55'00"	20.225	181	348°54'50"	29.84
96	170°36'50"	17.895	182	326°36'50"	4.23
97	205°21'20"	9.535	183	330°56'30"	13.695
98	219°29'50"	7.505	184	329°13'30"	17.71
99	231°08'10"	7.51	185	317°19'00"	20.205
100	265°39'40"	0.605	186	321°36'10"	35.365
101	239°46'20"	6.4	187	272°33'20"	26.09
102	215°45'30"	7.91	188	268°32'50"	33.065
103	251°16'50"	1.58	189	266°41'50"	29.46
104	248°37'00"	1.1	190	260°26'30"	30.62
105	214°32'40"	14.955	191	253°25'50"	27.47
106	203°42'10"	15.65	192	253°19'40"	23.18
107	215°38'00"	12.19	193	238°04'10"	18.96
108	232°40'40"	6.4	194	263°08'00"	10.655
109	244°43'30"	1.39	195	256°20'00"	18.655
110	258°50'50"	19.845	196	255°29'00"	17.58
111	265°23'50"	2.14	197	263°40'20"	16.4
112	277°07'30"	19.16	198	259°53'30"	20.58
113	288°46'30"	5.64	199	263°11'40"	19.9
114	308°09'30"	15.01	200	260°50'40"	17.93
115	307°12'10"	8.775	201	275°06'20"	15.01
116	326°36'50"	21.255	202	277°57'20"	20.53
117	321°48'10"	18.605	203	284°59'00"	18.5
118	345°34'30"	12.415	204	290°03'50"	21.25
119	327°34'00"	25.27	205	285°32'20"	18.125
120	326°50'10"	20.95	206	280°52'30"	51.935
121	318°36'30"	21.75	207	278°38'20"	10.465
122	316°07'10"	17.015	208	296°35'40"	10.88
123	321°30'30"	9.58	209	288°11'30"	49.135
124	315°34'20"	17.465	210	292°57'00"	23.265
125	318°47'40"	17.905	211	295°47'00"	31.315
126	313°12'30"	25.505	212	291°10'40"	27.365
127	302°36'00"	25.015	213	299°30'30"	19.115
128	294°01'50"	24.005	214	296°55'50"	27.18
129	274°38'30"	13.835	215	301°39'20"	67.005
130	268°53'40"	19.335	216	306°41'10"	24.825
131	256°51'40"	26.93	217	285°50'20"	23.44
132	247°58'10"	14.18	218	294°55'20"	25.38
133	219°14'40"	15.1	219	297°33'40"	22.32
134	210°23'20"	10.625	220	293°18'30"	18.42
135	223°14'20"	10.03	221	293°03'30"	21.8
136	191°46'10"	37.79	222	307°54'10"	20.67
137	168°20'50"	25.31	223	300°17'00"	7.66
138	188°12'40"	28.96	224	315°11'20"	15.825
139	197°44'20"	18.335	225	324°26'50"	19.775
140	185°33'30"	15.095	226	323°54'10"	11.47
141	180°18'20"	26.31	227	355°12'00"	14.32
142	189°23'00"	24.715	228	19°57'50"	18.565
143	182°41'40"	55.745	229	49°48'40"	11.5
144	165°54'40"	15.225	230	81°25'30"	14.515
145	210°27'00"	8.69	231	72°57'50"	21.02
146	213°08'30"	20.36	232	49°39'40"	33.905
147	224°38'40"	20.27	233	40°45'40"	26.45
148	216°49'10"	21.45	234	50°05'50"	34.07
149	226°24'50"	21.135	235	54°12'40"	22.655
150	223°15'00"	19.75	236	64°53'10"	27.895
151	236°25'10"	15.035	237	61°53'50"	25.385
152	244°45'30"	14.73	238	69°11'50"	37.71
153	252°16'20"	16.94	239	65°16'30"	74.695
154	264°23'40"	23.225	240	60°04'10"	21.76
155	264°42'40"	18.16	241	56°39'40"	58.635
156	258°53'50"	19.76	242	51°57'10"	30.89
157	251°21'40"	22.325	243	65°59'50"	23.87
158	245°33'30"	26.56	244	58°25'50"	27.415
159	256°21'50"	65.36	245	56°32'40"	49.455
160	251°06'20"	17.5			
161	259°31'40"	19.095			
162	271°27'00"	15.845			
163	270°03'20"	14.905			
164	277°48'40"	20.67			
165	295°18'30"	12.49			
166	313°09'30"	19.96			
167	359°08'20"	7.95			
168	357°37'50"	13.085			
169	342°11'50"	17.07			
170	348°30'30"	18.55			

(d): RIGHT OF CARRIAGEWAY OVER TRACK IN USE

GN MGA

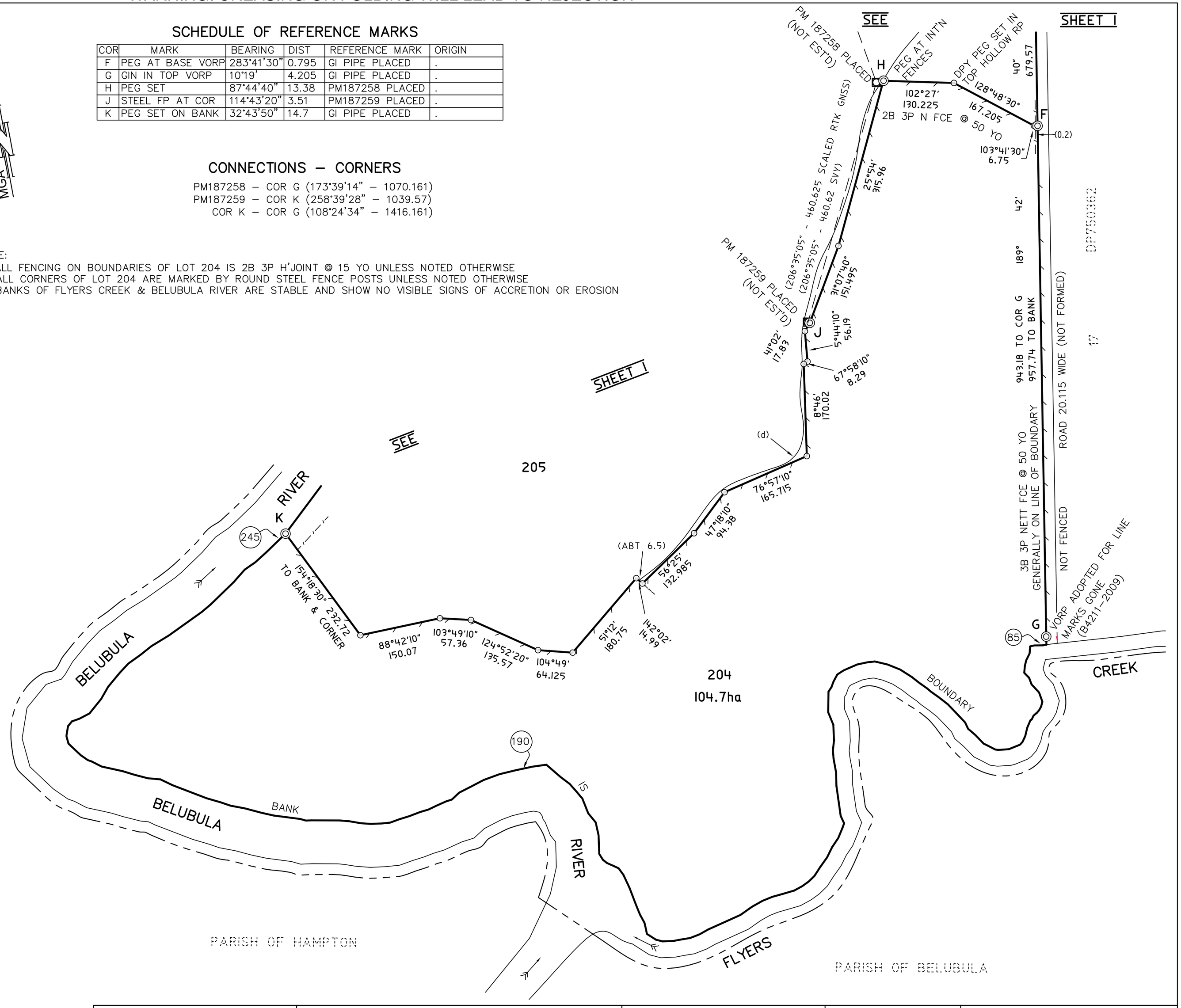
SCHEDULE OF REFERENCE MARKS

COR	MARK	BEARING	DIST	REFERENCE MARK	ORIGIN
F	PEG AT BASE VORP	283°41'30"	0.795	GI PIPE PLACED	.
G	GIN IN TOP VORP	10°19'	4.205	GI PIPE PLACED	.
H	PEG SET	87°44'40"	13.38	PM187258 PLACED	.
J	STEEL FP AT COR	114°43'20"	3.51	PM187259 PLACED	.
K	PEG SET ON BANK	32°43'50"	14.7	GI PIPE PLACED	.

CONNECTIONS – CORNERS

PM187258 – COR G (173°39'14" – 1070.161)
PM187259 – COR K (258°39'28" – 1039.57)
COR K – COR G (108°24'34" – 1416.161)

NOTE:
1: ALL FENCING ON BOUNDARIES OF LOT 204 IS 2B 3P H'JOINT @ 15 YO UNLESS NOTED OTHERWISE
2: ALL CORNERS OF LOT 204 ARE MARKED BY ROUND STEEL FENCE POSTS UNLESS NOTED OTHERWISE
3: BANKS OF FLYERS CREEK & BELUBULA RIVER ARE STABLE AND SHOW NO VISIBLE SIGNS OF ACCRETION OR EROSION



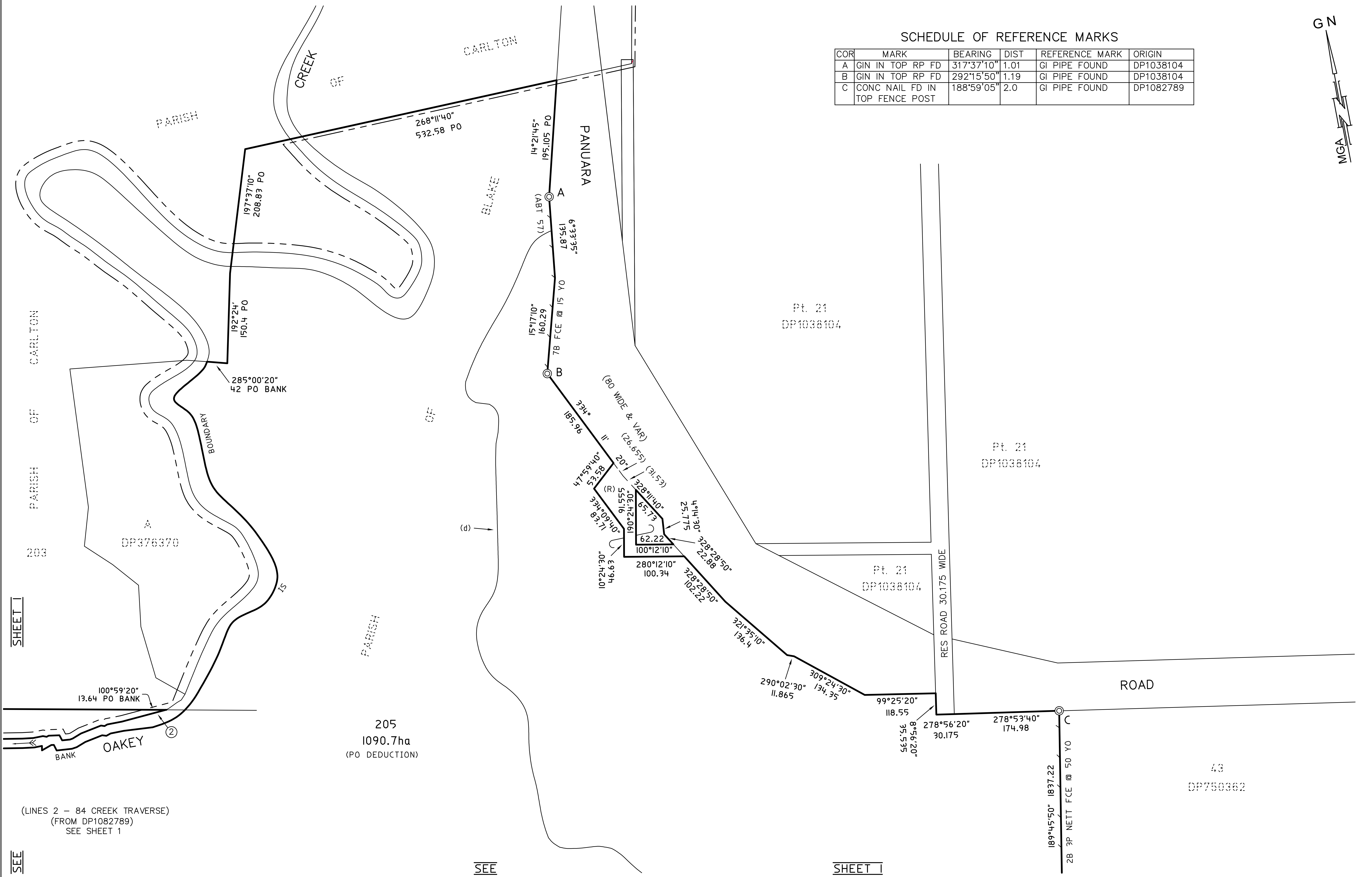
10	20	30	40	50	60	70	80	90	100	Table of mm

Surveyor: TIMOTHY COLLINS Date of Survey: 22/11/2016 Surveyor's Reference: 21175B	PLAN OF SUBDIVISION OF LOT 201 DP1037198	LGA: BLAYNEY Locality: PANUARA Subdivision No: Lengths are in metres. Reduction Ratio 1 : 5000	Registered	DP

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

SCHEDULE OF REFERENCE MARKS

COR	MARK	BEARING	DIST	REFERENCE MARK	ORIGIN
A	GIN IN TOP RP FD	317°37'10"	1.01	GI PIPE FOUND	DP1038104
B	GIN IN TOP RP FD	292°15'50"	1.19	GI PIPE FOUND	DP1038104
C	CONC NAIL FD IN TOP FENCE POST	188°59'05"	2.0	GI PIPE FOUND	DP1082789



G N
MGA
PARISH OF CARLTON
CREEK OF
CARLTON
PARISH
268°11'40"
532.58 PO
14°21'45"
195.105 PO
PANUARA
A
(ABT 57)
6°33'35"
135.87
BLAKE
197°37'10"
208.83 PO
192°24'
150.4 PO
15°17'10"
160.29
7B FCE @ 15 YO
B
285°00'20"
42 PO BANK
334°
185.96
(80 WIDE & VAR)
11'
20"
(26.655)
(31.53)
47°59'40"
53.58
(R)
91.555
190°24'30"
328°11'40"
65.73
334°09'40"
83.71
4°14'30"
25.775
62.22
100°12'10"
328°28'50"
22.88
10°24'30"
46.63
280°12'10"
100.34
328°28'50"
102.22
321°35'10"
136.4
290°02'30"
11.865
309°24'30"
134.35
99°25'20"
118.55
8°56'20"
35.535
278°56'20"
30.175
278°53'40"
174.98
C
189°45'50" 1837.22
2B 3P NETT FCE @ 50 YO
ROAD
RES ROAD 30.175 WIDE
Pt. 21
DP1038104
Pt. 21
DP1038104
Pt. 21
DP1038104
43
DP750362
BOUNDARY
IS
A
DP376370
203
(d)
OF
PARISH
205
1090.7ha
(PO DEDUCTION)
100°59'20"
13.64 PO BANK
2
OAKEY
BANK
SHEET 1
SEE
(LINES 2 – 84 CREEK TRAVERSE)
(FROM DP1082789)
SEE SHEET 1
SEE
SHEET 1

(d): RIGHT OF CARRIAGEWAY OVER TRACK IN USE
(R): ROAD 20.115 WIDE & VARIABLE WIDTH

Surveyor: TIMOTHY COLLINS Date of Survey: 22/11/2016 Surveyor's Reference: 21175B	PLAN OF SUBDIVISION OF LOT 201 DP1037198	LGA: BLAYNEY Locality: PANUARA Subdivision No: Lengths are in metres. Reduction Ratio 1 : 4000	Registered	DP

10 20 30 40 50 60 70 80 90 100 Table of mm

PLAN FORM 6 (2012) **WARNING: Creasing or folding will lead to rejection**

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet **1** of **2** sheet(s)

Office Use Only

Registered:

Title System:

Purpose:

Office Use Only

PLAN OF SUBDIVISION OF LOT 1422 DP1168271

LGA: **BLAYNEY**

Locality: **PANUARA**

Parish: **BLAKE & CARLTON**

County: **BATHURST**

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the land shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

*Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of s.109J of the *Environmental Planning and Assessment Act 1979* have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature: .....

Accreditation number: .....

Consent Authority: .....

Date of endorsement: .....

Subdivision Certificate number: .....

File number: .....

*Strike through if inapplicable.

Survey Certificate

I, **TIMOTHY COLLINS**

of **CARPENTER COLLINS & CRAIG, PO BOX 685 ORANGE 2800**

a surveyor registered under the *Surveying and Spatial Information Act 2002*, certify that:

~~*(a) The land shown in the plan was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on .....~~

*(b) The part of the land shown in the plan being **Lot 204, part Lot 205 and connections** was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on, **22 November, 2016** the part not surveyed was compiled in accordance with that Regulation.

~~*(c) The land shown in this plan was compiled in accordance with the *Surveying and Spatial Information Regulation 2012.*~~

Signature: .....Dated: .....

Surveyor ID: **861**

Datum Line: **'X'-'Y' MGA**

Type: **Rural**

The terrain is **Steep-Mountainous**.

*Strike through if inapplicable.

^Specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey.

Statements of intention to dedicate public roads, public reserves and drainage reserves.

Plans used in the preparation of survey/compilation.

DP1002665

DP1038104

DP1082789

DP1168271

47-691

B4211-2009

If space is insufficient continue on PLAN FORM 6A

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

Surveyor's Reference: ***21175B***

PLAN FORM 6A (2012) WARNING: Creasing or folding will lead to rejection

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet **2** of **2** sheet(s)

Office Use Only

Registered:

Office Use Only

PLAN OF SUBDIVISION OF LOT 1422 DP1168271

This sheet is for the provision of the following information as required:

- A schedule of lots and addresses - See 60(c) *SSI Regulation 2012*
- Statements of intention to create and release affecting interests in accordance with section 88B *Conveyancing Act 1919*
- Signatures and seals- see 195D *Conveyancing Act 1919*
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Subdivision Certificate number: .....

Date of Endorsement: .....

LOT	STREET NO.	STREET NAME	STREET TYPE	LOCALITY
204	N/A	Panuara	Road	Panuara
205	529	Panuara	Road	Panuara

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919 IT IS INTENDED TO CREATE:

1. RIGHT OF CARRIAGEWAY OVER TRACK IN USE (d)

Executed by **Contango Agricultural Company Pty Limited**
ACN 078 273 033 in accordance with Section 127 of the Corporations Law.

…… ……
Secretary/Director Director

....
Name (Block Letters) Name (Block Letters)

Executed by **Cadia Holdings Pty Limited**
ACN 062 648 006 in accordance with Section 127 of the Corporations Law.

…… ……
Secretary/Director Director

....
Name (Block Letters) Name (Block Letters)

If space is insufficient use additional annexure sheet

Surveyor's Reference: ***21175B***

INSTRUMENT SETTING OUT TERMS OF EASEMENT TO BE CREATED PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919.

Lengths are in metres

Plan

Plan of Subdivision of Lot 1422 DP1168271

Subdivision Certificate

No. ……. Dated …….

Full Names and addresses of the Registered Proprietors of the land.

Contango Agricultural Company Pty Limited ACN 078 273 033

and

Cadia Holdings Pty Limited
ACN 062 648 006

Both

c/- Level 9
600 St Kilda Road
MELBOURNE
Vic 3004

PART 1

Number of item shown in the intention panel on the plan.	Identity of Easement, profit a' prendre, restriction or positive covenant to be created and referred to in the plan.	Burdened lots or parcels:	Benefited lots, roads, bodies or Prescribed Authorities:
1	Right of Carriageway over Track in Use (d)	205	204

PART 2

Terms of Right of Carriageway over Track in Use numbered 2 in the plan

Right of Carriageway as set out in Part 1 of Schedule 8 of the Conveyancing Act 1919 provided that:

1. The track in use shall be maintained to a standard that provides no less than all weather access by a four wheel drive vehicle.
2. The Right of Way defined on the plan of survey attached hereto provides benefit and is used on a regular basis by both the lots burdened and the lot benefited. The cost of repairs and maintenance of the Right of Way shall be borne equally by both the proprietors of the land hereby benefited and the proprietors of the land hereby burdened.

Plan

Plan of Subdivision of Lot 1422 DP1168271

Subdivision Certificate

No. ……. Dated …….

Executed by **Contango Agricultural Company Pty Limited** ACN 078 273 033 in accordance with Section 127 of the Corporations Law.

……	……
Secretary/Director	Director
.....	.....
Name (Block Letters)	Name (Block Letters)

Executed by **Cadia Holdings Pty Limited** ACN 062 648 006 in accordance with Section 127 of the Corporations Law.

……	……
Secretary/Director	Director
.....	.....
Name (Block Letters)	Name (Block Letters)

PLAN FORM 2 (A2)

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

Sheet 1 of 1 sheets

SCHEDULE OF REFERENCE MARKS

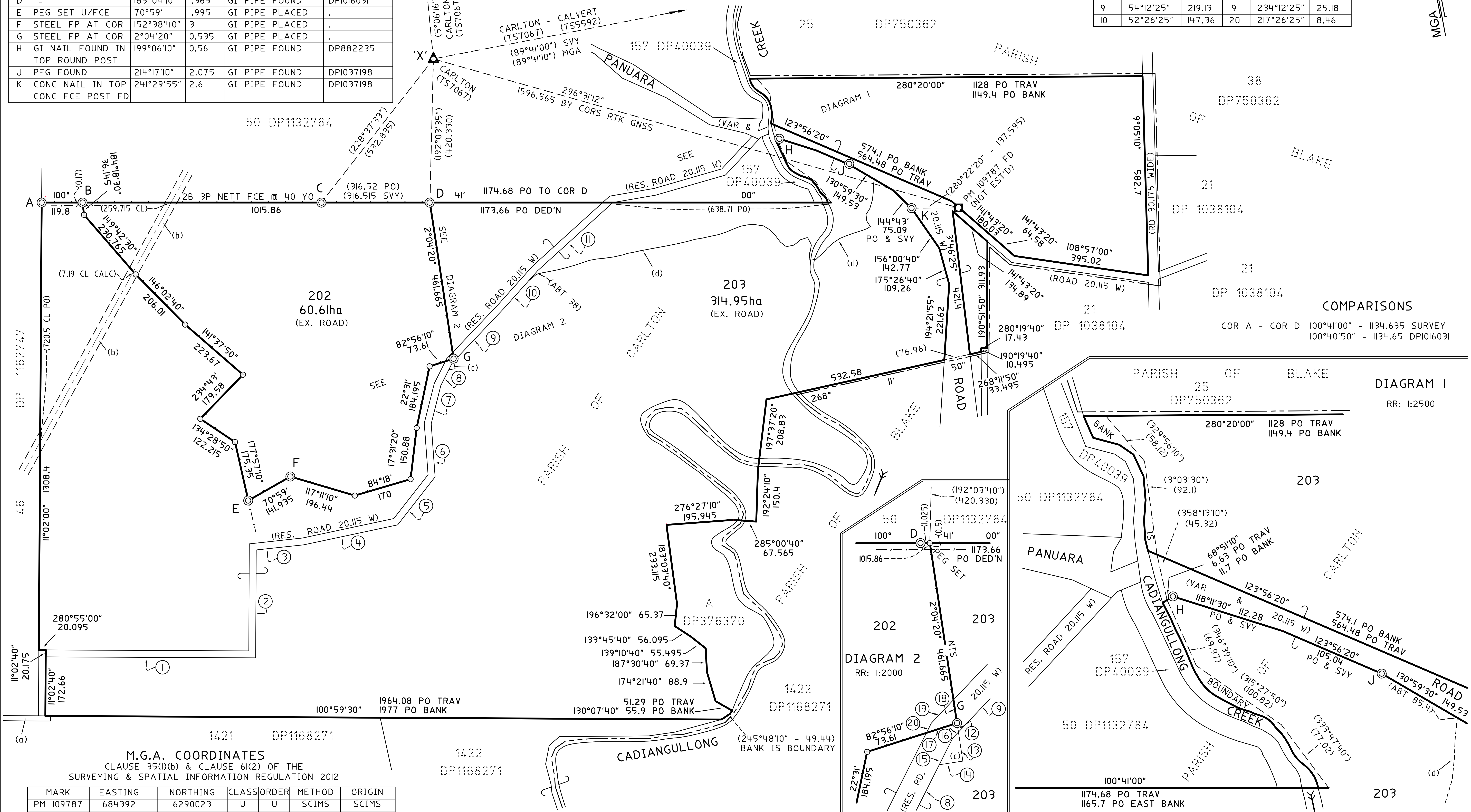
COR	MARK	BEARING	DIST	REFERENCE MARK	ORIGIN
A	PEG FD DISTURBED RESET AT STH FACE ORP	223°39'	20.095	DEAD TREE FD NO NO'S VISIBLE	B5521-2009
		2°36'10"	4.535	GI PIPE PLACED	.
B	NOT M'RKED. (ON CONC FCE FDNS)	184°18'30"	1.28	GI PIPE PLACED	.
C	PEG FD U/FCE	130°54'10"	17.205	TREE FD DEAD ↑151	B5521-2009
D	-	185°04'10"	1.365	GI PIPE FOUND	DP1016031
E	PEG SET U/FCE	70°59'	1.995	GI PIPE PLACED	.
F	STEEL FP AT COR	152°38'40"	3	GI PIPE PLACED	.
G	STEEL FP AT COR	2°04'20"	0.535	GI PIPE PLACED	.
H	GI NAIL FOUND IN TOP ROUND POST	199°06'10"	0.56	GI PIPE FOUND	DP882235
J	PEG FOUND	214°17'10"	2.075	GI PIPE FOUND	DP1037198
K	CONC NAIL IN TOP CONC FCE POST FD	241°29'55"	2.6	GI PIPE FOUND	DP1037198

NOTE:
1: ALL FENCING ON BOUNDARIES OF LOT 202 IS 2B 3P H'JOINT @ 15 YO UNLESS NOTED OTHERWISE
2: ALL CORNERS OF LOT 202 ARE MARKED BY ROUND STEEL FENCE POSTS UNLESS NOTED OTHERWISE

(a): RIGHT OF CARRIAGEWAY 15 WIDE (DP1016031)
(b): EASEMENT FOR TRANSMISSION LINE 30.48 WIDE (MS2807 Oe & TRANSFER D773791)
(c): RIGHT OF CARRIAGEWAY VARIABLE WIDTH
(d): RIGHT OF CARRIAGEWAY OVER TRACK IN USE

ROAD & EASEMENT DIMENSIONS

LINE	BEARING	DIST	LINE	BEARING	DIST
1	100°56'25"	613.99	11	58°31'25"	297.135
2	10°56'25"	315.33	12	182°04'20"	7.115
3	94°26'25"	139.765	13	182°04'20"	22.885
4	88°41'25"	281.055	14	272°04'20"	18.57
5	48°41'25"	178.12	15	37°26'25"	23.12
6	6°26'25"	155.605	16	54°12'20"	6.575
7	24°47'25"	114.815	17	82°56'10"	25.09
8	37°26'25"	75.39	18	2°04'20"	18.37
9	54°12'25"	219.13	19	234°12'25"	25.18
10	52°26'25"	147.36	20	217°26'25"	8.46



COMPARISONS

COR A - COR D 100°41'00" - 1134.635 SURVEY
100°40'50" - 1134.65 DP1016031

M.G.A. COORDINATES

CLAUSE 35(1)(b) & CLAUSE 61(2) OF THE
SURVEYING & SPATIAL INFORMATION REGULATION 2012

MARK	EASTING	NORTHING	CLASS	ORDER	METHOD	ORIGIN
PM 109787	684392	6290023	U	U	SCIMS	SCIMS
TS 5592	693253.459	6290792.436	2A	0	SCIMS	SCIMS
TS 7067	682963.518	6290736.071	2A	0	SCIMS	SCIMS
TS 10949	684596.056	6309012.216	C	3	SCIMS	SCIMS

SOURCE: SCIMS DATE 7 JUNE 2016
COMBINED SCALE FACTOR : 0.999891 ZONE 55

Surveyor: TIMOTHY COLLINS Date of Survey: 8/06/2016 Surveyor's Reference: 21175A	PLAN OF SUBDIVISION OF LOT 201 DP1037198	LGA: BLAYNEY Locality: PANUARA Subdivision No: Lengths are in metres. Reduction Ratio 1 : 7500	Registered	DP

10 20 30 40 50 60 70 80 90 100 Table of mm

PLAN FORM 6 (2012) **WARNING: Creasing or folding will lead to rejection**

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet **1** of **2** sheet(s)

Office Use Only

Registered:

Title System:

Purpose:

Office Use Only

PLAN OF SUBDIVISION OF LOT 201 DP1037198

LGA: **BLAYNEY**

Locality: **PANUARA**

Parish: **CARLTON**

County: **BATHURST**

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the land shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

*Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of s.109J of the *Environmental Planning and Assessment Act 1979* have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature: .....

Accreditation number: .....

Consent Authority: .....

Date of endorsement: .....

Subdivision Certificate number: .....

File number: .....

*Strike through if inapplicable.

Survey Certificate

I, **TIMOTHY COLLINS**

of **CARPENTER COLLINS & CRAIG, PO BOX 685 ORANGE 2800**

a surveyor registered under the *Surveying and Spatial Information Act 2002*, certify that:

~~*(a) The land shown in the plan was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on .....~~

*(b) The part of the land shown in the plan being **Lot 202 and connections** was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on, **8 June, 2016** the part not surveyed was compiled in accordance with that Regulation.

~~*(c) The land shown in this plan was compiled in accordance with the *Surveying and Spatial Information Regulation 2012.*~~

Signature: .....Dated: .....

Surveyor ID: **861**

Datum Line: **'X'-'Y' MGA**

Type: **Rural**

The terrain is **Steep-Mountainous**.

*Strike through if inapplicable.

^Specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey.

Statements of intention to dedicate public roads, public reserves and drainage reserves.

Plans used in the preparation of survey/compilation.

DP1016031

DP1037198

If space is insufficient continue on PLAN FORM 6A

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

Surveyor's Reference: ***21175A***

PLAN FORM 6A (2012) WARNING: Creasing or folding will lead to rejection

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet **2** of **2** sheet(s)

Office Use Only

Registered:

Office Use Only

PLAN OF SUBDIVISION OF LOT 201 DP1037198

This sheet is for the provision of the following information as required:

- A schedule of lots and addresses - See 60(c) *SSI Regulation 2012*
- Statements of intention to create and release affecting interests in accordance with section 88B *Conveyancing Act 1919*
- Signatures and seals- see 195D *Conveyancing Act 1919*
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Subdivision Certificate number: .....

Date of Endorsement: .....

LOT	STREET NO.	STREET NAME	STREET TYPE	LOCALITY
202	N/A	Panuara	Road	Panuara
203	563	Panuara	Road	Panuara

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919 IT IS INTENDED TO CREATE:

1. **RIGHT OF CARRIAGEWAY VARIABLE WIDTH (c)**
2. **RIGHT OF CARRIAGEWAY OVER TRACK IN USE (d)**

Executed by **Contango Agricultural Company Pty Limited**
ACN 078 273 033 in accordance with Section 127 of the Corporations Law.

…… ……
Secretary/Director Director

....
Name (Block Letters) Name (Block Letters)

Executed by **Cadia Holdings Pty Limited**
ACN 062 648 006 in accordance with Section 127 of the Corporations Law.

…… ……
Secretary/Director Director

....
Name (Block Letters) Name (Block Letters)

If space is insufficient use additional annexure sheet

Surveyor's Reference: ***21175A***

INSTRUMENT SETTING OUT TERMS OF EASEMENT TO BE CREATED PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919.

Lengths are in metres

Plan

Plan of Subdivision of Lot 201 DP1037198

Full Names and addresses of the Registered Proprietors of the land.

Contango Agricultural Company Pty Limited ACN 078 273 033

and

Cadia Holdings Pty Limited
ACN 062 648 006

Both

c/- Level 9
600 St Kilda Road
MELBOURNE
Vic 3004

PART 1

Number of item shown in the intention panel on the plan.	Identity of Easement, profit a' prendre, restriction or positive covenant to be created and referred to in the plan.	Burdened lots or parcels:	Benefited lots, roads, bodies or Prescribed Authorities:
1	Right of Carriageway Variable Width (c)	203	202
2	Right of Carriageway over Track in Use (d)	203	202

PART 2

Terms of Right of Carriageway over Track in Use numbered 2 in the plan

Right of Carriageway as set out in Part 1 of Schedule 8 of the Conveyancing Act 1919 provided that:

1. The track in use shall be maintained to a standard that provides no less than all weather access by a four wheel drive vehicle.
2. The Right of Way defined on the plan of survey attached hereto provides benefit and is used on a regular basis by both the lots burdened and the lot benefited. The cost of repairs and maintenance of the Right of Way shall be borne equally by both the proprietors of the land hereby benefited and the proprietors of the land hereby burdened.

Plan Plan of Subdivision of Lot 201 DP1037198

Executed by **Contango Agricultural Company Pty Limited**
ACN 078 273 033 in accordance with Section 127 of the Corporations Law.

…….	…….
Secretary/Director	Director
.....	.....
Name (Block Letters)	Name (Block Letters)

Executed by **Cadia Holdings Pty Limited**
ACN 062 648 006 in accordance with Section 127 of the Corporations Law.

…….	…….
Secretary/Director	Director
.....	.....
Name (Block Letters)	Name (Block Letters)

Appendix B

SECTION 9 CVO LAND AND BIODIVERSITY (LANDSCAPE) MANAGEMENT PLAN

9.0 CADIA EAST OFFSET (BLACK ROCK RANGE, FLYERS CREEK & STRATTON VALE) LANDSCAPE.

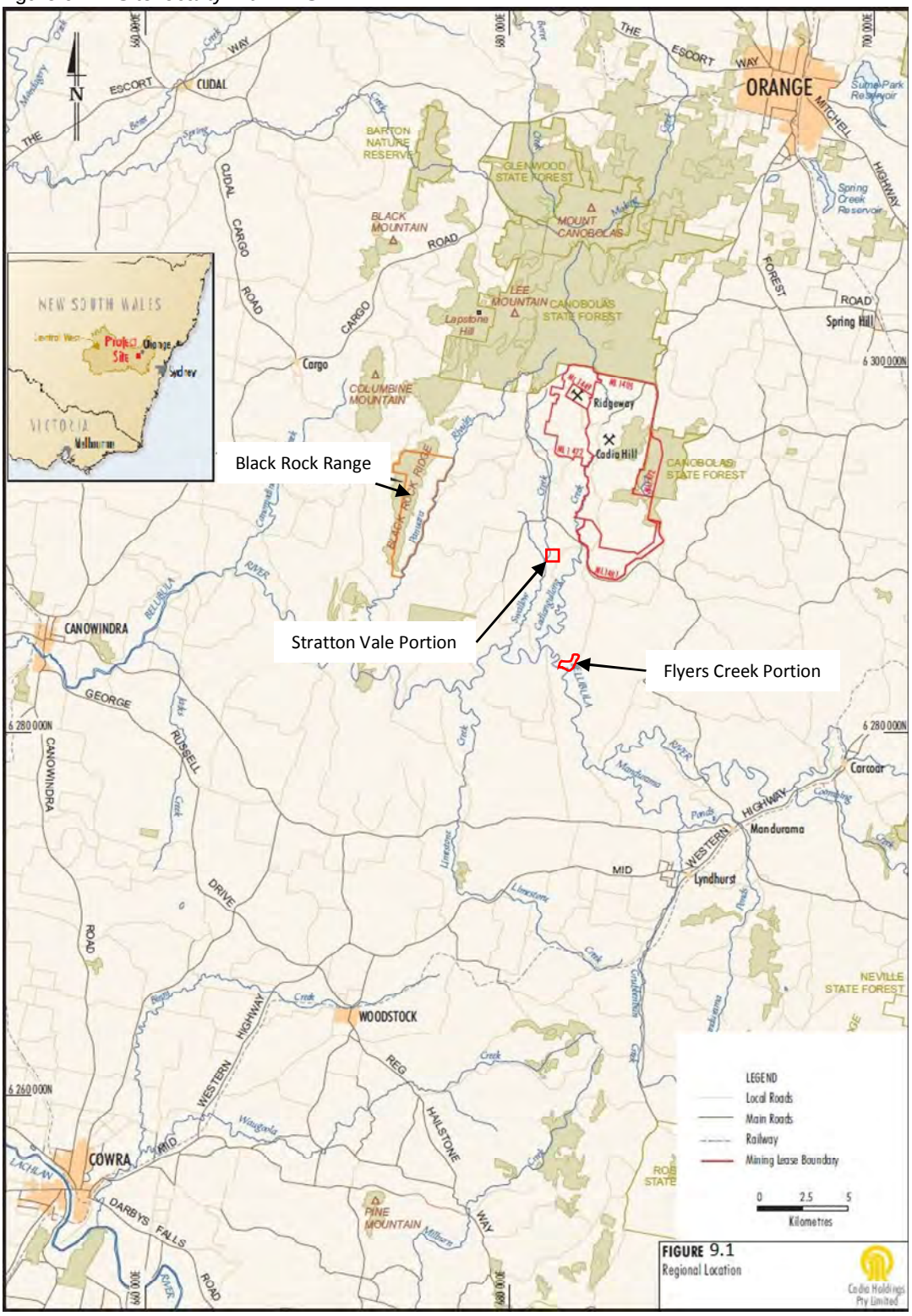
9.1 INTRODUCTION

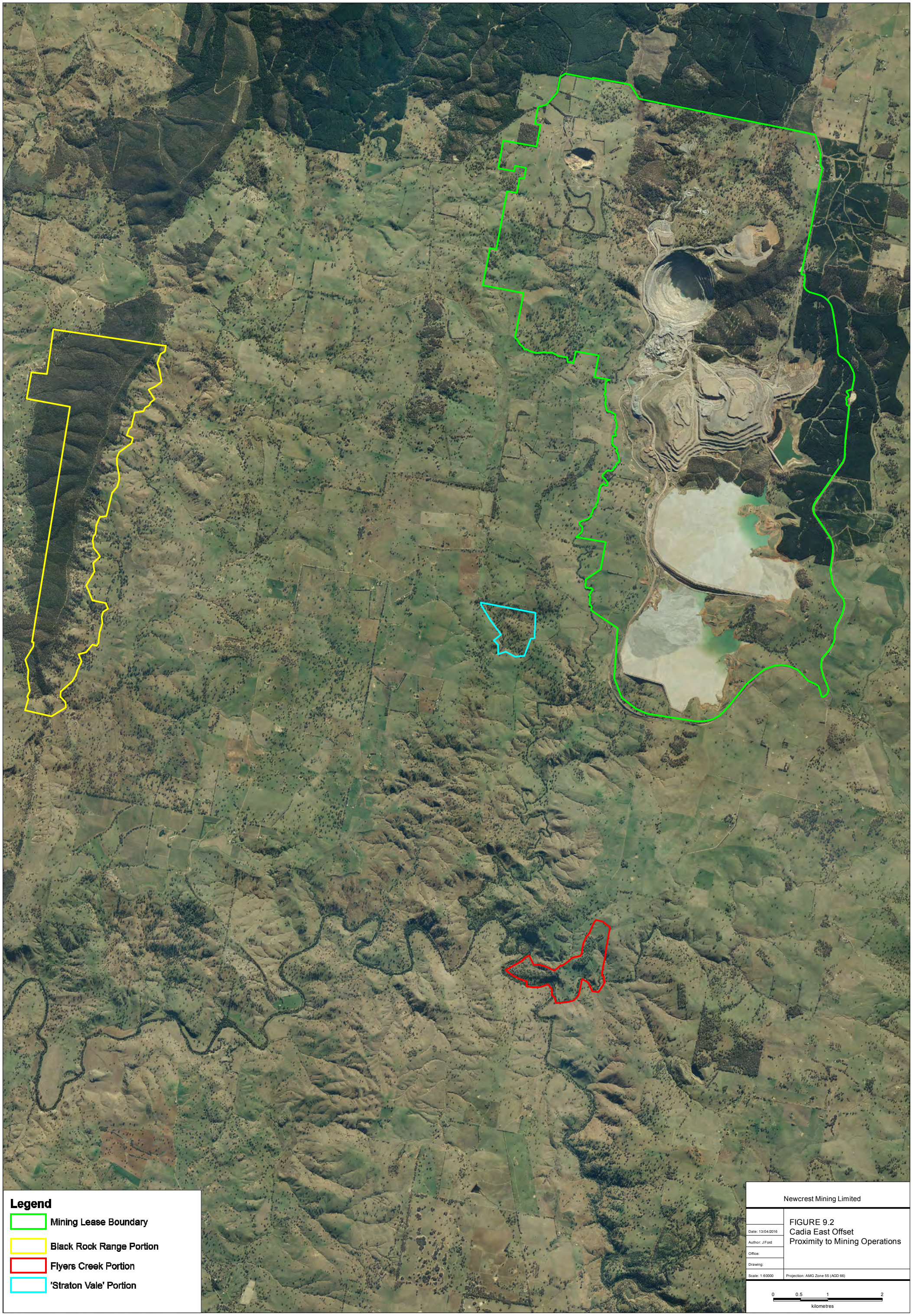
In lieu of clearing remnant vegetation as part of the Cadia East project, a conservation offset has been approved. The majority of the offset area is located on Black Rock Range, which is approximately 11 km west of Cadia Valley Operations. The Black Rock Range offset area contains approximately 647 ha of remnant vegetation and approximately 162 ha of predominately cleared agricultural land, the latter of which will be revegetated. The agreed offset also includes a portion of land at the confluence of the Flyers Creek and the Belubula River and comprises 97 ha and a portion of 60 ha on the property 'Stratton Vale' with a history of clearing for agricultural purposes.

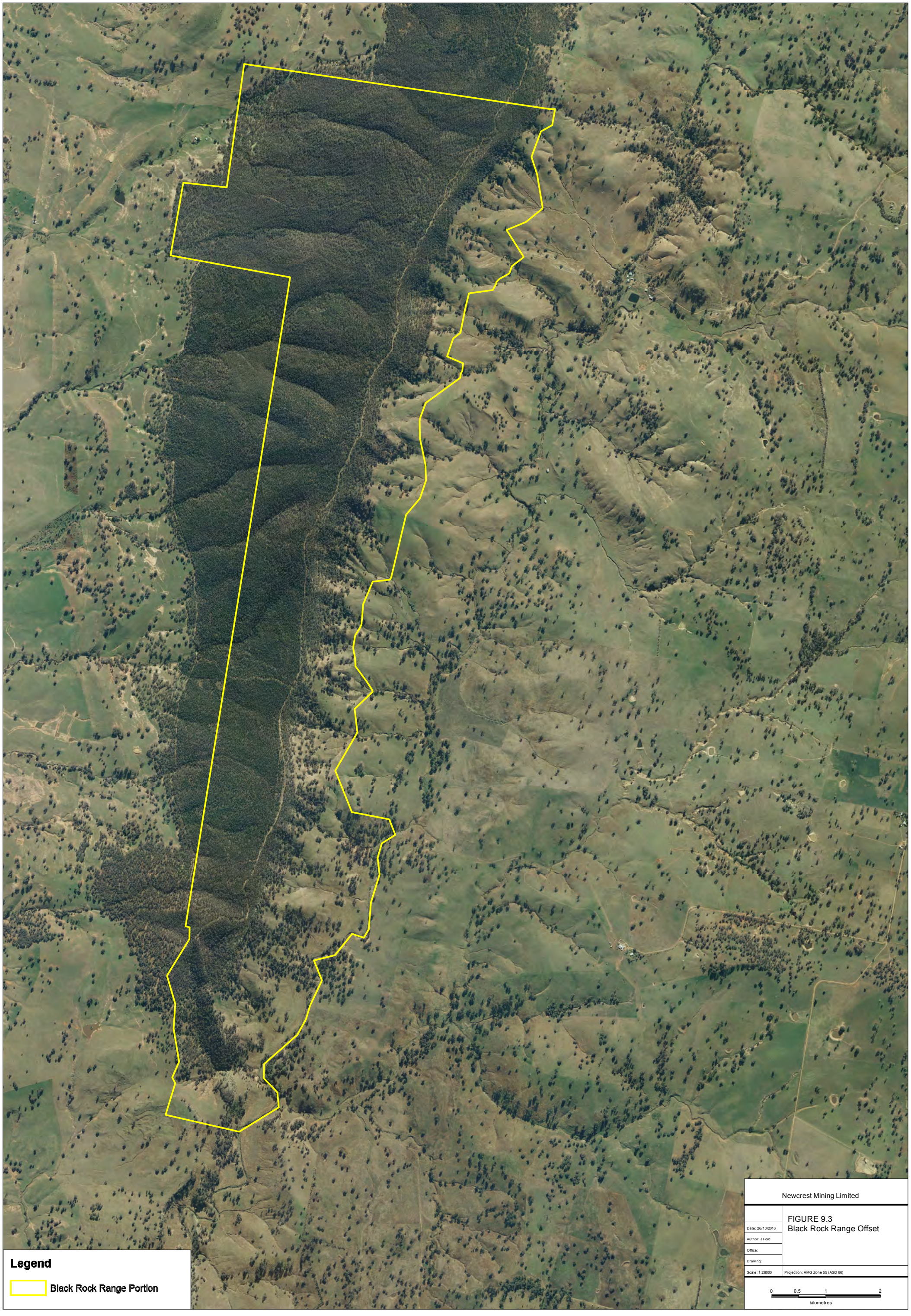
9.2 LOCALITY

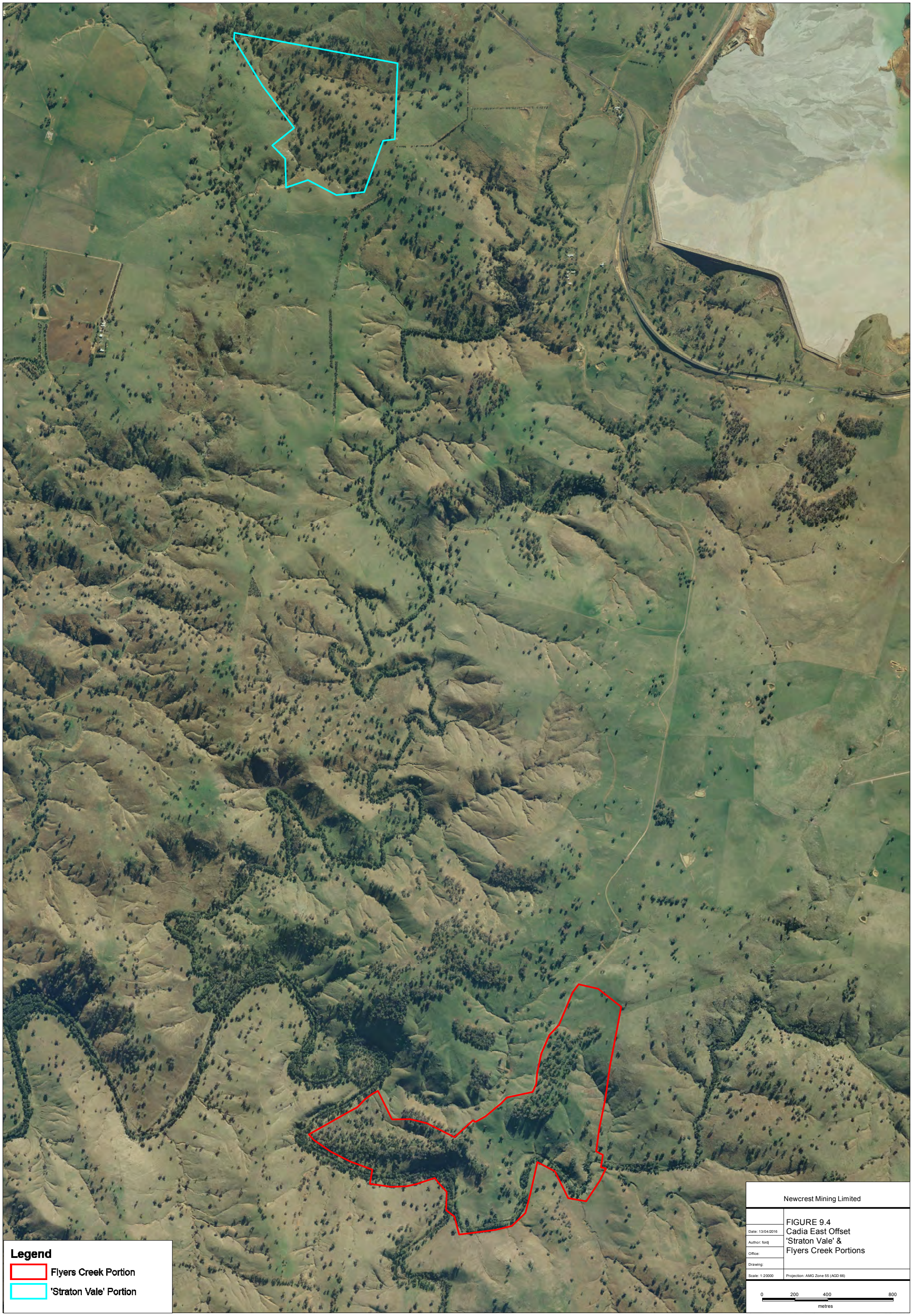
The following figures show the location of the offset areas within NSW (Figure 9.1) and relative to Cadia Valley Operations (Figure 9.2), a detailed aerial photo of the Black Rock Range Offset Area (Figure 9.3) and a detailed aerial photo of the Flyers Creek and 'Stratton Vale' portions of the Cadia East Offset (Figure 9.4). Deposited plan maps showing the formal surveyed lots are located in Appendix A.

Figure 9.1 – Site locality within NSW.




Legend
Mining Lease Boundary
Black Rock Range Portion
Flyers Creek Portion
'Straton Vale' Portion
Newcrest Mining Limited
FIGURE 9.2
Cadia East Offset
Proximity to Mining Operations
Date: 13/04/2016
Author: J Ford
Office:
Drawing:
Scale: 1:60000
Projection: AMG Zone 55 (AGD 66)
0
0.5
1
2
kilometres


Legend
Black Rock Range Portion
Newcrest Mining Limited
FIGURE 9.3
Black Rock Range Offset
Date: 26/10/2016
Author: J Ford
Office:
Drawing:
Scale: 1:28000
Projection: AMG Zone 55 (AGD 66)
0
0.5
1
2
kilometres


Legend
Flyers Creek Portion
'Straton Vale' Portion
Newcrest Mining Limited
FIGURE 9.4
Cadia East Offset
'Straton Vale' &
Flyers Creek Portions
Date: 13/04/2016
Author: fordj
Office:
Drawing:
Scale: 1:20000
Projection: AMG Zone 55 (AGD 66)
0
200
400
800
metres

9.3 BACKGROUND INFORMATION

The following section provides a general overview of the environmental context of the region surrounding Cadia Valley Operations and where appropriate specific to the conservation offset areas. The information has generally been sourced from the Cadia East Environmental Assessment (CHPL 2009) including associated studies.

9.3.1 Climate

Regional meteorological data are available from the Bureau of Meteorology (BoM) weather stations at Orange Agricultural Institute (BoM Station No. 063254), Orange Airport Comparison (BoM Station No. 063231) and the discontinued Blayney Post Office (BoM Station No. 063010).

Meteorological conditions are currently monitored at the Cadia Valley Operations at on-site meteorological stations within ML 1405 (Southern Lease Boundary (SLB) Station) and ML 1449 (Ridgeway Station).

Temperature

Regional temperatures are warmest from November to March and coolest from May to August. Average daily maximum temperatures peak in January with 26.2℃, (Orange Airport Comparison), while average daily minimum temperatures are lowest in July with 0.6℃, (Orange Airport Comparison).

Rainfall

The mean annual rainfall recorded at the Orange Airport Comparison site is 884mm / year, however this varies considerably with site based weather stations where averages for SLB and Ridgeway stations are 593 and 659mm / year respectively. However the periods of records for SLB and Ridgeway Stations have coincided with a period where drought has been a feature of the climate

The months with the highest and lowest monthly average rainfalls at the SLB and Ridgeway Stations are February (71.4 mm and 83.3 mm) and April (25.7 mm and 24.6 mm), respectively.

Evaporation

Total mean annual evaporation based on Orange Agricultural Institute records was 1,461.0 mm per year. January (220.1 mm) had the highest monthly rates of evaporation while June (42.0 mm) had the lowest monthly rates.

Wind

Assessment of wind data indicates that at the Ridgeway Station, the most common winds are from the south-west and north-east. The area did not commonly experience low wind speeds with calm periods (i.e. winds less than or equal to 0.5 metres per second [m/s]) measured only 3.2% of the time.

At the SLB Station, the prevailing winds were generally from the north-eastern quadrant and from the west-southwest to the north-northwest. For the July 2007 to June 2008 period, this site recorded approximately 3.0% of calm periods (i.e. winds less than or equal to 0.5 m/s).

Annual average wind speeds for the SLB and Ridgeway Stations were 3.7 m/s and 3.5 m/s respectively for the July 2007 to June 2008 monitoring period.

9.3.2 Bushfire

The bushfire season experienced in the Cadia Valley area and Central West Region is generally from mid-November to mid-March.

Depending on factors such as weather, fuel loads (build-up of leaf litter and broken branches) and drought indices, this season can be extended from early September to late April.

CHPL-owned land, including conservation offset areas extends over four NSW Rural Fire Brigades brigade jurisdictions (i.e. Burnt Yards/Cadia, Panuara/Four Mile Creek, Springside and Cargo Brigades) which form part of the Canobolas Zone. CHPL operates the Cadia Valley Operations Emergency Response Team which provides emergency assistance to the NSW Rural Fire Brigade when required.

9.3.3 Physical environment

Landforms and Topography

The Orange region is located on the western side of the Great Dividing Range. Areas of higher elevation in the region include Mount Canobolas (1,396 m AHD) and Mount Towac (1,136 m AHD) located to the north of the Cadia Valley. In the Cadia Valley, elevations generally range from approximately 600 m AHD to 1,000 m AHD.

The region is predominantly characterised by gently undulating hills, cleared open grassland and vegetation consisting mainly of scattered paddock trees, with isolated patches of remnant woodland and shelterbelts. State Forests situated in the area include the Glenwood and Canobolas State Forests to the south-west of Orange.

Soils

The following soil types have been encountered in the area,

- alluvial soil;
- yellow podzolic;
- red podzolic;
- krasnozem;
- red earth;
- yellow earth;
- euchrozem;
- lithosol;
- yellow solodic soil.

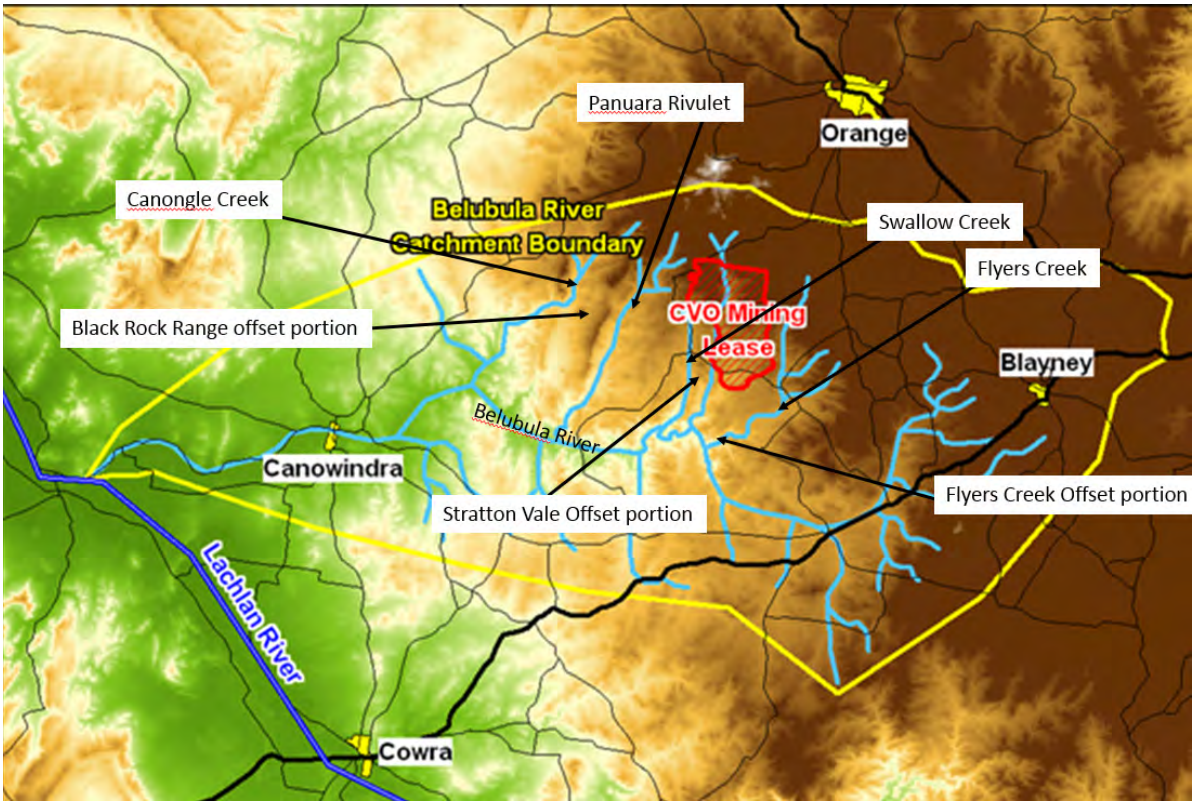
The following soil landscapes have been identified in the Cadia Valley Operations area:

- Barenore-Lyndhurst;
- Panuara;
- Quarry;
- Canobolas;
- Vittoria-Blayney; and
- Towac.

Hydrology

Conservation Offset areas have interaction with the surface water catchments of Flyers Creek, Swallow Creek, the Belubula River, Panuara Rivulet and Canongle Creek. These creek systems generally drain to the south into the Belubula River, which forms part of the Lachlan River catchment (Figure 9.5 – Location of CVO in Upper Lachlan Catchment). At its confluence with the Lachlan River the Belubula drains a total catchment area of approximately 2,570 km2 and has an estimated mean annual flow of 97,400 ML. The Lachlan is a major inland river system in the NSW section of the Murray-Darling Basin.

Figure 9.5 – Location of CVO in Upper Lachlan Catchment



9.4 BASELINE INFORMATION

The following is a brief summary of baseline features of conservation offset areas which is drawn from numerous studies leading to the Cadia East Project Approval and associated modifications. The relevant studies have been included as Appendices for future reference and include:

Appendix B	Black Rock Ridge Flora Assessment (Florasearch March 2006)
Appendix C	Flora and Fauna Habitat Survey of proposed changes to the Cadia Valley Operations Biodiversity Offset Areas (Florasearch April 2015)
Appendix D	Black Rock Range Vertebrate Fauna Survey (Western Research Institute March 2006)
Appendix E	An Assessment of the Bat Fauna at Black Rock Range, Cadia Valley NSW (Greg Richards & Associates (March 2006)

9.4.1 Flora and Fauna

Black Rock Range Portion

Flora

Five natural plant communities were defined on BRR, one of which had four distinct sub-communities. The following table provides a summary of the identified communities (corresponding maps are contained in Section 9.14).

Community Number	Common Names	Scientific Names	Landscape Position
1	White Box Woodland	*Eucalyptus albens*	Deep stony colluvial soils on upper slopes below the escarpment on the eastern side of the BRR and on deep sandy loam soils in the north western corner of the BRR Study Area on the footslopes of the range.
2	Yellow Box/Blakely's Red Gum Woodland	*E. melliodora/E. blakelyi*	Lower slopes and valleys on deep colluvial soils at the south end of the BRR and on colluvial/alluvial soils in the lower gullies and slopes draining to Panuara Creek. There is also a small occurrence in the north western corner of the BRR Study Area.
3	Red Stringybark/Red Box Forest	*E. macrorhyncha/E. polyanthemos*	This community occurs upslope of community 1 in the north west of the BRR Study Area on stony loam soils of moderate depth that may be wet for long periods in winter. It also occurs to the top of the BRR on the western side in the south.
4a	Red Stringybark/Bundy/Black Cypress Pine Forest	*E. macrorhyncha/E. goniocalyx/Callitris endlicheri*	This sub-community occurs on steep rocky slopes, often south or west facing, which afford some protection from the sun.
4b	Red Stringybark/Bundy/Black Cypress Pine/Rusty Spider Flower/Common Heath Myrtle Heathy Woodland	*E. macrorhyncha/E. goniocalyx/C. endlicheri / Grevillea floribunda / Calytrix tetragona*	Heathy woodlands are found on the upper western slopes and ridges of the BRR on shallow or skeletal soils, often where the sloping sandstone beds are exposed.
4c	Black Cypress Pine	*C. endlicheri*	Black Cypress Pine may form almost pure stands over relatively large areas on the upper slopes and ridgetops in the central and southern parts of the range.
4d	Currawang	*Acacia doratoxylon*	Currawang occurs in pure stands on slopes and ridges in the central parts of the range.
5	Gully Forest	Mixed *Eucalyptus* species	This community is characteristic of the lower ends of watercourses in the deeper gullies draining the western side of the BRR.
6	Cleared land	Many introduced and native species of grasses and herbs with scattered native trees.	Between the BRR and the Panuara Rivulet.

The 2006 vegetation survey recorded 312 vascular plant species on the study area, of which 223 are native (71.5%) and 89 introduced (28.5%). A complete list of recorded plant species is given according to vegetation community and sub-community in Appendix B.

The most prominent native plant families represented on the study area were the Daisies (Asteraceae) – 28 species, the Grasses (Poaceae) – 23 species, the Orchids (Orchidaceae) – 22 species, the Pea Flowers (Faboideae) – 11 species and the Eucalypts and allies (Myrtaceae) - 11 species.

The dominant families of introduced species were the Grasses (Poaceae) – 23 species, the Daisies (Asteraceae) – 14 species, the Pea Flowers (Faboideae) – 12 species and the Chickweeds and relatives (Caryophyllaceae) – 8 species. Introduced species were most prominent in communities dominated by White Box and Yellow Box on deep fertile soils at the margins of BRR, and were least evident in communities dominated by Red Stringybark, Bundy and Black Cypress Pine on low fertility skeletal soils on the upper slopes and ridges of BRR. 4 introduced species are declared noxious in the Cabonne Council area and have specific control requirements; namely Blackberry (*Rubus fruticosus* agg. spp.), St. John's Wort (*Hypericum perforatum),* Serrated Tussock (*Nassella trichotoma*) and Sweet Briar (*Rosa rubiginosa*)

No species listed as threatened under the NSW Threatened Species Conservation Act, 1995 or the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 were found during the surveys. Nor were any species listed as Rare or Poorly Known in Rare or Threatened Australian Plants (ROTAP) (Briggs and Leigh, 1995) identified.

The White Box, Yellow Box, Blakely's Red Gum Woodland EEC listed under the NSW TSC Act occurs within the BRR Study Area. This community is equivalent to the listed Grassy White Box Woodlands, together with the nominated Yellow Box/Red Gum Grassy Woodlands under the Commonwealth EPBC Act. This EEC is represented in the BRR Study Area by vegetation communities 1 and 2, which occur at the margins of the core wooded areas of BRR and as semi-cleared remnants in the agricultural land between BRR and the Panuara Rivulet. (refer to Section 9.14)

The condition of the vegetation varies across the study area. In general, vegetation condition in the communities of the densely wooded parts of BRR is good to very good, despite the effects of the 1985 wildfire and high levels of macropod grazing. Patches of remnant vegetation in the heavily grazed agricultural areas are generally in poor condition due to dominance by weeds in the understorey, although tree health is good.

Fauna

A total of 138 species were identified in the 2006 survey of Black Rock Range including 129 native and 9 introduced species. A fully copy if the survey results is contained in Appendix D and E

Black Rock Range Study Area	
Amphibians	6
Reptiles	20
Birds	82
Mammals	10
Mammals (bats)	11
Introduced	7
Totals	125

Six threatened species were identified during the survey including:

Scientific Name	**Common Name**	**Conservation Status**	
		TSA	**EPBC**
Varanus rosenbergi	Heath Monitor	V	
Pyrrholaemus sagittatus	Speckled Warbler	V	
Climacteris picumnus	Brown Tree Creeper	V	
Stagonopleura guttata	Diamond Fire-tail Finch	V	
Polytelis swainsonii	Superb Parrot	V	V
Ninox connivens	Barking Owl	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	
Miniopterus schreibersii	the Large Bentwing Bat	V	

Nine introduced species were identified during the 2006 survey including:

- Common Blackbird,
- Common Starling,
- House Mouse,
- Fox,
- Cat,
- Rabbit,
- Brown Hare,
- Dog,
- House Sparrow,
- Common Myna
- European Cow

Habitat assessment indicated that forest/woodland types found in the study area had medium conservation value with some loss of resilience[1] and mid to low levels of disturbance. Under current management practice (no grazing and little disturbance), the dynamics are towards an overall increase in conservation value. In a landscape context, the 1985 fire created a successional mosaic that in a pre-European context would have been balanced by greater areas of unburnt mature age communities elsewhere in the landscape. This 'balance' no longer exists. Hence in the current agricultural context, hot wild fire can be a degrading factor and lead to local loss of species diversity. Vegetation layers ranged from 7 (litter, rock, log, grass-herb, shrub, mid canopy, and mature tree canopy in a range of configurations from sparse to dense) through to bare ground. The habitat values are further modified by aspect, slope, soil depth, and terrain (e.g. drainage line). Little dieback was evident, weed invasion other than in the western box woodlands was relatively light. Stags without hollows were relatively common.

The unburnt woodlands were located either on the western slope near the ridge between the ridge fire trail and the escarpment, or on the eastern slopes. These ranged from woodland formation with dominants spaced at 20-40 m intervals through to open woodland or cleared areas with remnant scattered old growth trees 50 - 200 m apart. Hollows were relatively common in these woodlands and were the major contributing factor to the presence of a much greater density of arboreal fauna in these woodlands compared to the expanse of hollow-limited mosaic communities on the greater proportion of the western slopes. Grazed areas, with their very modified understorey and continuing stock access, had diminished habitat value. Unburnt communities were assessed as reasonable examples of intact communities. However this assertion is not necessarily reflected in the vertebrate species diversity, given their relatively small areas. Rather, the overall habitat value of this landscape is very likely dependant on the structural and floristic variability within the landscape.

The sandstone escarpment offers very specialised habitats, with its array of ledges, small caves, nooks and crannies, vine-clad sections, protection from predators, cliff-base undercuts and a rocky basal platform protruding 2-20 m from the cliff face. This is further enhanced by mostly intact vegetation communities to east and west of the escarpment.

[1] Resilience Def. Resilience is the system's ability to recover from damage (sometimes called 'regeneration capacity') (Buchanan 2009). Evidence of a system's resilience can include: remnant native plants, seed stored in the soil, unmodified soil conditions, adjacent nearby seed sources. Areas which have high resilience will have several of these examples featured in the landscape, these areas will recover faster and with less effort than areas with low resilience (which will require significant intervention for recovery such as soil amendment, complete replanting / re-sowing mass removal of weed species etc).

Stratton Vale Portion

Flora

The vegetation of the Stratton Vale Offset portion comprises four vegetation communities:

- Yellow Box Woodland;
- White Box Woodland;
- Derived Grassland; and
- Exotic Grassland.

The original woodland vegetation on Stratton Vale has been thinned historically and now comprises mostly widely spaced trees separated by grassland dominated by exotic grasses and legumes. Some large areas of derived native grassland also occur. These are dominated by grazing-tolerant native species including Speargrass (Austrostipa scabra) on dry north-facing slopes and Red Grass (Bothriochloa macra) on south-facing slopes.

A total of 69 flora species were identified during April 2015 surveys comprising twenty three native (33.3%) and 46 introduced (66.7%) species. The results showed the presence of low numbers of native species and that introduced species greatly predominated.

Three introduced species are declared noxious weeds under the NSW Noxious Weeds Act, 1993 for the Upper Macquarie County Council Area and occur within the offset area including;

- Bathurst Burr (*Xanthium spinosum*);
- Blackberry (*Rubus fruticosus agg.* spp); and
- St. John's Wort (*Hypericum perforatum*).

All noxious weeds occurred only in low numbers indicating they have been well controlled.

Vegetation condition assessments concluded that that the vegetation was in relatively poor condition. The groundcover was in low condition with greater than 50% cover by exotic species. Despite this, the area does contain important features including groundcover containing native grasses/herbs/forbs, trees with hollows, fallen logs and a native overstory.

No threatened flora species were identified during the survey.

The vegetation assessment concluded that all Box-Gum Woodland remnants within the survey area conformed to the TSC Act EEC guidelines, but none conform to the EPBC Act CEEC guidelines owing to the very poor condition of the ground cover

The proposed Stratton Vale offset portion has relatively high fauna habitat values for the following reasons;

- Many of the remnant trees at Stratton Vale are very large and clearly pre-date European settlement. One tree hosts the nest of a Little Eagle (*Hieraaetus morphnoides*), listed as Vulnerable under the TSC Act. In addition, many of the White Box trees have hollows suitable for parrots and a nesting population of the Vulnerable Superb Parrot (Polytelis swainsonii) is present on and around the investigation area.
- While the groundcover is generally dominated by exotic species, there is a good representation of native perennial grasses, potentially providing habitat for granivorous birds favouring native grass seed, such as finches and the Superb Parrot.
- However, the Stratton Vale offset portion is lacking in tall and low shrubs that would provide cover and nesting habitat for many birds including finches, babblers, thornbills and others.
- There are limited opportunities for most reptiles owing to very dense exotic grass cover over much of the area and relatively few logs on the ground. However, areas of surface rock on ridges and rock outcrops along Swallow Creek provide reptile habitat.
- Swallow Creek provides water for wildlife and habitat for aquatic fauna.

Flyers Creek / Belubula River Portion

The Flyers Creek / Belubula River offset portion comprises 97 Hectares, of which approximately 23 Hectares meets the criteria for the NSW listed Box-Gum Woodland EEC and the Commonwealth listed Box-Gum Grassy Woodlands and Derived Native Grasslands CEEC. The offset area also includes frontage to approximately 600m of the Belubula River and 1370m to Flyers Creek (Figure 9.6).

Flora

Figure 9.6 shows the vegetation communities and locations within the Flyers Creek offset portion. i

BioMetric data on vegetation condition in the Belubula River/Flyers Creek area indicated that the River Oak Forest and immediately adjacent Yellow Box Woodland were both in poor condition with their ground cover in 'low' condition owing to a high dominance of exotic species. Further away from riparian areas, in areas formally identified as EEC, the condition of the Yellow Box Woodland improves with a higher incidence of native grasses, herbs and forbs.

No threatened flora species were identified in the existing Belubula River/Flyers Creek offset area

Fauna

Fauna habitat value for offset area is relatively low for the following reasons;

The eucalypt canopy has been thinned. Nevertheless, the remaining canopy provides habitat for a range of open woodland bird species and foraging opportunities for possums and gliders. The often dense River Oak canopy in riparian areas provides shelter for a variety of bird species, especially those associated with aquatic habitats.

The open grassland areas dominated by exotic species have limited habitat value, except for macropods, granivorous birds such as finches and common insectivorous birds adapted to grasslands such as Yellow-tailed Thornbills and Magpies.

There are limited opportunities for reptiles with few logs on the ground or surface rocks for habitat.

The area contains old growth trees with hollows suitable for a variety of wildlife, but they are scattered in a cleared landscape with limited habitat available to denning or nesting species that depend on woodlands and forests. The area lack patches of dense shrub cover required by some bird species for nesting and foraging.

9.5 DESIRED OUTCOME

The broad desired outcome of the management of the conservation offset portions is to improve the overall ecological health, value and connectivity of these areas. Focus and priority will be given to Endangered Ecological Community areas to return them to a condition that is equivalent or better than local reference site condition. The following broad objectives will be applied to all three offset portions:

- Overall, offset condition is equivalent or better than local reference site condition.
- Improving the health of native vegetation:
    - Revegetation of cleared areas.
    - Progressively reduce the prominence of introduced species and replace with locally occurring native species.
    - Encourage natural resilience, regeneration and recruitment processes.
    - Provide a range of habitat resources for native fauna.
- Improving the structural diversity
    - Provide a range of vegetation age classes.
    - Conserve vegetation strata within remnant areas.
    - Revegetation of cleared areas targeting the replacement of understory, mid story and over story species.
- Improving the species diversity
    - Conserve / manage vegetation diversity within remnant areas.
    - Revegetation of cleared areas targeting the replacement of a range of locally occurring native species from understory, mid story and over story classes.
- The active management of threatening processes including:
    - Grazing.
    - Clearing (removal of old, large habitat trees)
    - Removal of firewood / bushrock
    - Bushfire.
    - Unauthorised access.
- Increasing connectivity between remnant / offset areas:
    - Establish a series of patches / corridors to progressively link remnant / offset areas (addressed in Section 3)
- Provide for long term conservation:
    - Local government zoning.
    - Voluntary Planning Agreement.

While particular focus will be on the management of Endangered Ecological Communities, the above measures will generally and progressively apply to all areas within the offset portions.

9.6 LONG TERM SECURITY OF OFFSET AREAS

This section outlines the efforts taken by CVO to secure biodiversity offset areas to meet obligations under approvals issued in accordance with the Environmental Protection and Biodiversity Conservation Act (Commonwealth) and the Planning and Assessment Act (NSW).

Securing conservation/biodiversity offsets is a requirement of condition 39, Schedule 3 of the NSW Project Approval (06_0295) dated 6 January 2010 and condition 1 of the Approval granted under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC 2006/3196) on 18 February 2010.

Condition 39 (Schedule 3) of PA 06_0295 reads:

39. Within 2 years of the date of this approval, the Proponent shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Secretary.

Condition 1 of the EPBC approval 2006/3196 reads:

1. The person taking the action must prepare a plan to offset the loss of 23 ha of the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community.

The plan must include:

- *The desired outcomes of implementing the plan;*
- *The short (12 months from the date of the approval), medium (five years from the date of the approval) and long term measures that will be employed to implement the plan;*
- *Details of how the person taking the action will provide for the long term security of the offset areas and details of the timing of when this will occur;*
- *Detailed performance and completion criteria for the implementation of the plan, including details of methods to rehabilitate areas of the ecological community, and methods to control weeds, feral animals, grazing, access and bushfires;*

The plan must be submitted to the Minister within 18 months of the date of this approval and prior to any subsidence impacts on the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community. The plan must be approved by the Minister and the approved plan must be implemented.

(Note: The third dot point above is highlighted in red as it relates specifically to this section.)

The Plan (LBMP) was submitted to the Department of Environment, Water Heritage and the Arts and NSW Department of Planning on 30 June 2011.

The June 2011 LBMP presented — in the form of an "Action Plan" — the following details (among others) in respect of the long term security of the offset areas:

(a) within one year of approval of the June 2011 LBMP, CHPL will take the following action:

> *Liaise with Cabonne Council and Blayney Shire Council regarding the re-zoning of Offset areas for conservation. Initiate process for rezoning. Consideration will be given to re-zoning as Zone E2 Environmental – Conservation or Zone E3 Environmental Management in liaison with Councils.*

The "Performance measure" indicated for this action is stated to be:

> *Area re-zoned by the 6th of January 2012;*

(b) within one year of approval of the June 2011 LBMP, CHPL will take the following action:

Investigate options (such as voluntary conservation agreements, covenant etc) for the long term conservation (in perpetuity) of offset areas.

The "Performance measure" indicated for this action is stated to be:

Preferred option selected and implemented by the 6th of January 2012

and

(c) within one year of approval of the June 2011 LBMP, CHPL will take the following action:

To ensure implementation of the plan, a security deposit will be lodged with I&I NSW.

The "Performance measure" indicated for this action is stated to be:

Security lodged within 6 months of approval of Land and Biodiversity Management Plan (Landscape Management Plan).

Measures taken since 2011 to implement these actions are addressed below.

The Department of Sustainability, Environment, Water, Population and Communities (DSEWP&C) wrote to CVO on 9 September 2011 expressing concerns regarding the details for the long term security of the offset areas.

CVO replied to DSEWP&C on 23 September 2011 regarding its proposal to secure the required offset in part through use of a Voluntary Planning Agreement. CVO was advised that this met the requirements of DSEWP&C pending approval from NSW Department of Planning Infrastructure.

On 4 January 2012 CVO wrote to NSW Department of Planning and Infrastructure outlining its proposal to secure the offset required by condition 39 of the Project Approval.

On 9 March 2012 CVO advised the DOP by email of the reasoning behind the use of the VPA according to legal advice dated 24 February 2012 from Blake Dawson (now Ashurst Australia).

A VPA was considered in 2012 to be an appropriate mechanism to secure the biodiversity offset for the following reasons:

(a) the legal status and operation of a VPA is clear under the Environmental Planning & Assessment Act 1979 (EP&A Act);

(b) it has the ability to ensure the long term protection of the offset through a number of different mechanisms including registration of the VPA on title and the use of terms requiring the registration of positive covenants;

(c) it is a NSW mechanism for securing biodiversity offsets which is accepted by the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)

(d) notification requirements provide enhanced public accountability; and

(e) there has been considerable time, effort and expense already incurred in preparing the draft VPA.

BENEFITS OF USING VPA TO SECURE BIODIVERSITY OFFSETS

Benefits for using a VPA are considered to be:

- Legal status and operation of VPA
- Provision of long term security
- VPA allows for dedication of lands
- Recognition and use by Department of Planning and Environment
- Approval of VPAs by the Federal Minister and Department of Environment and Energy (DE&E)
- Public accountability

These benefits are outlined below:

Legal status and operation of VPA

A VPA is a mechanism created under the EP&A Act which may be used for securing biodiversity offsets. It is a voluntary agreement between a planning authority and a developer under which a developer agrees to provide a material public benefit to be used for or applied for a public purpose. Relevantly a public benefit includes the conservation or enhancement of the natural environment.

One benefit of a VPA is that its legal status in the planning system is clear and there are statutory controls in relation to its content. For example, a VPA is required to provide the following information:

(a) the time by which the provision is to be made;

(b) the manner by which the provision is to be made;

(c) a mechanism for the resolution of disputes under the agreement; and

(d) the enforcement of the agreement by a suitable means in the event of a breach of the agreement by the developer.

These statutory requirements ensure that VPAs are clear in their operation and ensure the VPA fulfils the purpose for which it was created.

Provision of long term security

The EP&A Act provides that a VPA can be registered on title so that it becomes binding on and enforceable against subsequent owners of the land as if each owner had entered into the VPA:

Section 93H of the Act is an important feature in the long term protection of an offset as it ensures that even if the land the subject of the offset is sold the land is still subject to the requirements of the VPA. We note that the draft VPA we prepared provides for registration of the VPA on title.

Another benefit of a VPA is that it can be used together with other legal mechanisms to provide additional protection to the offset. For example, the draft VPA we prepared requires that a section 88E instrument under the Conveyancing Act 1919 be registered prior to the transfer of the Offset Areas which will restrict the use of the Offset Areas for conservation purposes only.

VPAs also offer the flexibility to include terms that further ensure the long term protection of the offset area. For example, the draft VPA we prepared includes a clause stating that the landowner will not transfer the Offset Areas without the written permission of the Minister. Further, it also sets out a mechanism for CHPL and the Minister to agree on a transferee within 12 months of mine closure. In the event that agreement cannot be reached the VPA provides that the Minister is to nominate the transferee. This ensures that the transferee is suitable and acceptable to the Minister.

The benefits of a covenant is that there is a strong legal framework to enforce conditions. For example the Minister can undertake the work required to be undertaken by the landowner and then recover costs; the Minister can seek a judgment and register a charge

over the land, or have the land conveyed or transferred to the Minister; and the Minister can seek an injunction to prevent or rectify a breach and can obtain damages: Conveyancing Act 1919 sections 88F, 88H and 881.

VPA allows for dedication of lands

During the life of the Cadia East Project, CVO will actively manage the Offset Areas in accordance with the Landscape Management Plan and the Approval. However, after closure of the mine it is sensible that the Offset Areas be transferred to an appropriate party to act as the custodian of the Offset Areas.

A VPA allows for the dedication of the Offset Areas to be provided in the agreement itself, which is not the case for a Conservation Agreement for example.

Recognition and use by Department of Planning and Environment

The Department of Planning and Environment is party to a number of VPAs and is familiar with their negotiation and operation. Accordingly, in our view, the use of a VPA where the Department of Planning and Environment is a party results in a more efficient process for all involved.

Approval of VPAs by the Federal Minister and DE&E

The use of VPAs to secure biodiversity offsets required for projects in NSW is recognised by the Federal Minister and Department of Environment and Energy. For example, in the Federal Minister's approval for the Duralie Coal Extension Project, which he granted on 22 December 2010, a VPA was only one of the three mechanisms which he stipulated would be satisfactory for securing protection of a required offset area. The Federal Minister stipulated this in condition 16 of his approval. It states:

> *16. Within one year of the commencement of the action, the person taking the action must demonstrate in writing to the satisfaction of the Minister that a conservation covenant or similar instrument has been registered on the title/s of land containing the offset area required in Condition 12. This must provide for the protection of this offset area in perpetuity through one of the following means:*

- *a Conservation Agreement under s 69 of the National Parks and Wildlife Act 1974 (NSW),*
- *placing a restrictive or public positive covenant over the offset land under s 888-E of the Conveyancing Act 1919 (NSW), or*
- *a Planning Agreement under s 93F(1l of the Environmental Planning and Assessment Act 1979 (NSW)*

Public accountability

A VPA increases public accountability as it cannot be entered into, or amended or revoked, unless public notice has been given of the proposed agreement, amendment or revocation and a copy of the proposed agreement, amendment or revocation has been made available for inspection by the public for a period of not less than 28 days: s 93G.

Further, a planning authority proposing to enter into a VPA, or an agreement that revokes or amends a VPA, must prepare a written statement (explanatory note) that:

(a) summarises the objectives, nature and effect of the proposed agreement, amendment or revocation; and

(b) contains an assessment of the merits of the proposed agreement, amendment or revocation, including the impact (positive or negative) on the public or any relevant section of the public.

The explanatory note must be prepared jointly with the other parties proposing to enter into the VPA. A copy of the explanatory note must be exhibited with the copy of the proposed agreement, amendment or revocation when it is made available for inspection by the public.

The Black Rock range area was zoned E2 Environmental Conservation with 18 January 2013 commencement of the Cabonne Local Environmental Plan 2012

CVO received advice from DP&I on 5 June 2013 that the VPA was considered to be an appropriate means for securing the offset area where it was stated that "I see no reason why this should not be an appropriate mechanism for securing the offsets for the Cadia East Project."

On 21 May 2013 DSEWP&C advised CVO that details and mechanisms for securing the long term protection of the offset areas still remained unresolved/

CVO in response by letter dated 14 June 2013 advised DSEWP&C that it had become aware of discrepancies in areas of the offset areas as proposed in the offset plan.

CVO advised DoE on 14 June 2013 of progress with securing the offset and that the LBMP as posted on the Cadia Valley website was considered appropriate for reconsideration for the purposes of the EPBC approval.

On 14 March 2014 the Commonwealth Department of Environment (DoE) wrote to CVO alleging a breach of condition of 1 attached to the EPBC approval 2006/3196.

CVO responded on 7 April 2014 with the view that CVO had not contravened Condition 1 of the EPBC Approval, citing correspondence referenced above.

A security deposit was lodged with the Department of Planning on 14 May 2014 as required by condition 40, schedule 3 of the Project Approval (PA 06_0295).

An application to modify the Project Approval was lodged with DPE on 25 May 2015. The DoP assessment report on the application stated that:

> *In finalising in-perpetuity security arrangements for the biodiversity offset strategy CVO become aware that some small land parcels within the Black Rock Range and Belubula River/Flyers Creek offset areas are not able to be secured as planned due to a number of cadastral issues.*

The modification proposed approximately:

- 14.2 ha being removed from the Belubula River/Flyers Creek offset area;
- 16.5 ha being removed from the Black Rock Range offset area; and
- 60.7 ha being added to the offset strategy from Cadia's 'Stratton Vale' property

The modification was approved on 4 August 2015 which adjusted the offset areas as follows:

Table 14: Biodiversity Offset Strategy

Area	***Minimum Size****
Black Rock Range Offset Area – Enhancement Area	647 ha
Black Rock Range Offset Area – Revegetation Area	162 ha
Flyers Creek and Belubula River Offset Area	97 ha
Stratton Vale Offset Area	60 ha
Total	**966 ha**

**Subject to final survey constraints*

The Black Rock Range land (lot 21) was formally acquired on 26 April 2016. All offset areas are under the ownership of Contango Agricultural Company which is a related body corporate to Cadia Holding Pty Limited.

The Department of the Environment and Energy was advised of the modification in the Annual Report dated 19 May 2016.

In May 2016 CVO arranged for surveys of the other offset areas to be undertaken. Survey for the 'Stratton Vale' area was completed in August 2016. Record winter rainfalls have delayed surveys of the Belubula River frontage area for the Flyers Creek offset area. The subdivision plans for Black Rock range (lot 21 DP 1204782) and Stratton Vale (subdivision of are attached. The subdivision plan for the Belubula and Flyer Rivers offset area in the subdivision of lot 1422 DP 1168271 as generally indicated in the project approval will be attached once completed.

Once the plans of subdivision are finalised applications will be made to the relevant council to progress the E2 zoning for the 'Stratton Vale' and Belubula River/Flyers Creek offset areas, consistent with the zoning of the BRR area and for the VPA to progress through the NSW Department of Planning and Environment.

PROPOSED ACTIONS

Action	Estimated timetable*
Completion of survey of the Flyers Creek and Belubula River offset area that meets the area requirements of Table 14 Cadia East Project Approval (06_0295).	November 2016
Subdivision Certificate Blayney Council	December 2016
Subdivision plan registration NSW LPI	February- March 2017
Resubmission of the updated VPA to the Department of Planning and Environment to incorporate the Stratton Vale offset area and include finalised survey plans	Resubmission of updated VPA to DP&E: November 2016 Submission of Subdivision Plans: After registration (March 2017)
Submission of Flyers Creek and Stratton Vale offset areas following subdivision plan finalisation of these two areas to Blayney Council for rezoning consideration to *Zone E2 Environmental Conservation*.	March 2017

* Timeframes are subject to procedures by various agencies and as such are estimates only

Correspondence between Cadia Valley Operations and the Federal Department of the Environment and Energy relating to the establishment of the Voluntary Planning Agreement and compliance with the federal project approval conditions are located in Appendix F

9.7 CONSERVATION BOND

Schedule 3, Condition 40 of the Cadia East Project Approval requires that a conservation bond be lodged with the Department of Planning and Environment. A detailed and costed conservation estimate was submitted to the Department on 3 September 2013 and was subsequently accepted (email dated 29 November 2013). The bond dated 14 May 2014 provides for the full cost of management and restoration of offset areas over the life of the project.

9.8 ROLES AND RESPONSIBILITIES

The following roles and responsibilities relate to the management of conservation offset areas and the implementation of this management plan.

Role	Responsibility
CVO General Manager	- Compliance with project approval and EPBC requirements. - Overall implementation of the Land and Biodiversity Management Plan. - Ensure sufficient resources are allocated for the implementation of this plan
Manager – Health, Safety, Environment, Social Responsibility and Training (HSESRT)	- High level endorsement of budgets, schedules and works. - High level tracking of compliance with the Land and Biodiversity Management Plan. - Internal approval of the Land and Biodiversity Management Plan. - Escalate any risks of non-compliance. - Ensure sufficient resources are allocated for the implementation of this plan - Approve monitoring results / reports for publishing
Manager – Approvals	- Facilitate / arrange and required project modifications. - Arrange any formal compliance audits. - Arrange long term security of offset areas. - Escalate any risks of non-compliance
Superintendent – Environment and Community Relations	- Approval of budgets, schedules and works. - Periodically review compliance with the Land and Biodiversity Management Plan. - Review and update of the Land and Biodiversity Management Plan. - Escalate any risks of non-compliance - Review and approve monitoring results and reports
Environmental Scientist (Land and Biodiversity (L&B))	- Planning, Scheduling, costing and implementing the Land and Biodiversity Management Plan. - Supervision of field works. - Conducting field monitoring and recording of actions and progress against the Land and Biodiversity Management Plan. - Reporting as required by the Land and Biodiversity Management Plan. - Escalate any risks of non-compliance
Contractors	- Undertake field based works in accordance with directions provided and in accordance with the Land and Biodiversity Management Plan.

9.9 ACTION PLANS

The following section provides a series of specific action plans for key operational aspects relating to the offset areas including:

1. Revegetation of cleared / grazed / riparian areas	2. Management of remnant vegetation
3. Bushfire Management	4. Weed management
5. Pest management	6. Fauna Management
7. Unauthorised access (including livestock grazing)	8. Erosion
9. European / Aboriginal Heritage	10. Resource salvage

The action plans:

- Outline the current state and the future desired state for each management aspect.
- Provide specific and measureable management actions, responsibilities and timeframes.
- Identifies performance measures and how the delivery of the plan will be monitored and reported.
- Provides a risk assessment for each management aspect, identifies corrective actions, contingencies, responsibilities and timing. (Refer to risk matrix – Section 4.0)
- Assesses a range of possible contingencies based on a 'worst case scenario' and justifies the preferred option to achieve the desired outcome (assessment matrix embedded in action tables).

Clarification of timing

Annual	Action to occur on an annual basis
1 year	Action to be undertaken within 1 year of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
2-5 years	Action to be undertaken within 2-5years of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
5-10 years	Action to be undertaken within 5-10 years of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
* Refer to 'Document Status and History" located inside the cover of this plan.	
# signifies a recurring action as per the specified frequency in the action plan.	

Acronyms

BRR = Black Rock Range

FC = Flyers Creek Portion

SV = Stratton Vale Portion

Annual reporting requirements

EPBC Annual Report (due before 22 May each year)

NSW Project Approval (AEMR) (nominally due before 31 October each year)

Management Aspect : 1. Revegetation of cleared / grazed / riparian areas

Current Situation	**Desired Outcome**
Areas cleared for agricultural purposes are present within each conservation offset portion including the eastern portions of Black Rock Range and all of the Flyers Creek and Stratton Vale areas. These open areas have (in places) remnant canopy trees, an absent mid / shrub story and a highly disturbed understory dominated by introduced grasses and weeds.	Areas of EEC are protected, enhanced and expanded (revegetation of suitable areas to an EEC woodland community) Areas are rehabilitated with locally occurring native species, suitable to the soil type, aspect and topography (through either direct seeding or tubestock planting) to reinstate species and structural diversity. Areas are similar (or are evolving towards) identified reference sites comprising the best local example of the same vegetation type.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Assess and document the resilience of offset areas and the potential for natural regeneration. Areas assessed with high resilience are left to naturally regenerate, observed and monitored for response.	X	X	X	Environmental Scientist (L&B)			X	
Implement an annual schedule of direct seeding and Tubestock planting (season dependent). refer to section 9.14 for further explanation, species lists, methodology etc) Nominally >2000 tubestock planted or > 5ha direct seeded per year (season dependent)	X	X	X	Environmental Scientist (L&B)	X			
Implement a native seed collection program, to collect seed for future revegetation programs. Seed to be collected from within 20 kilometres of the CVO mine lease boundary. Maintain a seed store database	X	X	X	Environmental Scientist (L&B)	X			
Annual inspection of tubestock success / seedling density	X	X	X	Environmental Scientist (L&B)	X			
Independent (consultant) annual assessment (representative sites) of revegetation success against reference site condition. refer to Section 9.10 for further explanation	X	X	X	Environmental Scientist (L&B)	X			
Fertilisers will not be used in any offset revegetation programmes	X	X	X	Environmental Scientist (L&B)	X			

signifies a recurring action as per the specified frequency in the action plan.

Management Aspect (Continued) : 1. Revegetation of cleared / grazed / riparian areas

Performance Measures

- Demonstrated progression towards reference site condition (refer to Section 9.10).

>2000 tubestock planted per reporting period (23 Feb to 22 Feb) (season dependent) or

>5ha direct seeded per reporting period (23 Feb to 22 Feb) (season dependent)

-Seed collection contract (active agreement / purchase order) in place each season.

>50% tubestock survival rate after 1 year

>3 direct seeded shrubs per 10 linear metres (after 2 years)

>1 direct seeded eucalyptus per 10 linear metres (after 2 years)

Monitoring

Annual records of tubestock planted, hectares sown will be kept and reported annually.

An annual inspection / assessment of tubestock survival and seedling density will be undertaken and reported annually.

Annual assessment of representative revegetated sites against reference site condition. (refer to section 9.10 for further explanation)

Reporting

Annual records of tubestock planted, survival rates, hectares sown, seedling density will be kept and reported in the EPBC Annual report and the CVO AEMR.

Annual assessment of representative revegetated sites against reference site condition will be reported in EPBC Annual report and the CVO AEMR

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Failure of direct seeding	Minor	Occasional	Med	Defer direct seeding if seasonal conditions are poor. Re-seeding as required to meet targets	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Failure of tubestock	Minor	Occasional	Med	Defer tubestock planting if seasonal conditions are poor Re-planting as required to meet targets	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Rehabilitation monitoring not progressing towards reference site condition.	Minor	Occasional	Med	Assess individual factors from monitoring. Document improvement actions in annual report and implement.	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Insufficient local seed for revegetation.	Minor	Occasional	Med	Consider extending collection areas to >20km Source alternate contractor for seed collection.	Environmental Scientist (L&B)	Annual review of seed store	Minor	Unlikely	Low

Management Aspect (Continued) : 1. Revegetation of cleared / grazed / riparian areas

Contingency Effectiveness Assessment

Scenario : Failure of revegetation works. Targets not met / no (or poor) progression towards reference site condition

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Plant during every season – even in poor conditions	Meet revegetation performance measures	High risk of failure	4	Low
Do nothing	Reduced cost / effort	No change in success	3	Low
Assess contributing factors and adjust revegetation techniques and processes	Higher chance of success	Additional effort and cost	2	High
Defer revegetation works if there are poor seasonal conditions.	Higher chance of success	Not meet revegetation performance measures	1	High
Allow natural regeneration to occur an areas of high resilience	Higher chance of revegetation success. Low cost and effort.	Progress can be slow, triggers may be required to stimulate regeneration	1	High
Replanting / re-seeding to meet targets	Meet revegetation performance measures	Additional effort and cost	2	High
Allow natural regeneration to occur in all cleared areas.	Reduced cost / effort	Not meet revegetation performance measures in low resilience areas.	3	Low

Management Aspect : 2. Management of Remnant Vegetation

Current Situation	**Desired Outcome**
The vast majority of the Flyers Creek and Stratton Vale portions of the offset areas consist of remnant canopy eucalyptus spp. with little to no native shrub or understory species. These areas are subject to management aspect 1 – Revegetation of cleared / grazed / riparian areas. A large portion of Black Rock Range consists of healthy remnant bushland / woodland with intact groundcover, shrub and canopy strata and very few weeds.	Areas of EEC are protected, enhanced and expanded Maintain the health and resilience of remnant areas.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Undertake weed mapping of remnant areas, identifying weeds present, degree of infestation, priority areas. Areas re-mapped every 5 years.	X			Environmental Scientist (L&B)			X#	
Undertake annual inspection of remnant areas for weeds to determine priority control areas – focus on edges of remnant areas which are most susceptible to weed invasion.	X			Environmental Scientist (L&B)	X			
Implement low impact 'bush regeneration' principles for weeds in remnant areas. Ongoing on annual basis once commenced.	X			Environmental Scientist (L&B)			X#	
Use low impact, low intensity mosaic burning practices to promote a variety of vegetation age classes and structural diversity. Biennial program (season dependent) as per bushfire management plan (separate document).	X			Environmental Scientist (L&B)	Biennial			
Investigate wider weed sources, develop and implement controls to reduce future weed burden.	X			Environmental Scientist (L&B)			X	
Undertake vegetation mapping and assessment every 5 years (independent consultant) to determine structural / floristic changes, achievement / progression towards all desired outcomes and to make recommendations for future implementation.	X	X	X	Environmental Scientist (L&B)				X#

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 2. Management of Remnant Vegetation

Performance Measures

Annual inspection completed and documented.

Biennial low intensity burning undertaken as per Bushfire Management Plan (season dependent)

Weed mapping completed

Contract bush regenerations specialists engaged (contract / purchase order)

5 year mapping and assessment completed – showing progress towards all desired outcomes

Monitoring

Annual weed inspections documented.

Any low intensity burns are documented (photographs). Monitoring program commenced.

Internal monitoring of bush regeneration works and progress

Reporting

Annual inspections documented. Any key issues reported in EPBC Annual report.

Any low intensity burns are documented (photographs) and reported in the EPBC Annual report and the CVO AEMR.

5 year mapping and assessment completed – summary provided in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Remnant areas become weed infested resulting in loss of biodiversity.	Moderate	likely	Med	Annual inspection, weed mapping. Bush regeneration / weed control Identification / control of weed sources 5 year assessment and implementation of recommendations	Environmental Scientist (L&B)	Annual	Minor	unlikely	Low
Remnant areas loose structural and species diversity due to too frequent / infrequent / high intensity fire.	Moderate	likely	Med	Low intensity burns (biennial). Conformance with Bushfire management plan and burn regime.	Environmental Scientist (L&B)	Biennial	Minor	unlikely	Low

Management Issue (Continued) : 2. Management of Remnant Vegetation

Contingency Effectiveness Assessment

Scenario : Degradation of remnant areas due to weeds, fire regime / intensity. Loss of structural / species diversity.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of biodiversity	3	Low
Implement higher intensity (controlled) fires	More thorough fuel / hazard reduction	Possible loss of biodiversity	4	Low
Implement no burning – increasing risk of uncontrolled wildfire.	Low cost / effort	High risk of loss of biodiversity / vegetation structure	3	Low
Use chemical weed (spray) control methods in remnant areas	Efficiency in application / result	Possible loss of biodiversity / non target damage.	3	Low
Implement low intensity burns	Promotes species and structural diversity.	Less thorough fuel reduction	2	High
Undertake inspections / weed mapping and adjust management actions	Allows management / seasonal adjustment.	Higher cost / effort	2	High
Implement low impact bush regeneration techniques	No non-target damage	Higher Cost / effort	2	High
Undertake 5 yearly vegetation mapping and assessment for all offset areas.	Demonstrates progression towards desired outcome / corrective actions. Independent assessment and advice	Higher Cost / effort	2	High
Do not undertake monitoring	Lower cost / effort	No independent advice / input Unknown performance of management measures	3	Low

Management Aspect : 3. Bushfire Management

Current Situation	**Desired Outcome**
There is no current active bushfire management within / in the vicinity of offset portions. As the offset areas are generally un-grazed there is an annual (seasonal) risk of uncontrolled bushfire impact on the offset areas. 2 separate bushfire management plans have been developed; 1 addresses bushfires within the Black Rock Range Offset portion; the second addresses bushfire fuel management in the vicinity of the Flyers Creek and Stratton Vale offset portions.	Implement the 2 bushfire management plans to reduce the risk of a high intensity uncontrolled bushfire from impacting the offset areas resulting in biodiversity loss. Use low intensity fire as a tool to increase structural and species diversity.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Undertake bushfire fuel assessments to assist in identifying priority areas for low intensity burns. Assessment undertaken every 2-5 years.	X			Environmental Scientist (L&B)			X#	
Implement low intensity burns as per BRR bushfire management plan (season dependent) (currently scheduled every 2 years)	X			Environmental Scientist (L&B)	Biennial			
Implement fuel reduction regimes in vicinity of Flyers Creek and Stratton Vale offset portions as per bushfire fuel reduction plan. (season dependent)		X	X	Environmental Scientist (L&B)	X			
Undertake a literature review on the use of low impact, low intensity mosaic burning practices to stimulate regeneration within cleared / grazed offset areas. (season dependent)	X	X	X	Environmental Scientist (L&B)				X
Annual maintenance of fire trails. Contractor engaged to undertake prior to bushfire season in accordance with RFS guidelines.	X			Environmental Scientist (L&B)	X			
Upgrade fire trail signs as per RFS guidelines	X			Environmental Scientist (L&B)		X		

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 3. Bushfire Management

Performance Measures

Fuel assessment completed and documented.

Low intensity burning undertaken (season dependent) as per bushfire management plan

Annual fuel reduction works implemented in vicinity of Flyers Creek and Stratton Vale offset portions as per bushfire fuel reduction plan. (season dependent)

Annual fire trail maintenance completed (Contractor engaged)

Literature review completed on the use of fire in cleared / grazed areas to stimulate regeneration.

Monitoring

Any low intensity burns / fuel reduction work are documented (photographs).

Fire trails checked prior to bushfire season

Reporting

Any low intensity burns are documented (photographs) and reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled wildfire resulting in loss of biodiversity.	Major	Occasional	High	Low intensity burns. Fuel reduction activities RFS / emergency response. Post wildfire - monitoring / assessment / weed control	Environmental Scientist (L&BM) RFS	Annual	Major	unlikely	Med
Fire trails un-usable in event of a wildfire	Moderate	Occasional	Med	Annual maintenance of fire trails Annual inspection prior to fire season.	Environmental Scientist (L&BM)	Annual	Moderate	unlikely	Med

Management Issue (Continued) : 3. Bushfire Management

Contingency Effectiveness Assessment

Scenario : Uncontrolled wildfire resulting in widespread loss of vegetation and loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Implement higher intensity or higher frequency (controlled) fires. Better fuel / risk reduction	More thorough fuel reduction	Possible loss of structural and species diversity	4	Low
Implement no burning – increasing risk of uncontrolled wildfire.	Low cost / effort	High risk of uncontrolled wildfire / loss of biodiversity	3	Low
Implement low intensity burns	Promotes species and structural diversity.	Less thorough fuel reduction	2	High
Implement fuel reduction measures (Flyers Creek / Stratton Vale Portions).	Reduces risk of catastrophic fire.	Higher cost / effort	2	High
Following a catastrophic wildfire…..do nothing	Low cost / effort	Possible loss of diversity	3	Low
Following a catastrophic wildfire…..monitoring / assessment / weed control.	Promotes vegetation recovery	Higher cost / effort	2	High

Management Aspect : 4. Weed Management

Current Situation

Weed management programs have been in place for many years for the three offset portions, as such the noxious weed burden is currently considered low.

Remnant areas located on Black Rock Range are least prone to weed establishment due to the strong competition from native species; as such this area is most vulnerable to weed invasion on the bushland / woodland edges, however bird spread weed species have the opportunity to establish throughout the area.

Previously cleared and grazed areas located within the three offset portions are most vulnerable to weed invasion and currently have a high incidence of introduced grass and broadleaf weeds with few native species.

Desired Outcome

The ultimate aim is that weeds do not impact on biodiversity values of offset areas.

Remnant areas are kept clean with a low weed incidence.

Weeds are progressively replaced with desirable, native, competitive species.

Noxious and high priority weeds are controlled through the implementation of annual weed management programmes to progressively reduce weed populations, the risk of spread and management costs.

Literature reviews are conducted to determine methods to progressively reduce the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.

Management Actions / Schedule	Applies to……			Responsibility / Timing				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Undertake weed mapping of offset areas to determine areas, degree of infestation, weed species present. Mapping is used to determine priority locations. Areas re-mapped every 5 years.	X	X	X	Environmental Scientist (L&B)			X#	
Conduct annual inspection (nominally in August) to plan spring and summer weed control programmes	X	X	X	Environmental Scientist (L&B)	X			
Annual contract in place for the control of noxious and high priority weeds (refer to Section 9.11 for a list of weeds and control measures)	X	X	X	Environmental Scientist (L&B)	X			
Weeds are progressively replaced with native competitive species. (through planting, seeding, selective weed control, encouraging native species) (refer to Management Aspect 1)	X	X	X	Environmental Scientist (L&B)	X			
Undertake literature reviews to determine methods of progressively reducing the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.	X	X	X	Environmental Scientist (L&B)				X

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 4. Weed Management

Performance Measures

Weed mapping completed as per schedule (every 5 years). Ongoing weed mapping verifies reducing weed burden over time.

Annual contracts in place for the control of noxious and high priority weeds (refer to Section 9.11).

Works undertaken to replace weeds with desirable native plants (eg planting, seeding, selective weed control (bush regeneration principles), encouraging native species) (as per Management Aspect 1)

Literature reviews conducted to determine methods of progressively reducing the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.

Monitoring

Field monitoring conducted on contract compliance – any non-conformances corrected. Monitoring of hours vs weed management budget.

Ongoing weed mapping verifies reducing weed burden over time.

Reporting

A brief summary of weeds controlled and hours spent reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled weeds impact on biodiversity values of offset areas	Moderate	Likely	Med	Weed mapping and annual Inspections. Annual weed control contracts Checks to ensure contract compliance Long term encouragement / replacement with native species.	Environmental Scientist (L&B)	Annual	Minor	unlikely	Low

Management Issue (Continued) : 4. Weed Management

Contingency Effectiveness Assessment

Scenario : Uncontrolled weeds resulting in loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of biodiversity	3	Low
Weed mapping to verify long term weed reduction	Accurate assessment of performance.	Higher cost / effort	2	High
Annual inspections and weed control contracts in place and enforced	Effective weed control	Higher cost / effort	2	High
Rely solely on biological controls	Low cost / effort	Select weeds targeted only Possible loss of diversity	3	Low
Weed control without replacing with native species	Low cost / effort (short term)	Higher cost / effort (long term)	4	Low
Rely on native species to out-compete weed species	Low cost / effort	Likely unsuccessful. Possible loss of biodiversity	3	Low

Management Aspect : 5. Pest Management

Current Situation	**Desired Outcome**
Pest management programs have been in place for many years for the three offset portions, as such the vertebrate pest burden is currently considered reasonably low. All offset areas are considered equally vulnerable to pest species impact due to the transient nature of vertebrate pests.	The ultimate aim is that vertebrate pest species do not impact on biodiversity values and fauna populations of offset areas. Priority pest species are controlled through the implementation of annual pest management programmes to progressively reduce pest populations and harbor.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Conduct annual fox baiting program in coordination with neighbouring landholders.	X	X	X	Environmental Scientist (L&B)	X			
Conduct annual inspection (nominally in March) to plan Autumn and winter rabbit, eastern grey kangaroo, pig, wild dog, fallow Deer control programmes. (refer to section 9.12 for a list of vertebrate pest and control options). Implement control programmes (as per section 9.12) as required.	X	X	X	Environmental Scientist (L&B)	X			

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 5. Pest Management

Performance Measures

Annual fox control program conducted

Annual inspection conducted and control programmes implemented as required.

Monitoring

Annual inspection conducted to assess pest incidence and impact.

Reporting

A brief summary of pest management activities reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled pests impact on biodiversity values of offset areas	Moderate	Likely	Med	Annual fox control program Annual inspections for vertebrate pests and implement control programmes as required.	Environmental Scientist (L&B)	Annual	Minor	unlikely	Low

Management Issue (Continued) : 5. Pest Management

Contingency Effectiveness Assessment

Scenario : Uncontrolled Pests resulting in loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Annual fox control programme (to be run in conjunction with neighbouring properties)	Effective local / temporary reduction in fox numbers.	Higher cost / effort. Result is likely to be localised and temporary. Ongoing annual control required.	2	High
Annual inspections (for other vertebrate pests) and control programmes implemented as required	Effective pest control	Higher cost / effort	2	High
Rely solely on natural agents (Myxomatosis, Rabbit Calicivirus) and predation (eg foxes / dogs / cats preying on rabbits)	Low cost / effort	In-effective on carnivorous pests. Likely loss of biodiversity.	3	Low

Management Aspect : 6. Native Fauna Management

Current Situation	**Desired Outcome**
A range of native fauna species occur within the offset areas (refer to Section 9.4 and appendices D and E). Management to date has been 'passive' allowing for minimal disturbance. There have been no habitat enhancement works conducted within offset areas. Refer to Pest Management and Bushfire Management sections for other Fauna management measures.	The ultimate aim is that native fauna species are protected from major impacts that may severely impact on their population and viability. Native fauna habitat is considered and allowed for in all management works (with priority given to threatened species). Native fauna habitat is enhanced in areas with a history of clearing and grazing (with priority given to threatened species).

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Conduct fauna surveys every 5 years to determine fauna species, distribution and effectiveness of management regimes (including future recommendations). Commencing FY2018	X	X	X	Environmental Scientist (L&B)				X#
Develop and implement a procedural checklist to ensure that fauna considerations are incorporated into all field based works (focussing on threatened species, recommendations from recovery plans and mitigation of key threatening processes (Refer to Section 9.13).	X	X	X	Environmental Scientist (L&B)		X		
No firewood collection or bush rock removal is permitted from within offset areas. No tree felling (or removal of stags) is permitted (with the exception of high risk bushfire and safety considerations).	X	X	X	Environmental Scientist (L&B)	X			
Opportunistically retain / place additional habitat structures within previously cleared and grazed offset portions (sourced from nearby farming / offset areas).	X	X	X	Environmental Scientist (L&B)	X			
Undertake literature review on the success of man-made habitat boxes for arboreal species (in leiu of hollows). Implement in cleared areas to increase habitat availability.	X	X	X	Environmental Scientist (L&B)			X	

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 6. Native Fauna Management

Performance Measures

Fauna surveys conducted every 5 years.

Checklist developed and utilised to assess potential impact from field based works.

Habitat structures opportunistically placed within previously cleared and grazed offset portions.

Monitoring

Fauna surveys conducted every 5 years.

Reporting

A brief summary of fauna survey outcomes and recommendations reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Field works impact on threatened fauna populations or habitat.	Moderate	Occasional	Med	Assessment of field works / risk prior to implementation.	Environmental Scientist (L&B)	Prior to field works being implemented.	Minor	Unlikely	Low
Unauthorised removal of firewood, bush rock, stags, habitat trees	Moderate	Occasional	Med	Removal of firewood, bush rock, stags, habitat trees not permitted. Additional resources placed within previously cleared / grazed areas	Environmental Scientist (L&B)	Ongoing policy	Minor	Rare	Low
Uncontrolled high intensity bushfire destroying habitat resources. (Refer to management aspect 3)	Major	Occasional	High	Low intensity burns. Fuel reduction activities RFS / emergency response. Post wildfire - monitoring / assessment / weed control	Environmental Scientist (L&BM) RFS	Annual	Major	unlikely	Med

Management Issue (Continued) : 6. Native Fauna Management

Contingency Effectiveness Assessment

Scenario : Field works impact on threatened fauna populations or habitat. (for bushfires refer to Refer to management aspect 3)

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Assess field works prior to implementation for the potential to impact upon threatened and native fauna species.	Effective in assessing risks to fauna impact.	Nil	1	High
No firewood collection, bush rock collection or tree felling permitted within offset areas.	Effective in retaining habitat	Nil	1	High
Key threatened species management actions incorporated into this management plan and implemented (Refer to section 9.13)	Effective in protecting / facilitating the recovery of threatened species.	Nil	2	High
Detailed fauna surveys conducted every 5 years. Recommendations incorporated into management plan	Known performance of management actions. Corrective / improvement actions	Higher cost / difficulty	2	High

Management Aspect : 7. Unauthorised access (including livestock grazing)

Current Situation	**Desired Outcome**
There is no open public access to any of the three conservation offset portions; access is via private property with standard agricultural gates. The three portions of the offset areas are fenced to exclude livestock and are excised from any neighbouring grazing rights agreement areas.	The ultimate aim is that unauthorised access by people or livestock does not impact on biodiversity values and fauna populations of offset areas. Gates to remain un-locked for RFS access and the retrieval of livestock.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Contract fencer to conduct annual inspection of offset boundary fences and undertake repairs. Ad-hoc inspections and repairs following severe storms (trees over fences / repair of floodgates).	X	X	X	Environmental Scientist (L&B)	X			
Remove internal fences from offset areas	X			Environmental Scientist (L&B)			X	
Place signs at the entrances to each gate identifying the area as a conservation offset area and providing contact details.	X	X	X	Environmental Scientist (L&B)			X	
Undertake annual inspections for unauthorised access; devise actions and timeframes to increase security of offset areas as required.	X	X	X	Environmental Scientist (L&B)	X			
Replace boundary fences as required in consultation with neighbouring landholders. Fence design to consider fauna movements.	X	X		Environmental Scientist (L&B)	As required			
Use grazing as a strategic tool to improve biodiversity outcomes (remove litter, reduce seed set etc). Timing and intensity considered on an annual / ad-hoc basis (nominally high intensity / short duration). Applied in cleared areas (with dominant introduced pasture species) only.	X	X	X	Environmental Scientist (L&B)	X			

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 7. Unauthorised access (including livestock grazing)

Performance Measures

Annual boundary fence inspection and repair regime.

Placement of signs at access points.

No observed impact on biodiversity aspects due to unauthorised access.

Monitoring

Annual inspection on unauthorised access and livestock impact.

Reporting

A brief summary of any observed unauthorised access / livestock damage reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Unauthorised people, vehicle / livestock access. Impacts upon flora, fauna or EEC's.	Moderate	Unlikely	Med	Offsets located on private land with no nearby public access. Annual inspections to identity unauthorised access / correction as required. Annual fence inspection and maintenance regime.	Environmental Scientist (L&B)	Annual	Minor	Rare	Low
Use of strategic grazing impacts upon biodiversity values.	Moderate	Unlikely	Med	Inspection and assessment of grazing as a strategic tool – undertaken on a conservative basis. Applied in cleared areas (with dominant introduced pasture species) only	Environmental Scientist (L&B)	Annual	Minor	Rare	Low

Management Issue (Continued) : 7. Unauthorised access (including livestock grazing)

Contingency Effectiveness Assessment

Scenario : Unauthorised people / vehicle / livestock access impacting upon flora, fauna or EEC's.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Likely livestock access and impact upon biodiversity	3	Low
Annual boundary fence inspection and repair regime	Effective in maintaining boundary fence condition.	Cost / access difficulties	2	High
Annual inspections for unauthorised people / vehicle / livestock access and correction as required.	Effective in identifying / correcting any issues	Nil	1	High
Signs installed at boundary gates	Effective in identifying a change in land-use / ownership.	Not effective in restricting access.	3	Low
Removal of internal fences to facilitate fauna movement	Facilitates fauna movement	Cost / access difficulties	2	High
Access gates to remain unlocked	Allows RFS and neighbour access for management purposes. Reduced risk of damage for forced access.	Not effective in restricting access.	3	Low
Undertake strategic grazing to improve biodiversity outcomes (nominally high intensity / short duration).	Low cost / effort. Effective in removal of litter, reducing seed set of introduced palatable species.	Detailed inspections and assessments to avoid damage	2	High
Restrict all grazing	Low cost / effort.	Litter and seed from introduced (palatable) species continues to dominate.	3	Low

Management Aspect : 8. Erosion

Current Situation	**Desired Outcome**
The Flyers Creek and Stratton Vale offset portion have no significant erosion and are deemed quite stable due to persistent vegetation cover. The eastern portions of Black Rock Range have the highest potential for erosion due to 'light' soil type, steep slope, existing eroded gullies and annual vegetation cover due to prolonged grazing pressure.	Eastern gullies on Black Rock Range are slowly and progressively stabilised through erosion control measures.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Inspect and assess active eroding gullies for the purpose of identifying priority locations for remedial works	X			Environmental Scientist (L&B)			X	
Design and implement remediation works (will be specific to each individual gully) to reduce soil erosion. Steep slopes: nominally, minimise mechanical engineering solutions due to steepness of the terrain and focus on establishing perennial, deep rooted vegetation, slowing and retaining water / nutrient within the landscape (leaky weir / natural sequence/ LFA concepts) Flat areas: Mechanical engineering solutions plus establishing perennial, deep rooted vegetation, slowing and retaining water / nutrient within the landscape (leaky weir / natural sequence/ LFA concepts) 1 campaign undertaken every 2-5 years	X			Environmental Scientist (L&B)			X#	
Exclude strategic grazing from steep areas with a high risk of erosion.	X			Environmental Scientist (L&B)	X			

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 8. Erosion

Performance Measures

Inspections undertake and priority gully's identified

Works programme implemented every 2-5 years.

Monitoring

Inspection / photography (before and after) of erosion control works / progress.

Reporting

A brief summary of any erosion control works reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled erosion impacts upon biodiversity values of offset areas.	Major	Occasional	High	Design and implement erosion mitigation works	Environmental Scientist (L&B)	Every 2 years	Moderate	Occasional	Med

Management Issue (Continued) : 8. Erosion

Contingency Effectiveness Assessment

Scenario : Uncontrolled erosion impacts upon biodiversity values of offset areas.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Continued erosion / degradation of eastern gully's	3	Low
Design and implement mechanical / highly engineered erosion control works on steep slopes		High Cost. High risk of failure due to extreme slope of eastern portions.	4	Low
Design and implement mechanical / engineered erosion control works on flat areas	Effective in managing erosion on flatter, lower slope areas.	High Cost.	2	High
Design and implement – low impact mitigation works such as leaky weir / natural sequence/ LFA concepts / perennial deep rooted vegetation	Potentially effective in managing erosion.	Slow / gradual progress, open to setbacks following storms.	2	High

Management Aspect : 9. European / Aboriginal Heritage								
Current Situation European and Aboriginal heritage aspects of the conservation offset portion has not been assessed and remains unknown.				**Desired Outcome** Develop an understanding of European and Aboriginal heritage aspects of the offset areas and implement management actions for assessment / conservation.				
Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Undertake European and Aboriginal heritage surveys of offset areas. Incorporate heritage survey findings into future revisions of this management plan	X	X	X	Environmental Scientist (L&B)				X
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued) : 9. European / Aboriginal Heritage

Performance Measures

European and Aboriginal heritage surveys undertaken

Management Plan updated.

Monitoring

Nil – pending completion of heritage surveys.

Reporting

Any ad-hoc heritage findings will be reported in the EPBC Annual report and the CVO AEMR.

A summary will also be included following the completion of the heritage surveys.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Damage / loss of heritage items due to lack of information / assessment.	Minor	Unlikely	Low	Undertake survey to assess heritage items / significance Report / assess any ad-hoc heritage findings	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low

Management Issue (Continued) : 9. European / Aboriginal Heritage

Contingency Effectiveness Assessment

Scenario : Damage / loss of heritage items due to lack of information / assessment.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Potential loss of heritage items	3	Low
Undertake heritage survey of European and Aboriginal heritage	Known location and significance of heritage items.	Cost. Potential land management conflicts.	2	High
Following survey, update management plan	Management measures in place for the conservation of heritage items	Cost. Potential land management conflicts.	2	High

Management Aspect : 10. Resource Salvage

Current Situation	**Desired Outcome**
Currently, no habitat salvage is undertaken to relocate items from the Cadia East Subsidence zone to offset areas. Offset areas currently have significant remnant trees, trees with hollows, fallen timber and intact soil resources due to the previous management of these areas.	Schedule 3, Condition 38b of the Cadia East Project Approval requires that investigation be undertake into the beneficial use of resources (timber, fauna habitat, seed and soil) from the Cadia East Subsidence Zone (as far as is reasonable and feasible). Offset areas currently have significant remnant trees, trees with hollows, fallen timber and intact soil resources due to the previous management of these areas. As such it is considered that the best use of these resources from the Cadia East Subsidence Zone is to place these resources onto mine site rehabilitation areas where these assets are scarce. The site based rehabilitation areas are also much closer to facilitate ease and efficiency of placement. Resources salvageable from the Cadia East Subsidence Zone that are suitable for offset areas is restricted to seed for revegetation purposes.

Management Actions / Schedule	**Applies to……**			**Responsibility / Timing**				
	BRR	FC	SV	Responsibility	Annual	1 year	2-5 years	5-10 years
Annual seed collection contracts to include potential collection from the Cadia East Subsidence Zone	X	X	X	Environmental Scientist (L&B)	X			
Habitat resources (with the exception of seed) from the Cadia East Subsidence zone will be used exclusively in the rehabilitation of mine disturbed areas. Considered annually based on availability.				Environmental Scientist (L&B)	X			
Relocate / redistribute habitat from within offset areas / adjacent farming areas to offset areas that have been previously cleared and grazed. Nominal program every 2-5 years pending availability of resources.	X	X	X	Environmental Scientist (L&B)			X#	

signifies a recurring action as per the specified frequency in the action plan.

Management Issue (Continued) : 10. Resource Salvage

Performance Measures

Annual seed collection contracts to include potential collection from Cadia East Subsidence Zone

Habitat resources from the Cadia East Subsidence zone used in the rehabilitation of mine disturbed areas.

Habitat from within offset areas / adjacent farming areas are placed within previously cleared and grazed offset areas.

Monitoring

Internal monitoring of habitat resource relocation, seed stocks and provenance.

Reporting

Any habitat relocation and placement undertaken within the mine disturbed landscape will be reported in the CVO AEMR.

Any habitat relocation and placement undertaken within the conservation offset landscape will be reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Loss of potential resources from the Cadia East Subsidence Zone.	Minor	Likely	Med	Habitat resources utilised in the rehabilitation of mine disturbed areas Seed collection undertaken from the Cadia East Subsidence Zone used in site based rehabilitation and also offset revegetation works.	Environmental Scientist (L&B)	Annual	Minor	Occasional	Med
Lack of habitat resources located within previously cleared / grazed offset areas.	Minor	Unlikely	Med	Habitat from within offset areas / adjacent farming areas to are placed within previously cleared and grazed offset areas	Environmental Scientist (L&B)	Program every 2-5 years	Minor	Rare	Low

Management Issue (Continued) : 10. Resource Salvage

Contingency Effectiveness Assessment

Scenario : Loss of potential resources from the Cadia East Subsidence Zone.

Contingency Assessment Matrix. The following matrix is used to assess the lilely success of the contingeny measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.

Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Loss of habitat resources	3	Low
Utilise habitat resources from Cadia East Subsidence Zone in offset areas	Meet compliance condition. Add some limited value to offset areas	Significant cost and difficulty in relocating large and bulky items. Limited value to offset areas due to existing trees, fallen timber, habitat items etc	4	Low
Utilise habitat resources from Cadia East Subsidence Zone in site rehabilitation areas	Relative to above – significantly reduced cost and difficulty. Adds significant habitat value to site based rehabilitation areas.	Nil	2	High
Utilise seed from Cadia East Subsidence Zone in offset areas.	Provides local seed for revegetation programmes. Considered local provenance for offset areas	Nil	1	High
Relocate / redistribute habitat from within offset areas to areas previously cleared and grazed	Relative to above – significantly reduced cost and difficulty. Adds habitat value to previously cleared and grazed areas.	Nil	1	High

9.10 PERFORMANCE MONITORING AGAINST REFERENCE SITES

As described in section 8.1, CVO has been monitoring selected local reference sites since 2008 to define 'success criteria' for mine site rehabilitation. Monitoring of rehabilitation sites is undertaken in an identical manner to the reference sites (at the same time of the year, having experienced similar climatic conditions) with the results compared against those of the reference site. If measured parameters of the rehabilitated site are progressing (or showing trajectory) towards those of the reference site, the rehabilitation is showing signs of success. If rehabilitation sites are not steadily progressing towards those of the reference site, there may be a fundamental issue with the rehabilitation process. The large range of detailed parameters measured and assessed can be used to highlight areas that require further consideration and correction.

CVO propose to use a similar methodology to assess the success of revegetation works on areas that were previously cleared and grazed (refer to Action Plan 1).

The methodology adopted by CVO involves the selection and monitoring of a series of reference sites that are representative of the target vegetation community (such as a woodland community) (refer to section 9.14). A large number of parameters are measures as indicated in the following table:

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
Landform establishment and stability	Ecosystem function	Landform is functional and performing as it was designed to do	LFA Stability	Based on key physical, biological and chemical characteristics the LFA stability index provides an indication of the sites stability and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Infiltration	Based on key physical, biological and chemical characteristics the LFA infiltration index provides an indication of the sites infiltration capacity and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Nutrient recycling	Based on key physical, biological and chemical characteristics the LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to that of the local remnant vegetation
Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry
			Organic Matter	Organic Carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry
Ecosystem establishment, development and habitat	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant	Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
complexity		vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (less than 50cm in height) is comparable to that of the local remnant vegetation
Ecosystem establishment, development and habitat complexity	Protective ground cover		Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation
	Vegetation density		Density of shrubs and juvenile trees	The density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation
			Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to that of the local remnant vegetation
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees less than 0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation
			shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees less than 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation
Ecological stability	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
		vegetation	Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation
			Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation

Selection of reference sites

Selecting suitable reference sites is essential to this model as they ultimately set the benchmark for revegetation targets and indications of success. Reference sites chosen for CVO were sites that were typical of the local environment, including those considered to be in the best condition within the local context, and as such are a true representation of the 'current condition' of remnant woodland and riparian communities. The reference sites were spread out where possible to maximise the spatial distribution and subsequent variations in community composition. It is acknowledged that reference sites chosen, while they are the best that could be found in a local context are still subject to impact and change due to (for example) occasional grazing, fire, drought, physical disturbance etc.

Reference sites have been selected based on the following target vegetation communities (for revegetation):

Woodland Reference Sites

- Woodland (refer to section 9.14 – predominantly areas on better soil types on the lower eastern and western slopes of Black Rock Range, non-riparian areas of the Flyers Creek and Stratton Vale offset portions.)
    - RfWood01
    - RfWood02
    - RfWood04
    - RfWood05

General description

The grassy woodland reference sites are comprised of low various densities of E. albens (White Box) or E. melliodora trees but E. blakelyi (Blakely's Red Gum), E. macrorhyncha (Red Stringybark), E. bridgesiana (Apple Box) or E. goniocalyx (Bundy Box) may also have been present. Scattered old growth trees are present as well as younger regrowth and some relatively recent natural eucalypt recruitment was present in all sites. There was an absence of a shrub layer in two sites however in the other two woodland sites, shrubs including Cassinia arcuata and Acacia dealbata and A. implexa were more common and eucalypt regeneration was present. There may also have been the occasional Rubus fruticosus (Blackberry) or Rosa rubiginosa (Sweet Briar), exotic shrubs and declared noxious weeds in some woodland areas. The understoreys were usually dominated by native perennial grasses and common native forbs and all sites contained a high cover of leaf litter. There were also scattered exotic annuals and pockets of exotic grasses or weeds in previously disturbed areas.

Specific descriptions

Site	Reference	Description	Plate
Woodland Ashleigh Park	RfWood01	E. melliodora woodland with mixed native grasses, introduced annuals and forbs.	
Woodland Bundarra	RfWood02	E. albens remnant on the side of a rocky hill behind cattle yards. Improved pastures (Phalaris) dominate the paddock clearings but Bothriochloa and Microlaena persist within the rocky areas. Mixture of large old growth trees and regrowth trees. There was no regeneration or shrub understorey however large rocks and fallen branches were common. There were large patches of native grasses and scattered forbs but exotic species were more abundant.	
Woodland CVO Access	RWood04	Young regrowth woodland containing several mature eucalypts including E. melliodora, E. bridgesiana and E. macrorhyncha on a slope. Nice scattering of eucalypt, Cassinia and Acacia dealbata regeneration. The grassy understorey was grazed very low by wildlife and dominated by Austrodanthonia, Microlaena and Bothriochloa	
Woodland Cadiangullong Dam	RWood05	Remnant woodland dominated by E. melliodora and E. goniocalyx with an understorey of Acacia dealbata (A. implexa, Cassinia sp.). Predominantly regrowth but few old growth trees and some shrub regeneration occurring. Understorey contained scattered grasses and herbs. Many scattered logs and branches. In 2011 and 2012 there was improved growth of native grasses and shrubs	

Riparian Reference Sites

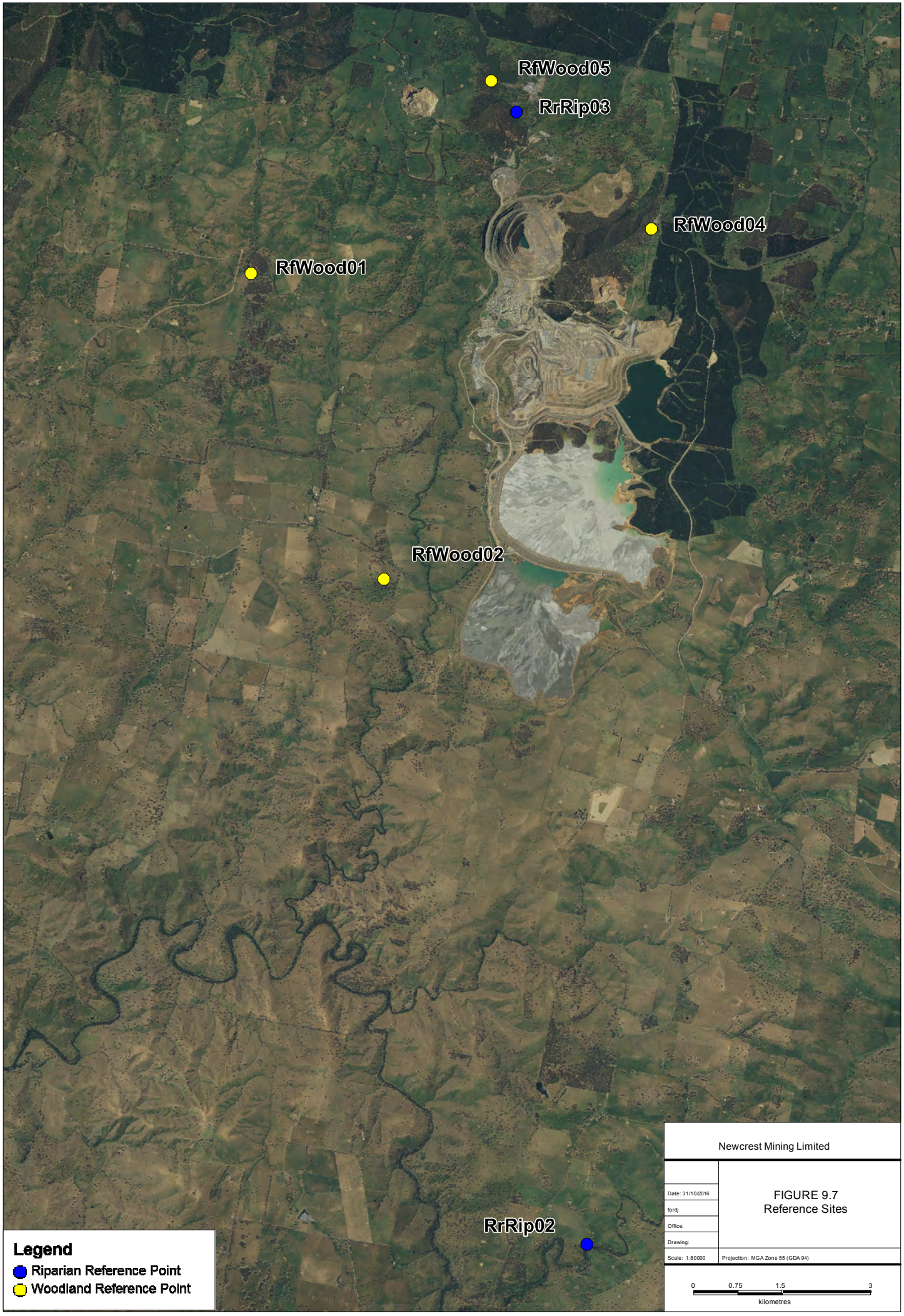
- Riparian (Refer to Section 9.14 riparian areas located along Panuara Rivulet (Black Rock Range), Flyers Creek / Belubula River (Flyers Creek portion) and Swallow Creek (Stratton Vale portion)
    - RrRip02
    - RrRip03

General description

The two riparian woodland sites were quite different to each other but both were characteristically open grassy woodland. One site was comprised of scattered old growth trees of E. camaldulensis (River Red Gum), E. melliodora and E. bridgesiana (Apple Box) and had an understorey dominated by Phalaris aquatica and Dactylis glomerata with patches of introduced annual grasses and native grass and herbs. The second was also comprised of scattered old growth trees dominated by E. viminalis, E. melliodora and E. bridgesiana and a relatively intact native and diverse understorey and contained some patches of shrubs including Acacia melanoxylon and A. dealbata. Both sites however contained various noxious weeds and floods waters continue to alter the stream morphology.

Specific descriptions

Site	Reference	Description	Plate
Riparian Bakers Shaft Reserve	RrRip02	Open woodland dominated by E. camaldulensis, E. melliodora and E. bridgesiana. Understorey dominated by Phalaris aquatica and Dactylis glomerata with patches of introduced annual grasses and native grass and herbs. Some E. camaldulensis regeneration occurring along the rocky banks	
Riparian Cadiangullong Creek	RrRip03	Cadiangullong Creek CVO. Open woodland dominated by E. viminalis, E. melliodora and E. bridgesiana and a relatively intact native understorey. Large old growth trees and midstorey shrubs including Acacia melanoxylon and A. dealbata.	


RfWood05
RrRip03
RfWood04
RfWood01
RfWood02
RrRip02
Legend
Riparian Reference Point
Woodland Reference Point
Newcrest Mining Limited
Date: 31/10/2016
fordj
Office:
Drawing:
Scale: 1:80000
Projection: MGA Zone 55 (GDA 94)
FIGURE 9.7
Reference Sites
0
0.75
1.5
3
kilometres

Determining success

Revegetation success criteria (as at 2016) are presented in the following table (DNA Environmental 2016). Each parameter measured (on an annual basis) has a desirable range (based on the minimum and maximum values determined from reference sites). Revegetation sites have met the closure criteria parameter if the measurement falls within or exceeds this range.

A range of representative revegetation sites (nominally a total of 6-10 covering woodland and riparian revegetation within the three offset portions) will be chosen for ongoing monitoring. Revegetation monitoring and assessment against closure criteria will be undertaken on an annual basis (nominally April / May each year) by an external independent consultant. A detailed report is produced following annual monitoring which assesses the revegetation performance against reference site condition. A summary will be placed in the EPBC Annual Report

Reference site condition and therefore success criteria are dynamic and will change from year to year based on annual monitoring, therefore the relevant success criteria at any time will be contained in the most recent AEMR (and will be used / repeated in the corresponding EPBC Annual Report)

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 2: Landform establishment and stability	**Landform slope, gradient**	Landform suitable for final landuse and generally compatible with surrounding topography	Slope	Landform is generally compatible within the context of the local topography and final landform design.	✓		< Degrees (18°)	**10**	**14**	**10**	**14**
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	Number of gullies or rills >0.3m in width or depth in a 50m transect are limited and stabilising	✓		No.	**0**	**0**	**0**	**0**
			Cross-sectional area of rills	Provides an assessment of the extent of soil loss due to gully and rill erosion and that it is limited and/or is stabilising		✓	m2	**0**	**0**	**0**	**0**
Phase 3: Growth medium development	**Soil chemical, physical properties and amelioration**	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry	✓		pH (5.6-7.3)	**5.9**	**7.3**	**6.5**	**6.5**
			EC	Electrical Conductivity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	< dS/m (<0.150)	**0.068**	**0.289**	**0.074**	**0.086**
			Organic Matter	Organic Carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	✓		% (>4.5)	**7.8**	**14.3**	**6.3**	**8.6**
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	✓		mg/kg (50)	**12.0**	**48.5**	**17.8**	**20.6**
			Nitrate	Nitrate levels are typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	mg/kg (>12.5)	**0.4**	**26.2**	**1.5**	**9.0**
			CEC	Cation Exchange Capacity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	Cmol+/kg (>14)	**12.7**	**39.8**	**16.6**	**22.8**
			ESP	Exchangeable Sodium Percentage (a measure of sodicity) is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	% (<5)	**0.1**	**7.5**	**0.1**	**0.4**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								**Lower KPI**	**Upper KPI**	**Lower KPI**	**Upper KPI**
Phase 4: Ecosystem & Landuse Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	Landform is stable and performing as it was designed to do	LFA Stability	The LFA stability index provides an indication of the sites stability and is comparable to or trending towards that of the local remnant vegetation	✓		%	**66.1**	**77.5**	**67.9**	**71.2**
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to that of the local remnant vegetation	✓		%	**87**	**100**	**91**	**100**
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	The diversity of shrubs and juvenile trees with a stem diameter less than 5cm is comparable to that of the local remnant vegetation.		✓	species/ area	**0**	**8**	**5**	**7**
				The percentage of shrubs and juvenile trees with a stem diameter less than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	✓		% populatio n	**87**	**100**	**17**	**43**
			Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation	✓		No./area	**7**	**37**	**35**	**44**
			Native species richness	The total number of live native plant species provides an indication of the native plant diversity of the site and that it is greater than or comparable to the local remnant vegetation		✓	>No./are a	**4**	**22**	**17**	**27**
			Exotic species richness	The total number of live exotic plant species provides an indication of the exotic plant diversity of the site and that it is less than or comparable to the local remnant vegetation		✓	<No./are a	**3**	**16**	**17**	**18**
			Ratio of native to exotic species	The ratio of live native species compared to live exotic plant species provides an indication of the relative native species richness of the site and that it is more than or comparable to the local remnant vegetation		✓	>	**1.0**	**2.8**	**0.9**	**1.6**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								**Lower KPI**	**Upper KPI**	**Lower KPI**	**Upper KPI**
Phase 4: Ecosystem & Landuse Establishment	**Vegetation density**	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	The total density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation		✓	No./area	**0**	**212**	**14**	**59**
				The density of endemic shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation	✓		No./area	**0**	**204**	**6**	**10**
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	**1**	**4**	**3**	**4**
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	**0**	**6**	**3**	**8**
			Sub-shrubs	The number of sub-shrub species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**0**	**0**	**0**	**0**
			Herbs	The number of herbs or forb species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**2**	**16**	**8**	**21**
		The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	**3**	**10**	**7**	**17**
			Reeds	The number of reed, sedge or rush species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**1**	**3**	**3**	**3**
			Vines	The number of vines or climbing species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**0**	**0**	**0**	**1**
			Ferns	The number of ferns comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**0**	**0**	**0**	**1**
			Aquatic	The number of aquatic plants comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	**0**	**0**	**0**	**0**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								**Lower KPI**	**Upper KPI**	**Lower KPI**	**Upper KPI**
Phase 5: Ecosystem & Landuse Development	**Landscape Function Analysis (LFA): Landform function and ecological performance**	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	LFA infiltration index provides an indication of the sites infiltration capacity and is comparable to or trending towards that of the local remnant vegetation	✓		%	**50.7**	**61.9**	**42.8**	**58.2**
			LFA Nutrient recycling	LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and is comparable to or trending towards that of the local remnant vegetation	✓		%	**47.6**	**58.1**	**37.7**	**55.9**
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Litter cover	Percent ground cover provided by dead plant material is comparable to that of the local remnant vegetation		✓	%	**76.0**	**90.8**	**70.5**	**75.5**
			Annual plants	Percent ground cover provided by live annual plants is comparable to that of the local remnant vegetation		✓	<%	**0**	**0**	**0**	**0.5**
			Cryptogam cover	Percent ground cover provided by cryptogams (eg mosses, lichens) is comparable to that of the local remnant vegetation		✓	%	**0**	**10.5**	**0**	**0**
			Rock	Percent ground cover provided by stones or rocks (> 5cm diameter) is comparable to that of the local remnant vegetation		✓	%	**0**	**1**	**0**	**1.5**
			Log	Percent ground cover provided by fallen branches and logs (>5cm) is comparable to that of the local remnant vegetation		✓	%	**0**	**6**	**0**	**4**
			Bare ground	Percentage of bare ground is less than or comparable to that of the local remnant vegetation		✓	< %	**0**	**15.5**	**1.5**	**3**
			Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (<0.5m in height) is comparable to that of the local remnant vegetation	✓		%	**0**	**9**	**21**	**22.5**
			Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation	✓		%	**84.5**	**100**	**97**	**98.5**
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation	✓		> species/ m^2	**0**	**3.2**	**1.2**	**4.8**
			Exotic understorey abundance	The abundance of exotic species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has less than or an equal number of native species as the local remnant vegetation		✓	< species/ m^2	**0**	**1**	**1.2**	**1.6**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								**Lower KPI**	**Upper KPI**	**Lower KPI**	**Upper KPI**
Phase 5: Ecosystem & Landuse Development	**Native ground cover abundance**	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	The percent ground cover abundance of native species (<0.5m) compared to exotic species is comparable to that of the local remnant vegetation	✓		%	**0**	**100**	**42.4**	**86.8**
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees <0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	✓		No./area	**0**	**73**	**2**	**33**
			shrubs and juvenile trees 0.5 - 1m in height	The number of shrubs or juvenile trees 0.5-1m in height provides and indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	**0**	**75**	**4**	**23**
			shrubs and juvenile trees 1 - 1.5m in height	The number of shrubs or juvenile trees 1-1.5m in height provides and indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	**0**	**39**	**1**	**1**
			shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	✓		No./area	**0**	**19**	**1**	**3**
			shrubs and juvenile trees >2m in height	The number of shrubs or juvenile trees >2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	**0**	**9**	**1**	**4**
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	**0**	**8**	**0**	**0**
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	**0**	**0**	**0**	**9**
			Foliage cover 4 - 6m	Projected foliage cover provided by perennial plants in the 4 -6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation		✓	% cover	**0**	**5**	**0**	**17**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								**Lower KPI**	**Upper KPI**	**Lower KPI**	**Upper KPI**
Phase 5: Ecosystem & Landuse Development	**Ecosystem structure**	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover >6m	Projected foliage cover provided by perennial plants >6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	**51**	**56**	**37**	**60**
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	The diversity of trees or shrubs with a stem diameter greater than 5cm is comparable to the local remnant vegetation		✓	species/area	**1**	**6**	**3**	**5**
				The percentage of maturing trees and shrubs with a stem diameter greater than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	✓		%	**100**	**100**	**100**	**100**
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to that of the local remnant vegetation	✓		No./area	**9**	**43**	**8**	**26**
			Average dbh	Average tree diameter of the tree population provides a measure of age, (height) and growth rate and that it is trending towards that of the local remnant vegetation.		✓	cm	**25**	**64**	**31**	**72**
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	The percentage of the tree population which are live individuals and that the percentage is comparable to the local remnant vegetation		✓	% population	**88.9**	**100**	**87.5**	**92.3**
			Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation	✓		% population	**11.1**	**70.833**	**0**	**19.2**
			Medium health	The percentage of the tree population which are in a medium health condition and that the percentage is comparable to the local remnant vegetation		✓	% population	**20.8**	**77.8**	**69.2**	**87.5**
			Advanced dieback	The percentage of the tree population which are in a state of advanced dieback and that the percentage is comparable to the local remnant vegetation		✓	% population	**0**	**4.7**	**0**	**3.8**
			Dead Trees	The percentage of the tree population which are dead (stags) and that the percentage is comparable to the local remnant vegetation		✓	% population	**0**	**11.1**	**7.7**	**12.5**
			Mistletoe	The percentage of the tree population which have mistletoe provides an indication of community health and habitat value and that the percentage is comparable to the local remnant vegetation		✓	% population	**0**	**10.0**	**3.8**	**12.5**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2016 Woodland ecosystem range		2016 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 5: Ecosystem & Landuse Development	**Ecosystem health**		Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation	✓		% population	**40**	**83.3**	**0**	**0**
			Hollows	The presence of hollows provides evidence that the ecosystem is maturing and can provide habitat resources comparable to that of the local remnant vegetation		✓	% population	**0**	**44.4**	**7.7**	**37.5**

9.11 WEEDS CONTROL MEASURES.

The following table provides a list of known noxious and priority weeds that occur within the region of the three offset portions (drawn from vegetation surveys, management experience and regional observations). Weeds have been prioritised based on noxious weed declarations, known invasiveness, known impact on biodiversity and means / risk of rapidly spreading. The list of priorities will be used to assist in the preparation and execution of field based weed control.

The control of weeds will be undertaken using an integrated approach that reduce the prevalence of the weed (including preventing seed set, spread etc) and increases the presence of desirable species that will eventually occupy the space or niche of the weed and outcompete future establishing weeds. Control means will include:

- Chemical (undertaken in accordance with NSW DPI - Noxious and Environmental Weed control handbook, product labels and SDS).
- Mechanical (slashing, physical removal, low impact bush regeneration techniques)
- Biological (biological control agents, livestock grazing)

Methods of replacing the weed with desirable species will include:

- Planting
- Seeding
- Selective weed control
- Other practices that may stimulate native species regeneration (for example low intensity burning, soil disturbance etc)

Weed control will be undertaken by local specialist weed contractors and / or bush regeneration companies (remnant areas)

Acronyms
NOX = Declared Noxious (either within Cabonne Council or Upper Macquarie County Council areas)
WONS = Weed of National Significance

Definitions
Known = known to occur within the region / offset areas
Potential = not currently known to occur, has potential to become established in the area.

Weed	NOX	WONS	Known	Potential	Control Options	Timing	Priority
Blackberry *(Rubus fruticosus* agg. spp *)*	X	X	X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
St Johns Wort *(Hypericum perforatum)*	X		X		Selective herbicide (spray) Strategic grazing where possible to reduce seed set Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
Bathurst Burr *(Xanthium spinosum)*	X		X		Selective herbicide (spray) Mechanical / chipping for isolated plants / small patches. Strong competition to reduce establishment.	Following summer rains and before seed set.	High
Sweet Briar *(Rosa rubiginosa)*	X		X		Selective herbicide (spray / cut stem method) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	High
Hawthorn *(Crataegus spp)*				X	Selective herbicide (spray / cut stem / injection method) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Medium
Serrated Tussock *(Nassella trichotoma)*	X	X	X		Semi-selective herbicide (spray) Strong competition to reduce establishment Mechanical / chipping for isolated plants / small patches	Late winter / early spring prior to seed set	High
Chilean needle grass *(Nassella neesiana)*	X	X	X		Semi-selective herbicide (spray) Strong competition to reduce establishment Mechanical / chipping for isolated plants / small patches. Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	High
Phalaris *(Phalaris aquatica)*			X		Non-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set	Late winter / early spring prior to seed set	Low
Cocksfoot *(Dactylis glomerata)*			X		Non-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set	Late winter / early spring prior to seed set	Low
Scotch thistle *(Onopordum spp)*	X		X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	High
Nodding Thistle *(Carduus nutans)*	X			X	Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	High
Sticky Nightshade *(Solanum Sisymbriifolium)*				X	Selective herbicide (spray) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Medium
Other thistles (Asteraceae family)			X		Selective herbicide (spray) Strategic grazing (spray graze) where possible to reduce seed set Strong competition to reduce establishment. Biological control options available (species specific).	Late winter / early spring prior to seed set	Low
Basket Willow *(Salix viminalis)*		X	X		Non-selective herbicide (Spray / cut stump / injection methods) Mechanical removal	Spring / summer while actively growing.	High

Weed	NOX	WONS	Known	Potential	Control Options	Timing	Priority
Brome grass *(Bromus spp.)*			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Spring / early summer prior to seed set.	Low
Horehound *(Marrubium vilgare)*			X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	Medium
Sifton bush *(Cassina arcuate)*	X		X		Native colonising species: will only be controlled where dominant and excluding the regeneration / establishment of other native species. Selective herbicide (spray) Mechanical ripping / slashing Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Low
Paterson's Curse *(Echium plantagineum)*			X		Selective herbicide Strategic grazing (spray graze) where possible to reduce seed set Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	Low
Hemlock *(Conium maculatum)*				X	Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Fleabane *(Conyza spp.)*			X		Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Capeweed *(Arctotheca calendula)*			X		Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Blackberry nightshade *(Solanum nigrum)*			X		Selective herbicide (spray) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	High
Barley Grass *(Hordeum leporinum)*			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	Low
Ryegrass *(Lolium spp)*			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	Low
Privet *(Ligustrum spp)*	X			X	Selective herbicide (Spray / cut stump / injection methods) Mechanical removal	Spring / early summer prior to seed set.	High
English / scotch Broom *(Cytisus spp)*	X	X		X	Selective herbicide (Spray / cut stump / injection methods) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
Heliotrope *(Heliotropium spp)*			X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	Medium
Fireweed (Senecio madagascariensis)				X	Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Medium

9.12 PESTS AND PEST CONTROL MEASURES

The following table provides a list of known pests that occur within the region of the three offset portions (drawn from fauna surveys, management experience and regional observations). Pests have been prioritised based on their potential to impact on biodiversity / desired outcomes. The list of priorities will be used to assist in the preparation and execution of field based pest control.

The control of pests will be undertaken using an integrated approach that reduce the prevalence (and impact) of the pest and include destruction of the pest / removal of harbor / habitat where possible.

Where poisoning is identified as a potential control option, works will be conducted in conjunction with Central Tablelands Local Land Services. Works will be implemented by local qualified pest control contractors.

Pest	Status	Known / Potential	Control Options.	Priority
Feral Pig *(sus scrofa)*	NSW declared pest species	Known	Trapping Shooting 1080 poisoning	High
Fox *(Vulpes vuples)*	NSW declared pest species	Known	Shooting 1080 poisoning	High
Rabbit *(Oryctolagus cuniculus)*	NSW declared pest species	Known	Pindone / 1080 poisoning Harbor / burrow destruction	High
Wild Dog *(Canis lupus)*	NSW declared pest species	Potential	Shooting 1080 poisoning	High
Feral cat *(Felis catus)*		Known	Trapping Shooting	High
Brown Hare *(Lepus europaeus)*		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low
Eastern Grey Kanagaroo (Macropus giganteus)		Known	Will only be controlled where population numbers are impacting on biodiversity outcomes. Shooting / commercial harvesting. (Pending approval / issue of tags by NPWS)	Medium
Fallow Deer		Known	Shooting	Medium
Livestock (Sheep, cattle, goats)		Known	Round-up, trapping, removal from offset areas. Exclusion through fencing. Shooting (feral goats)	Medium
Introduced birds: Common Blackbird Common Starling Common Myna House Sparrow		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low
Rodents: House mouse Black rat		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low

9.13 THREATENED SPECIES RECOVERY ASSISTANCE

The following table provides a summary of key considerations for known threatened species and Endangered Ecological Communities that occur within the offset portions. Information where available is drawn from draft or final recovery plans, threatened species profiles etc for the relevant species. Each management requirement has been included in the action plans (above) or other section within the plan and is referenced accordingly.

Species / Community	Reference	Key Management Requirements	Action Plan
Heath Monitor *(Varanus rosenbergi)*	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting)	1 & 2
		Maintain / improve structural diversity	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species	5
		Cease firewood collection / tidying up / removal of logs etc	6
		Cease bush rock removal.	6
Speckled Warbler *(Pyrrholaemus sagittatus)*	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting (open woodland)	1 & 2
		Maintain / improve structural diversity (Patches of dense shrubs for nesting)	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species and weeds	4 & 5
		Cease firewood collection / tidying up / removal of logs etc.	6
Brown Tree Creeper *(Climacteris picumnus)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat (open woodland)	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection / tidying up / removal of logs etc	6
		Control pest species and weeds	4 & 5
		Low frequency burning.	3
Diamond Fire-tail Finch *(Stagonopleura guttata)*	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting (open woodland)	1 & 2
		Diverse native understory	1 & 2
		Maintain / improve structural diversity (Patches of dense shrubs for nesting)	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species and weeds	4 & 5
		Cease firewood collection / tidying up / removal of logs etc.	6
		Reduce grazing by domestic stock.	7
Superb Parrot *(Polytelis swainsonii)*	National Recovery Plan for the Superb Parrot Polytelis swainsonii	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
Barking Owl *(Ninox connivens)*	DRAFT Recovery Plan for the Barking Owl Ninox connivens	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting (open woodland))	1 & 2
		Cease firewood collection.	6

Species / Community	Reference	Key Management Requirements	Action Plan
Little Eagle (*Hieraaetus morphnoides*),	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat	1 & 6
		Conservation of large habitat trees for nesting)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
		Risk on non-target damage through fox and rabbit poisoning programmes	6
Yellow-bellied Sheathtail Bat *(Saccolaimus flaviventris)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
Large Bentwing Bat *(Miniopterus schreibersii)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat in vicinity of cave locations.	1 & 2
		Conservation of bush rock / rock escarpments / caves	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection	6
		Control pest species and weeds	4 & 5
*Squirrel Glider *(Petaurus norfolcensis)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of bushland habitat with shrub / acacia mid-story.	2
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
White Box, Yellow Box, Blakely's Red Gum Woodland. Grassy White Box Woodlands. Yellow Box/Red Gum Grassy Woodlands.	National Recovery Plan: White Box- Yellow Box-Blakely's Red Gum Grassy Woodland and Derives Native Grassland.	**Objectives**	
		Achieve no net loss in extent and condition of the EEC	1 & 2
		Increasing protection of sites in good condition	1 & 2
		Increasing landscape function of the EEC through management and restoration	1 & 2 Section 9.10
		Increasing transitional areas around remnants and linkages between remnants.	Section 3.9
		Management Practices	
		Avoid fertiliser use	1
		Control weeds	4
		Regeneration works (correct species selection, density of planting)	1 & 2
		Maintain / improve connectivity	Section 3.9
		Maintain / improve structural diversity	1 & 2
		Use strategic grazing / otherwise exclude	7
		Use appropriate burning regimes and intensity	3
		Control pest species	5
		Cease firewood collection / tidying up / removal of logs etc	6
*Identified in 2008 survey of Black Rock Range: not identified during 2006 survey.			

9.14 REVEGETATION OF CLEARED AREAS

The following figures show areas within the Cadia East Offset (Black Rock Range (Figure 9.8), Flyers Creek (Figure 9.9) and Stratton Vale (Figure 9.10) portions that require rehabilitation. The vegetation community proposed (either 1a or 2b) has been selected to mirror the adjacent vegetation type suitable to the location (based on soil and topography). The vegetation types have been described by FloraSearch (FloraSearch 2005)

A priority for offset areas will be to manage the site to reinstate ecological functionality (in line with the principles of Landscape Function Analysis) particularly on the upper eastern slopes of Black Rock Range. Works may include:

- Seeding / encouragement of perennial (native) grasses on degraded slope areas to trap sediment, nutrient and water. This may initially be undertaken in strips across the contour and encouraged / expanded to cover more of the slope areas. Seeding other species (in line with target vegetation community) as the slopes stabilise.
- In line with Natural Sequence Farming principles, installation of 'leaky weir' structures (rock boulders / logs etc) in upper slope drainage lines to trap sediment, nutrient and water.
- Management to encourage the build up of organic matter and improvement in soil health / structure. Intermittent disturbance may be used (such as occasional grazing) to assist in the process.

Prior to undertaking additional rehabilitation works an assessment will be carried out on the resilience of the area and whether the native vegetation community is capable of 'self or assisted' repair, back to a functional community. If the area has good resilience the area will be encouraged to return without intensive rehabilitation works. Several tools may be trialled and used to assist the recovery including targeted grazing, scarification, fire, brush matting and seed broadcast.

The following methods will be applied to areas with low resilience:

- Direct seeding (restricted to trafficable / arable areas)
    - Site preparation (2-3 knockdown sprays applied in 2m bands along the contour at a suitable spacing – nominally 5 metres apart)
    - Selection of appropriate native species seed consistent with the target community
    - Direct seeding (along the contour in prepared areas)
    - Monitoring of representative sites
    - Maintenance (including re-sowing if required)

- Planting of tubestock (all other areas).
    - Site preparation (knockdown spray)
    - Ripping (across the contour)
    - Site preparation (2nd knockdown spray)
    - Planting tubestock consistent with the target community
    - Knockdown spray (around planted tubestock)
    - Monitoring of representative sites
    - Maintenance (including weed control and replanting if required)

Species selection for revegetation will be based on the following lists (for Communities 1a, 2b and gully / riparian areas) which have been extracted from the FloraSearch survey (FloraSearch 2005) conducted as part of the Cadia East Environmental Assessment or from baseline vegetation assessments. From the survey lists, the following native species (Table 4.1) have been selected due to the potential for the collection and germination of seed to produce tubestock and / or for direct seeding purposes. The actual species sown / planted will depend on the availability of seed at the time of conducting rehabilitation works.

During implementation of the above rehabilitation techniques, species lists, numbers of tubestock for each species and seeding rates will be adjusted in an attempt to provide the structural diversity for the target vegetation community. Relevant reference sites used in the CVO annual rehabilitation monitoring program will also be used to determine appropriate species and densities. For example for woodland community 1a, CVO will attempt to rehabilitate the area with a eucalypt canopy with a relatively sparse mid-story and an under-story dominated by native grasses and herbs.

At Black Rock Range, a large proportion of the target vegetation community exists as a degraded native grassland and therefore rehabilitation efforts will largely focus on reinstating 'missing' structural elements and species which are primarily tree and shrub species. A reduction in grazing pressure initially followed by planned intermittent grazing is likely to assist the recovery of ground flora. Regular monitoring and comparison to reference sites will determine the need for assisted regeneration.

At Flyers Creek, the understory is dominated by introduced perennial grasses and there are few native ground cover species. In these sites, the aim will be to increase the tree and shrub cover.

At Stratton vale portion is open White Box remnant with improved pastures (Phalaris) which dominate the paddock clearings but *Bothriochloa* and *Microlaena* persist within the rocky areas. Mixture of large old growth trees and regrowth trees.

Rehabilitation success will be determined as described in Section 9.10

Potential species for rehabilitation (communities 1a, 2b & gully / riparian)

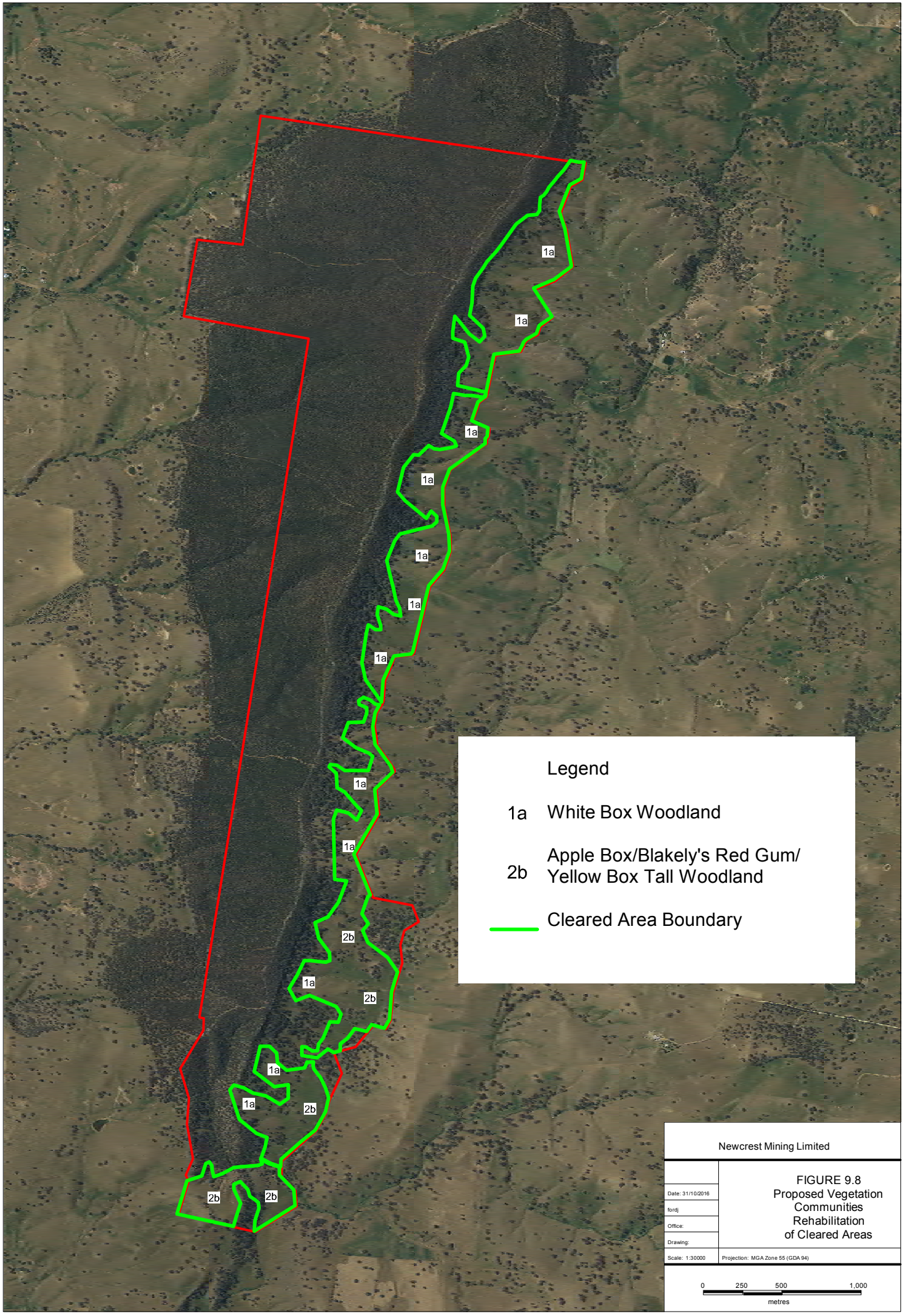
Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Cupressaceae				
Callitris endlicheri	Black Cypress Pine	●		●
Casuarinaceae				
Casuarina cunninghamiana	River she-oak			●
Allocasuarina diminuta				●
Dillenaceae				
Hibbertia obtusifolia	Grey Guinea Flower	●	●	●
Epacridaceae				
Brachyloma daphnoides	Daphne Heath			●
Styphelia triflora	Five Corners	●		●
Fabaceae: Faboideae				
Dillwynia phylicoides				●
Glycine clandestina	Twining Glycine	●		●
Hardenbergia violacea	False Sarsaparila	●		●
Indigofera australis	Austral Indigo	●		●
Pultenaea procumbens	Heathy Bush-pea			●
Fabaceae: Mimosoideae				
Acacia buxifolia	Box-leaf Wattle			●
Acacia dealbata	Silver Wattle	●	●	●
Acacia decora	Western Golden Wattle	●	●	
Acacia doratoxylon	Currawang	●		●
Acacia implexa	Hickory	●		●
Acacis leucolada		●	●	
Acacia melanoxylon	Blackwood wattle			●
Acacia paradoxa	Kangaroo Thorn		●	●
Acacia pennivervis	Mountain Hickory			●
Acacia ulicifolia	Prickly Moses			●
Acacia vestita	Boree wattle	●	●	●
Goodeniaceae				
Goodenia hederacea			●	●
Goodenia pinnatifida	Ivy Goodenia		●	
Myrtaceae				
Calytrix tetragona	Fringe-myrtle			●
Eucalyptus albens	White Box	●	●	●
Eucalyptus blakelyi	Blakely's Red Gum		●	●
Eucalyptus bridgesiana	Apple Box		●	●
Eucalyptus dealbata	Tumbledown Red Gum			●
Eucalyptus goniocalyx	Bundy		●	●
Eucalyptus melliodora	Yellow Box		●	●
Eucalyptus macrorhyncha	Red Stringybark	●	●	●
Eucalyptus polyanthemos	Red Box	●	●	●
Eucalyptus viminalis	Ribbon Gum		●	●
Leptospermum multicaule	Silver Teatree			●

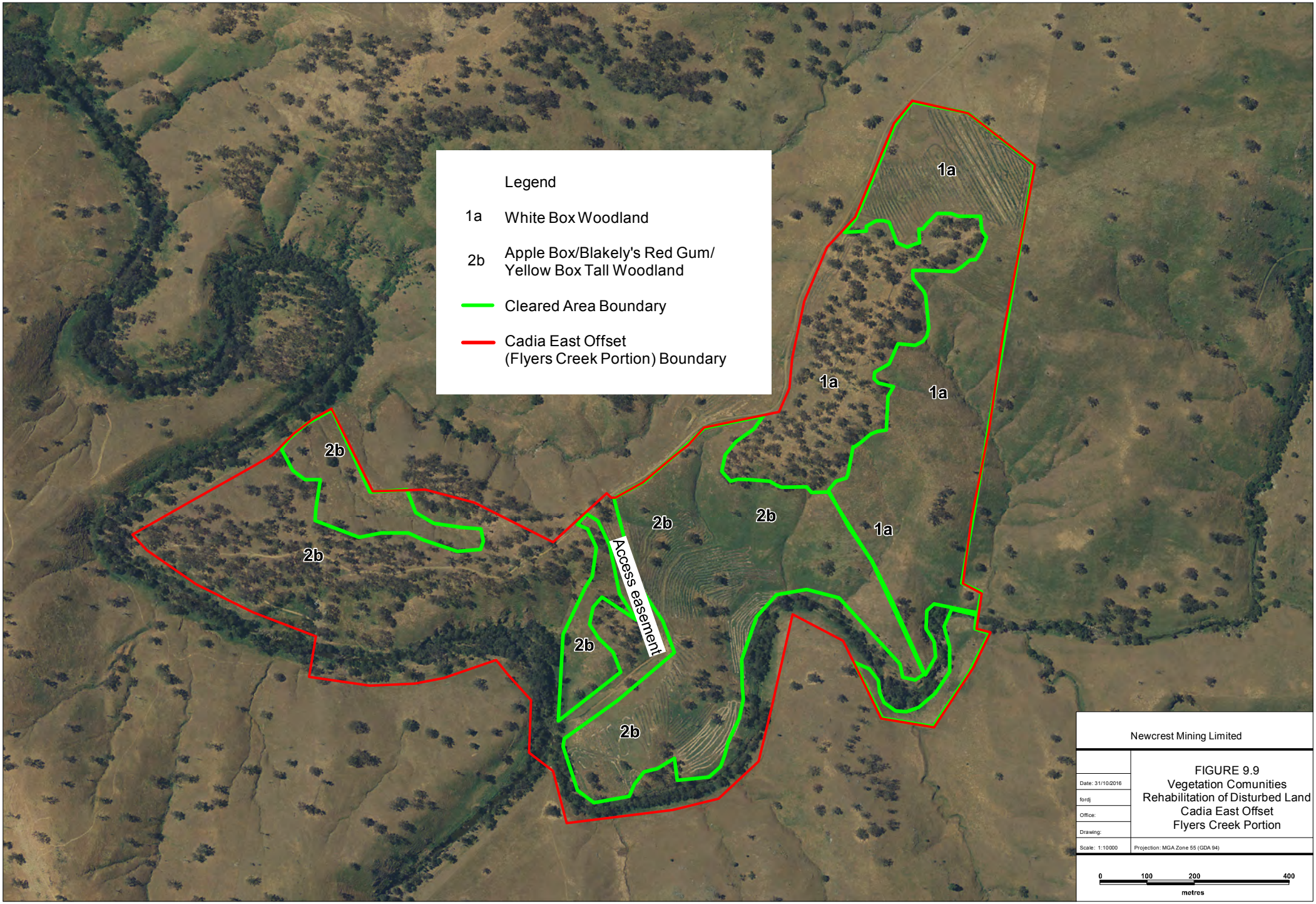
Table 4.1 Potential species for rehabilitation (communities 1a, 2b & gully / riparian) (*continued*)

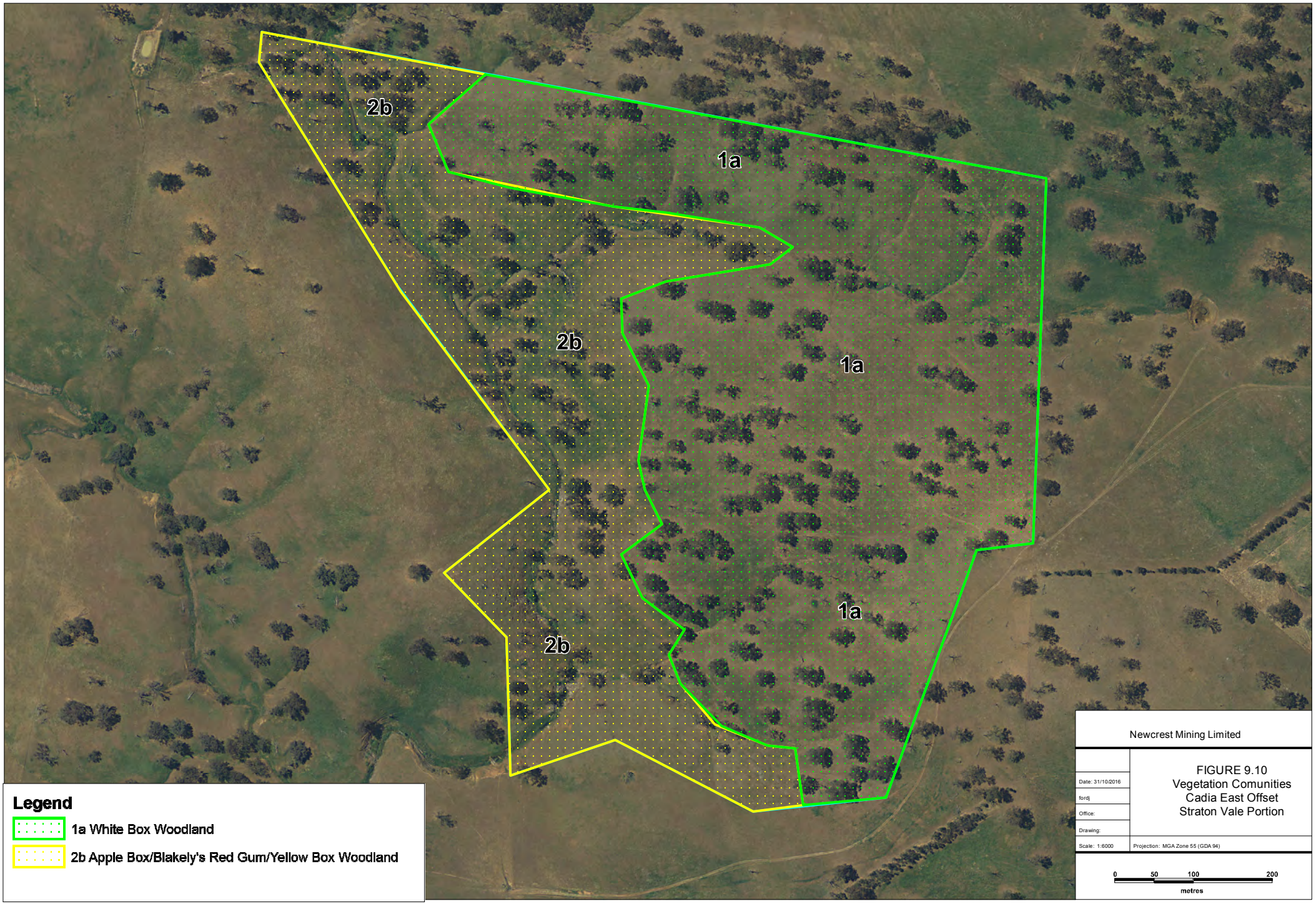
Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Pittosporaceae				
Bursaria spinosa		●	●	●
Proteaceae				
Grevillea floribunda ssp. *floribunda*	Seven Dwarfs Grevillea			●
Grevillea ramosissima ssp. *ramosissima*	Fan Grevillea			●
Sapindaceae				
Dodonaea viscosa ssp. *spatulata*	Sticky Hop-bush	●		●
Santalaceae				
Exocarpus cupressiformis	Native Cherry			●
Sterculiaceae				
Brachychiton populneus	Kurrajong	●	●	
Cyperaceae				
Carex appressa				●
Carex inversa	Knob Sedge	●	●	●
Isolepis hookeriana				●
Lepidosperma laterale	Broad Sword-sedge	●		●
Luzula meridionalis	Field Woodrush	●	●	●
Schoenus apogon			●	
Juncaceae				
Juncus homalocaulis	A Rush	●	●	
Juncus remotiflorus				●
Juncus subsecundus	A Rush	●	●	●
Lomandraceae				
Lomandra filiformis ssp. *coriacea*	Wattle Matrush	●	●	●
Lomandra filiformis ssp. *filiformis*	Iron Grass			●
Lomandra glauca	Pale Matrush			●
Lomandra multiflora	Many-flowered Mat-rush	●		●
Phormiaceae				
Dianella caerulea				●
Dianella longifolia			●	
Dianella revoluta		●	●	●
Stypandra glauca	Nodding Blue Lily			●

Table 4.1 Potential species for rehabilitation (communities 1a, 2b & gully / riparian) (*continued*)

Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Poaceae				
Agrostis avenacea		●		
Aristida behriana	Bunch Wiregrass		●	
Aristida ramosa var. *speciosa*			●	●
Aristida vagans			●	
Austrodanthonia auriculata	Lobed Wallaby Grass	●		
Austrodanthonia caespitosa	Ringed Wallaby Grass		●	
Austrodanthonia eriantha	Hill Wallaby Grass	●	●	●
Austrodanthonia laevis		●		
Austrodanthonia racemosa var. *racemosa*	A Wallaby Grass	●	●	
Austrostipa densiflora				●
Austrostipa scabra ssp. *falcata*	Speargrass	●	●	
Bothriochloa macra	Red Grass	●	●	
Dichelachne hirtella	A Plumegrass		●	●
Dichelachne sieberiana	A Plumegrass			●
Echinopogon caespitosus				●
Echinopogon ovatus	Forest Hedgehog Grass	●		●
Eleocharys acuta	Spike rush			●
Elymus scaber	Wheat Grass	●	●	
Microlaena stipoides var. *stipoides*	Weeping Grass	●	●	●
Phragmites australia	common reed			●
Poa labillardieri	Tussock	●	●	●
Poa sieberiana var. *sieberiana*	Fine-leaved Tussock Grass	●	●	
Typha spp.	cumbungi / bullrush			●
Xanthorrhoeaceae				
Xanthorrhoea glauca ssp. *angustifolia*	A Grass Tree		●	●


1a
1a
1a
1a
1a
1a
1a
1a
1a
1a
2b
1a
2b
1a
1a
2b
2b
2b
Legend
1a White Box Woodland
2b Apple Box/Blakely's Red Gum/ Yellow Box Tall Woodland
Cleared Area Boundary
Newcrest Mining Limited
FIGURE 9.8
Proposed Vegetation Communities Rehabilitation of Cleared Areas
Date: 31/10/2016
fordj
Office:
Drawing:
Scale: 1:30000
Projection: MGA Zone 55 (GDA 94)
0 250 500 1,000
metres


Legend
1a White Box Woodland
2b Apple Box/Blakely's Red Gum/ Yellow Box Tall Woodland
Cleared Area Boundary
Cadia East Offset (Flyers Creek Portion) Boundary
1a
1a
1a
1a
2b
2b
2b
2b
2b
2b
Access easement
Newcrest Mining Limited
FIGURE 9.9
Vegetation Comunities
Rehabilitation of Disturbed Land
Cadia East Offset
Flyers Creek Portion
Date: 31/10/2016
fordj
Office:
Drawing:
Scale: 1:10000
Projection: MGA Zone 55 (GDA 94)
0 100 200 400
metres


2b
1a
2b
1a
1a
2b
Legend
1a White Box Woodland
2b Apple Box/Blakely's Red Gum/Yellow Box Woodland
Newcrest Mining Limited
FIGURE 9.10
Vegetation Comunities
Cadia East Offset
Straton Vale Portion
Date: 31/10/2016
fordj
Office:
Drawing:
Scale: 1:6000
Projection: MGA Zone 55 (GDA 94)
0
50
100
200
metres

Appendix C

THE ENVIRONMENTAL ASSESSMENT REPORT FOR THE CVO BIODIVERSITY OFFSET MODIFICATION

Cadia Valley Operations

Cadia Valley Operations Biodiversity Offset Area Modification

Environmental Assessment | May 2015

NEWCREST MINING LIMITED

CADIA VALLEY OPERATIONS BIODIVERSITY OFFSET AREA MODIFICATION

ENVIRONMENTAL ASSESSMENT

PREPARED BY
RESOURCE STRATEGIES PTY LTD

APRIL 2015
Project No. NEC-14-81
Document No. 00672356

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1 INTRODUCTION

1.1 BACKGROUND

Project Approval (PA) for the Cadia East Project was granted by the New South Wales (NSW) Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 6 January 2010 (PA 06_0295). The approval includes all components of the mining operations at Cadia (as described in Schedule 1 of the PA) including the Cadia East underground mine, Cadia Hill open cut mine, Ridgeway underground mine, the Concentrate Dewatering Facilities, and ancillary infrastructure. These integrated operations are herein referred to as the Cadia Valley Operations (CVO).

The CVO are located approximately 25 kilometres (km) south-west of Orange, in the Central Tablelands of NSW (Figure 1). Cadia Holdings Pty Limited (CHPL) is the owner and operator of the CVO and is a wholly owned subsidiary of Newcrest Mining Limited.

The Cadia Hill open pit, Ridgeway underground mine and Cadia East underground mine are located in the Cadia Valley within Mining Lease (ML) 1405, ML 1472, ML 1481 and ML 1449 (Figure 1). The Concentrate Dewatering Facilities are located approximately 25 km to the east of the Cadia Valley in the town of Blayney (Figure 1).

Operations at the Cadia Hill open pit ceased in 2012, and are currently under care and maintenance. With the Ridgeway Deeps extension, Ridgeway is currently scheduled to cease operations by 2017.

Cadia East involves panel cave mining to extract approximately 450 million tonnes of ore over a period of 21 years. The ore contains gold, copper and some molybdenum. Cadia East extends the life of the Cadia Valley Operations to approximately 2030. Figure 2 shows the approved General Arrangement at the end of the currently approved mine life.

The Cadia East underground mine is described in full in the Cadia East Project Environmental Assessment (the Cadia East EA) (CHPL, 2009). Since the grant of PA 06_0295, the following Modifications have been granted:

- Mod 1 (2010) – a modification to allow construction of a decline beneath Cadia Hill open pit.
- Mod 2 (2010) – a modification of operations at the existing Blayney Dewatering Facility.
- Mod 3 (2011) – a modification to allow the realignment of a section of the concentrate and return water pipelines to Blayney.
- Mod 4 (2014) – a Modification to allow hydraulic preconditioning.
- Mod 5 (2014) – a Modification to allow blasting preconditioning.

A further Modification is proposed to adjust the CVO biodiversity offset area (this Modification).

1.2 OVERVIEW OF THE PROPOSED MODIFICATION

The biodiversity offset area Modification would include the following components:

- An approximately 14.2 hectare (ha) area of land would be removed from the Belubula River/Flyers Creek portion of the CVO biodiversity offset area.
- An approximately 16.5 ha area of land would be removed from the Black Rock Range portion of the CVO biodiversity offset area.
- An approximately 60.7 ha[1] replacement area within the CHPL-owned 'Stratton Vale' property would be added to the CVO biodiversity offset.

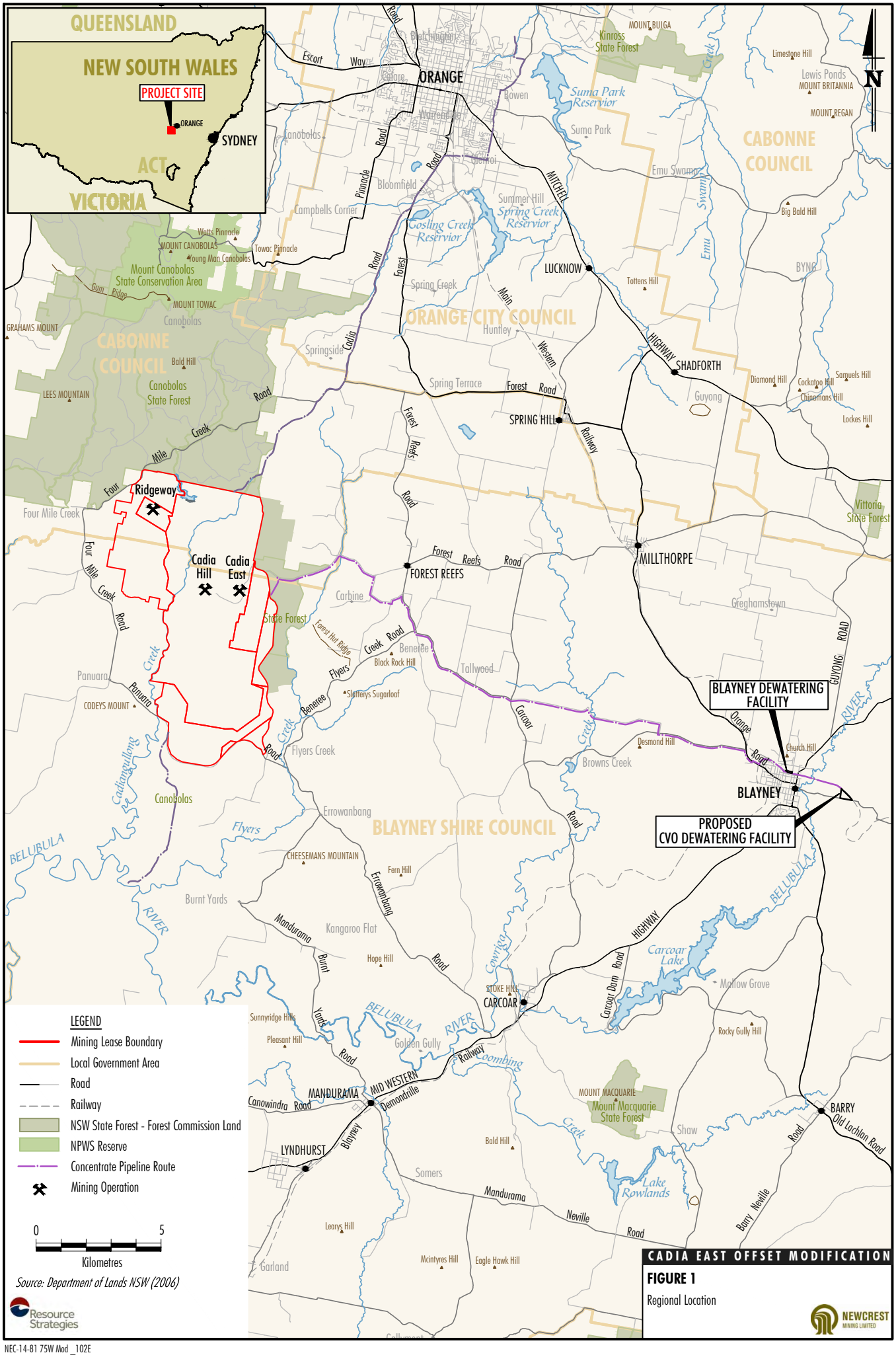
There would be no change to any of the currently approved mining operations and activities as a result of the Modification.

1.3 NEED FOR THE PROPOSED MODIFICATION

The CVO biodiversity offset strategy is described in the Cadia East EA (CHPL, 2009) and is shown in Figure 3.

CHPL has recently discovered that there are some small land parcels within the CVO biodiversity offset area nominated in PA 06_0295 that are unable to be secured in perpetuity due to several cadastral issues. These parcels of land are located in the vicinity of the Belubula River and Flyers Creek confluence, in the southern part of the Black Rock Range offset area, and at a Trigonometry (Trig) Station located on the ridgeline at Black Rock Range. Figures 4 and 5 show the locations of these areas.

[1] Note that the exact size of the replacement area would be subject to final survey.



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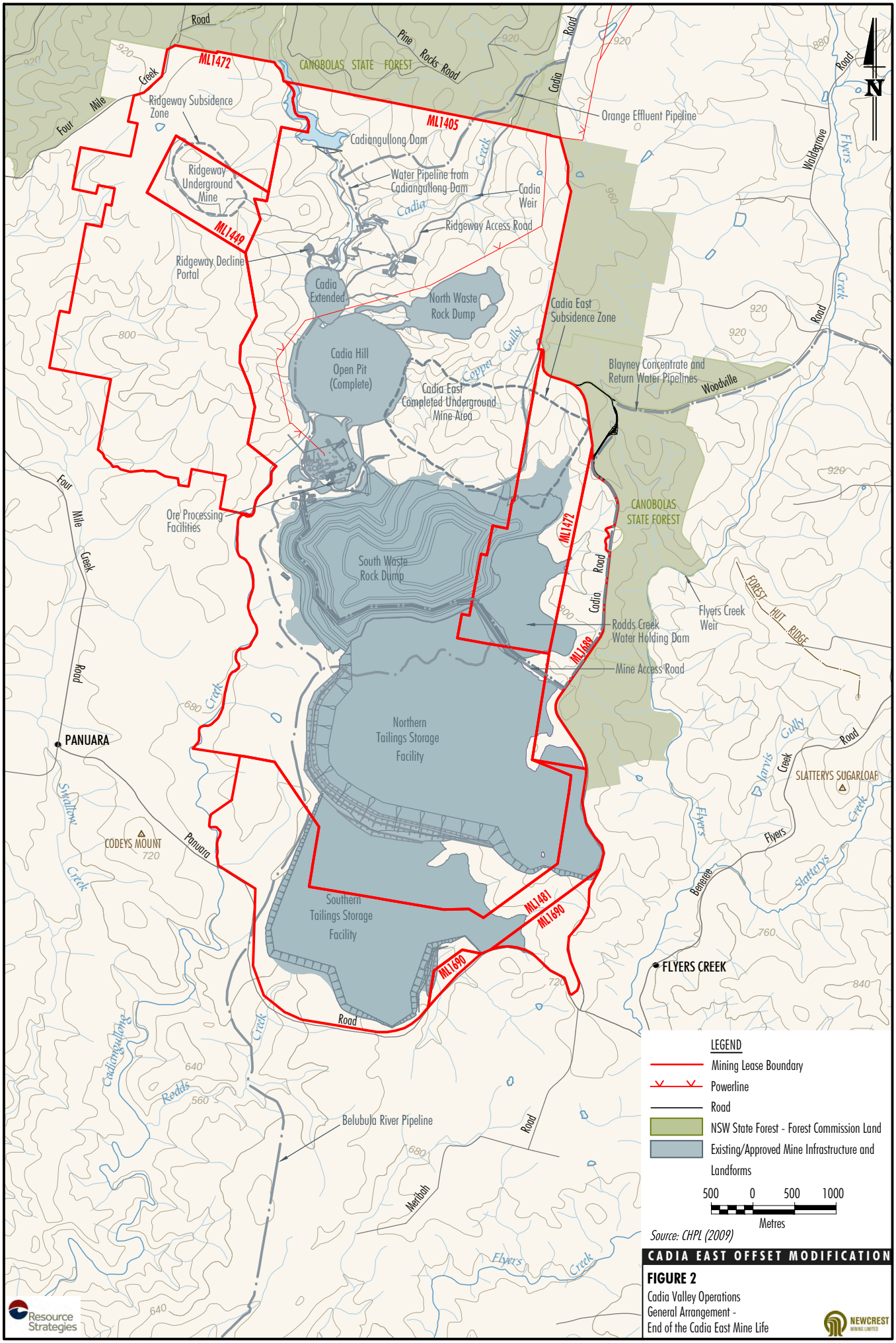

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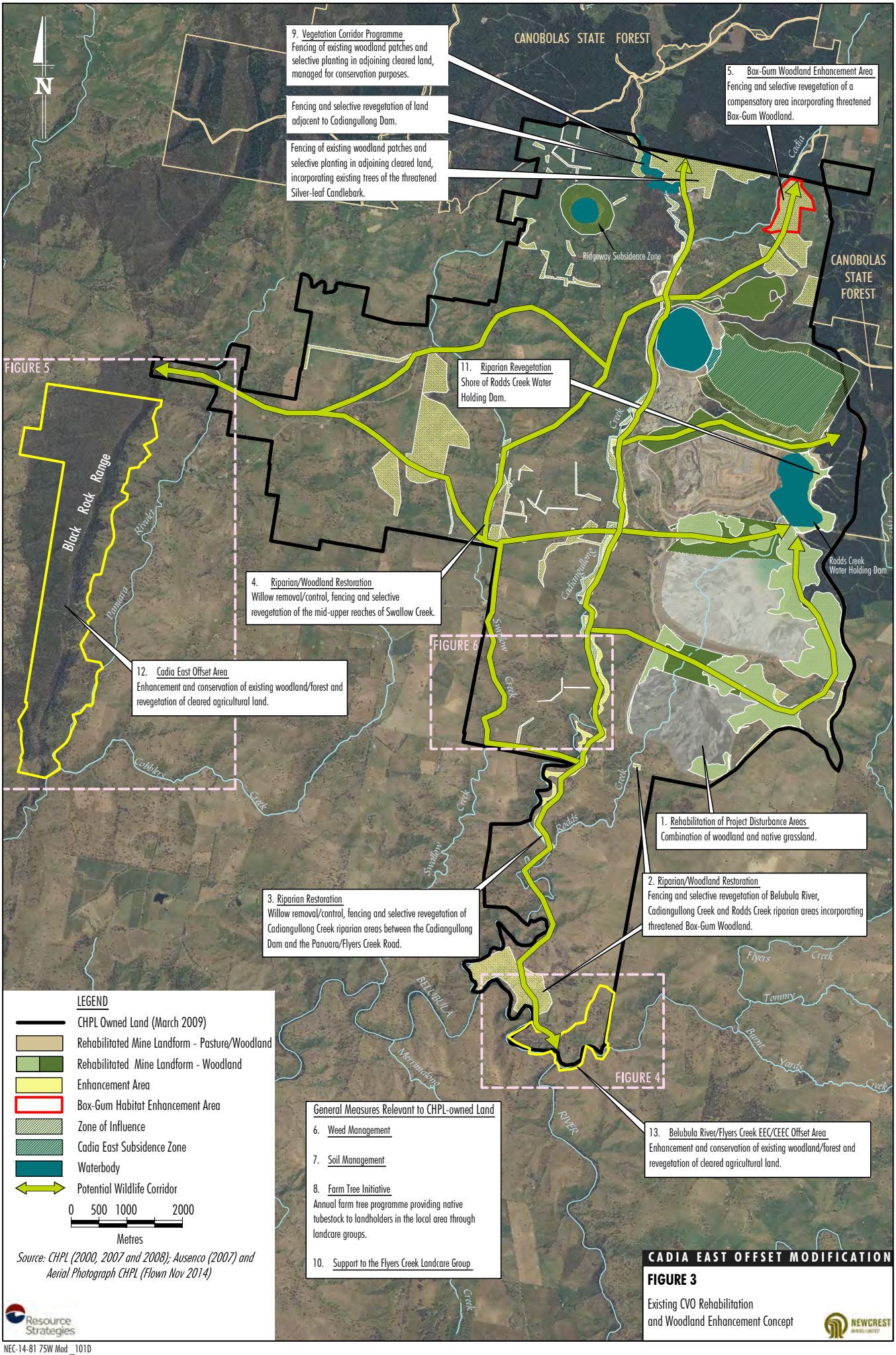

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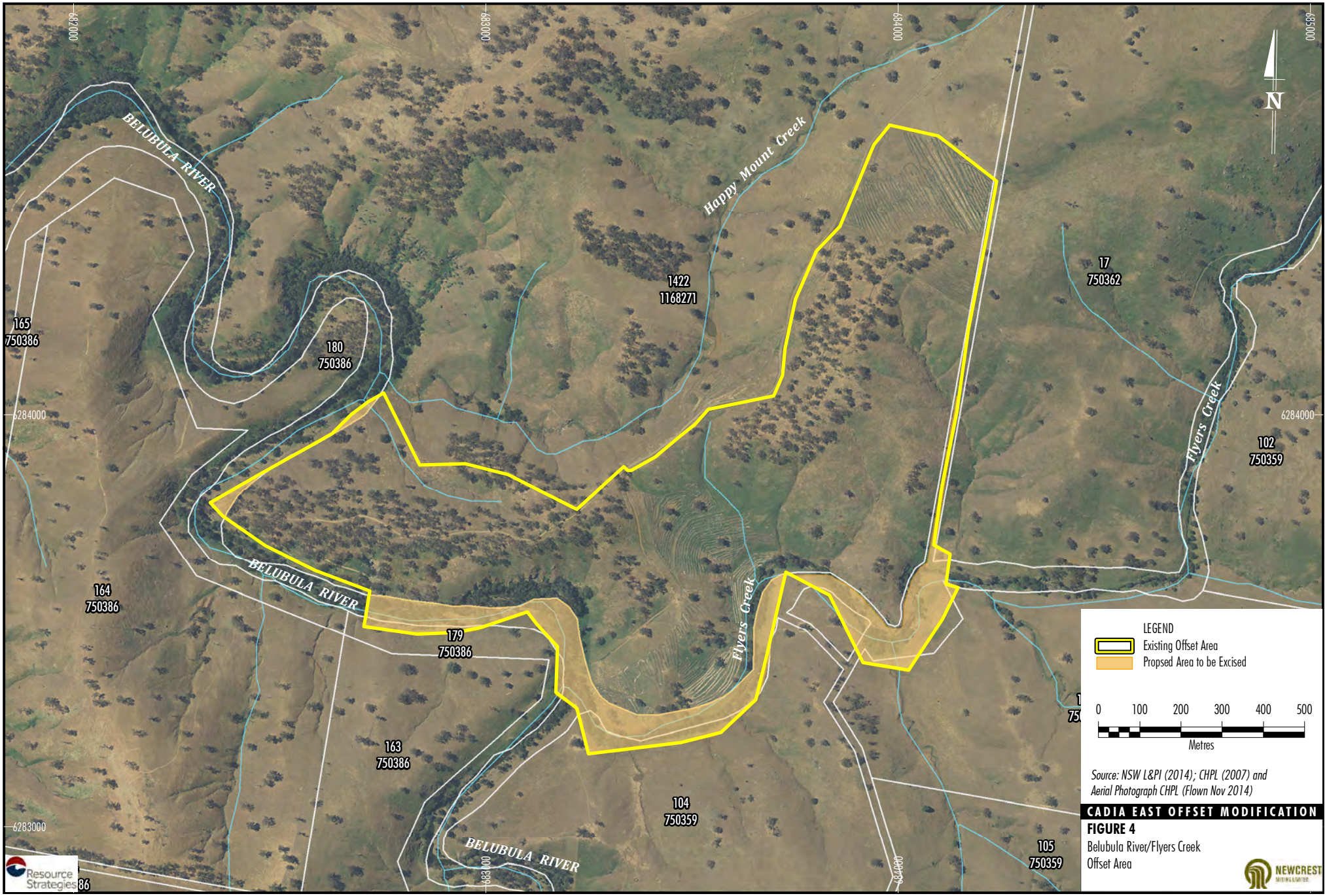

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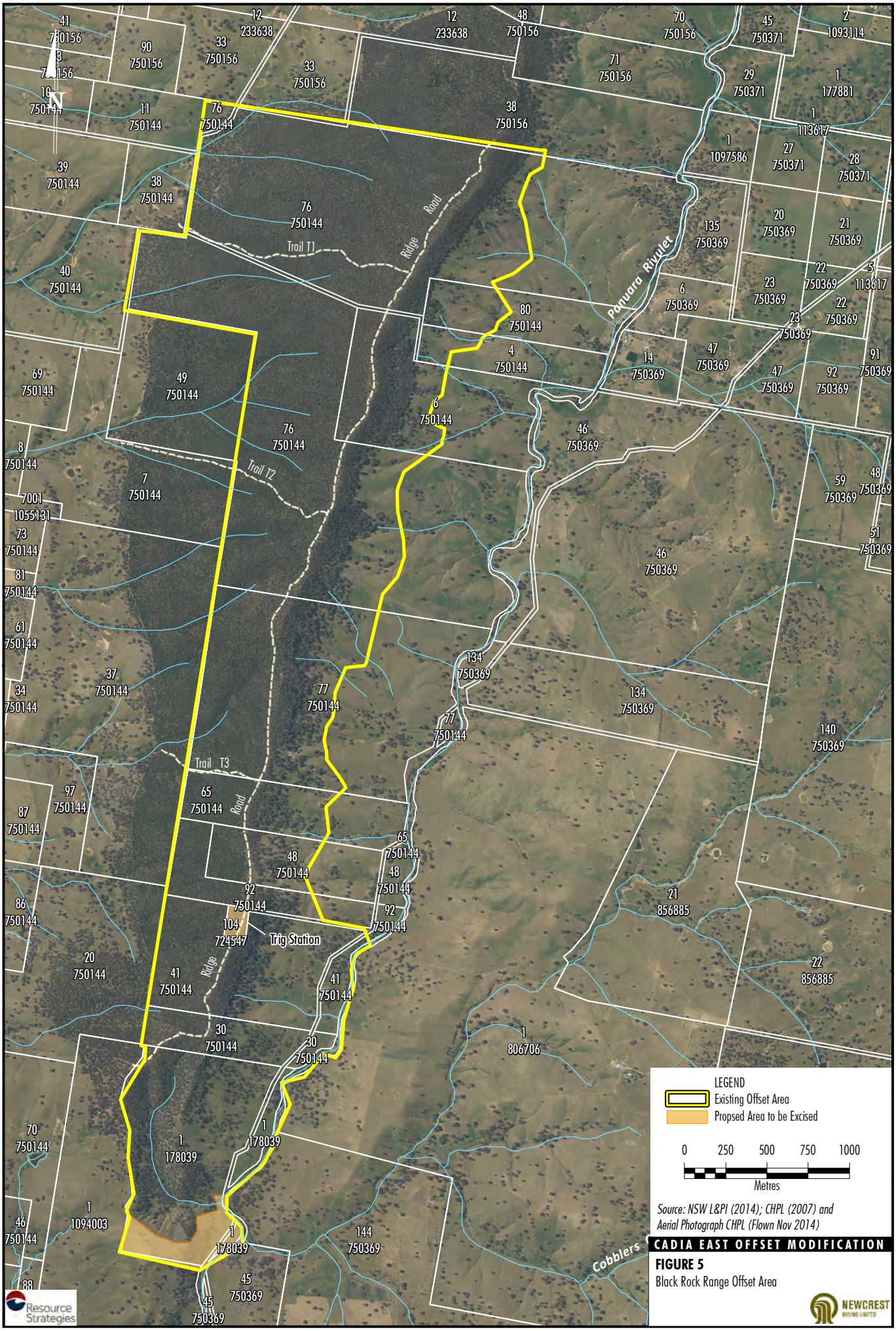

CADIA EAST OFFSET MODIFICATION

FIGURE 5

Black Rock Range Offset Area

Resource Strategies

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NEC-14-81_75W Mod_207C

A modification to PA 06_0295 is required to remove these areas from the current CVO biodiversity offset strategy, and to replace them with a new area with equal or better biodiversity values within the Stratton Vale property.

1.4 LEGISLATIVE FRAMEWORK

New South Wales

Approval of the Modification is sought as a modification to PA 06_0295 under section 75W of the EP&A Act. Section 75W of the EP&A Act relevantly provides:

> ***75W Modification of Minister's approval***
>
> *(1) In this section:*
>
> ***Minister's approval** means an approval to carry out a project under this Part, and includes an approval of a concept plan.*
>
> ***modification of approval** means changing the terms of a Minister's approval, including:*
>
> *a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
>
> *b) changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
>
> *(2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
>
> *(3) The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
>
> *(4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.*
>
> *…*

Relevant conditions in PA 06_0295 that pertain to the CVO biodiversity offset strategy are repeated below.

> *38. The Proponent shall:*
>
> *(a) implement the biodiversity offset strategy as described in the EA, and summarised in Table 14 (and shown conceptually in Appendix 6); and*
>
> *(b) investigate ways to salvage and beneficially use resources (including timber, fauna habitat, seed and soil resources) in areas subject to subsidence as far as is reasonable and feasible,*
>
> *to the satisfaction of the Secretary.*

Table 14: Biodiversity Offset Strategy

Area	***Minimum Size***
Black Rock Range Offset Area – Enhancement Area	*653 ha*
Black Rock Range Offset Area – Revegetation Area	*173 ha*
Flyers Creek and Belubula River Offset Area	*112 ha*
Total	***938 ha***

> *39. Within 2 years of the date of this approval, the Proponent shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Secretary.*

Commonwealth

Approval for the Cadia East Project (EPBC 2006/3196) was granted by a delegate of the Commonwealth Minister for the Environment in February 2010 under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

Relevant conditions in EPBC 2006/3196 that pertain to the CVO biodiversity offset strategy are repeated below.

> *1. The person taking the action must prepare a plan to offset the loss of 23 ha of the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community.*
>
> *The plan must include:*
>
> - *The desired outcomes of implementing the plan;*
> - *The short (12 months from the date of the approval), medium (five years from the date of the approval) and long term measures that will be employed to implement the plan;*
> - *Details of how the person taking the action will provide for the long term security of the offset areas and details of the timing of when this will occur;*
> - *Detailed performance and completion criteria for the implementation of the plan, including details of methods to rehabilitate areas of the ecological community, and methods to control weeds, feral animals, grazing, access and bushfires;*

- *A detailed description of how the performance of the implementation of the plan would be monitored over time to achieve the performance and completion criteria;*
- *A description of the potential risks to successful management and rehabilitation in the offset area, and a description of the contingency measures that would be implemented to mitigate these risks; and*
- *Details of who is responsible for monitoring, reviewing and implementing the plan.*

The plan must be submitted to the Minister within 18 months of the date of this approval and prior to any subsidence impacts on the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community. The plan must be approved by the Minister and the approved plan must be implemented.

1.5 CONSULTATION FOR THE MODIFICATION

CHPL consulted with the NSW Department of Planning and Environment (DP&E) and the Commonwealth Department of the Environment (DotE) with regard to the proposed Modification in February 2015.

1.6 DOCUMENT STRUCTURE

The remainder of this Environmental Assessment (EA) is structured as follows:

Section 1 Provides an introduction to the Modification and the purpose of this EA, describes the structure of this EA and provides a summary of the consultation undertaken.

Section 2 Describes the approved CVO operations, the existing biodiversity offset strategy and the proposed Modification.

Section 3 Provides an environmental impact assessment of the proposed Modification.

Section 4 Provides a conclusion to this EA.

Section 5 Lists documents and reports referenced in this EA.

This EA is supported by the following specialist assessments:

Appendix A Flora Survey and Habitat Assessment (FloraSearch Pty Ltd).

2 OVERVIEW OF CADIA VALLEY OPERATIONS

2.1 BACKGROUND

The CVO have provided significant economic stimulus and employment generation to the region since Cadia Hill was approved in 1996. Mining at the Cadia Hill open pit commenced in 1998 after a two year construction phase, and was placed in care and maintenance in 2012.

Ore production from the Ridgeway underground mine commenced in 2002. A significant extension to the mine, called Ridgeway Deeps, is currently being mined. With the Ridgeway Deeps extension, Ridgeway is currently scheduled to cease operations within the next 1 to 2 years. Ridgeway Deeps uses block caving underground mining methods.

The CVO includes significant surface infrastructure developed since 1996, including ore processing, water management and staff facilities. Product concentrate is pumped to the Blayney Dewatering Facility and CVO Dewatering Facility (under construction) as a slurry, where it is dewatered and transported via rail.

The Cadia East Project involves the underground mining of a significant orebody adjacent to Cadia Hill. Cadia East was approved in 2010 and is described below.

2.2 CADIA EAST PROJECT

The major components of the Cadia East Project include:

- underground mining of approximately 450 million tonnes (Mt) of ore from the Cadia East deposit using the panel caving mining method;
- development of underground crushing, handling and conveyor systems to transfer ore and waste rock to the surface;
- development of supporting infrastructure for the underground mine including multiple ventilation shafts, and personnel and equipment access systems;
- upgrade of the existing Cadia Valley Operations ore processing facilities to accommodate the harder ore from Cadia East and to enable the total Cadia Valley Operations ore processing rate to increase from 24 Mtpa to approximately 27 Mtpa;
- construction and operation of a molybdenum recovery plant with a capacity of up to 460,000 tonnes per annum (tpa) and trucking of molybdenum products off-site;
- placement of waste rock produced by the Project in the existing South Waste Rock Dump;
- raising of the existing Northern Tailings Storage Facility (NTSF) and Southern Tailings Storage Facility (STSF) embankments to accommodate approximately 450 Mt of Cadia East tailings;
- augmentation and upgrade of the existing Cadia Valley Operations water management/supply system including development of additional pipeline/pumping systems and raising of the Rodds Creek Water Holding Dam;
- obtaining additional mining leases to facilitate the Project extensions of the STSF, NTSF, subsidence zone and Rodds Creek Water Holding Dam;
- re-alignment of a 1.1 km section of Cadia Road;
- construction of a new dewatering facility to the east of Blayney (known as the CVO Dewatering Facility);
- maintaining the existing Blayney Dewatering Facility to provide standby additional processing capacity during the peak production period from Year 3 to Year 7 and the decommissioning of this facility if it is deemed redundant after this time;
- installation of a new concentrate pipeline and return water pipeline between the Cadia Valley Operations and the CVO Dewatering Facility;
- increased rail transportation of dewatered mineral concentrate from Blayney to the eastern seaboard;
- augmentation, relocation and upgrade of supplementary surface facilities including workshops, administration and site access roads; and
- other associated modifications to existing infrastructure, plant, equipment and activities to allow mining of the Cadia East deposit and integration with the approved Cadia Valley Operations.

2.3 CVO BIODIVERSITY OFFSET STRATEGY

The Cadia East Project EA (CHPL, 2009) and PA 06_0295 describe the CVO biodiversity offset strategy. The strategy integrates rehabilitation activities with regional conservation initiatives, and was consistent with the NSW Department of Planning (now DP&E) Director-General's environmental assessment requirements (DGR's) and the NSW Department of Environment, Climate Change and Water (DECCW), DoP and the Commonwealth Department of Environment, Water, Heritage and the Arts (now DotE) biodiversity offset policies that were in place at the time.

The CVO biodiversity offset strategy, along with continued use of the on-site flora and fauna impact management measures and rehabilitation, was designed to mitigate the potential impacts associated with the clearing of approximately 238 ha of native vegetation. This vegetation included approximately 23.5 ha of NSW-listed Box-Gum Woodland Endangered Ecological Community (EEC), of which approximately 23 ha was the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community (CEEC).

The majority of the biodiversity offset area is located on Black Rock Range, which is situated approximately 11 km to the west of the CVO (Figure 3). The offset area contains approximately 653 ha of remnant vegetation and approximately 173 ha of predominantly cleared agricultural land, with the later to be fenced and revegetated. Similar vegetation communities occur in the Cadia East Project area and within the offset area, particularly White Box Woodland (community 1a), Red Stringybark/Long-leaved Box Open Forest (community 3a), and Red Box/Red Stringybark Open Forest (community 3b).

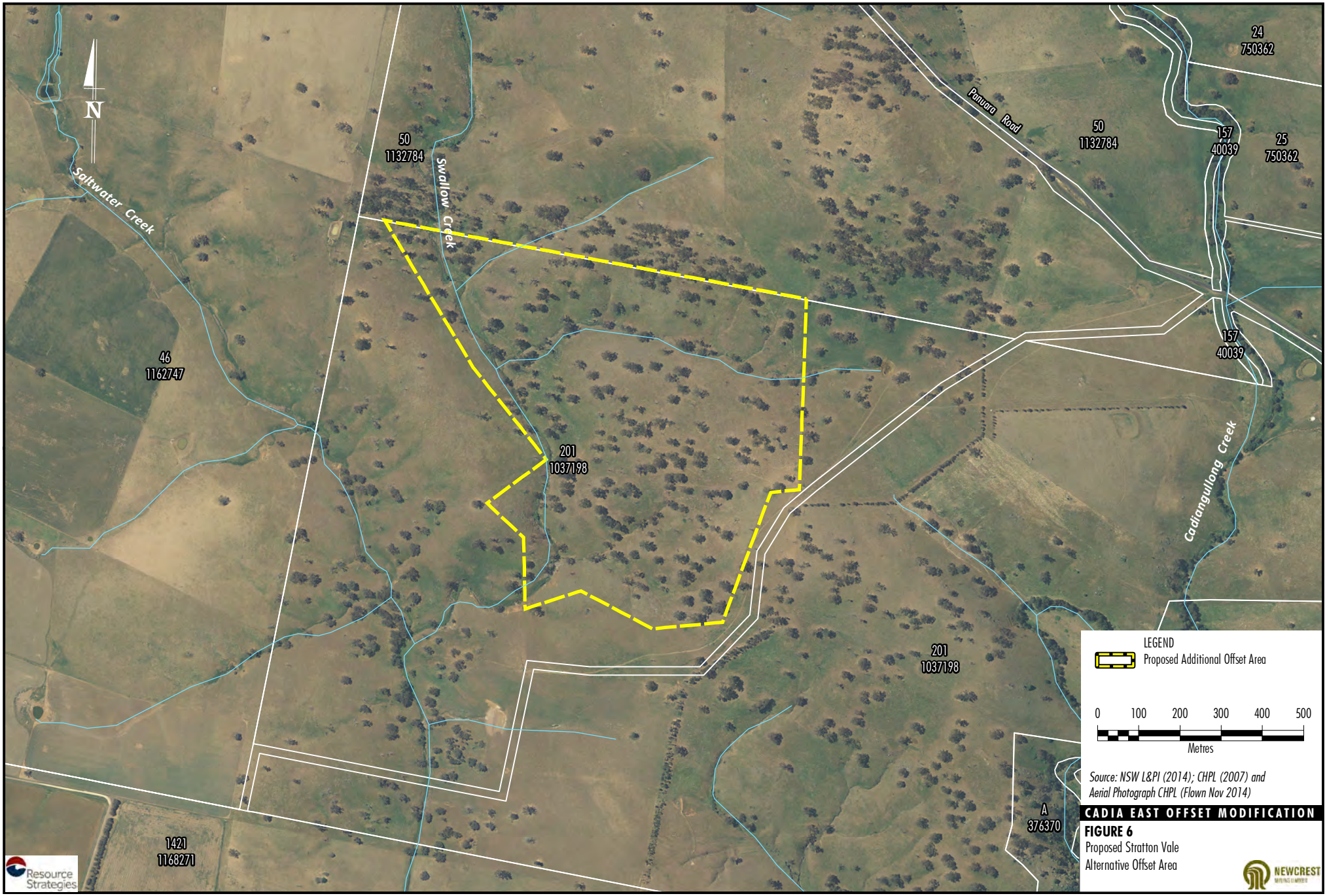
The Black Rock Range offset area contains significant areas of the NSW-listed Box-Gum Woodland EEC (i.e. approximately 210 ha) and the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community CEEC (i.e. approximately 154 ha). Figure 6 shows the 2009 mapping of vegetation communities at Black Rock Range.

The Black Rock Range offset area also adjoins approximately 1,200 metres (m) of the local creek to the east of the ridge (i.e. Panuara Rivulet). As a result, the proposed offset would directly link approximately one third of the length of Black Rock Range with Panuara Rivulet via the intervening mid and lower slopes and riparian zone. A large proportion of this area has been mapped as EEC and/or CEEC.

The Black Rock Range offset area would be linked to the existing CVO via a network of vegetation corridors, several of which are already in place. CHPL's vegetation corridor programme aims to conserve remnant vegetation, link significant areas of remnant vegetation, provide habitat for native fauna, promote the movement of genetic material between flora and fauna populations and increase the sustainability and biodiversity of CVO farms and environs (Figure 3).

Also included in the CVO biodiversity offset strategy is a 112 ha offset area located at the junction of the Belubula River and Flyers Cree (Figure 3). The Belubula River/Flyers Creek offset area includes approximately 62 ha of existing native vegetation, of which approximately 23 ha has been determined by FloraSearch Pty Ltd as meeting the criteria for the NSW-listed Box-Gum Woodland EEC and the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands CEEC. Figure 6 shows the 2011 mapping of vegetation communities at Black Rock Range.

As described in the EA, the specialist consultants who undertook the flora and fauna impact assessments (Dr Colin Bower and Dr David Goldney respectively), concluded that it is likely that the proposed offset biodiversity offset strategy would constitute a suitable offset against flora impacts associated with the Cadia East Project, and the proposed fauna impact mitigation and offset measures are likely to maintain regional fauna biodiversity in the short-term and enhance it in the long-term.



CADIA EAST OFFSET MODIFICATION

FIGURE 6
Proposed Stratton Vale
Alternative Offset Area

NEC-14-81_75W Mod_206B

3 MODIFICATION DESCRIPTION

The biodiversity offset area Modification would include the following components:

- An approximately 14.2 ha area of land would be removed from the Belubula River/Flyers Creek portion of the CVO biodiversity offset area.
- An approximately 16.5 ha area of land would be removed from the Black Rock Range portion of the CVO biodiversity offset area.
- An approximately 60.7 ha[2] replacement area within the CHPL-owned Stratton Vale property would be added to the CVO biodiversity offset.

These elements are further described in the sub-sections below.

3.1 BELUBULA RIVER/FLYERS CREEK AREA

Condition 38 of PA 06_0295 requires the Belubula River/Flyers Creek component of the CVO biodiversity offset to be a minimum of 112 ha and to be located as shown conceptually in the Cadia East EA and Appendix 5 of PA 06_0295.

The shape of the Belubula River/Flyers Creek component of the CVO biodiversity offset depicted in Appendix 5 of PA 06_0295 was based on the existing perimeter fences of the Oaky Creek property.

As a result of CHPL's recent review of cadastral information, it has become apparent that these fence lines do not accurately follow the official cadastral boundary of the Oaky Creek property (i.e. Lot 1422, DP1168271 – refer to Figure 4). As indicated on the figure, there are several areas where the current boundary incorporates Crown Land associated with the Belubula River and Flyers Creek, as well as some parcels of land that are owned by other landholders on the southern side of the River and Creek.

Rather than attempt to purchase the land in question from the NSW Department of Lands and the adjoining landholders, CHPL wishes to adjust the boundary of the Belubula River/Flyers Creek component of the CVO biodiversity offset to be generally consistent with the southern boundary of Lot 1422, DP1168271 (i.e. the official southern boundary of the Oaky Creek property).

The adjustment would mean that approximately 14.2 ha would no longer form part of the Belubula River/ Flyers Creek offset area. The area to be excised is shown on Figure 4.

It should be noted that the above change would be an administrative change in order to facilitate the securing of the area in perpetuity, without the need to subdivide adjoining non CHPL-owned land and/or acquire Crown land. From a practical and on-the-ground perspective it is anticipated that the existing Oaky Creek perimeter fence lines would remain in their current position. This is because it is not considered practicable for a fence to follow the Lot 1422, DP1168271 boundary as this boundary criss-crosses the current Belubula River and Flyers Creek channels.

3.2 BLACK ROCK RANGE AREA

Condition 38 of PA 06_0295 requires the Black Rock Range component of the CVO biodiversity offset to be a minimum of 826 ha and to be located as shown conceptually in the Cadia East EA and Appendix 5 of PA 06_0295.

Currently CHPL is in the process of acquiring the portion of Black Rock Range that occurs within the 'Ulah' property (i.e. as depicted in Appendix 5 of PA 06_0295). However, during this process is has become apparent that the southern-most portion of the area to be acquired has been occupied and farmed by the neighbouring landholder for many decades (i.e. technically it is part of the Ulah property but it has not been fenced or managed as such). Rather than reclaim the land from this neighbour and include it in the offset, CHPL wishes to remove approximately 13.9 ha area from the Black Rock Range component of the CVO offset.

In addition to the above, a Trig Station is located on the ridge that runs north-south along the Black Rock Range offset area. The Trig Station sits within a small (2.6 ha) parcel of Crown Land (i.e. Lot 104 DP724547). CHPL does not intend to include this parcel of land in the Black Rock Range component of the CVO offset, as the NSW Department of Crown Lands does not wish to relinquish it.

Figure 5 shows the locations of the two areas to be excised from the Black Rock Range component of the CVO biodiversity offset area.

[2] Note that the exact size of the replacement area would be subject to final survey.

There are also some other parcels of Crown Land within the Black Rock Range portion of the CVO biodiversity offset area (Figure 5). These occupy a total area of approximately 20 ha and were most likely included in the original surveying of Black Rock Range and were intended to provide access between lots, or are associated with creek lines.

These parcels of Crown Land remain undeveloped and have not been formed into publically accessible roads between properties (i.e. they are now just 'paper roads') and are not fenced or managed differently to the remainder of the Black Rock Range offset area.

CHPL intends to acquire these parcels of land from the NSW Department of Lands so that they can be incorporated into the Black Rock Range offset and conserved in perpetuity.

3.3 STRATTON VALE AREA

The area that would be removed from the offset as a result of the adjustments described in Sections 3.1 and 3.2 would be replaced with a single parcel of land located on a CHPL-owned property ('Stratton Vale').

The Stratton Vale offset area is situated 1 to 2 km to the west of the CVO (Figure 6). The additional area to be added to the CVO biodiversity offset is approximately 60.7 ha in size and is predominantly covered with remnant native woodland vegetation. Swallow Creek runs in a north-south direction through the area over a distance of approximately 1,000 m.

4 ENVIRONMENTAL REVIEW

FloraSearch Pty Ltd was engaged to undertake a flora survey of the Belubula River/Flyers Creek area as well as the southern portion of the Black Rock Range biodiversity offset. FloraSearch also surveyed the proposed replacement area at Stratton Vale. A copy of the FloraSearch (2015) report is contained in Appendix A. The following sub-sections discuss the results of the survey and assessment.

4.1 VEGETATION CHARACTERISTICS OF THE BELUBULA RIVER/FLYERS CREEK AREA

The Belubula River/Flyers Creek area to be excised consists of a narrow strip of land along a section of the Belubula River and the lower reaches of Flyers Creek (Figure 7). The area is almost entirely within the riparian zone, but also includes a small amount of the adjoining lower slopes along Flyers Creek in places.

FloraSearch surveyed the Belubula River/Flyers Creek area to be excised in October 2014. Figure 7 shows the mapped vegetation communities and sample locations, and Appendix A provides details of the survey methodology. Vegetation sampling was stratified according to the standard Plant Community Types (PCT) recognised by OEH (2014a).

Fourteen native plant species and 55 introduced species were recorded during the survey, and two natural vegetation communities and one anthropogenic community were identified and mapped (Table 4-1 and Figure 7).

River Oak Forest was by far the dominant community (i.e. 11.7 ha) since much of the area is within the riparian zones of the Belubula River and Flyers Creek (Figure 7). A very small (i.e. 0.3 ha) remnant patch of Yellow Box Woodland (i.e. Community 2) was also present. However, most of the non-riparian lower slope areas were covered in exotic grasses and herbs (i.e. 2.3 ha).

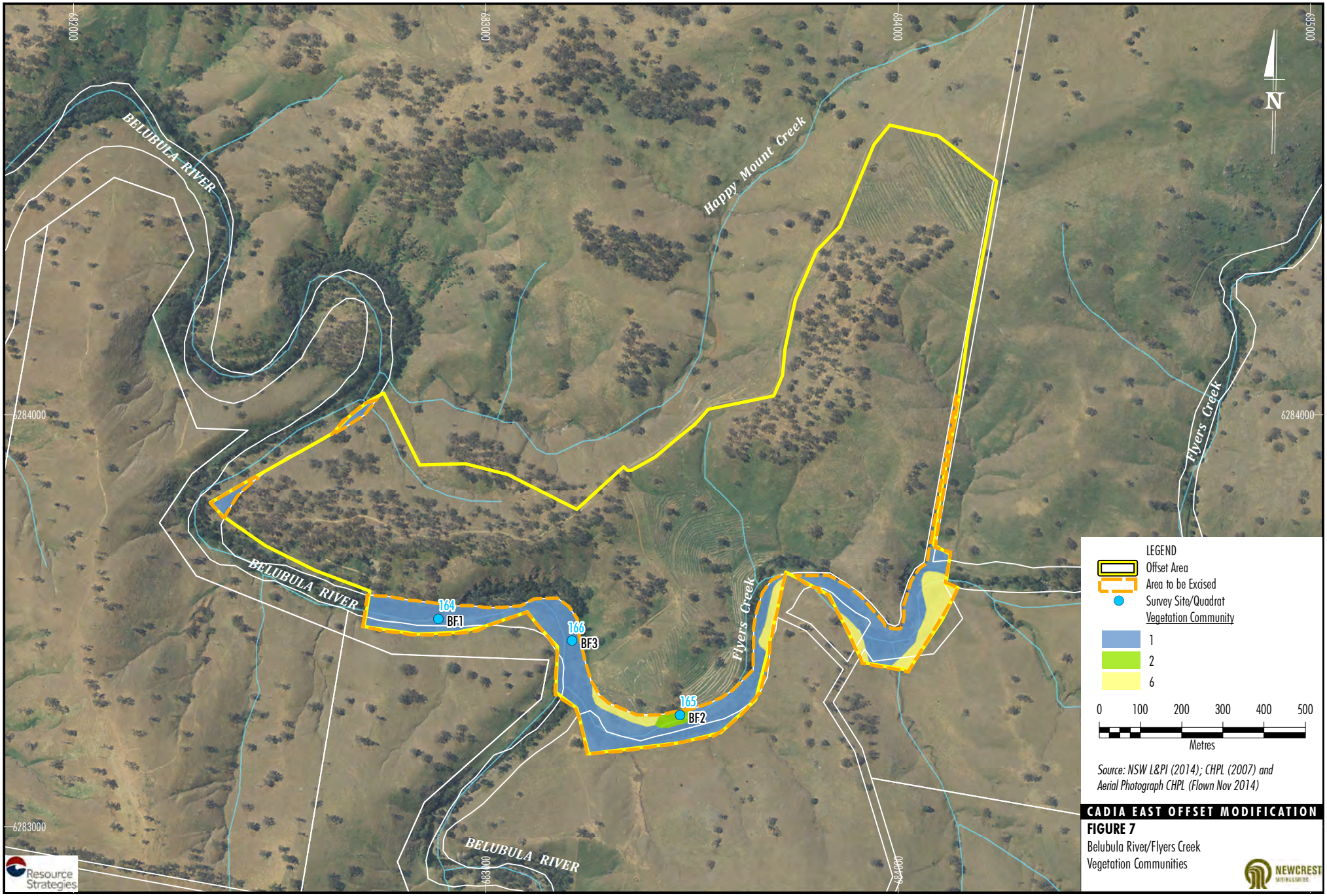
BioMetric data on vegetation condition in the Belubula River/Flyers Creek area indicated that the River Oak Forest and the small remnant of Yellow Box Woodland were both in poor condition with their ground cover in 'low' condition owing to a high dominance of exotic species; 68% exotic cover for River Oak Forest and 100% exotic cover for the area of Yellow Box Woodland (Appendix A).

No threatened flora species were identified in the existing Belubula River/Flyers Creek offset area (Appendix A).

FloraSearch (2015) used the relevant NSW and Commonwealth guidelines to determine whether any of the recorded vegetation communities conformed to the definitions of the NSW-listed Box-Gum Woodland EEC and/or the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community CEEC (Appendix A). The analysis indicated that the small 0.3 ha area of Yellow Box Woodland (i.e. Community 2) conformed to the NSW-listed Box-Gum Woodland EEC, but did not conform to the Commonwealth CEEC (due to the very poor condition of the ground cover).

Table 4-1
Vegetation Communities Recorded in the Belubula River/Flyers Creek Excise Area

Community No.	PCT Code	Area (ha)	Short Name	Plant Community Type (OEH, 2014b)	Dominant Species on Study Areas
1	85	11.7	River Oak Forest	*River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregions*	River Oak (*Casuarina cunninghamiana*), River Red Gum (*Eucalyptus camaldulensis*)
2	277	0.3	Yellow Box Woodland (Box-Gum Woodland EEC)	*Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*	Yellow Box (*Eucalyptus melliodora*), Apple Box (*Eucalyptus bridgesiana*)
6	N/A	2.3	Exotic Grassland	-	Great Brome (*Bromus diandrus*), Soft Brome (*Bromus hordeaceus*), *Vulpia muralis*, Wimmera Ryegrass (*Lolium rigidum*)



CADIA EAST OFFSET MODIFICATION

FIGURE 7

Belubula River/Flyers Creek Vegetation Communities

NEWCREST MINING LIMITED

NEC-14-81_75W Mod_208C

FloraSearch (2015) evaluated the fauna habitat values of the Belubula River and Flyers Creek area to be excised.

The River Oak Forest had moderate habitat value due to the relatively dense stands of River Oak (*Casuarina cunninghamiana*) and River Red Gum (*Eucalyptus camaldulensis*). The Belubula River and Flyers Creek watercourses provide water for wildlife and habitat for aquatic fauna.

The other parts of the Belubula River and Flyers Creek area to be excised were considered to have low habitat value for the following reasons:

- The open grassland areas were dominated by exotic species and have limited habitat value, except for macropods, granivorous birds such as finches and common insectivorous birds adapted to grasslands such as Yellow-tailed Thornbills and Magpies.
- There are limited opportunities for reptiles with few logs on the ground or surface rocks for habitat on both areas.
- The area has some retained old growth trees with hollows suitable for a variety of wildlife, but they are scattered in a mostly cleared landscape with limited habitat available to denning or nesting species that depend on woodlands and forests.
- The area lacks dense shrub cover required by some bird species for nesting and foraging.

4.2 VEGETATION CHARACTERISTICS OF THE BLACK ROCK RANGE AREA

Southern Black Rock Range Area

This area is located at the southernmost extremity of the Black Rock Range biodiversity offset where it meets the Panuara Rivulet. It comprises steep east and south facing slopes descending from a dome-shaped hill (approximately 570 metres Australian Height Datum [m AHD]) and a ridge extending to its west (approximately 600 m AHD). It also includes some of the lower slopes along Panuara Rivulet.

Twenty native plant species and 29 introduced species were recorded during the FloraSearch (2015) survey, and two natural vegetation communities and one anthropogenic community were identified and mapped (Table 4-2 and Figure 8).

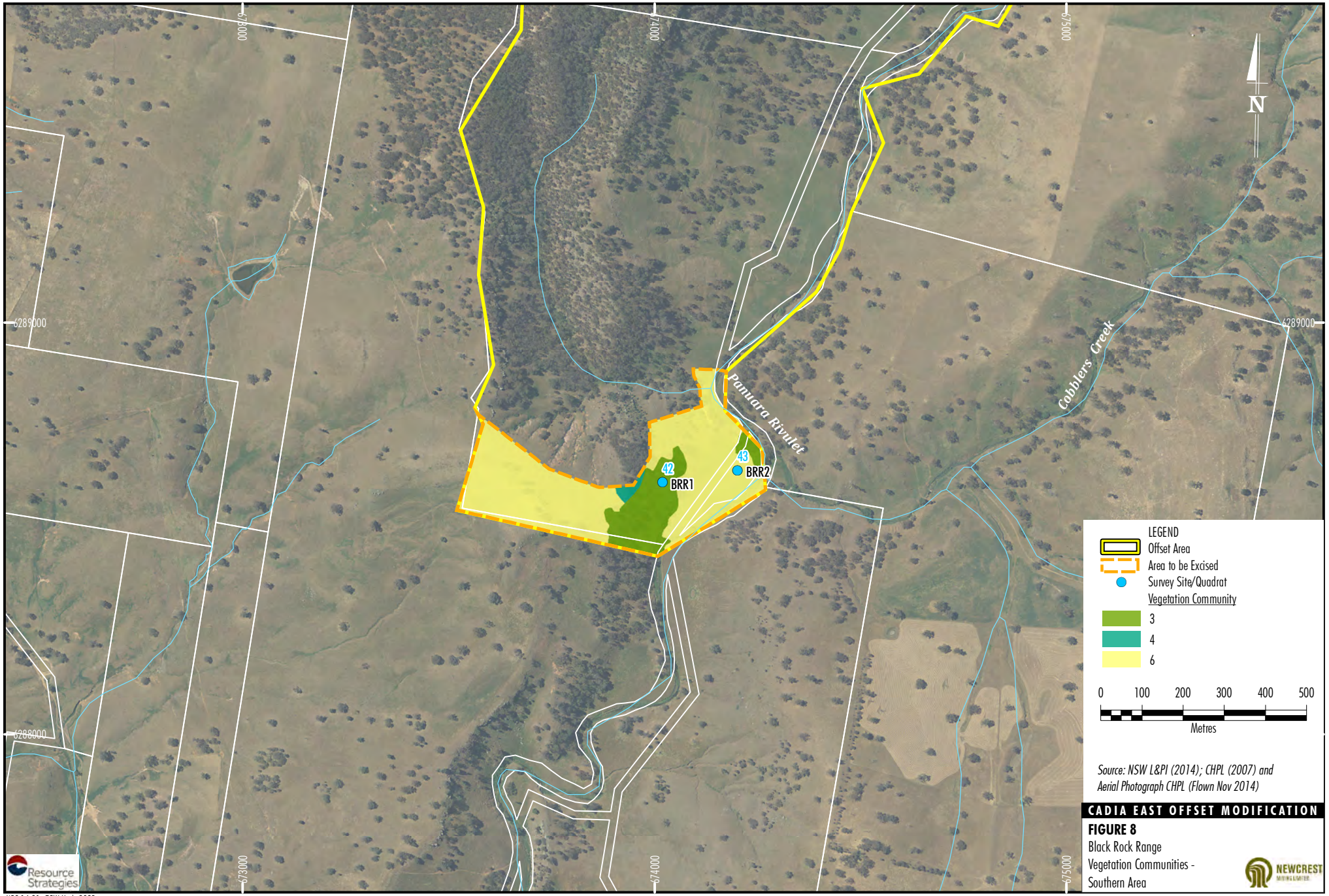
Exotic grassland was the dominant vegetation community (i.e. 11 ha), with two small areas of White-Box Woodland (i.e. total 2.7 ha) and a very small area (i.e. 0.2 ha) of Red Stringybark Woodland also occurring.

BioMetric data for the southern Black Rock Range area, indicated that the vegetation was in poor condition. The groundcover was in low condition with much greater than 50% cover by exotic species for the White Box Woodland (72%) and the Exotic Grassland (90%) (Appendix A).

No threatened flora species were identified in the southern Black Rock Range area (Appendix A).

Table 4-2
Vegetation Communities Recorded in the Southern Black Rock Range Excise Area

Community No.	PCT Code	Area (ha)	Short Name	Plant Community Type (OEH, 2014b)	Dominant Species on Study Areas
3	266	2.7	White Box Woodland (Box- Gum Woodland EEC)	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	White Box (*Eucalyptus albens*)
4	1095	0.2	Red Stringybark Woodland	*Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion*	Red Stringybark (*Eucalyptus macrorhyncha*), Red Box (*Eucalyptus polyanthemos*)
6	N/A	11.0	Exotic Grassland	-	Great Brome (*Bromus diandrus*), Soft Brome (*Bromus hordeaceus*), *Vulpia muralis*, Wimmera Ryegrass (*Lolium rigidum*)



CADIA EAST OFFSET MODIFICATION

FIGURE 8

Black Rock Range
Vegetation Communities -
Southern Area

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FloraSearch (2015) used the relevant NSW and Commonwealth guidelines to determine whether any of the recorded vegetation communities conformed to the definitions of the NSW-listed Box-Gum Woodland EEC and/or the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community CEEC. The analysis indicated that the 2.7 ha area of White Box Woodland (i.e. Community 3) conformed to the NSW-listed Box-Gum Woodland EEC, but did not conform to the Commonwealth CEEC.

As per the Belubula River/Flyers Creek area to be excised, the fauna habitat values of the southern Black Rock Range area to be excised were considered by FloraSearch (2015) to be low.

Black Rock Range Trig Station Area

Figure 9 shows the mapped vegetation communities in the vicinity of the Trig Station at Black Rock Range based on the mapping conducted for the Cadia East Project (FloraSearch, 2009). As indicated on the figure, the Trig Station contains a small area of vegetation classified as the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community CEEC (i.e. approximately 0.5 ha). However, the area is located on the steeply sloping eastern face of the ridgeline (i.e. is inaccessible to vehicles) and would be entirely encompassed by the Black Rock Range offset and would, in effect, be managed as part of the offset (i.e. livestock would be excluded and other management measures for weeds and fire would be applied to this area). The revised LBMP would describe how this area would be managed.

4.3 VEGETATION CHARACTERISTICS OF THE STRATTON VALE REPLACEMENT AREA

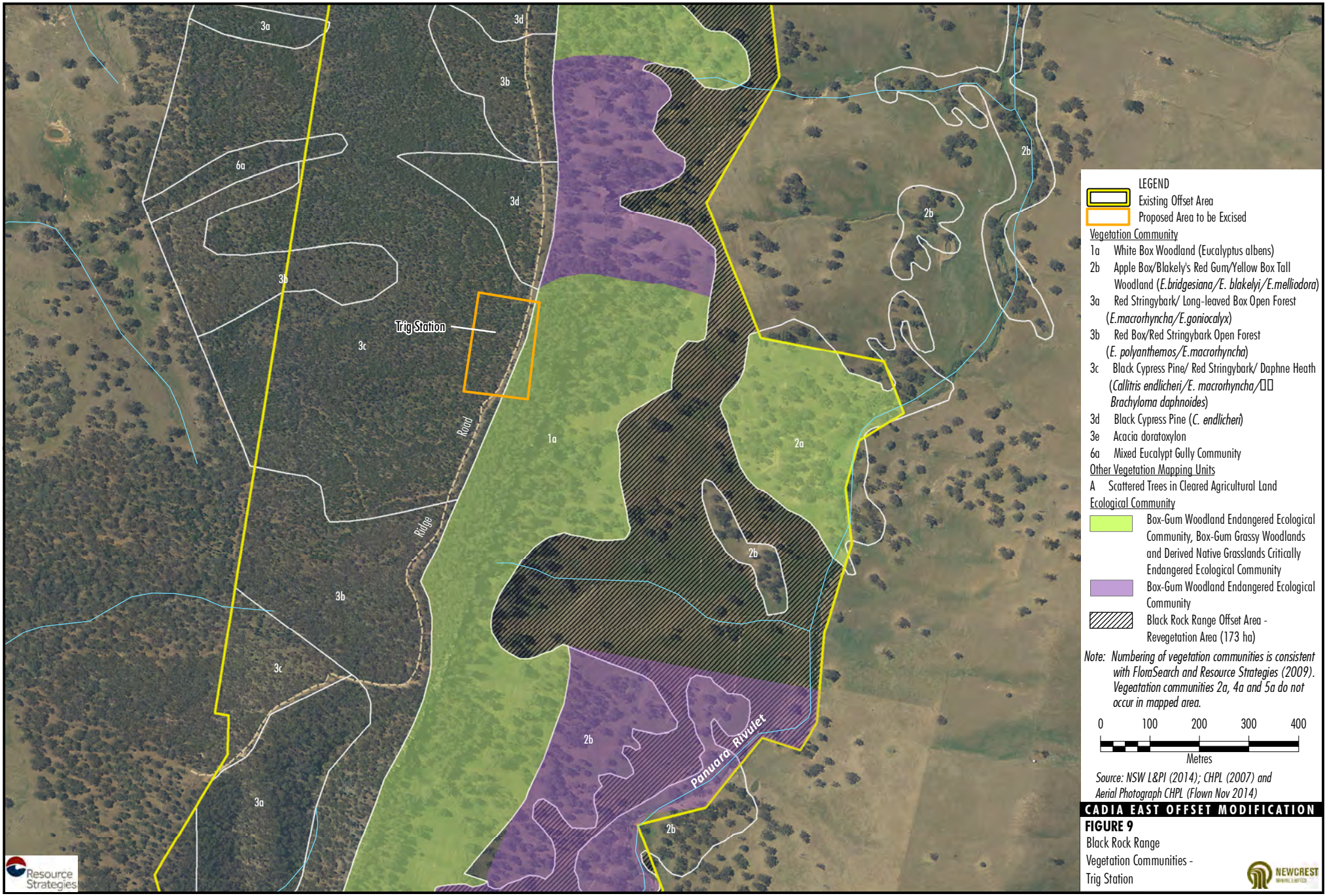
The Stratton Vale replacement area occupies approximately 60.7 ha of undulating hilly land. The area includes the riparian zone of Swallow Creek (i.e. approximately 1000 m), a small part of the lower slope to its west and parts of three unnamed tributary gullies entering from the east. Elevations vary between approximately 600 m AHD on Swallow Creek in the south-west corner, to 680 m AHD in the north-east corner. The Stratton Vale replacement area is currently used for livestock grazing.

FloraSearch surveyed the Stratton Vale replacement area in October 2014. Twenty-three native plant species and 46 introduced species were recorded during the survey, and three native vegetation communities and one anthropogenic community were identified and mapped (Table 4-3 and Figure 10).

The original woodland vegetation on Stratton Vale has been thinned historically and now comprises mostly widely spaced trees separated by grassland dominated by exotic grasses and legumes. The larger treeless areas have been mapped by as Exotic Grassland on Figure 10. Some areas of derived native grassland also occur. These are dominated by grazing-tolerant native species including Speargrass (*Austrostipa scabra*) on the dry north-facing slopes and Red Grass (*Bothriochloa macra*) on south-facing slopes.

Table 4-3
Vegetation Communities Recorded in the Stratton Vale Replacement Area

Community No.	PCT Code	Area (ha)	Short Name	Plant Community Type (OEH, 2014b)	Dominant Species on Study Areas
2	277	15.6	Yellow Box Woodland (Box-Gum Woodland EEC)	*Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion*	Yellow Box (*Eucalyptus melliodora*), Apple Box (*Eucalyptus bridgesiana*)
3	266	29.8	White Box Woodland (Box- Gum Woodland EEC)	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	White Box (*Eucalyptus albens*)
5	N/A	1.2	Derived Grassland	-	Speargrass (*Austrostipa scabra*), Red Grass (*Bothriochloa macra*)
6	N/A	14.1	Exotic Grassland	-	Great Brome (*Bromus diandrus*), Soft Brome (*Bromus hordeaceus*), *Vulpia muralis*, Wimmera Ryegrass (*Lolium rigidum*)



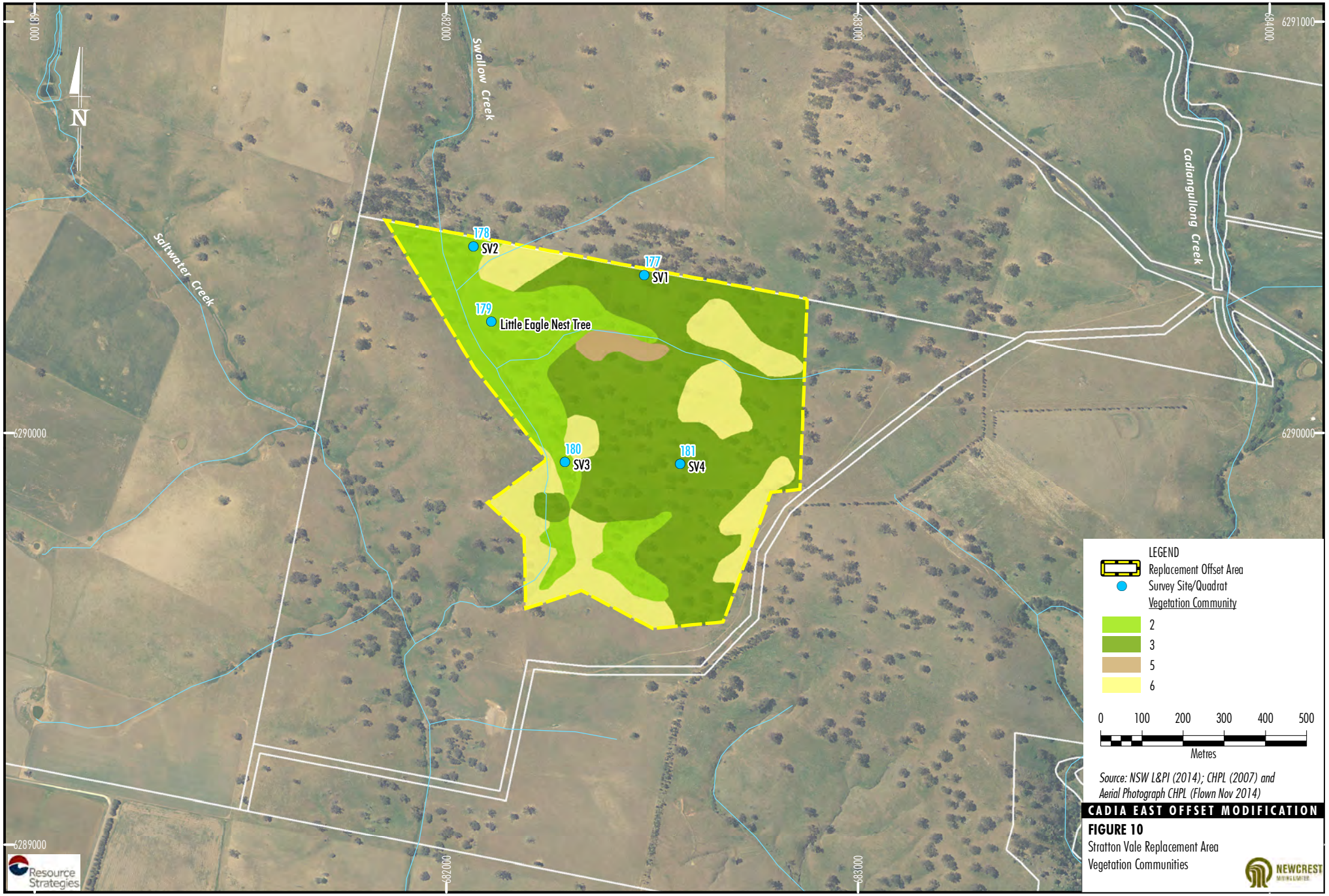
CADIA EAST OFFSET MODIFICATION

FIGURE 9

Black Rock Range
Vegetation Communities -
Trig Station

NEWCREST MINING LIMITED

NEC-14-81_75W Mod_210B



CADIA EAST OFFSET MODIFICATION

FIGURE 10

Stratton Vale Replacement Area
Vegetation Communities

NEC-14-81_75W Mod_211B

BioMetric vegetation condition data collected in the Stratton Vale replacement area indicated that the vegetation was in relatively poor condition (Appendix A). The groundcover was in low condition with greater than 50% cover by exotic species in both the Yellow Box Woodland (62%) and White Box Woodland (80%).

No threatened flora species were identified in the Stratton Vale replacement area.

FloraSearch (2015) used the relevant NSW and Commonwealth guidelines to determine whether any of the recorded vegetation communities conformed to the definitions of the NSW-listed Box-Gum Woodland EEC and/or the Commonwealth-listed Box-Gum Grassy Woodlands and Derived Native Grasslands Critically Endangered Ecological Community CEEC. The analysis indicated that all Box-Gum Woodland remnants (i.e. Community 2 [15.6 ha] and Community 3 [29.8 ha]) conformed to the NSW-listed Box-Gum Woodland EEC, but did not conform to the Commonwealth CEEC.

The fauna habitat values of the Stratton Vale replacement area were evaluated by FloraSearch (2015) and were considered to be relatively high for the following reasons:

- Many of the remnant trees at Stratton Vale are very large and clearly pre-date European settlement. One tree hosts the nest of a Little Eagle (*Hieraaetus morphnoides*), which is listed as Vulnerable under the TSC Act. In addition, many of the White Box trees have hollows suitable for parrots and a nesting population of the Vulnerable Superb Parrot (*Polytelis swainsonii*) is present on and around the investigation area.
- While the groundcover is generally dominated by exotic species, there is a good representation of native perennial grasses, potentially providing habitat for granivorous birds favouring native grass seed, such as finches and the Superb Parrot.
- Swallow Creek provides water for wildlife and habitat for aquatic fauna.

Current habitat limitations identified by FloraSearch (2015) included a general lack of tall and low shrubs that would provide cover and nesting habitat for many birds including finches, babblers, thornbills and others. There are also limited opportunities for most reptiles owing to very dense exotic grass cover over much of the area and relatively few logs on the ground.

4.4 ENVIRONMENTAL ASSESSMENT

The proposed Modification would result in the substitution of 30.7 ha of land within the existing CVO biodiversity offset (i.e. 14.2 ha at the Belubula River/Flyers Creek and 16.5 ha at Black Rock Range), with approximately 60.7 ha within the Stratton Vale replacement area. CHPL believes that this would provide a net environmental benefit, solve the current cadastral boundary issue, and allow the CVO biodiversity offset to be secured in perpetuity as required by PA 06_0295 and EPBC 2006/3196.

The existing vegetation condition and habitat value of the areas to be excised is generally low, whereas the habitat value of the replacement area is higher.

More than a third of the areas to be excised is exotic grassland (i.e. 13.3 ha), which has been extensively cleared. Of the remaining areas, approximately 2.7 ha of White Box Woodland (i.e. Community 3) at Black Rock Range conformed to the NSW-listed Box-Gum Woodland EEC. The excision of this area would be compensated for by the inclusion of 45.4 ha of remnant native vegetation at Stratton Vale that conforms to the NSW-listed Box-Gum Woodland EEC.

Approximately 1 ha of vegetation that is mapped as conforming to the Commonwealth Box-Gum Woodland CEEC is located in the Trig Station area at Black Rock Range. The Stratton Vale replacement area does not contain any vegetation that meets the Commonwealth CEEC criteria. However, because the Trig Station area at Black Rock Range is located on the steeply sloping eastern face of the ridgeline (i.e. is inaccessible to vehicles) and would be entirely encompassed by the Black Rock Range offset, it would remain protected (i.e. livestock would be excluded and other management measures for weeds and fire would be applied to this area). The revised LBMP would describe how the Trig Station area would be managed as part of the Black Rock Range offset area.

The proposed Stratton Vale replacement area contains approximately 1,000 m of direct frontage to Swallow Creek. This would effectively replace the sections of Panuara Rivulet, Belubula River and Flyers Creek that would be formally removed from the CVO offset. However, it should be noted that from a practical and on-the-ground perspective the Belubula/Flyers Creek offset area would still include the majority of the Crown land that directly fronts the River/Creek because the existing fence lines for the Oaky Creek property are likely to remain in place.

5 CONCLUSION

The proposed Modification would address the recently identified issue with cadastral boundaries within the CVO biodiversity offset area as currently depicted in the Cadia East Project EA (CHPL, 2009) and PA 06_0295. If approved it would allow CHPL to secure the biodiversity in perpetuity as required by PA 06_0295 and EPBC 2006/3196.

The proposal would result in the excision of 30.7 ha of land within the existing CVO biodiversity offset and replacement of it with approximately 60.7 ha within the CHPL-owned Stratton Vale. The quantity and quality of vegetation within the Stratton Vale replacement area is such that there would be a net environmental gain as a result of the proposed Modification.

6 REFERENCES

FloraSearch and Resource Strategies (2009) *Cadia East Project Flora Assessment*. Report prepared for Cadia Holdings Pty Limited.

Office of Environment and Heritage (2014) *VIS Classification 2.1*. Website: http://www.environment.nsw.gov.au/NSWVCA20PRapp/search/pctsearch.aspx Accessed: November 2014.

APPENDIX A

FLORA SURVEY AND HABITAT ASSESSMENT

FLORA AND FAUNA HABITAT SURVEY OF PROPOSED CHANGES TO THE CADIA VALLEY OPERATIONS BIODIVERSITY OFFSET AREAS

PREPARED BY

FLORASEARCH

APRIL 2015

Project No. NEC-14-81

Document No. 00672361

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1 INTRODUCTION

Cadia Holdings Pty. Limited (CHPL) has recently discovered that two small parcels of land in the original Cadia Valley Operations (CVO) biodiversity offset are unable to be secured in perpetuity due to several cadastral issues. These areas are located in the southern part of the Black Rock Range offset area and in the vicinity of the Belubula River and Flyers Creek confluence. The net effect is that CHPL requires 28.1 hectares (ha) of alternative suitable native vegetation/fauna habitat in order to replace the area unable to be secured.

FloraSearch has been commissioned by CHPL to undertake flora surveys and habitat assessments of the two parcels of land to be excised, and to survey a potential replacement area located in the CHPL-owned Stratton Vale property. The surveys and habitat assessments are to be included in an Environmental Assessment, which is being prepared to support a Modification application to the CVO Project Approval under Section 75W of the *Environmental Planning and Assessment Act, 1979* (EP&A Act).

In this report the attributes of the two land parcels to be excised are determined through the application of appropriate survey methods and compared with the same data from the potential replacement area at Stratton Vale. The three areas are herein referred to as the study areas.

The objectives of the surveys are to:

- sample the natural vegetation on the study areas using standard flora survey techniques;
- determine the Plant Community Types (PCT) present within each study area;
- compile a flora species list for each study area;
- conduct targeted searches for potentially occurring threatened flora species, populations and communities; and
- determine the distribution of *White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community* listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (CEEC) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (commonly known as Box-Gum Woodlands); and
- assess the habitat quality for fauna within each study area.

2 REGIONAL SETTING

The three study areas are located in undulating to steep hilly country to the west and south west of the CVO mining tenements (Figure 1). The study areas vary from 28 kilometres (km) to 34 km south west of Orange, the nearest major population centre. The nearest named locality is Panuara, a small hamlet only 1.4 km north of the Stratton Vale investigation area. Apart from the CVO, the other major land uses in the surrounding district are softwood plantation forestry (Canobolas State Forest), livestock grazing and viticulture (Angullong Vineyard).

The main watercourses in the study areas are the Belubula River and its tributaries Flyers Creek, Cadiangullong Creek, Swallow Creek and Panuara Rivulet (Figure 1). The proposed Stratton Vale replacement area includes a section of Swallow Creek, and the existing offset area at the south end of the Black Rock Range borders the Panuara Rivulet.

The study areas lie within the Central Tablelands botanical region and close to the boundary of the Central Western Slopes botanical region (Anderson, 1961). They are also within the South Eastern Highlands Biogeographical Region and close to the boundary with the South Western Slopes Biogeographical Region (Thackway and Cresswell, 1995). Given the study areas are situated close to the boundaries of major botanical and biogeographical regions, it is likely that the study area flora would contain a blend of species characteristic of both sets of regions.

3 GENERAL DESCRIPTION OF THE STUDY AREAS

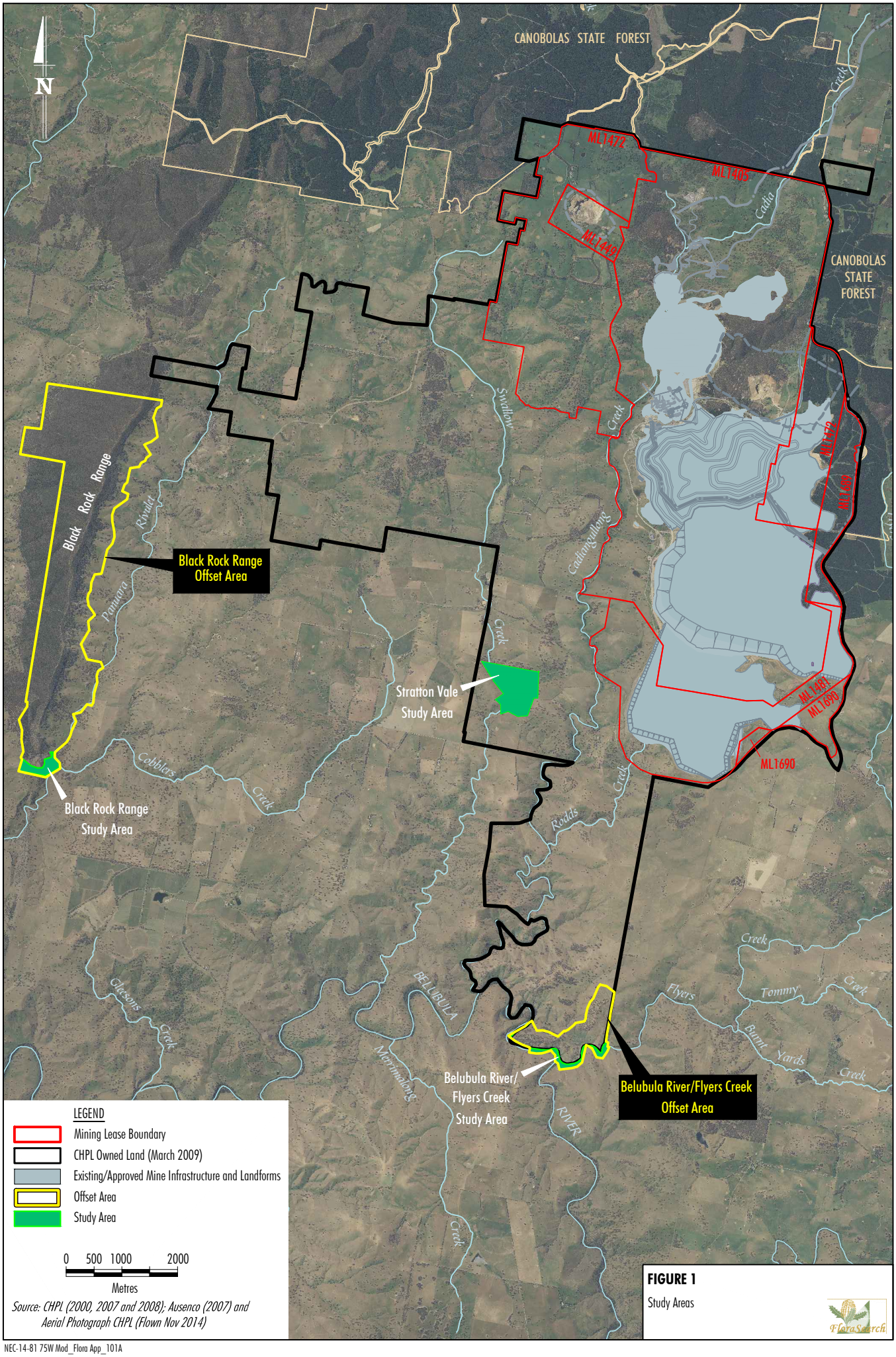
3.1 EXISTING OFFSET AREAS

Belubula River/Flyers Creek

The Belubula River/Flyers Creek study area comprises a narrow strip along a section of the Belubula River and the lower reaches of Flyers Creek (Figure 2). The study area is almost entirely within the riparian zone, but also includes a small amount of the adjoining lower slopes along Flyers Creek in places.

South End of Black Rock Range

This area is at the southernmost extremity of Black Rock Range where it meets the Panuara Rivulet (Figure 3). It comprises steep east and south facing slopes descending from a dome-shaped hill (570 metres Australian Height Datum [m AHD]) and ridge extending to its west (600 m AHD), as well as flats along Panuara Rivulet. The lowest altitude in the study area is approximately 505 m beside the Panuara Rivulet. The soils are predominantly stony clays with small areas of alluvial/colluvial soils on the river flats.



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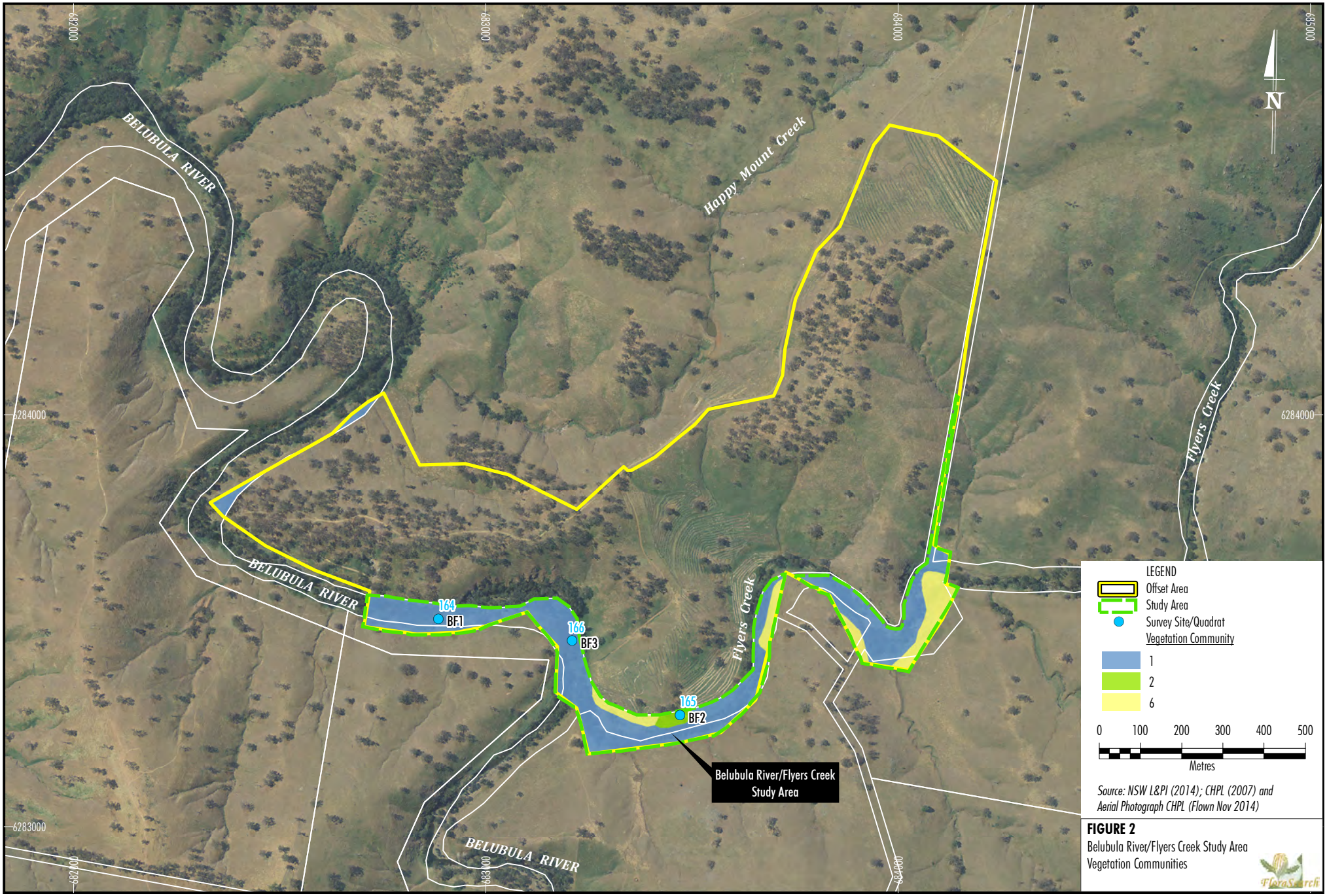

FIGURE 2
Belubula River/Flyers Creek Study Area
Vegetation Communities

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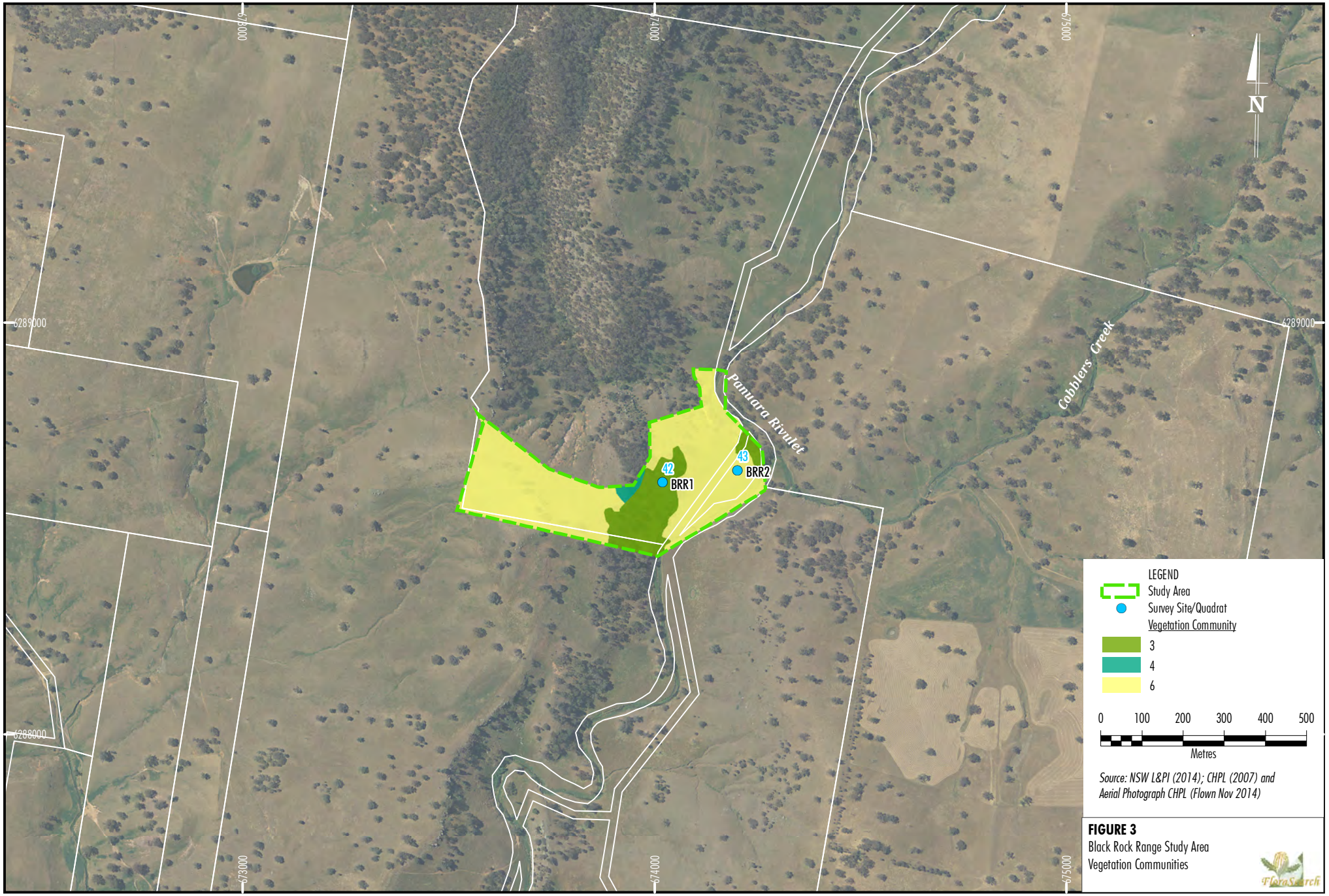


FIGURE 3
Black Rock Range Study Area
Vegetation Communities

NEC-14-81_75W Mod_Offset Mod_Flora App_203C

3.2 INVESTIGATION AREA

Stratton Vale

The proposed Stratton Vale replacement area of approximately 60.7 ha comprises undulating hilly country along Swallow Creek (Figure 4). The Study area includes the riparian zone of Swallow Creek, a small part of the lower slope to its west and parts of three unnamed tributary gullies entering from the east. Elevations on the Study area vary between approximately 600 m AHD on Swallow Creek in the south-west corner to 680 m AHD in the north-east corner, a relief of 80 m. The proposed Stratton Vale replacement area is currently used for livestock grazing. Pasture improvement by ground equipment is likely to have occurred there in the decades after World War II, when government subsidies for fertiliser use were available.

4 METHODS

4.1 SURVEY TIMING

The survey was conducted in spring and summer 2014 as follows:

- Belubula River/Flyers Creek – 27 October;
- Black Rock Range – 28 October and 12 December; and
- Stratton Vale – 31 October.

Seasonal conditions leading up to the survey were favourable for the growth of ground cover species, even though rainfall was 12 percent below average for the period January to September 2014[1].

4.2 VEGETATION SAMPLING

Vegetation was documented by two methods; standard quadrat sampling and random meanders, as recommended by the New South Wales (NSW) Office of Environment and Heritage (OEH) (Department of Environment and Conservation [DEC], 2004; OEH, 2014a), and summarised below. Figures 2-4 show the locations of quadrat sites. Vegetation sampling was stratified according to the standard Plant Community Types (PCT) recognised by OEH (2014b).

[1] Bureau of Meteorology Station Number 063113, Angullong, 4.2 km south east of the south end of Black Rock Range.

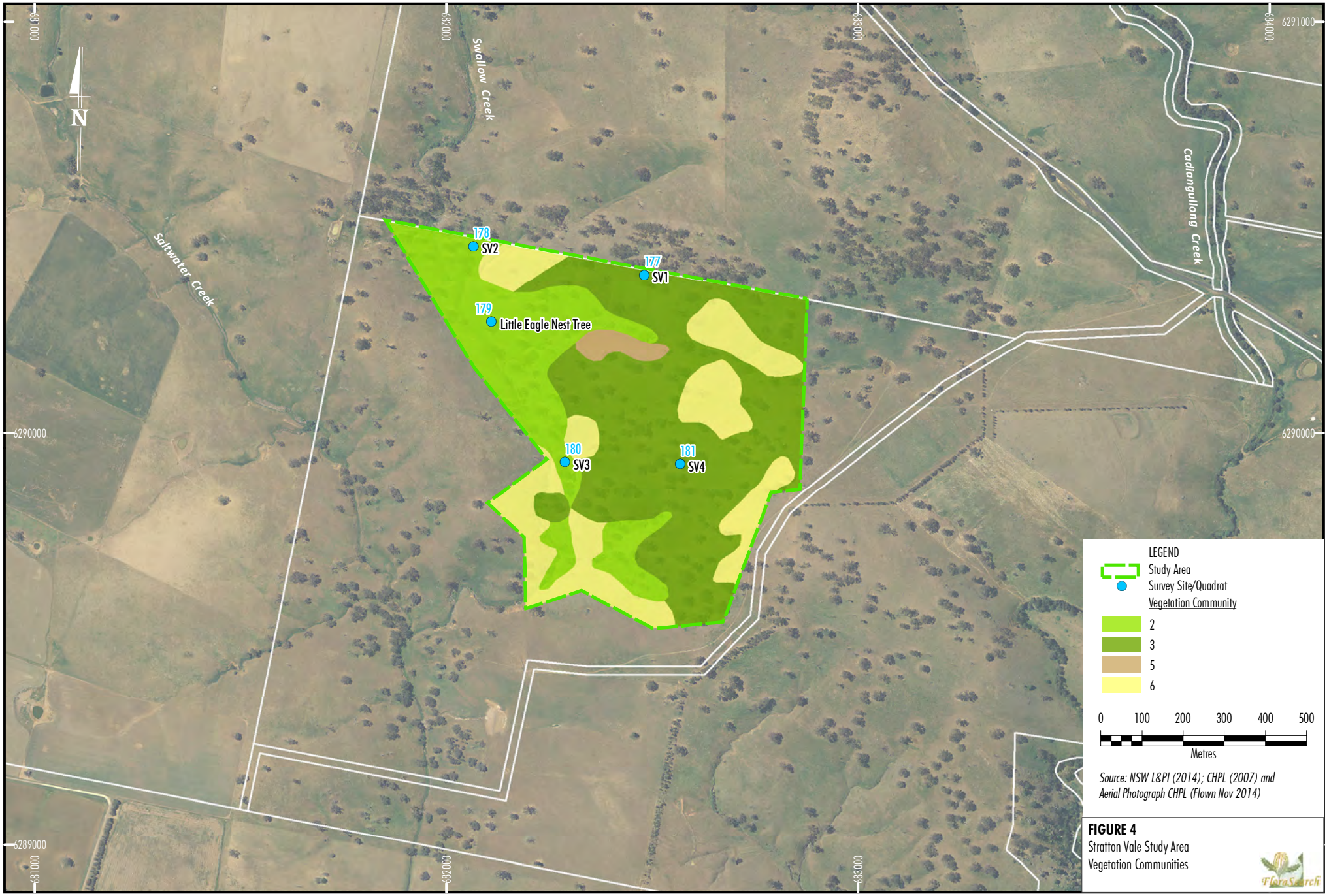


FIGURE 4
Stratton Vale Study Area
Vegetation Communities

NEC-14-81_75W Mod_Offset Mod_Flora App_204B

4.2.1 Quadrat Sampling

Flora on the Study areas was sampled with 20 × 20 m (0.04 ha) quadrat sites (Table 1, Figures 2-4). Sampling intensity was based on the approximate areas of each vegetation zone in each study area (DEC, 2004). Within each plot the dominant species in each vegetation stratum were recorded, with an estimate of the percentage of the ground surface covered by their canopies. A list of all vascular plant species present within the quadrat was also made with each being assigned a cover abundance rating using a modified Braun-Blanquet scale (Table 2). Details recorded for each site included its Global Positioning System (GPS) position, landform, physiography, topsoil characteristics, disturbance, vegetation structural formation and general comments.

Table 1
Number of Quadrats conducted within each Vegetation Community on each Study Area.

Community No.	PCT		Current Offset Areas		Replacement Area
	No.	Name	Belubula River	Black Rock Range	Stratton Vale
1	85	*River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregions*	2	N/A	N/A
2	277	*Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*	1	0	2
3	266	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	N/A	1	2
4	1095	*Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion*	N/A	0	N/A
5[1]	N/A	Derived Grassland	N/A	N/A	0[2]
6[1]	N/A	Exotic Grassland	0	1	0

[1] No equivalent PCT has been described for this vegetation type.
[2] Derived grassland occupied only very small areas and was not sampled.
N/A = Not applicable

Table 2
Modified Braun-Blanquet Cover Abundance Rating Scale

Rating	Percent Ground Cover	Rating	Percent Ground Cover
1	<1, rare	5	6 to 25
2	<5, uncommon	6	26 to 50
3	<5, common	7	51 to 75
4	<5, abundant	8	76 to 100

4.2.2 Random Meanders

Random meanders were undertaken for 30 minutes from each quadrat site. Random meanders were aimed at detecting the presence of any threatened flora species that may occur.

4.2.3 Habitat Quality

The condition of the native vegetation on the study areas and their value as fauna habitat was measured using the OEH BioMetric terrestrial biodiversity assessment methodology (Gibbons *et al.* 2005). BioMetric measurements form part of the input to the NSW Property Vegetation Plan Developer, which is used to assist decision making for applications to clear native vegetation under the NSW *Native Vegetation Act, 2003.* This methodology allows the value of vegetation to be assessed in a repeatable fashion for comparison with established benchmarks for the vegetation types on the study area (Department of Environment and Climate Change [DECC], 2008a).

The 20 × 20 m flora survey plots were extended to 50 × 20 m for 'Biometric' measurements (Figures 2-4). Ten condition parameters used in BioMetric to assess site value were measured in each plot. The measurement methods were based on Appendix 3 of the BioMetric Operational Manual (Gibbons *et al.*, 2005). The parameters and methodology are:

- Native plant species diversity: - the number of native plant species in the 20 × 20 m subplot.
- Native overstorey cover: – mean percent cover of ground by the foliage of the uppermost vegetation layer; trees or tall shrubs (>1 m) at 10 points along a 50 m transect along the long axis of the plot.
- Native midstorey cover: – mean percent cover of ground by the foliage of the middle vegetation layer; tall shrubs (>1 m), low trees and regeneration at 10 points along a 50 m transect along the long axis of the plot.
- Native groundcover – grasses: - presence or absence of native grasses at 50 points 1m apart on a 50 m transect along the long axis of the plot.
- Native groundcover – shrubs: - mean percent cover of ground by the foliage of low shrubs (>1 m) and regeneration at 10 points along a 50 m transect along the long axis of the plot.
- Native groundcover – other: - Presence or absence of native herbs, sedges, rushes, ferns and other groundcover species at 50 points 1m apart on a 50m transect along the long axis of the plot.
- Exotic plant cover: – Presence or absence of exotic species at 50 points 1m apart on a 50m transect along the long axis of the plot.
- Number of trees with hollows: - All living and dead standing trees with their centres in the 50 × 20 quadrat were examined for hollows capable of harbouring wildlife. Hollows are defined as tree holes > 5 centimetres (cm) diameter, having depth, and > 1 m above the ground.
- Regeneration: - The proportion of overstorey trees species on the 50 × 20 m quadrat that are regenerating.

- Total length of fallen logs: - The length of fallen logs > 10 cm diameter and > 0.5 m long was totalled for the whole 50 × 20 m quadrat.

4.2.4 Flora Species Listing

All observed plant species were recorded, whether identified on formal sample sites or not. Some less common plants were only observed on one occasion whilst moving around the site. Where plants could not be quickly identified in the field, a sample was taken for later examination. Samples were preserved in a plant press and identified using a binocular microscope and flora keys. The principal reference was the Flora of New South Wales (Ed. G. Harden 1990-2002) and it is used as the basis for plant naming in this report along with any updates on the PlantNet web site of the Royal Botanic Gardens and Domain Trust Sydney (PlantNet, 2014).

4.2.5 Vegetation Mapping

The distribution of PCTs on the study areas was determined by visiting all parts of each area by 4WD vehicle and on foot. The vegetation was examined with binoculars where access was difficult or dangerous, as on very steep slopes. Vegetation distribution was mapped in the field onto high resolution aerial photographs.

4.2.6 Determination of Box - Gum Woodland Status as EEC (TSC Act) or CEEC (EPBC Act)

The *White Box Yellow Box Blakely's Red Gum Woodland* vegetation community is listed as endangered under the TSC Act and the analogous *White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived native grasslands critically endangered ecological community* is listed under the EPBC Act. These woodlands are commonly referred to as Box – Gum Woodlands.

The Box-Gum Woodland EEC/CEEC is characterised by one or more of the following species in varying proportions and combinations; White Box, Yellow Box or Blakely's Red Gum (NPWS undated, DEH 2006). Native grass and herbaceous species generally dominate the ground layer, and shrubs are usually sparse or absent, though they may be locally common (ibid.). A predominantly grassy, rather than shrubby understorey is a defining characteristic of the community (ibid.).

This community is widespread on the western slopes and tablelands of New South Wales and occurs commonly in the region around Cadia. Because it occurs on relatively deep high fertility soils, it has been extensively cleared historically for cropping and grazing over its entire range. Very few remnants remain in close to pristine condition. Most examples of Box-Gum Woodland are small patches of trees or isolated single trees on farmland. In nearly all cases the former understorey shrub species have completely disappeared and most of the native herbs and grasses have also been eliminated by farming and grazing. Remnants in fair to good condition occur mainly in cemetery reserves, crown reserves and in some travelling stock routes and reserves. The key characteristic for defining remnant quality of this community is the condition of the understorey in terms of the relative absence of weeds and the presence of close to the full suite of original herbs and grasses. Some native components of this community are more sensitive to disturbance than others and the presence of these indicates the remnant is in good condition.

Guidelines for determining whether particular Box-Gum Woodland remnants conform to the definitions of the EEC and/or CEEC have identification keys or flowcharts based on community criteria (NPWS undated, DEH 2006) (Figures 5 and 6). Remnants must meet all relevant key or flowchart criteria to be recognised as part of the EEC or CEEC. The NSW and Commonwealth jurisdictions have taken fundamentally different approaches to conservation of Box-Gum Woodlands. The NSW community recognition criteria and key are very broad, such that all predominantly grassy Box-Gum Woodland remnants, including those that are highly degraded, are included in the EEC unless they occur in urban backyards or cropping paddocks (NPWS undated). Accordingly, all remnants on the Study areas are considered to be part of the NSW EEC in this report.

By contrast, the Commonwealth listing of Critically Endangered seeks to focus protection on the highest quality remnants, that is, those that have retained a significant proportion of the original floristic diversity of the community. For this study, the most important Commonwealth criterion is at the second line in the flow diagram (Figure 6) which asks whether the understorey is predominantly native. The explanatory notes below the flow diagram (Figure 6) indicate the question refers to perennial not annual species. It also recommends that surveys be conducted in late autumn when annual growth of exotic species is absent. Accordingly for surveys conducted at other times of the year great care is needed to assess perennial not annual species when determining whether a patch meets Commonwealth CEEC criteria. The most important BioMetric measures that focus on this issue are the proportions of *native groundcover – grasses* and *native groundcover – other*, both of which measure mainly perennial species.

Identifying Box-Gum Woodland

Following is a key for use in determining whether Box-Gum Woodland exists on a site. Where doubt exists over an appropriate category (e.g. whether the site is mainly grassy or is shrubby), use a precautionary approach that assumes that the community is present.

At each stage there are two alternatives. Choose which is most like the site under consideration, and proceed to the alternative numbered in the right margin.

1 The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions: **2**

1* The site is outside the above bioregions: **the site is not Box-Gum Woodland**

2 There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration (see section on Degraded Sites, page 3): **the site is not Box-Gum Woodland**

2* The understorey is otherwise: **3**

3 The site has trees: **4**

3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing: **5**

4 White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present: **5**

4* White Box, Yellow Box or Blakely's Red Gum have never been present: **the site is not Box-Gum Woodland**

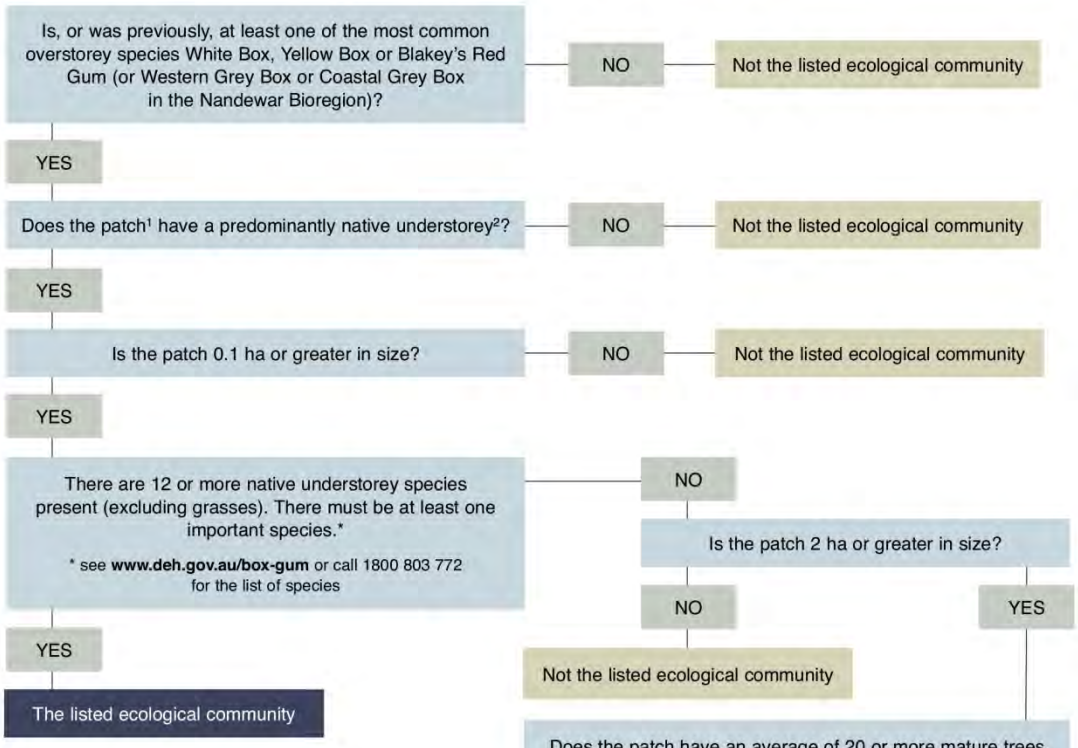
5 The site is predominantly grassy: **the site is Box-Gum Woodland**

5* The understorey of the site is dominated by shrubs excluding pioneer species (see section on The Understorey: page 2): **the site is not Box-Gum Woodland**

Figure 5. NSW Box-Gum Woodland identification key (NPWS undated).
[Under this key and the explanatory text in NPWS (undated), all Yellow Box, White Box and Blakely's Red Gum trees in the Bioregions at Point 1 are part of the EEC unless they occur in urban backyards, cropping paddocks or have heavy native shrub cover.]

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 (1000m^2) 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.

Figure 6. Commonwealth flowchart for identification of the Box-Gum Woodland CEEC (DEH 2006). [Importantly, a 'no' answer at any of the first three steps excludes a patch from the EEC, whether or not the patch is greater than 2 ha in size and has a high density of trees or regeneration]

5 RESULTS

5.1 EXISTING OFFSET AREAS

5.1.1 Vegetation Communities

The PCTs described below are considered closest in floristic composition and site characteristics to those described in the OEH (2014b) Plant Community Types Database. In some cases there are relatively large differences between the OEH (2014b) community and that observed on the study areas. These discrepancies may arise because past clearing and intensive grazing have changed community composition, for example formerly shrubby areas may now lack shrubs and appear grassy. However, vegetation varies across the landscape and some less prominent variants may not be covered explicitly by OEH (2014b). [Note: PCTs in the following lists are given in italics by their title in OEH (2014b).]

Belubula River/Flyers Creek

Two natural vegetation communities and one anthropogenic community occurred in the existing Belubula River / Flyers Creek offset area (Table 3).

- River Oak Forest (Community 1);
- Yellow Box Woodland (Community 2); and
- Exotic Grassland (Community 6).

River Oak Forest was by far the dominant community since much of the area is within the riparian zones of the Belubula River and Flyers Creek (Figure 2). A very small remnant patch of Yellow Box Woodland was also present (Figure 2). However, most of the non-riparian lower slope areas were covered in exotic grasses and herbs.

Table 3
Vegetation Types in the Existing Offset Areas

Community No.*	Belubula River/Flyers Creek	Black Rock Range	PCT code	Short Name	Plant Community Type (OEH, 2014b)	Dominant Species on Study Areas
1	✓	-	85	River Oak Forest	*River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregions*	River Oak (*Casuarina cunninghamiana*), River Red Gum (*Eucalyptus camaldulensis*)
2	✓	-	277	Yellow Box Woodland (Box-Gum Woodland EEC)	*Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*	Yellow Box (*Eucalyptus melliodora*), Apple Box (*Eucalyptus bridgesiana*)
3	-	✓	266	White Box Woodland (Box-Gum Woodland EEC)	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	White Box (*Eucalyptus albens*)
4	-	✓	1095	Red Stringybark Woodland	*Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion*	Red Stringybark (*Eucalyptus macrorhyncha*), Red Box (*Eucalyptus polyanthemos*)
6	✓	✓	N/A	Exotic Grassland	-	Great Brome (*Bromus diandrus*), Soft Brome (*Bromus hordeaceus*), *Vulpia muralis*, Wimmera Ryegrass (*Lolium rigidum*)

* Note: Community 5 does not occur in the existing offset area.

Black Rock Range

There were remnants of the following vegetation communities on the Black Rock Range study area (Figure 3, Table 3):

- White Box Woodland (Community 3);
- Red Stringybark Woodland (Community 4);
- Exotic grassland (Community 6).

The vegetation on the Black Rock Range offset area had a small area of Red Stringybark Woodland that was not found on the other areas (Figure 3, Table 3).

5.1.2 Flora Species

The flora species recorded on the two existing offset areas are given for each quadrat in Appendix 1. Table 4 summarises the total numbers of native and introduced flora species identified on three quadrats for Belubula River/Flyers Creek and two quadrats at Black Rock Range.

Table 4
Summary of Flora Species Numbers in the Existing Offset Areas

Area	Native Species	%	Introduced Species	%	Total
Belubula/Flyers	14	20.3	55	79.7	69
Black Rock Range	20	40.8	29	59.2	49

The results show that introduced species dominated on both areas and that relatively few native species were present (Table 4).

5.1.3 Noxious Weeds

The introduced species shown below are listed as Class 4 noxious weeds under the NSW *Noxious Weeds Act, 1993* (DPI, 2014) for the Upper Macquarie County Council Area and occurred on both existing offset areas (Appendix 1);

- Blackberry (*Rubus fruticosus* species aggregate; includes *R. anglocandicans*);
- St. John's Wort (*Hypericum perforatum*); and
- Sweet Briar (*Rosa rubiginosa*).

Blackberry and Sweet Briar occurred in only low numbers indicating they have been well controlled. However, moderate numbers of St. John's Wort were present in Exotic Grassland at Black Rock Range.

5.1.4 Vegetation Condition

BioMetric data on vegetation condition for the two existing offset areas are presented in Tables 5 and 6. For the Belubula River/Flyers Creek area, the data show that the River Oak Forest and the small remnant of Yellow Box Woodland were both in poor condition with their ground cover in 'low' condition owing to a high dominance of exotic species; 68% exotic cover for River Oak Forest and 100% exotic cover for Yellow Box Woodland (Table 5). The River Oak Forest met or exceeded benchmark values only for native overstorey cover, other native groundcover and the number of trees with hollows. On all other measures River Oak Forest was well below the benchmarks. The Yellow Box Woodland also met or exceeded only three of the ten benchmarks; native overstorey cover, number of trees with hollows and length of fallen logs.

Table 5
Vegetation Condition Data – Belubula River/Flyers Creek Area

Vegetation Type	No. of Replicates	Recorded Values			Benchmarks	
		Lower	Upper	Average	Lower	Upper
Native plant species richness (number of species)						
River Oak Woodland	2	6	8	7	21	-
Yellow Box Woodland	1	6	-	6	23	-
Native overstorey cover (%)						
River Oak Woodland	2	26.5	63.0	44.8	15	43
Yellow Box Woodland	1	28.5	-	28.5	8	35
Native midstorey cover (%)						
River Oak Woodland	2	0	0	0	1	20
Yellow Box Woodland	1	0	-	0	1	20
Native groundcover – grasses (%)						
River Oak Woodland	2	0	0	0	1	35
Yellow Box Woodland	1	0	-	0	15	70
Native groundcover – shrubs (%)						
River Oak Woodland	2	0	0	0	0	5
Yellow Box Woodland	1	0	-	0	3	5
Native groundcover – other (%)						
River Oak Woodland	2	6	6	6.0	5	20
Yellow Box Woodland	1	0	-	0	3	20
Exotic plant cover (%)						
River Oak Woodland	2	68	72	70.0	-	-
Yellow Box Woodland	1	100	-	100.0	-	-
Number of trees with hollows						
River Oak Woodland	2	2	3	2.5	1	-
Yellow Box Woodland	1	2	-	2	0.8	-
Regeneration (proportion of tree species)						
River Oak Woodland	2	100	100	100.0	-	-
Yellow Box Woodland	1	0	-	0	-	-
Total length of fallen logs (m)						
River Oak Woodland	2	17.7	23.1	20.4	50	-
Yellow Box Woodland	1	100.6	-	100.6	66	-

Table 6
Vegetation Condition Data – Black Rock Range Area

Vegetation Type	No. of Replicates	Recorded Values			Benchmarks	
		Lower	Upper	Average	Lower	Upper
Native plant species richness (number of species)						
White Box Woodland	1	13	-	13	23	-
Exotic Grassland	2	8	-	8	23	-
Native overstorey cover (%)						
White Box Woodland	1	21.5	-	21.5	8	35
Exotic Grassland	2	0	-	0	8	35
Native midstorey cover (%)						
White Box Woodland	1	0	0	0	1	20
Exotic Grassland	2	0	-	0	1	20
Native groundcover – grasses (%)						
White Box Woodland	1	6	-	6	15	70
Exotic Grassland	2	2	-	2.0	15	70
Native groundcover – shrubs (%)						
White Box Woodland	1	0	-	0	3	5
Exotic Grassland	2	0	-	0	3	5
Native groundcover – other (%)						
White Box Woodland	1	0	-	0	3	20
Exotic Grassland	2	4	-	4.0	3	20
Exotic plant cover (%)						
White Box Woodland	1	72	-	72.0	-	-
Exotic Grassland	2	94	-	94.0	-	-
Number of trees with hollows						
White Box Woodland		0	-	0	0.8	-
Exotic Grassland	1	0	-	0	0.8	-
Regeneration (proportion of tree species)						
White Box Woodland	1	0	-	0	-	-
Exotic Grassland	2	0	-	0	-	-
Total length of fallen logs (m)						
White Box Woodland	1			35.0	66	-
Exotic Grassland	2	0	-	0	66	-

The data for the Black Rock Range area show the vegetation was in poor condition. The groundcover was in low condition with much greater than 50% cover by exotic species for the White Box Woodland (72%) and the Exotic Grassland (90%) (Table 6). White Box Woodland was in poor condition, meeting only one benchmark, native overstorey cover, and falling well short of all others (Table 6).

There are no benchmarks for Exotic Grassland in DECC (2008a) for the Lachlan Local Land Services (Lachlan LLS) region. It is considered the grassland is likely to have resulted from clearing Yellow Box or White Box Woodland and accordingly is compared with the benchmarks for Yellow Box Woodland here. Since it met only one of the Yellow Box Woodland benchmarks, other native groundcover, and its ground cover was in low condition, the Exotic Grassland is considered to be in very poor condition overall.

5.1.5 Threatened Flora

Belubula River /Flyers Creek

No threatened flora species were identified in the existing Belubula River/Flyers Creek offset area.

One PCT at the Belubula River/Flyers Creek offset area, *Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*, is potentially part of the Box-Gum Woodland EEC/CEEC. Whether or not the remnant on the study area is considered part of the Box-Gum Woodland EEC/CEEC depends on whether it meets the relevant NSW (NPWS, undated) or Commonwealth (DEH, 2006) identification guidelines for acceptance. The guidelines are summarised in Table 7 and compared to the data obtained on the study area. The analysis indicates the Box-Gum Woodland remnants conform to the TSC Act EEC, but not the EPBC Act CEEC. In the latter case, the very poor condition of the ground cover excludes the remnant from the CEEC.

Table 7
Belubula River/Flyers Creek Area-
Conformance with Identification Criteria for the Box-Gum Woodland EEC/CEEC

Category	TSC Act		EPBC Act	
	Criterion	**Conforms?**	**Criterion**	**Conforms?**
Native understorey	Any native species present	Yes [Six native species on quadrat]	Predominantly native ground cover defined as 'at least 50% of the perennial vegetation cover in the ground layer is made up of native species'.	No [More exotic than native perennial species / cover]
Resilience	Site is 'likely to respond to assisted natural regeneration'	Yes [There is very limited potential for natural regeneration]	NA	-
Trees	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box present]	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box present]
Ground cover	Predominantly grassy	Yes [Introduced, not native grasses]	Native tussock grasses and herbs, and a sparse, scattered shrub layer.	No No native tussock grasses or shrubs]
Shrubs	'Shrubs are generally sparse or absent, though they may be locally common.'	Yes [No native shrubs recorded]	Patches with 'a continuous shrub layer of more than 30% cover' are excluded from the CEEC.	Yes [Native shrubs absent]
Important species	N/A	-	Twelve or more native (non-grass) understorey species present, including at least one 'important' species.	No [Only 4 native understorey species]
Disturbance	Natural soil and associated seed bank are still or at least partially intact.	Yes [Very limited potential]	Site is still the CEEC even if treeless, provided it has 'an intact native ground layer with a high diversity of native plant species'.	No [Native ground layer is depauperate]
Size	Not important	-	At least 0.1 ha with more than 12 native understorey species (not grasses) OR greater than 2 ha with an average of 20+ trees per ha, or active tree regeneration.	No [<12 non-grass native understorey species; <2 ha in area]

Black Rock Range

Two PCTs at Black Rock Range, *Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*, and *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion* are potentially part of the Box-Gum Woodland EEC/CEEC. An analysis (Table 8) indicates that the Box-Gum Woodland remnants conform to the TSC Act EEC (Figure 5) but not to the EPBC Act CEEC (Figure 6). No threatened flora species were identified in the existing Black Rock Range offset area.

Table 8
Black Rock Range Area-
Conformance with Identification Criteria for the Box-Gum Woodland EEC/CEEC

Category	TSC Act		EPBC Act	
	Criterion	Conforms?	Criterion	Conforms?
Native understorey	Any native species present	Yes [9 native species present]	Predominantly native ground cover defined as 'at least 50 percent of the perennial vegetation cover in the ground layer is made up of native species'.	Yes [Most exotic species are annuals, while most natives are perennials]
Resilience	Site is 'likely to respond to assisted natural regeneration'	Yes	NA	-
Trees	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box and White Box present]	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box and White Box present]
Ground cover	Predominantly grassy	Yes	Native tussock grasses and herbs, and a sparse, scattered shrub layer.	No [Ground layer dominated by exotic species]
Shrubs	'Shrubs are generally sparse or absent, though they may be locally common.'	Yes [Native shrubs are sparse]	Patches with 'a continuous shrub layer of more than 30 percent cover' are excluded from the CEEC.	Yes [Only a few tall native shrubs present]
Important species	NA	-	Twelve or more native (non grass) understorey species present, including at least one 'important' species.	No [9 present, 1 important]
Disturbance	Natural soil and associated seed bank are still or at least partially intact.	Yes [Seed bank likely to be partially intact, although considerably reduced]	Site is still the CEEC even if treeless, provided it has 'an intact native ground layer with a high diversity of native plant species'.	No [Native ground layer depauperate and dominated by exotic species]
Size	Not important	-	At least 0.1 ha with more than 12 native understorey species (not grasses) OR greater than 2 ha with an average of 20+ trees per ha, or active tree regeneration.	No No [Tree densities low, regeneration lacking]

5.1.6 Fauna Habitat

Fauna habitat values for both existing offset areas are relatively low for the following reasons;

- The eucalypt canopy has been substantially thinned in both areas. Nevertheless, the remaining canopy provides habitat for a range of open woodland bird species and foraging opportunities for possums and gliders. In the case of the Belubula River/Flyers Creek area, the often dense River Oak canopy provides shelter for a variety of bird species, especially those associated with aquatic habitats.
- The open grassland areas dominated by exotic species have limited habitat value, except for macropods, granivorous birds such as finches and common insectivorous birds adapted to grasslands such as Yellow-tailed Thornbills and Magpies.
- There are limited opportunities for reptiles with few logs on the ground or surface rocks for habitat on both areas.
- Both areas have retained old growth trees with hollows suitable for a variety of wildlife, but they are scattered in a cleared landscape with limited habitat available to denning or nesting species that depend on woodlands and forests.
- Both areas lack dense shrub cover required by some bird species for nesting and foraging.

5.2 PROPOSED STRATTON VALE REPLACEMENT AREA

5.2.1 Vegetation Communities

The PCTs detailed below are considered closest in floristic composition and site characteristics to those described in the OEH (2014b) Plant Community Types Database.

The vegetation on the proposed Stratton Vale replacement area is fairly uniform (Figure 4, Table 9), and comprises four vegetation communities:

- Yellow Box Woodland (Community 2);
- White Box Woodland (Community 3);
- Derived Grassland (Community 5); and
- Exotic Grassland (Community 6).

The original woodland vegetation on Stratton Vale has been thinned historically and now comprises mostly widely spaced trees separated by grassland dominated by exotic grasses and legumes. The larger treeless areas have been mapped as Exotic Grassland on Figure 4. Some large areas of derived native grassland also occur. These are dominated by grazing-tolerant native species including Speargrass (*Austrostipa scabra*) on dry north-facing slopes and Red Grass (*Bothriochloa macra*) on south-facing slopes.

Table 9
Vegetation Types in the Proposed Stratton Vale Replacement Area

Community No.*	PCT Code	Short Name	Plant Community Type (OEH, 2012)	Dominant Species on Study Areas
2	277	Yellow Box Woodland (Box-Gum Woodland EEC)	*Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion*	Yellow Box (*Eucalyptus melliodora*), Apple Box (*Eucalyptus bridgesiana*)
3	266	White Box Woodland (Box-Gum Woodland EEC)	*White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion*	White Box (*Eucalyptus albens*)
5	N/A	Derived Grassland	-	Speargrass (*Austrostipa scabra*), Red Grass (*Bothriochloa macra*)
6	N/A	Exotic Grassland	-	Phalaris (*Phalaris aquatica*), Madrid Brome (*Bromus madritensis*), Soft Brome (*Bromus hordeaceus*), Subterranean Clover (*Trifolium subterraneum*)

* Note: Communities 1 and 4 do not occur in the Stratton Vale investigation area.

5.1.1 Flora Species

The flora species recorded on the proposed Stratton Vale replacement area are given for each quadrat in Appendix 1. A total of 69 flora species was observed on four quadrats and through opportunistic observations. Twenty three native (33.3%) and 46 introduced (66.7%) flora species were identified. The results showed the presence of low numbers of native species and that introduced species greatly predominated.

5.1.2 Noxious Weeds

Three introduced species listed as Class 4 noxious weeds under the NSW *Noxious Weeds Act, 1993* (DPI, 2014) for the Upper Macquarie County Council Area occur on the study area (Appendix 1);

- Bathurst Burr (*Xanthium spinosum*);
- Blackberry (*Rubus anglocandicans*); and
- St. John's Wort (*Hypericum perforatum*).

All noxious weeds occurred only in low numbers indicating they have been well controlled.

5.1.3 Vegetation Condition

'BioMetric' vegetation condition data show that the vegetation was in relatively poor condition (Table 10). The groundcover was in low condition with greater than 50% cover by exotic species for both Yellow Box Woodland (62%) and White Box Woodland (80%) (Table 10). The Yellow Box Woodland met or exceeded only one of the ten benchmarks, native overstorey cover. However, it was very close to the lower benchmarks for groundcover by native grasses, other native groundcover, number of trees with hollows and length of fallen logs. The White Box Woodland at Stratton Vale met or exceeded the benchmarks for native overstorey cover and number of trees with hollows. It was also very close to the benchmark for groundcover by native grasses, but fell well short of five other benchmarks (Table 10).

5.1.4 Threatened Flora

No threatened flora species were identified on the proposed Stratton Vale replacement area.

Two PCTs, Yellow Box Woodland and White Box Woodland are potentially part of the Box-Gum Woodland EEC/CEEC. Whether or not the remnants on the study area are considered part of the Box-Gum Woodland EEC/CEEC depends on whether any patches meet the NSW (NPWS, undated) or Commonwealth (DEH, 2006) identification guidelines for acceptance. The analysis indicates that all Box-Gum Woodland remnants conform to the TSC Act EEC guidelines (Figure 5), but none conform to the EPBC Act CEEC guidelines (Figure 6) owing to the very poor condition of the ground cover (Table 11).

5.1.5 Fauna Habitat

The proposed Stratton Vale replacement area has relatively high fauna habitat values for the following reasons;

- Many of the remnant trees at Stratton Vale are very large and clearly pre-date European settlement. One tree hosts the nest of a Little Eagle (*Hieraaetus morphnoides*), listed as Vulnerable under the TSC Act. In addition, many of the White Box trees have hollows suitable for parrots and a nesting population of the Vulnerable Superb Parrot (*Polytelis swainsonii*) is present on and around the investigation area.
- While the groundcover is generally dominated by exotic species, there is a good representation of native perennial grasses, potentially providing habitat for granivorous birds favouring native grass seed, such as finches and the Superb Parrot.
- However, Stratton Vale is lacking in tall and low shrubs that would provide cover and nesting habitat for many birds including finches, babblers, thornbills and others.
- There are limited opportunities for most reptiles owing to very dense exotic grass cover over much of the area and relatively few logs on the ground. However, areas of surface rock on ridges and rock outcrops along Swallow Creek provide reptile habitat.
- Swallow Creek provides water for wildlife and habitat for aquatic fauna.

Table 10
Vegetation Condition Data – Proposed Stratton Vale Replacement Area

Vegetation Type	No. of Replicates	Recorded Values			Benchmarks	
		Lower	Upper	Average	Lower	Upper
Native plant species richness (number of species)						
Yellow Box Woodland	2	8	9	8.5	23	-
White Box Woodland	2	7	8	7.5	23	-
Native overstorey cover (%)						
Yellow Box Woodland	2	39.0	56.5	47.8	8	35
White Box Woodland	2	21.5	48.5	35.0	8	35
Native midstorey cover (%)						
Yellow Box Woodland	2	0	0	0	1	20
White Box Woodland	2	0	0	0	1	20
Native groundcover – grasses (%)						
Yellow Box Woodland	2	10.0	18.0	14.0	15	70
White Box Woodland	2	4.0	24.0	14.0	15	70
Native groundcover – shrubs (%)						
Yellow Box Woodland	2	0	0	0	3	5
White Box Woodland	2	0	0	0	3	5
Native groundcover – other (%)						
Yellow Box Woodland	2	0	4.0	2.0	3	20
White Box Woodland	2	0	2.0	1.0	3	20
Exotic plant cover (%)						
Yellow Box Woodland	2	50.0	74.0	62.0	-	-
White Box Woodland	2	76.0	84.0	80.0	-	-
Number of trees with hollows						
Yellow Box Woodland	2	0	1	0.5	0.8	-
White Box Woodland	2	0	2	1.0	0.8	-
Regeneration (proportion of tree species)						
Yellow Box Woodland	2	0	33.0	16.5	-	-
White Box Woodland	2	0	0	0	-	-
Total length of fallen logs (m)						
Yellow Box Woodland	2	35.1	59.2	47.2	66	-
White Box Woodland	2	30.8	41.7	36.3	66	-

Table 11
Proposed Stratton Vale Replacement Area -
Conformance with Identification Criteria for the Box-Gum Woodland EEC/CEEC

Category	TSC Act		EPBC Act	
	Criterion	**Conforms?**	**Criterion**	**Conforms?**
Native understorey	Any native species present	Yes [Low numbers of grazing tolerant native species are present]	Predominantly native ground cover defined as 'at least 50 percent of the perennial vegetation cover in the ground layer is made up of native species'.	No [Ground cover is dominated by exotics including perennial species]
Resilience	Site is 'likely to respond to assisted natural regeneration'	Yes There is limited potential for recovery of remaining resilient native species]	NA	-
Trees	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box and White Box present]	Site has, or is likely to have had prior to clearing, White Box, Yellow Box and/or Blakely's Red Gum.	Yes [Yellow Box and White Box present]
Ground cover	Predominantly grassy	Yes [Although mainly exotic species]	Native tussock grasses and herbs, and a sparse, scattered shrub layer.	No [Ground cover dominated by exotics (Table 12)]
Shrubs	'Shrubs are generally sparse or absent, though they may be locally common.'	Yes [Native shrubs absent]	Patches with 'a continuous shrub layer of more than 30 percent cover' are excluded from the CEEC.	Yes [Native shrubs absent]
Important species	NA	-	Twelve or more native (non grass) understorey species present, including at least one 'important' species.	No [Fewer than 12 native ground cover species present on all quadrats (Table 12)]
Disturbance	Natural soil and associated seed bank are still or at least partially intact.	Yes [Only a limited range of resilient species persists]	Site is still the CEEC even if treeless, provided it has 'an intact native ground layer with a high diversity of native plant species'.	No
Size	Not important	-	At least 0.1 ha with more than 12 native understorey species (not grasses) OR greater than 2 ha with an average of 20+ trees per ha, or active tree regeneration.	No No (Trees are sparse)

6 DISCUSSION AND CONCLUSIONS

Owing to similar histories of land use the three areas under investigation have many similarities in vegetation condition;

- All have had their original tree canopies heavily thinned and all have significant grassland expanses where most trees have been removed.

- All areas have virtually no extant tall or low shrubs owing to long histories of intensive livestock grazing and pasture improvement. Although Box-Gum Woodlands are predominantly grassy, they have a moderate shrub cover in their natural state, which provides habitat for a wide range of fauna species.

- Except for some small areas with northern and eastern aspects, the ground cover on all areas was heavily dominated by introduced annual and perennial grasses, and consequently is in 'low' condition as defined in the BioBanking assessment methodology (DECC, 2008b).

- The diversity of native flora was low on all areas.

- The proposed Stratton Vale replacement area has significant numbers of old growth Box trees with hollows suitable for a wide range of wildlife. Logs on the ground are present within patches of remnant woodland vegetation, but are generally absent from open grassland areas. Limited areas of rock outcrop and surface rock suitable for many reptiles are present at Stratton Vale. The Stratton Vale area is notable in having actual breeding habitat for two Vulnerable fauna species, the Little Eagle and the Superb Parrot.

- Owing to the very broad definition of the NSW Box-Gum Woodland EEC, all mapped occurrences of Yellow Box Woodland and White Box Woodland belong to the EEC. By contrast, the very strict Commonwealth Box-Gum Woodland CEEC guidelines mean that no areas investigated met the CEEC guidelines.

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APPENDIX 1. Flora Species and Cover Abundance on Each Quadrat
[the community number heads each quadrat column]

Scientific Name	Common Name	Belubula/Flyers			Black Rock		Stratton Vale				
		1	1	2	3	6	2	2	3	3	Opp.
CLASS FILICOPSIDA											
Pteridaceae											
Cheilanthes sieberi	Poison Rock Fern				1						
CLASS MAGNOLIOPSIDA											
SUBCLASS MAGNOLIIDAE											
Amaranthaceae											
Alternanthera sp. A								1			
Apiaceae											
**Conium maculatum*	Hemlock	4	5								
**Torilis nodosa*	Knotted Hedge-parsley				1						
Asteraceae											
**Arctotheca calendula*	Capeweed							5			
**Carduus pycnocephalus*	Slender Thistle	2	3	•	1		•		3	4	
**Carthamus lanatus*	Saffron Thistle				1	4				1	
**Chondrilla juncea*	Skeleton Weed			•	2	3	•				
**Cirsium vulgare*	Spear Thistle		2	•		1	•	2	2	3	
**Conyza sumatrensis*	Tall Fleabane	2	2								
**Hypochaeris radicata*	Flatweed	1	1			1					
**Lactuca serriola*	Prickly Lettuce	1		•		1	•	1		1	
Senecio quadridentatus	Cotton Fireweed	1									
**Silybum marianum*	Variegated Thistle	5	1	•		2	•	2	4	3	
**Sonchus asper*	Prickly Sowthistle		2								
**Sonchus oleraceaus*	Common Sowthistle	2	3	•	1			2		2	
**Xanthium spinosum*	Bathurst Burr						•			1	
Boraginaceae											
**Echium plantagineum*	Paterson's Curse	2	2	•	5	1		1		1	
Brassicaceae											
**Hirschfeldia incana*	Hairy Brassica	3	1								
**Lepidium africanum*	African Peppercress							2			
**Raphanus raphanistrum*	Wild Radish				1						
**Sisymbrium officinale*	Hedge Mustard	3	3	•			•	5	6	5	
Campanulaceae											
Wahlenbergia gracilis	Sprawling Bluebell							1			
Caryophyllaceae											
**Petrorhagia nanteuilii*		2			1	1					
**Stellaria media*	Common Chickweed	1									
Casuarinaceae											
Casuarina cunninghamiana	River Sheoak	6	8								
Chenopodiaceae											
**Chenopodium album*	Fat Hen				1						
**Chenopodium murale*	Nettle-leaf Goosefoot									1	
Einadia nutans subsp. *nutans*	Climbing Saltbush									2	
Clusiaceae											
**Hypericum perforatum*	St. John's Wort	1				3	•				
Convolvulaceae											

Scientific Name	Common Name	Belubula/Flyers			Black Rock		Stratton Vale				
		1	1	2	3	6	2	2	3	3	Opp.
Dichondra repens	Kidney Weed		2	●			●			2	
Crassulaceae											
Crassula sieberiana	Australian Stonecrop							1			
Euphorbiaceae											
**Euphorbia peplus*	Petty Spurge	1	1								
Fabaceae: Faboideae											
Desmodium varians	Slender Tick-trefoil				1						
**Medicago polymorpha*	Burr Medic	3		●			●	1		3	
**Medicago truncatula*	Barrel Medic								2		
**Trifolium angustifolium*	Narrow-leaved Clover				1	3			2		
**Trifolium arvense*	Haresfoot Clover	2			1			1	2		
**Trifolium campestre*	Hop Clover							2	3		
**Trifolium glomeratum*	Clustered Clover	1			3			3	2	3	
**Trifolium repens*	White Clover		2								
**Trifolium subterraneum*	Subterranean Clover	2		●			●	2	3	2	
**Trifolium suffocatum*	Suffocated Clover				3	4	●	4	4	4	
Fabaceae: Mimosoideae											
Acacia leucoclada					4						
Fumariaceae											
**Fumaria capreolata*	Climbing Fumitory	4	6								
Geraniaceae											
**Erodium cicutarium*	Common Storksbill							1			
**Geranium molle*	Cranesbill Geranium						●				
Geranium retrorsum	Common Cranesbill	3	5	●			●		3	2	
Geranium solanderi	Native Geranium				3						
Goodeniaceae											
Goodenia pinnatifida											●
Lamiaceae											
**Marrubium vulgare*	White Horehound				1			2			
**Mentha x piperita nothomorph citrata*			4								
**Salvia verbenaca*	Vervain		1				●	4	2	1	
Scutellaria humilis	Dwarf Skullcap				2						
Loranthaceae											
Amyema miquelii					3						
Malvaceae											
Brachychiton populneus	Kurrajong				1						
**Malva parviflora*	Small-flowered Mallow	3		●			●	4		4	
**Modiola caroliniana*	Red-flowered Mallow	1	2	●		2	●	4	1	2	
Myrtaceae											
Eucalyptus albens	White Box				6				8	8	
Eucalyptus bridgesiana	Apple Box			●							
Eucalyptus camaldulensis	River Red Gum	6									
Eucalyptus melliodora	Yellow Box			●			●	6			
Myrsinaceae											
**Anagallis arvensis*	Scarlet Pimpernel		2								
Nyctaginaceae											
Boerhavia dominii	Tarvine					2					
Onagraceae											

Scientific Name	Common Name	Belubula/Flyers			Black Rock		Stratton Vale				
		1	1	2	3	6	2	2	3	3	Opp.
Epilobium billardierianum subsp. *cinereum*							•				
Epilobium hirtigerum			1								
Oxalidaceae											
Oxalis perennans	A Woodsorrel						•			1	
Oxalis thompsoniae				•		2					
Pittosporaceae											
Bursaria spinosa	Boxthorn										•
Plantaginaceae											
**Plantago lanceolata*	Lamb's Tongues	2	2	•						2	
Polygonaceae											
Rumex brownii	Swamp Dock	2		•	1	1	•	1	3		
**Rumex conglomeratus*	Clustered Dock		4								
Rosaceae											
Acaena agnipila					1				2		
**Rosa rubiginosa*	Sweet Briar	1			1	1					
**Rubus anglocandicans*	Blackberry	1	1				•	2			
**Sanguisorba minor*	Salad Burnet	1									
Rubiaceae											
**Galium aparine*	Goosegrass	1	5	•							
**Sherardia arvensis*	Field Madder								1		
Salicaceae											
**Salix viminalis*	Basket Willow		2								
Scrophulariaceae											
**Orobanche minor*		1					•				
**Verbascum virgatum*	Twiggy Mullein	1									
Solanaceae											
**Solanum nigrum*	Black-berry Nightshade		1		1			1			
Urticaceae											
Urtica incisa	Stinging Nettle		3								
**Urtica urens*	Small Nettle		5	•			•			3	
Verbenaceae											
**Verbena incompta*	Purpletop		3								
**Verbena officinalis*	Common Verbena	2									
SUBCLASS LILIIDAE											
Cyperaceae											
Carex inversa	Knob Sedge					5	•				
**Cyperus eragrostis*	Umbrella Sedge	1	2								
Isolepis hookeriana			2								
Juncaceae											
**Juncus articulatus*			2								
Juncus usitatus			1								
Lomandraceae											
Lomandra filiformis subsp. *filiformis*	Wattle mat-rush					1					
Poaceae											
Austrostipa bigeniculata											•
Austrostipa scabra	Speargrass							5			•
**Avena barbata*	Bearded	2	2								

Scientific Name	Common Name	Belubula/Flyers			Black Rock		Stratton Vale				
		1	1	2	3	6	2	2	3	3	Opp.
**Avena fatua*	Wild Oats				1			1			
Bothriochloa macra	Red Grass				1					1	●
**Briza minor*	Small Shivery Grass					1					
**Bromus catharticus*	Prairie Grass	3	3	●			●	6			
**Bromus diandrus*	Great Brome	6	2	●	6	3				6	
**Bromus hordeaceus*	Soft Brome	2		●	2	6	●	3	3	2	
**Bromus madritensis*	Madrid Brome						●	3	4		
Cynodon dactylon	Couch	3	3								
**Dactylis glomerata*	Cocksfoot	2	4					2	2		
Elymus scaber	Wheat Grass					2		1			
**Holcus lanatus*	Yorkshire Fog		4								
**Hordeum leporinum*	Barley Grass			●	1		●	6	3	6	
**Lolium perenne*	Perennial Ryegrass	3		●			●	4	7	6	
**Lolium rigidum*	Wimmera Ryegrass	5	3	●	2	2			4	1	
Microlaena stipoides	Weeping Grass					2	●	2	3	1	
Panicum effusum	Hairy Panic					4					
**Paspalum dilatatum*	Paspalum	2		●			●				
**Phalaris aquatica*	Phalaris	2	3	●		2	●			2	
**Poa pratensis*	Kentucky Bluegrass		2								
Poa sieberiana	Snow Grass								2		
Rytidosperma caespitosum	Ringed Wallaby Grass				6		●	5	4	5	
Rytidosperma racemosum					1						
**Vulpia muralis*						5					
**Vulpia myuros*	Rat's Tail Fescue							2			
Total Native Species	43	14			20		23				
Total Introduced Species	76	55			29		46				
Total Species	119	69			49		69				

* = Introduced species; ● = Species present