	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

MAULES CREEK COAL MINE **OFFSET MANAGEMENT PLAN**

November 2021

Document History

Edition	Rev.	Comments	Date
1	0	Initial Draft Document	
		Approval of the Biodiversity Management Plan (BMP) by DP&I (now DPIE)	21 June 2013
1	4	Revision for further consultation with OEH (now BCS)	October 2013
1	5	Revision to address OEH (now BCS) consultation comments and submission to DotE (now DAWE)	February 2014
1	6	Revisions to address DP&I (now DPIE) comments	March 2014
1	7	Revisions to address OEH (now BCS) comments	May 2014
		Approval of the BMP by DP&E (now DPIE)	14 May 2014
1	8	Annual review	July 2014
1	9	Revisions to address stakeholder comments	August 2014
1	10	Revisions to address stakeholder comments	October 2014
		Approval of the BMP by DP&E (now DPIE)	23 October 2014
2	1	Revisions to address Condition 53	17 March 2015
2	2-5	Revisions to address stakeholder comments	April 2015 to April 2017
		Approval of the BMP by DP&E (now DPIE)	26 April 2017
3	1	Revisions of the BMP to address The Leard Forest RBS Stage 2 Report, and submission to DEE (now DAWE)	28 February 2018
4	1	Revisions to create separate Offset Management Plan and address a varied EPBC Act approval (24 March 2021), and submission to DAWE	9 September 2021
4	2	Revisions to address DAWE comments	5 November 2021
		Approval of the OMP by DAWE	20 December 2021


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	BACKGROUND	1
1.2	PURPOSE OF THIS OFFSET MANAGEMENT PLAN	1
1.3	STRUCTURE OF THE OFFSET MANAGEMENT PLAN	6
1.4	RESPONSIBILITIES	7
1.5	FUNDING OF MANAGEMENT ACTIVITIES	8
2	REQUIREMENTS FOR THE OFFSET MANAGEMENT PLAN	9
2.1	RELEVANT COMMONWEALTH APPROVAL CONDITIONS	9
2.2	OTHER REQUIREMENTS PERTAINING TO THE MANAGEMENT OF THE OFFSET AREAS	14
	2.2.1 Conservation Agreements	14
	2.2.2 Leard Forest Mining Precinct Regional Biodiversity Strategy	14
2.3	CONSERVATION ADVICES, RECOVERY PLANS AND THREAT ABATEMENT PLANS	14
3	BASELINE ECOLOGICAL CONDITIONS	15
3.1	EXTENT AND CONDITION OF VEGETATION COMMUNITIES	15
3.2	EXTENT AND CONDITION CLASS OF BOX-GUM WOODLAND	15
3.3	SURVEYS TARGETING THE REGENT HONEYEATER, SWIFT PARROT AND CORBEN'S LONG-EARED BAT	29
3.4	EXTENT AND QUALITY OF ALL AREAS OF HABITAT AND FUTURE POTENTIAL HABITAT FOR THE REGENT HONEYEATER, SWIFT PARROT AND CORBEN'S LONG-EARED BAT	29
3.5	OTHER SPECIES	30
4	MANAGEMENT OF THE OFFSET AREAS	38
4.1	OBJECTIVES AND IMPLEMENTATION SCHEDULE	38
	4.1.1 Ecological Management Objectives	38
	4.1.2 Implementation Schedule	38
4.2	MANAGEMENT ZONES	39
4.3	SEED COLLECTION	44
4.4	REVEGETATION	44
4.5	ECOLOGICAL THINNING	47
4.6	HABITAT AUGMENTATION	48
4.7	WEED MANAGEMENT	48
4.8	PEST ANIMAL MANAGEMENT	50
4.9	EROSION MANAGEMENT	52
4.10	AGRICULTURE MANAGEMENT	52
4.11	CONTROL OF ACCESS	52
4.12	BUSHFIRE MANAGEMENT	52
4.13	TYLOPHORA LINEARIS	53
4.14	PERFORMANCE AND COMPLETION CRITERIA	55


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

TABLE OF CONTENTS (continued)

	4.14.1	Box-Gum Woodland CEEC listed under the EPBC Act	55
	4.14.2	Habitat for Threatened Species listed under the EPBC Act	57
4.15		ECOLOGICAL MONITORING PROGRAM	58
	4.15.1	Vegetation and Habitat Monitoring	59
	4.15.2	Fauna Monitoring	63
4.16		POTENTIAL RISKS AND CONTINGENCY MEASURES	64
5		REPORTING AND REVIEW	66
	5.1	REPORTING SURVEY DATA	66
	5.2	OMP PUBLISHING	66
	5.3	COMMONWEALTH APPROVAL COMPLIANCE REPORTS	66
	5.4	MCCM ANNUAL REVIEW REPORT	66
	5.5	REVISION OF THE OFFSET MANAGEMENT PLAN	67
	5.6	BIODIVERSITY AUDIT	67
6		REFERENCES	68

LIST OF TABLES

Table 1-1	Offset Areas Subject to this Offset Management Plan
Table 1-2	Responsible Parties
Table 2-1	EPBC Act Approval 2010/5566 Requirements
Table 3-1	Box-Gum Woodland CEEC Listed Under the EPBC Act in the Offset Areas
Table 3-2	Condition States of Box Gum Woodland According to the State and Transition Model
Table 3-3	Habitat and Future Potential Habitat for Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and <i>Tylophora linearis</i> in the Offset Areas
Table 3-4	Threatened Species listed under the EPBC Act in the Offset Areas
Table 4-1	OMP Implementation Schedule
Table 4-2	Indicative Revegetation Species List
Table 4-3	Control of Example Target Priority Weeds
Table 4-4	Control Methods for Target Pest Animals
Table 4-5	Ecological Indicators for Detecting Changes to the Box-Gum Woodland CEEC
Table 4-6	Performance and Completion Criteria for Box-Gum Woodland CEEC
Table 4-7	Performance and Completion Criteria for Habitat
Table 4-8	Vegetation and Habitat Monitoring Methods
Table 4-9	Schedule of Flora Monitoring Sites
Table 4-10	Trigger, Action, Response Plan (TARP)


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

TABLE OF CONTENTS (continued)

LIST OF FIGURES

Figure 1	Project Location
Figure 2	Project Layout
Figure 3	Maules Creek Mine Biodiversity Offset Areas Subject to this Management Plan
Figure 4	Local Biodiversity Offsets
Figure 5a	Vegetation Communities – Wollandilly and Onavale
Figure 5b	Vegetation Communities – Kelso, Velyama, Louenville and Teston South
Figure 5c	Vegetation Communities – Roseglass and Bimbooria
Figure 5d	Vegetation Communities – Mt Lindesay, Wirradale and Wongala South
Figure 6	Box-Gum Woodland CEEC Listed Under EPBC – Overview Map
Figure 7a	Matters of National Environmental Significance – Wollandilly and Onavale Threatened Flora
Figure 7b	Matters of National Environmental Significance – Kelso, Velyama, Louenville and Teston South Threatened Flora
Figure 7c	Matters of National Environmental Significance – Roseglass and Bimbooria Threatened Flora
Figure 7d	Matters of National Environmental Significance – Mt Lindesay, Wirradale and Wongala South Threatened Flora
Figure 8a	Matters of National Environmental Significance – Wollandilly and Onavale Threatened Fauna
Figure 8b	Matters of National Environmental Significance – Kelso, Velyama, Louenville and Teston South Threatened Fauna
Figure 8c	Matters of National Environmental Significance – Roseglass and Bimbooria Threatened Fauna
Figure 8d	Matters of National Environmental Significance – Mt Lindesay, Wirradale and Wongala South Threatened Fauna
Figure 9a	Management Zones – Wollandilly and Onavale
Figure 9b	Management Zones – Kelso, Velyama, Louenville and Teston South
Figure 9c	Management Zones – Roseglass and Bimbooria
Figure 9d	Management Zones – Mt Lindesay, Wirradale and Wongala South
Figure 10	Area Undergoing Active Revegetation 2016-2021
Figure 11	Layout of Flora Monitoring Plot


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			


TABLE OF CONTENTS (continued)

LIST OF PLATES

Plate 1	Example of Box-Gum Woodland CEEC in the Offset Area
Plate 2	Example of Box-Gum Woodland CEEC in the Offset Area
Plate 3	Example of Areas Undergoing Active Revegetation across MCCM Offset Areas

LIST OF APPENDICES

Appendix A	Reconciliation of the Offset Management Plan against the Leard Forest Mining Precinct Regional Biodiversity Strategy
Appendix B	Maules Creek Coal Mine Offset Area Vegetation Mapping Report
Appendix C	Survey Sites and Photo Reference Points
Appendix D	<i>Tylophora linearis</i> Propagation and Translocation Program
Appendix E	Completion Criteria for Key Biometrics of Vegetation Classes and Corresponding BVTs/PCTs Mapped Within the Offset Area
Appendix F	Annual Performance Criteria for Key Biometrics of Vegetation Classes Mapped Within the Offset Area
Appendix G	Offset Area Risk Assessment

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

1 INTRODUCTION

1.1 BACKGROUND

The Commonwealth Minister for the Environment granted approval for the Maules Creek Coal Mine (MCCM) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 11 February 2013 (EPBC Act Approval 2010/5566). Project approval under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) was granted for the MCCM by the Planning Assessment Commission (PAC) under delegation of the Minister for Planning and Infrastructure on 23 October 2012 (Project Approval [PA] 10_0138). The location and layout of the approved MCCM is shown on Figures 1 and 2.

1.2 PURPOSE OF THIS OFFSET MANAGEMENT PLAN

This Offset Management Plan (OMP) has been prepared to address Conditions 12A and 12C of EPBC Act Approval 2010/5566 for the offset areas listed in Table 1-1¹ and the boundaries are shown on Figure 3. Two offset areas are located east of Mount Kaputar National Park, two offset areas are directly north of Boonalla CCA Zone 2 Aboriginal Area and the other offset areas are located to the north and west of Leard State Forest.

This OMP is accompanied by shapefiles containing the offset attributes (provided separately).

¹ Kelso, Velyama, Louenville, Teston South, Wollandilly, Wirradale and Mt Lindesay were proposed in the *Environmental Assessment* (Hansen Bailey, 2011). Onavale, Roseglass, Bimbooria and Wongala South were agreed as a result of the process in Conditions 10 and 11 of EPBC Act Approval 2010/5566. Blue Range, Cattle Plain, Teston North, Tralee, Warriahdool, Shared Property (Rocklea) and Olivedeen have been removed as offset areas pursuant to Condition 12A of EPBC Act Approval 2010/5566 and will be replaced with additional offset areas pursuant to condition 11A of EPBC Act Approval 2010/5566.


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 1-1
Offset Areas Subject to this Offset Management Plan

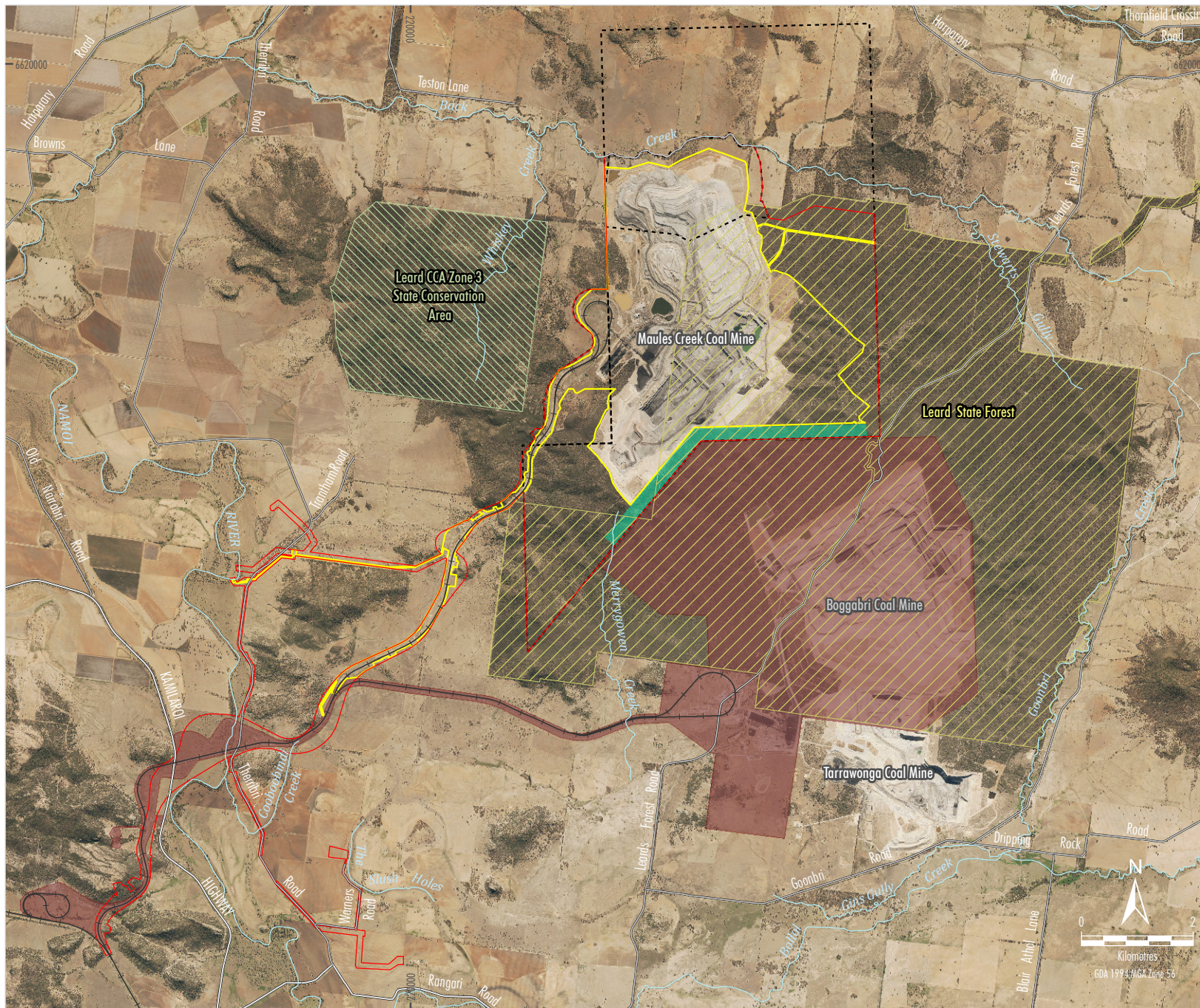
Offset Area	Total Size of the Offset Area (ha)	Conservation Agreement (CA) ID	Box-Gum Woodland CEEC Listed under the EPBC Act (ha)	Regent Honeyeater (ha)			Swift Parrot (ha)			Corben's Long-eared Bat (ha)			Total Existing and Future Habitat for Tylophora linearis (ha)
				Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	
Kelso	489.4	VCA0487 under the NP&W Act ¹	4	320.6	54.3	374.9	327.7	54.3	382	327.7	54.3	382	419.3
Velyama	702.6		61.8	128.9	97.4	226.3	133.3	97.4	230.7	142.2	97.4	239.6	530.6
Louenville	213.1		36	186.2	0	186.2	186.9	0	186.9	186.9	0	186.9	204.7
Teston South	336.2	VCA0491 under the NP&W Act	80.7	215.3	51.8	267.1	228.8	51.8	280.6	238.9	51.8	290.7	291.6
Wollandilly	804.4	VCA0490 under the NP&W Act	69.6	185.5	466.2	651.7	185.5	350.3	535.8	276.1	466.2	742.3	539.6
Onavale	557.7	VCA0492 under the NP&W Act	40.3	123.9	106.5	230.4	95.1	86.8	181.9	139.4	106.5	245.9	181.3
Roseglass	1,465.3	VCA0489 under the NP&W Act	113.8	35.1	304.5	339.6	55.9	304.5	360.4	1109.4	304.5	1,413.9	1,172.1
Bimbooria	622.5		373.2	267.2	217.3	484.5	364	217.3	581.3	405.1	217.3	622.4	520.8
Wirradale and Wongala South	4,446.6	CA0234 under the BC Act ²	1,700.7	3027.5	1165.1	4,192.6	2975.4	1158.1	4,133.5	2864.1	1193.7	4,057.8	704.7
Mt Lindesay	2,337.1	CA0235 under the BC Act	880.1	1212.8	171.3	1,384.1	1110	126.2	1,236.2	686.6	83.2	769.8	392.5
Total	11,974.9	-	3,360.2	5703	2634.4	8,337.4	5662.6	2446.7	8,109.3	6376.4	2574.9	8,951.3	4,957.2

¹ National Parks and Wildlife Act 1974 (NP&W Act).

² Biodiversity Conservation Act 2016 (BC Act).



Figure 1

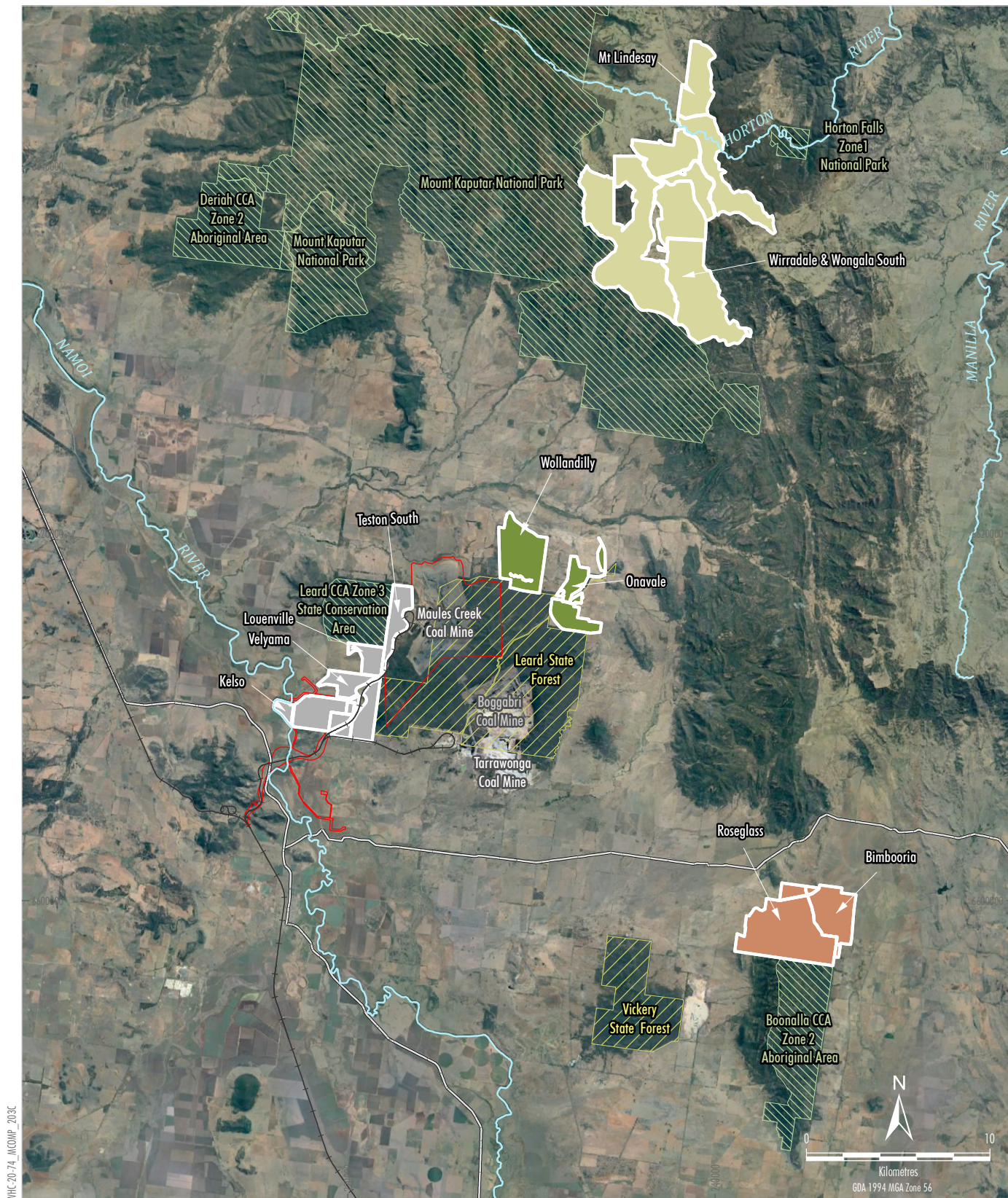


- LEGEND**
- Mining Tenement Boundary
 - NPWS Estate
 - State Forest
 - Project Boundary
 - Approximate Extent of Existing/Approved Surface Development
 - Maules Creek Biodiversity Corridor
 - Boggabri Project Approved Area

Source: NSW Spatial Services (2020);
Orthophoto Whitehaven Coal (April 2019)

WHITEHAVEN COAL
MAULES CREEK OFFSET MANAGEMENT PLAN
Project Layout

Figure 2



WHC-20-74_MCOMP_203C

- LEGEND**
- NPWS Estate
 - State Forest
 - Project Boundary
 - Maules Creek Offset Area


Source: NSW Spatial Services (2020)
Orthophoto: Google Earth (2020)



MAULES CREEK OFFSET MANAGEMENT PLAN

Maules Creek Mine
Biodiversity Offset Areas
Subject to this Management Plan

Figure 3

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Land-based offset areas additional to those in Table 1-1 are proposed in order to meet Conditions 9 and 9A of the EPBC Act Approval 2010/5566. In accordance with Condition 12B of EPBC Act Approval 2010/5566, an updated OMP including additional offset areas will be submitted to the Department of Agriculture, Water and the Environment (DAWE) within 6 months of approval of the additional offset areas under Condition 11A.

As per condition 37 of EPBC Act Approval 2010/5566, this OMP also describes relevant measures for *Tylophora linearis* (a threatened flora species listed under the BC Act and EPBC Act), in accordance with the approved *Maules Creek Tylophora linearis Offset Package* (Hunter Eco, 2021).

In addition to land-based offset areas, Maules Creek Coal Pty Ltd (MCC) will continue to provide \$2.5 million of funding as required by Conditions 15 and 16 of EPBC Act Approval 2010/5566 and in accordance with approved funding schedules. Condition 15 requires the investment of \$1 million for research on methodologies for achieving rehabilitation and restoration of the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (Box-Gum Woodland CEEC). To date, a total of \$440,000 of funding has been provided to meet Condition 15 and the approved funding schedule. Condition 16 requires the investment of \$1.5 million to deliver activities that implement priority recovery actions for the Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*) and the Corben's Long-eared Bat (*Nyctophilus corbeni*) (formerly known as the Greater or South-eastern Long-eared Bat). To date, a total of \$1.173 million of funding has been provided to meet Condition 16 and the approved funding schedule.


1.3 STRUCTURE OF THE OFFSET MANAGEMENT PLAN

The structure of this plan is as follows:

Section 2	Requirements for this OMP.
Section 3	Description of the existing environment relevant to the offset areas.
Section 4	Description of the management actions to be undertaken within the offset areas.
Section 5	Description of reporting and review requirements.

The following are appended to this OMP:

Appendix A	Reconciliation of the Offset Management Plan against the Leard Forest Mining Precinct Regional Biodiversity Strategy
Appendix B	Maules Creek Coal Mine Offset Area Vegetation Mapping Report
Appendix C	Survey Sites and Photo Reference Points
Appendix D	<i>Tylophora linearis</i> Propagation and Translocation Program
Appendix E	Completion Criteria for Key Biometrics of Vegetation Classes and Corresponding BVTs/PCTs Mapped Within the Offset Area
Appendix F	Annual Performance Criteria for Key Biometrics of Vegetation Classes Mapped Within the Offset Area
Appendix G	Offset Area Risk Assessment

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			


This OMP was prepared in consideration of the *Environmental Management Plan Guidelines* (Department of the Environment, 2014).

1.4 RESPONSIBILITIES

Whitehaven (Group Environment team) is responsible for managing, monitoring and implementing the management activities for the offset areas. In accordance with Condition 12C(f) of the EPBC Act Approval 2010/5566, Table 1-2 outlines the staff and contractors responsible for managing, monitoring and implementing the offset management activities in this OMP.

**Table 1-2
Responsible Parties**


Organisation	Position	Status	Responsibilities
Whitehaven	Group Manager - Environment and Approvals	Employee	Obtain and provide adequate resources for the Group Superintendent - Biodiversity to implement this OMP.
Whitehaven	Group Superintendent - Biodiversity	Employee	To authorise this OMP and undertake associated compliance and reporting requirements. Implement the overall biodiversity strategy on the offset area; coordinate and supervise biodiversity management and monitoring activities on the offset area.
Whitehaven	Biodiversity and Field Officers	Employee	Support the Group Superintendent - Biodiversity and supervise biodiversity management and monitoring activities on the offset area.
Pest Management Consultant/ Contractor	Scientists and Field Technicians	Contractors	Undertake biodiversity management activities as directed by the Group Superintendent - Biodiversity and Biodiversity/Field Officers for feral and pest animal monitoring and management/control.
Land Management and Weed Spraying Contactor	Field Operators and Technicians	Contractors	Undertake biodiversity management activities as directed by the Group Superintendent - Biodiversity and Biodiversity/Field Officers for weed spraying, habitat augmentation, threatened species, revegetation ground preparation and other minor earthworks and waste/infrastructure removal plus tree planting and maintenance activities.
Fire and Ecological Burn Contractor	Fire Fighters and Controlled Burn Practitioners	Contractors	Undertake biodiversity management activities as directed by the Group Superintendent - Biodiversity and Biodiversity/Field Officers for fire management planning, hazard reduction management and ecological burn implementation.
Ecological Consultant	Ecologists	Contractors	Undertake monitoring as directed by the Group Superintendent - Biodiversity and Biodiversity/Field Officers for threatened species and ecological communities assessment and flora/fauna surveys.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

1.5 FUNDING OF MANAGEMENT ACTIVITIES

MCC is responsible for funding the activities described in this OMP. In accordance with Condition 4 of EPBC Approval 2010/5566, the offset areas have an approved Conservation and Biodiversity Bond lodged with NSW DPIE that was most recently updated in May 2021. The Conservation and Biodiversity Bond ensures that the MCCM biodiversity offset strategy could be implemented in accordance with the performance and completion criteria if Whitehaven were unable to continue to manage the offset areas. The sum of the bond is determined by calculating the full cost of implementing the MCCM biodiversity offset strategy (other than land acquisition costs) in perpetuity. The sum of the bond includes all management measures prescribed within this OMP and is based on third party rates for fencing, fire management, weed management, feral animal control, seed collection, replanting/revegetation, monitoring, auditing and reporting. A suitably qualified quantity surveyor is employed to verify the calculated costs.

The May 2021 Conservation and Biodiversity Bond value was calculated at \$34,915,006, and verified by an independent third party who confirmed that the Conservation and Biodiversity Bond is sufficient to cover the funding of ongoing management activities. The Conservation and Biodiversity Bond will be updated annually during the third party review and a revised bond lodged. Once the revised bond is lodged with NSW DPIE, Whitehaven will notify DAWE (including providing the independent third party report, and detailed Bond spreadsheet) of the updated bond amount.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

2 REQUIREMENTS FOR THE OFFSET MANAGEMENT PLAN

2.1 RELEVANT COMMONWEALTH APPROVAL CONDITIONS

The conditions under EPBC Act Approval 2010/5566 that are relevant to this OMP are presented in Table 2-1.

Table 2-1
EPBC Act Approval 2010/5566 Requirements

Condition Number	Requirement	Relevant OMP Section
4	<i>The person taking the action is required to submit a Conservation and Biodiversity Bond under condition 55 of the NSW state government project approval dated 23 October 2012 (Application 10_0138). It is noted that this bond may be combined with the rehabilitation security deposit as required under the NSW Mining Act 1992. The person taking the action must submit details of this bond and the rehabilitation security deposit, to the Minister. If the Minister is not satisfied that the bond and the rehabilitation security deposit lodged by the person taking the action is adequate to provide for the implementation of the requirements referred to under conditions 3, 17, 25-28 the Minister may require the person taking the action establish an additional bond or equivalent financial instrument in trust, under conditions approved in writing by the Minister.</i>	Section 1.5
9	<p>Direct Offsets</p> <p><i>The person taking the action must register a legally binding conservation covenant over offset areas containing, to the satisfaction of the Minister, of no less than</i></p> <p>(a) 9,334 ha of equivalent or better quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat; and</p> <p>(b) 5,532 ha of an equivalent or better quality of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community.</p> <p><i>Note: the 5,532 ha of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community may be included within the 9,334 ha of offset area for the threatened species if it meets the listing criteria for the EPBC-listed critically endangered ecological community as defined in the EPBC listing advice for that community and the requirements of condition 9.</i></p>	Section 3.2, 3.3 and 3.4
9A	<p><i>The offset areas must be of an overall equivalent or better quality than the areas being cleared. This means:</i></p> <p>a. <i>for White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community, offset areas must meet the definition of the ecological community described in the listing advice, and must be of an overall equivalent or better condition class than the areas being cleared, based on the proportion of each condition class represented and other relevant ecological attributes;</i></p> <p>b. <i>for the threatened species, the quality of the habitat for the species, taking account of its ecological requirements, must be equivalent to or better than the areas being cleared.</i></p>	Section 3.2, 3.3 and 3.4


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 2-1 (Continued)
EPBC Act Approval 2010/5566 Requirements

Condition Number	Requirement	Relevant OMP Section
12A	<p><i>The person taking the action must submit to the Minister for approval an Offset management plan for all of the offset areas proposed in the Environmental Assessment, specified in Attachment B, within 12 months of this approval. The approved Offset management plan must be implemented for all of the offset areas proposed in the Environmental Assessment, specified in Attachment B, and any offset areas agreed as a result of independent verification process as specified in conditions 10 and 11, unless the Minister agrees to the removal of any specific properties as an offset area under this approval.</i></p> <p><i>If, after 31 October 2021, the Minister informs the person taking the action that the submitted Offset management plan is not suitable for approval, the Minister may, after 30 December 2021, approve a version of the Offset management plan revised by the Department.</i></p> <p><i>Note: for consistency, the person taking the action may develop a Biodiversity Management plan that includes the requirements set for managing offsets and set out in these conditions, to align with the requirements of the NSW state government Project Approval dated 23 October 2012 (application number 10_0138) and this approval.</i></p>	This OMP, Section 1.4
12B	<p><i>The person taking the action must submit to the Minister for approval an Additional Offset management plan for the additional offset areas within 6 months of their approval under condition 11A. The person taking the action must implement the approved Additional offset management plan.</i></p> <p><i>If, after a further 3 months, the Minister informs the person taking the action that the submitted Additional Offset management plan is not suitable for approval, the Minister may, after a further 3 months, approve a version of the Additional Offset management plan revised by the Department.</i></p> <p><i>Notes:</i></p> <p><i>(1) for consistency, the person taking the action may develop a Biodiversity Management plan that includes the requirements set for managing offsets and set out in these conditions, to align with the requirements of the NSW state government Project Approval dated 23 October 2012 (application number 10_0138) and this approval.</i></p> <p><i>(2) with the agreement of the Minister, the person taking the action may combine the Offset management plan and the Additional Offset management plan.</i></p>	Section 1.4
12C	<p><i>Each offset management plan must include, but not be limited to, the following:</i></p> <p><i>(a) a text description and map which clearly defines the location and boundaries of the offset areas. This must be accompanied by the offset attributes and shapefiles.</i></p> <p><i>(b) a description of the methodology and results of the surveys measuring the baseline ecological conditions in the offset areas. This must be consistent with the State and Transition Model and include but not be limited to:</i></p> <p><i>i. the extent and condition of all vegetation communities, including a description of the structure, floristics and tree age class representation of each community.</i></p> <p><i>ii. the extent and condition class of all areas of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community;</i></p> <p><i>iii. surveys targeting the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;</i></p> <p><i>iv. the extent and quality of all areas of habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;</i></p>	<p>Section 1.2 and Figure 3</p> <p>Section 3.1, Figures 5a to 5d, Appendix B</p> <p>Section 3.2, Figures 6, 7a to 7d</p> <p>Section 3.3</p> <p>Section 3.3, Figures 8a to 8d</p>


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 2-1 (Continued)
EPBC Act Approval 2010/5566 Requirements

Condition Number	Requirement	Relevant OMP Section
12C (Cont.)	v. <i>the location of all survey sites (including coordinates);</i>	Appendix C
	vi. <i>photo reference points at survey sites.</i>	Appendix C
	(c) <i>clearly defined ecological management objectives for the offset areas;</i>	Section 4.1
	(d) <i>detailed description of all ecological management activities proposed to be undertaken, including maps and/or diagrams showing areas to be managed and the timing of proposed activities;</i>	Section 4
	(e) <i>details of ongoing ecological monitoring programs, performance criteria, targets and provisions for adaptive management, including but not limited to:</i>	
	i. <i>a set of measurable ecological indicators for detecting changes to the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community, including those that may be ascribed to ongoing water stress;</i>	Section 4.14
	ii. <i>a monitoring plan to assess the success of the management activities measured against the baseline condition. The monitoring must be statistically robust and able to quantify change in the condition of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat. This should include the use of control sites and periodic ecological surveys to be undertaken by a qualified ecologist.</i>	Section 4.15
	iii. <i>a list of performance criteria based on the ecological management objectives for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;</i>	Section 4.14
	iv. <i>measures to exclude weeds from all offset areas for the period covered by this approval;</i>	Section 4.7
	v. <i>a description of the potential risks to successful management against the performance criteria, and a description of the contingency measures that will be implemented to mitigate against these risks;</i>	Section 4.16
	vi. <i>a process by which to report to the department the progress of management activities undertaken in the offset areas and the outcome of those activities, including identifying any need for improved management and activities to undertake such improvement.</i>	Section 5
12D	(f) <i>details of all parties responsible for management, monitoring and implementing the management activities, including their position or status as separate contractor.</i>	Section 1.4
	(g) <i>details of the funding requirements for the ongoing management activities, including an estimate of the costs of the activities and details of the parties responsible for funding the activities.</i>	Section 1.5
12D	<i>Unless otherwise agreed to in writing by the department, the baseline surveys for threatened species must be undertaken in accordance with the department's Survey Guidelines for Australia's Threatened Birds and the Survey Guidelines for Australian Threatened Bats. Subsequent monitoring must be carried out annually at the same time of year as the baseline surveys unless otherwise agreed to in writing by the department.</i>	Sections 3.3 and 4.15


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 2-1 (Continued)
EPBC Act Approval 2010/5566 Requirements

Condition Number	Requirement	Relevant OMP Section
13	<p><i>The mechanism/s for registering a legally binding covenant must provide protection for the offset areas proposed in the Environmental Assessment as specified at Attachment B of these conditions, in perpetuity and be registered by 30 June 2021, unless the Minister agrees in writing to removal of any specific properties.</i></p> <p><i>Evidence of compliance with condition 13 must be provided to the Department within 30 days of registering a legally binding covenant.</i></p> <p><i>The person taking the action must report on progress meeting these requirements in each annual compliance report required under condition 34 and as otherwise requested by the Department.</i></p>	Section 2.2.2
13A	<p><i>For any approved replacement and new offset area, the person taking the action must:</i></p> <ul style="list-style-type: none"> <i>a. implement an approved offset management plan (as per condition 12B);</i> <i>b. by 30 December 2022, submit an application to establish legally binding covenants that provide protection for the offsets areas in perpetuity; and</i> <i>c. by 31 March 2024, register the legally binding covenants that provide protection for the offset areas in perpetuity.</i> <p><i>The approval holder must report on progress meeting these requirements in each annual compliance report required under condition 34 and as otherwise requested by the Department.</i></p>	Section 2.2.2
15	<p>Indirect Offsets</p> <p><i>To compensate for the loss of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and habitat for the regent honeyeater, swift parrot and greater long-eared bat the person taking the action must submit to the Minister for approval, within 2 years of the date of this approval, a project plan to invest \$1 million for research that will identify effective methodologies for achieving rehabilitation and restoration of functioning White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community on mining sites. The research must be undertaken by a third party and be available to industry and governments generally. The approved project plan must be implemented.</i></p>	Section 1.2
16	<p><i>To compensate for the loss of the habitat for the regent honeyeater, swift parrot and greater long-eared bat the person taking the action must provide \$1.5 million over the life of the approval (comprising \$500,000 for each of the regent honeyeater, swift parrot and greater long-eared bat), to deliver activities that implement priority recovery actions for the regent honeyeater, swift parrot and greater long-eared bat. A detailed project plan governing the timing of the \$1.5 million funding for the activities and outcomes must be developed. The project plan must be submitted to the Minister for approval by 30 April 2017, or otherwise agreed in writing by the Minister. The project plan should demonstrate consultation with relevant species experts and be consistent with approved National Recovery Plans where they are available, and as agreed with the relevant Recovery Planning Teams. The approved project plan must be implemented.</i></p>	Section 1.2


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 2-1 (Continued)
EPBC Act Approval 2010/5566 Requirements


Condition Number	Requirement	Relevant OMP Section
24	<i>Leard Forest Mining Precinct Regional Biodiversity Strategy</i> <i>The person taking the action must implement the regional biodiversity strategy as required under condition 41 of the NSW state government project approval dated 23 October 2012 (application number 10_0138). The required scoping report for the development of the strategy must be submitted to the Minister for approval on or before 31 July 2013. The approved strategy must be implemented.</i>	Section 2.2.2
32	<i>In the event that any additional matters of national environmental significance are recorded within the project area and a significant impact on the matter/s is likely, the department must be notified in writing within 14 days of the matter/s being recorded. In accordance with condition 37, the Minister may request that the person taking the action revise any relevant plans to ensure better protection of the relevant matter/s.</i>	This section
37	<i>If the Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities or listed migratory species to do so, the Minister may request that the person taking the action make specified revisions to the management plan specified in the conditions and submit the revised plan for the Minister's written approval. The person taking the action must comply with any such request. The revised approved plan must be implemented. Unless the Minister has approved the revised plan then the person taking the action must continue to implement the originally approved plan, as specified in the conditions.</i>	This section

Tylophora linearis, a small twining plant, was identified within the MCCM Project Boundary during pre-clearing flora surveys in 2014. The Commonwealth Department of the Environment (now Department of Agriculture, Water and Environment [DAWE]) was notified in 2014 that *Tylophora linearis* had been found and Whitehaven was requested to revise the Offset Management Plan to reflect the compensatory measures being undertaken for *Tylophora linearis* in accordance with Conditions 32 and 37.

Accordingly, this OMP describes relevant measures for *Tylophora linearis* in accordance with the approved *Maules Creek Tylophora linearis Offset Package* (Hunter Eco, 2021).

Administrative Conditions

In addition to the conditions in Table 2-1, the offset areas will be managed and reported upon in accordance with Conditions 31, 34, 35, 36, 39 and 40 of the EPBC Act Approval 2010/5566.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

2.2 OTHER REQUIREMENTS PERTAINING TO THE MANAGEMENT OF THE OFFSET AREAS

2.2.1 Conservation Agreements

The offset areas are secured under the conservation agreements listed in Table 1-1 in accordance with Condition 13 of the EPBC Act Approval 2010/5566.


2.2.2 Leard Forest Mining Precinct Regional Biodiversity Strategy

Condition 24 of the EPBC Act Approval 2010/5566 requires implementation of the approved *Leard Forest Mining Precinct Regional Biodiversity Strategy* (Umwelt, 2017). Reconciliation tables are provided in Appendix A.

2.3 CONSERVATION ADVICES, RECOVERY PLANS AND THREAT ABATEMENT PLANS

The following plans and advices were considered in the preparation of this OMP:

- *National Recovery Plan for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment, Climate Change and Water [DECCW], 2011);
- threatened species recovery plans (Saunders and Tzaros, 2011; Department of the Environment [DotE], 2016);
- *Approved Conservation Advice for Tylophora linearis* (DEWHA, 2008c);
- *Conservation Advice Anthochaera phrygia Regent Honeyeater* (DotE, 2015a);
- *Conservation Advice Lathamus discolor Swift Parrot* (Threatened Species Scientific Committee, 2016);
- *Conservation Advice Nyctophilus corbeni South-Eastern Long-Eared Bat* (Threatened Species Scientific Committee, 2015);
- *Threat Abatement Plan for Predation by Feral Cats* (DotE, 2015b);
- *Threat Abatement Plan for Competition and Land Degradation By Rabbits* (Department of the Environment and Energy, 2016);
- *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission By Feral Pigs (Sus Scrofa)* (Department of the Environment and Energy, 2017);
- *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008a); and
- *Threat Abatement Plan for Competition and Land Degradation by Unmanaged Goats* (DEWHA, 2008b).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

3 BASELINE ECOLOGICAL CONDITIONS

This section provides a description of the methodology and results of the surveys measuring the baseline ecological conditions in the offset areas.

A Guide to Managing Box Gum Grassy Woodlands (Rawlings *et al.*, 2010) describes the different condition states (as reflected by disturbance, inputs and altered land use) in which a given vegetation can exist. State and Transition Models are based on the assumption that an ecosystem exists in a relatively stable state until a significant disturbance causes a transition to another state. The methodology and results of the surveys are consistent with the Box-Gum Woodland State and Transition Model as described below.

Figure 4 shows the location of the offset areas relative to other local biodiversity offset areas.

3.1 EXTENT AND CONDITION OF VEGETATION COMMUNITIES

AMBS Ecology and Heritage (AMBS) (2021a) undertook surveys of the vegetation communities in the offset areas. The survey methodology by AMBS (2021a) included 130 full floristic 20 metre (m) x 20 m quadrats (nested within a 20 m x 50 m transect) and 271 rapid data points. A cluster analysis of full floristic plot data was undertaken. The identification of threatened ecological communities was undertaken in accordance with the relevant listings under the EPBC Act and BC Act. The co-ordinate location of all surveys sites and photo reference points is provided in Appendix C.

Assignment of vegetation communities to Plant Community Types (PCTs), the master community-level typology used in NSW's vegetation mapping programs, was based on the published descriptions and associated data for PCTs included in the *BioNet Vegetation Classification Database* (DPIE, 2020).

The extent and condition (i.e. woodland or derived native grassland condition) of all vegetation communities are shown on Figures 5a to 5d.

The AMBS (2021a) *Maules Creek Coal Mine Offset Area Vegetation Mapping* report in Appendix B provides a description of the structure and floristics of each PCT. The tree age class of each PCT is variable across the offset areas depending on the amount of prior vegetation clearance from agricultural land use.

3.2 EXTENT AND CONDITION CLASS OF BOX-GUM WOODLAND

During the surveys of the vegetation in the offset areas, AMBS (2021a) identified the extent and condition class of all areas of Box-Gum Woodland CEEC listed under the EPBC Act as woodland or derived native grassland.

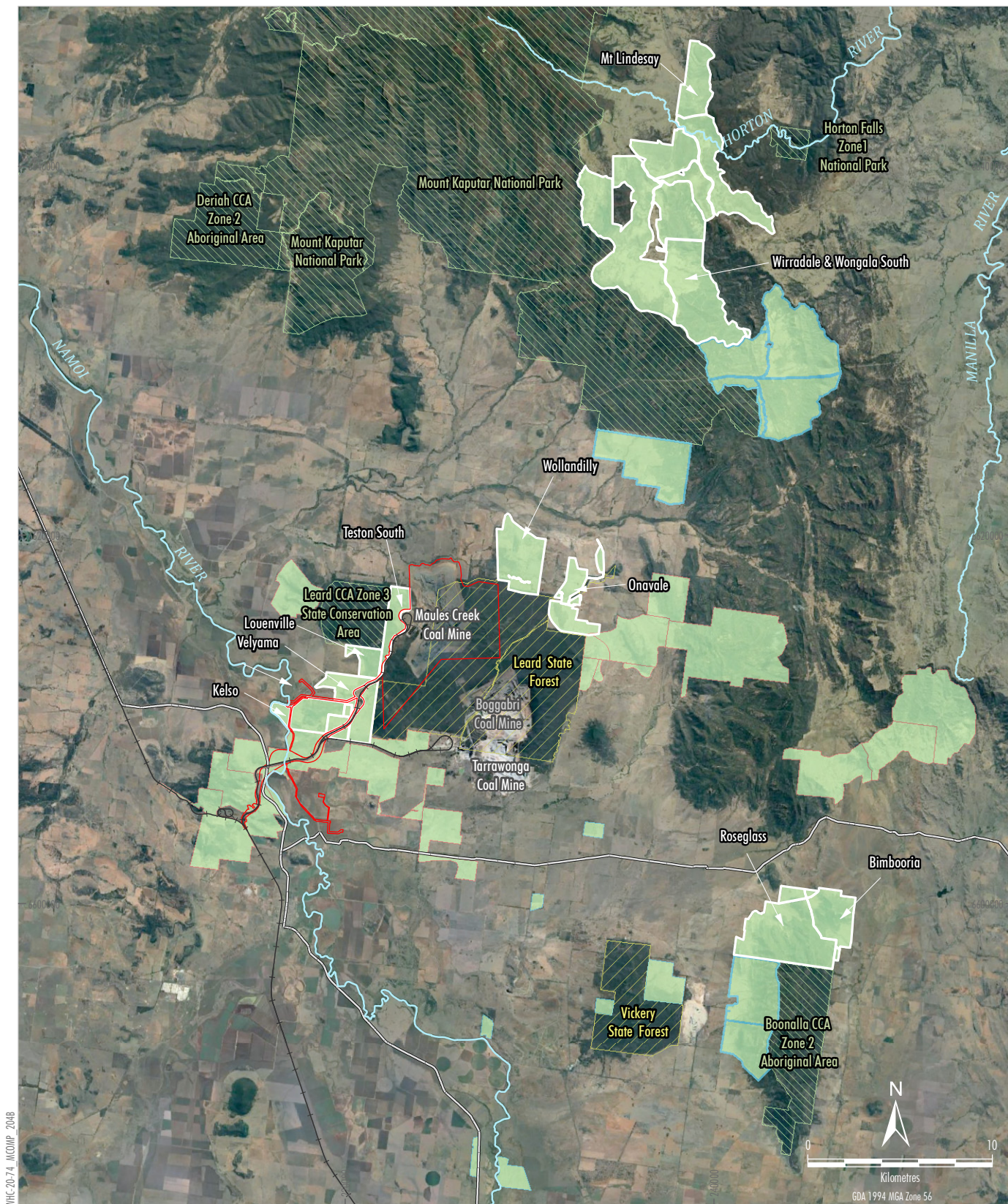
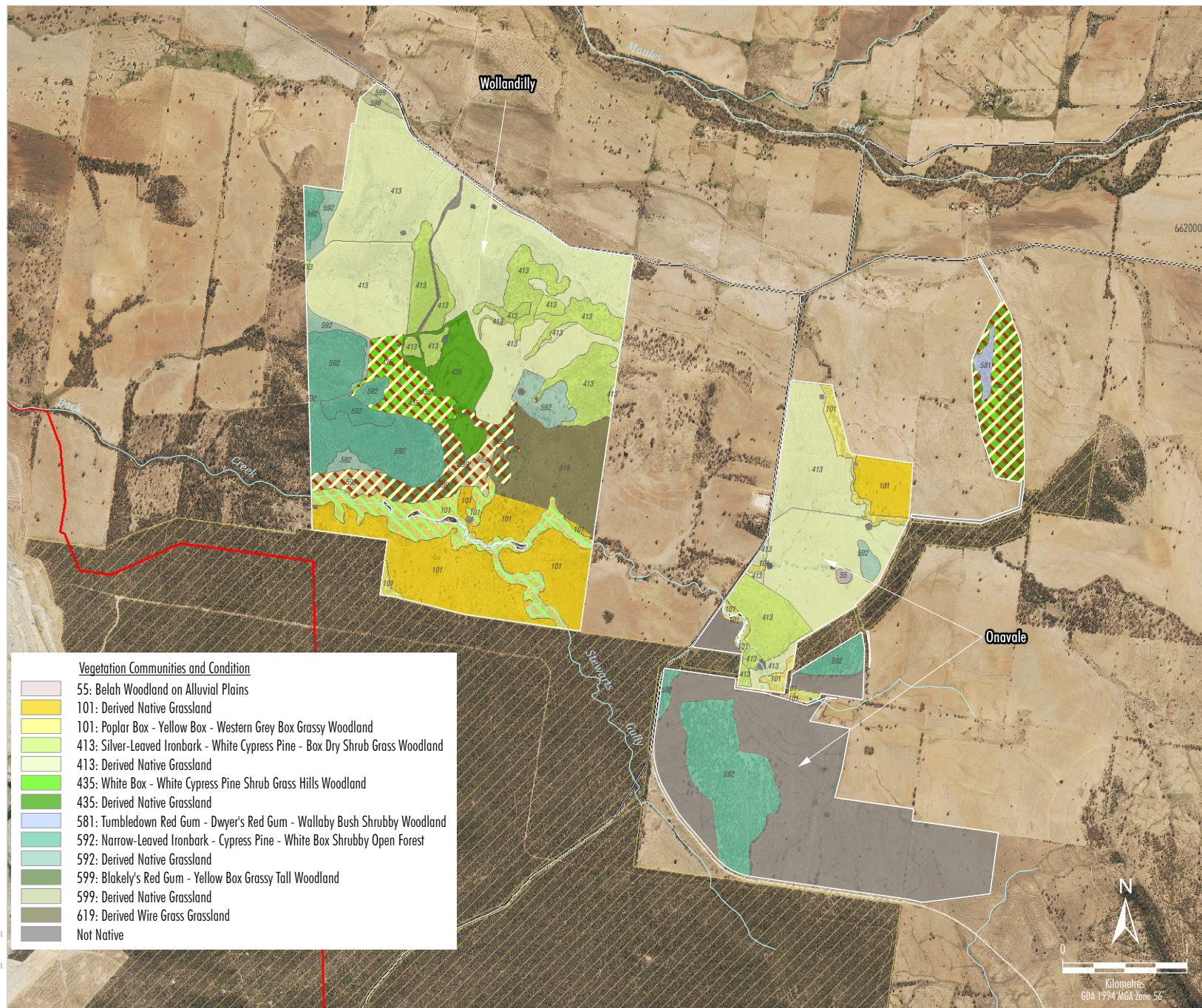
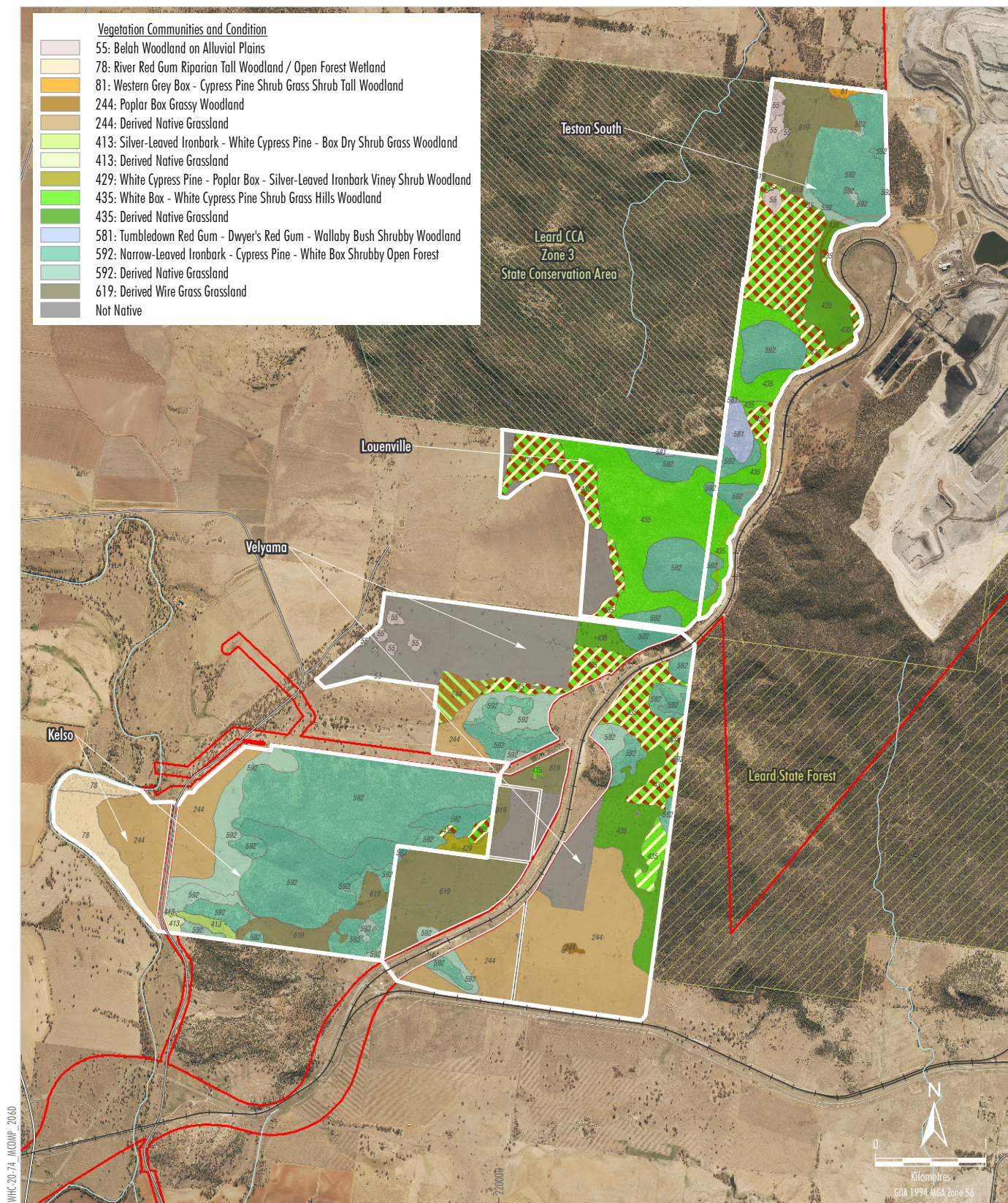


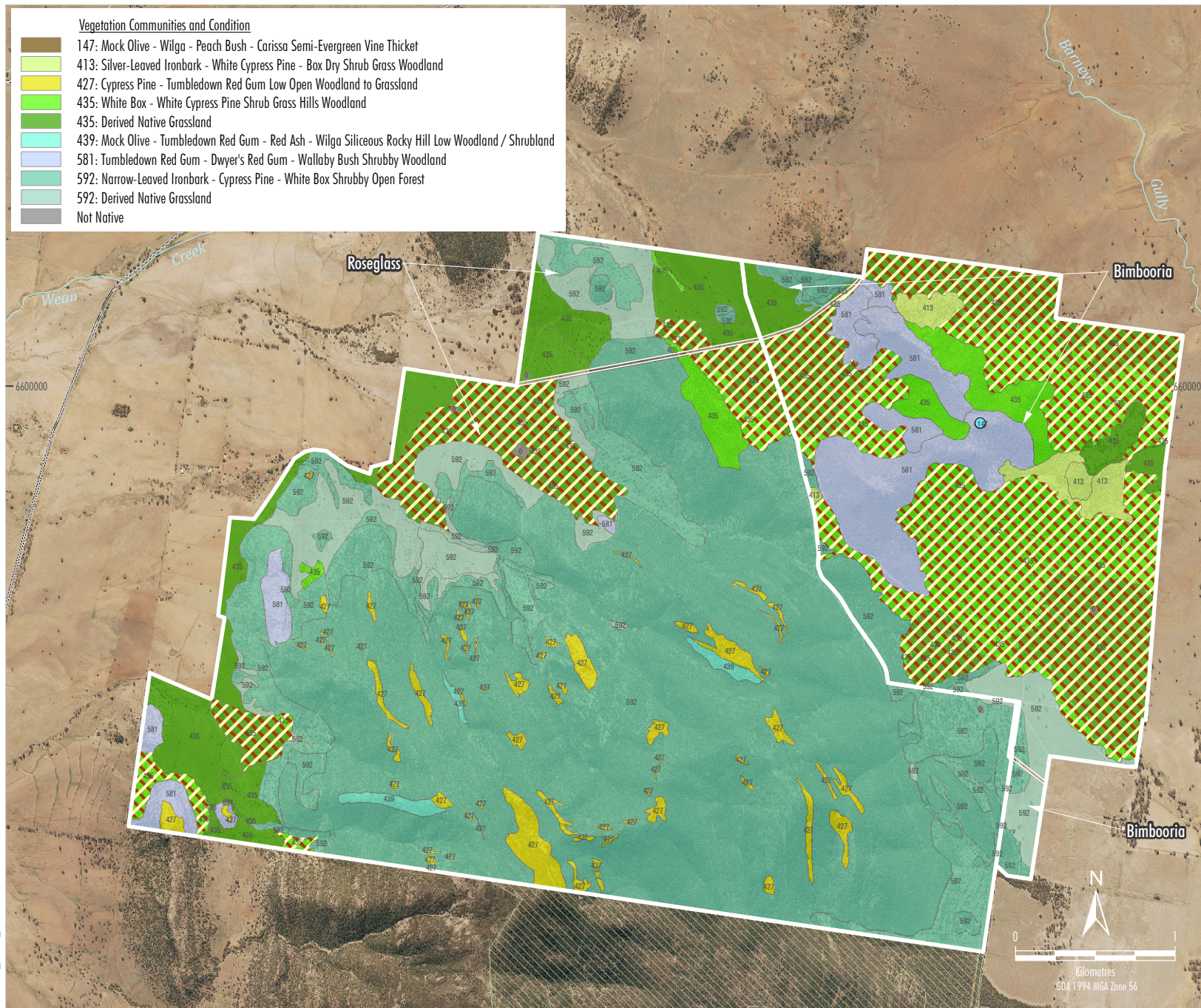
Figure 4



WHITEHAVEN COAL
MAULES CREEK OFFSET MANAGEMENT PLAN
Vegetation Communities -
Wollandilly and Onavale

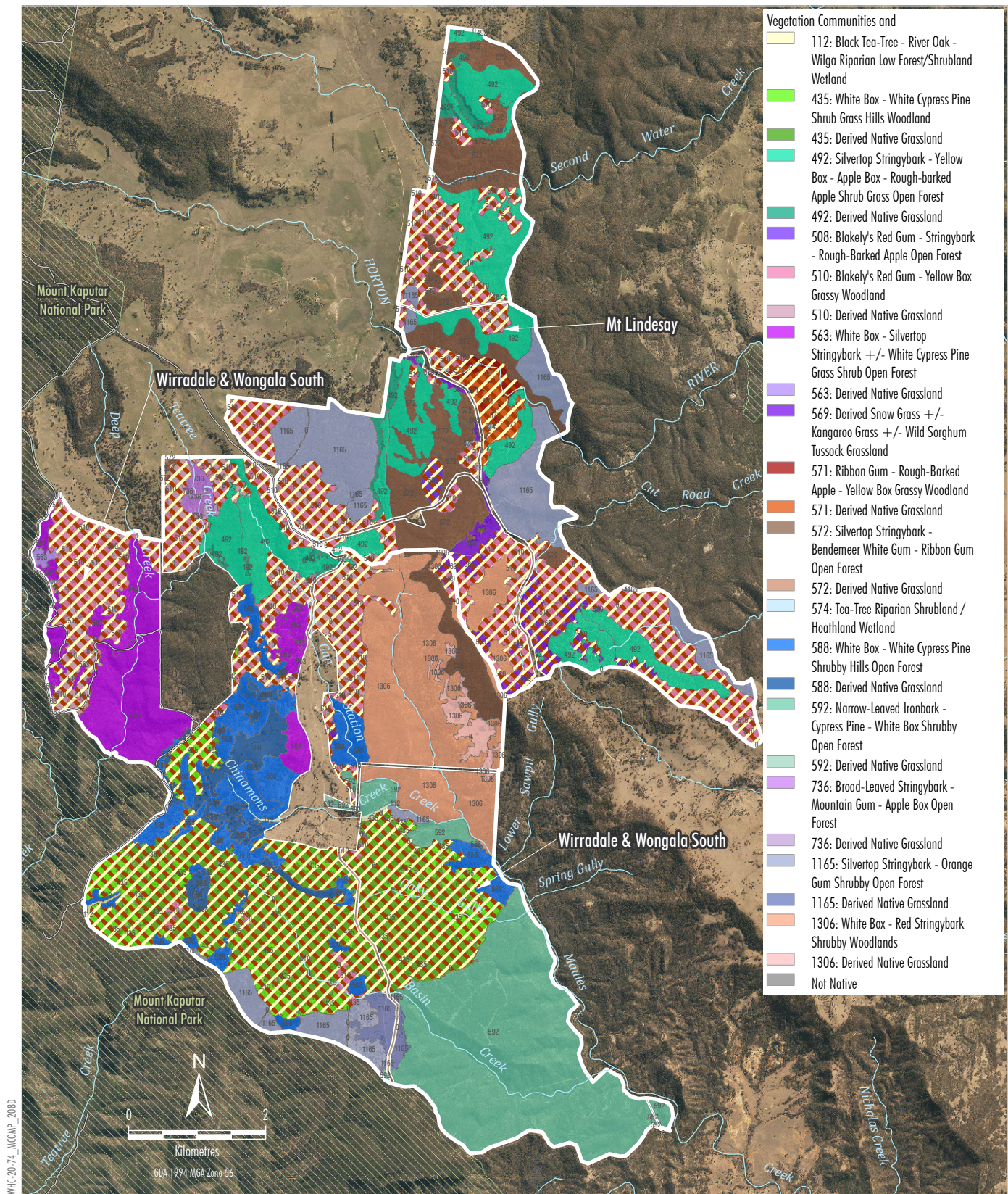
Figure 5a






WHITEHAVEN COAL
MAULES CREEK OFFSET MANAGEMENT PLAN
Vegetation Communities -
Roseglass and Bimbooria

Figure 5c



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Areas with the potential to fit the criteria for the Box-Gum Woodland CEEC listed under the EPBC Act were sampled with both full floristic 20 metre (m) x 20 m quadrats (nested within a 20 m x 50 m transect) and rapid data points. A cluster analysis of full floristic plot data was undertaken. The identification of Box-Gum Woodland CEEC listed under the EPBC Act was undertaken in accordance with the *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Threatened Species Scientific Committee [TSSC], 2006).

The Box-Gum Woodland CEEC listed under the EPBC Act is shown on Figures 6 and 7a to 7d. Table 3-1 provides a summary of the condition classes² of the Box-Gum Woodland CEEC listed under the EPBC Act within the offset areas. Plates 1 and 2 show examples of the Box-Gum Woodland CEEC in the offset areas.

Table 3-1
Box-Gum Woodland CEEC Listed Under the EPBC Act in the Offset Areas

Offset Area	Woodland Form of the Box-Gum Woodland CEEC Listed under the EPBC Act (ha)	Derived Grassland Form of the Box-Gum Woodland CEEC Listed under the EPBC Act (ha)	Total (ha)
Kelso	4	0	4
Velyama	58.8	3	61.8
Louenville	36	0	36
Teston South	63.1	17.6	80.7
Wollandilly	52.3	17.3	69.6
Onavale	10.3	30	40.3
Roseglass	19.5	94.3	113.8
Bimbooria	212.9	160.3	373.2
Wirradale and Wongala South	729.8	970.9	1,700.7
Mt Lindesay	660.9	219.2	880.1
Total	1,847.6	1,512.6	3,360.2

² **Condition class** – One of three states in which the White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community may exist, as defined within the Commonwealth listing advice for the listing of this ecological community as critically endangered under the EPBC Act.


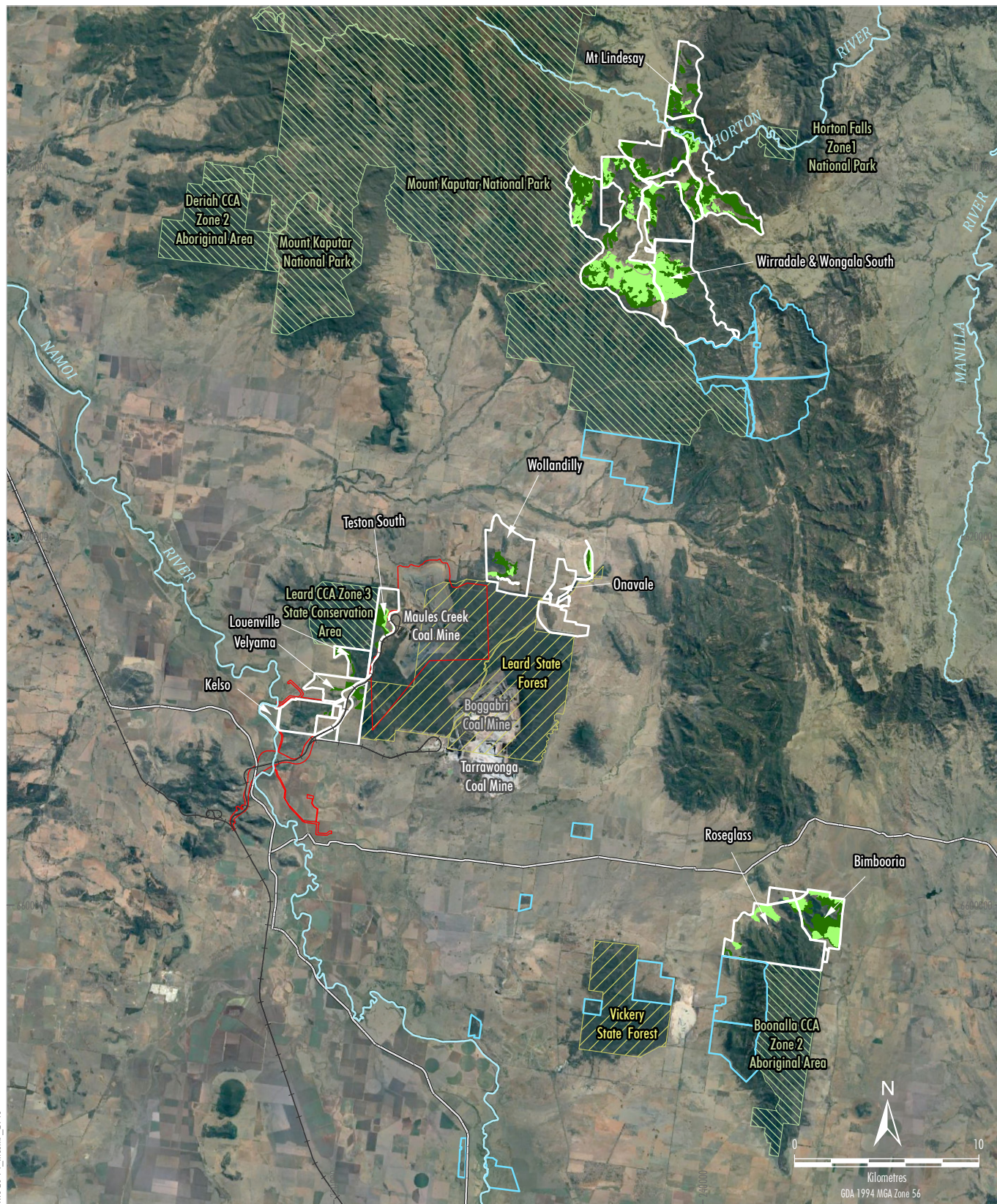
	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			



Plate 1 Example of Box-Gum Woodland CEEC in the Offset Areas
Source AMBS (2021a)



Plate 2 Example of Box-Gum Woodland CEEC in the Offset Areas
Source AMBS (2021a)

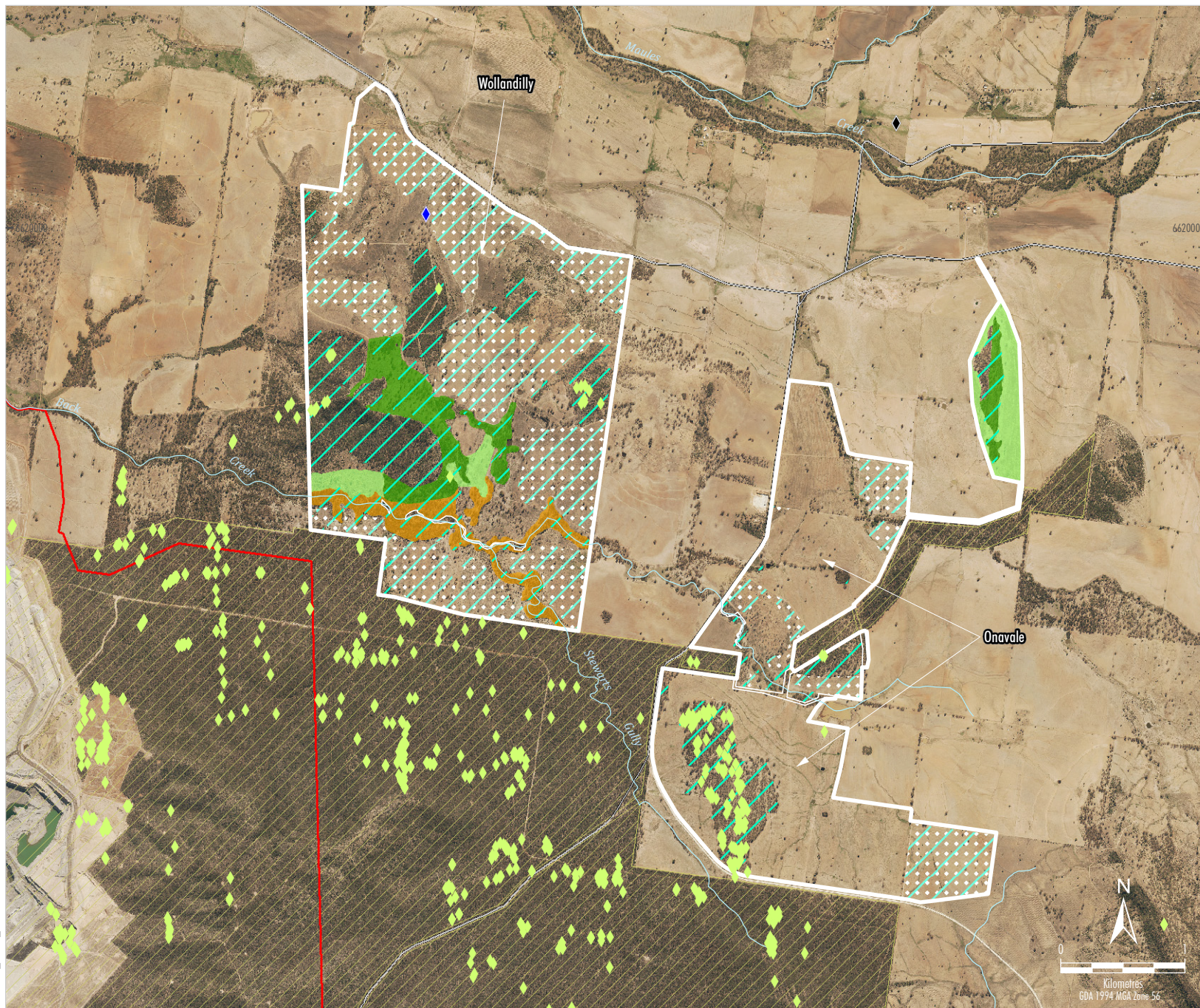


- LEGEND**
- NPWS Estate
 - State Forest
 - Railway
 - Project Boundary
 - Maules Creek Offset Area
 - Other Whitehaven Offset Area
 - Box-Gum Woodland (Grassland Form) Listed under the EPBC Act
 - Box-Gum Woodland (Woodland Form) Listed under the EPBC Act

Source: NSW Spatial Services (2020)
Orthophoto: Google Earth (2020)

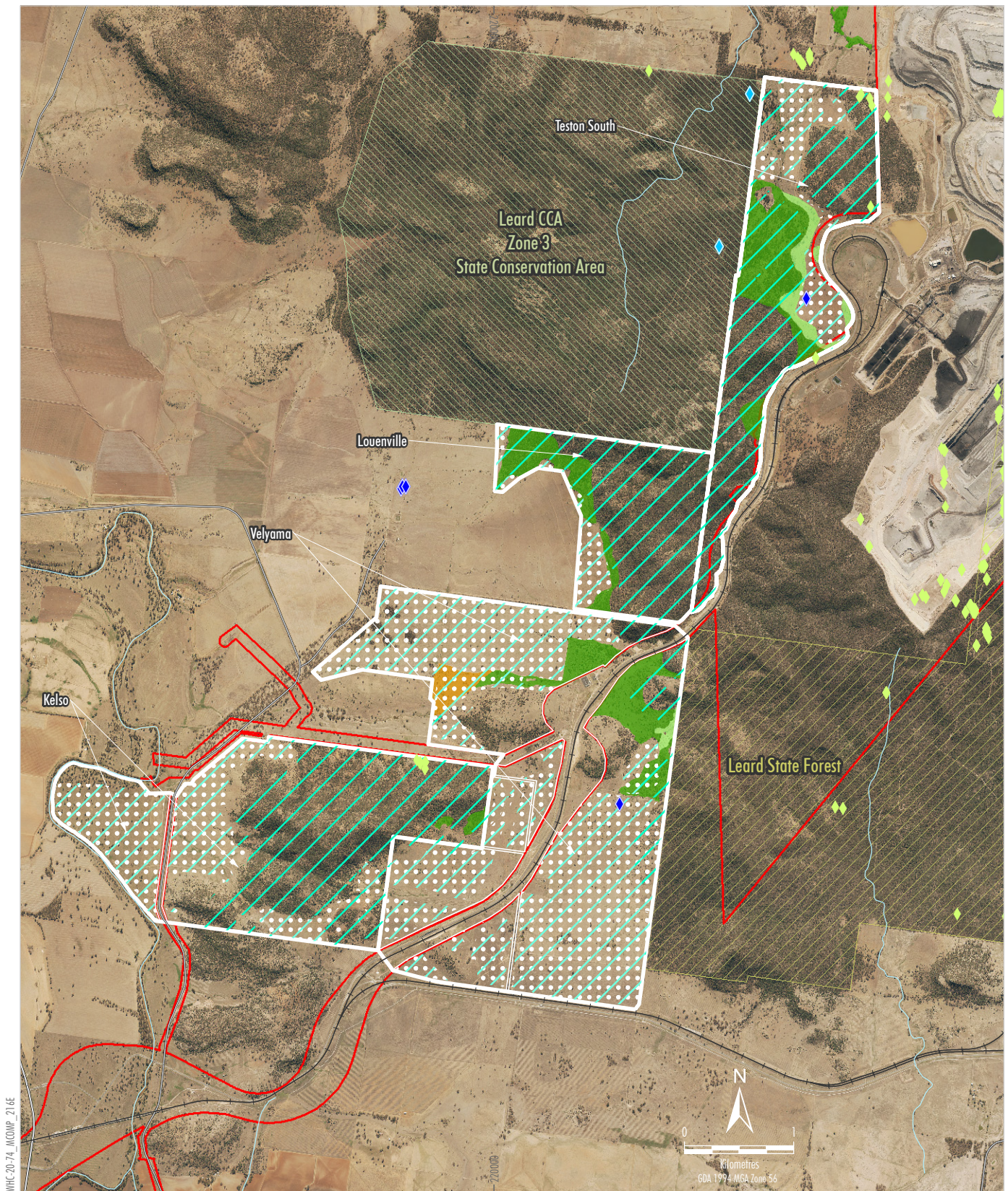
WHITEHAVEN COAL
MAULES CREEK OFFSET MANAGEMENT PLAN
Box-Gum Woodland CEEC
Listed Under EPBC -
Overview Map

Figure 6



- LEGEND**
- State Forest
 - Project Boundary
 - Offset Area
 - Threatened Ecological Communities**
 - Box Gum Woodland (Grassland Form) Listed under the EPBC Act
 - Box Gum Woodland (Woodland Form) Listed under the EPBC Act
 - Poplar Box Grassy Woodland EEC listed under the EPBC Act
 - Tylophora linearis* Existing and Future Potential Habitat
 - Area Undergoing Active Revegetation for *Tylophora linearis*
 - Threatened Species**
 - Bluegrass
 - Ooline
 - Tylophora linearis*

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); Cumberland Ecology (2011); DPIE (2021); East Coast Flora Survey (undated); Hunter Eco (2021); Niche (2014); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



WHC-20-74_MCOMP_216E

- LEGEND**
- NPWS Estate
 - State Forest
 - Project Boundary
 - Offset Area

- Threatened Ecological Communities**
- Box Gum Woodland (Grassland Form) Listed under the EPBC Act
 - Box Gum Woodland (Woodland Form) Listed under the EPBC Act
 - Poplar Box Grassy Woodland EEC listed under the EPBC Act
 - Tylophora linearis* Existing and Future Potential Habitat
 - Area Undergoing Active Revegetation for *Tylophora linearis*

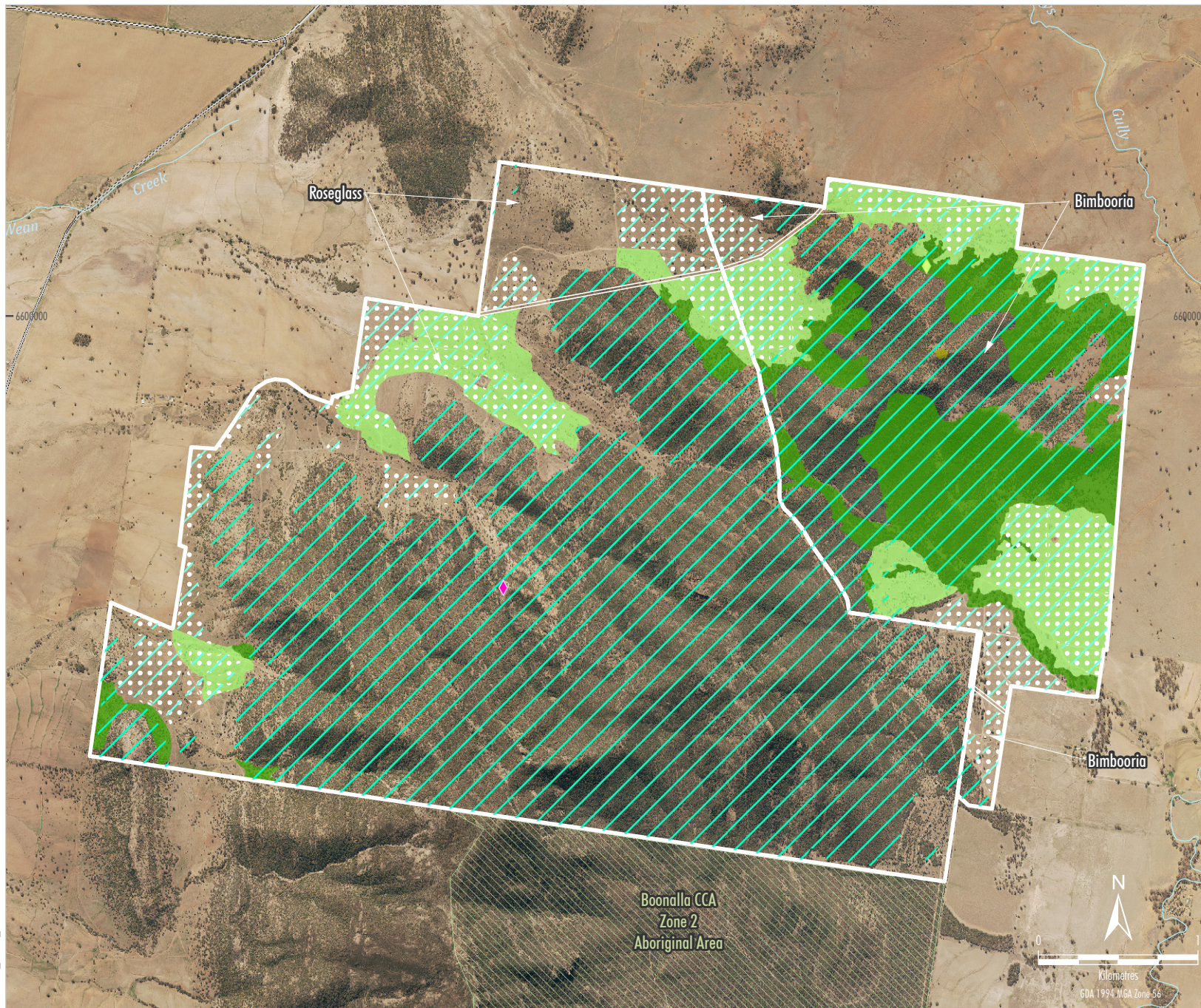
- Threatened Species**
- Bluegrass
 - Spiny Peppergrass
 - Tylophora linearis*

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); BirdLife Australia (2020); Cumberland Ecology (2011); DPIE (2021); Niche (2014); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



MAULES CREEK OFFSET MANAGEMENT PLAN

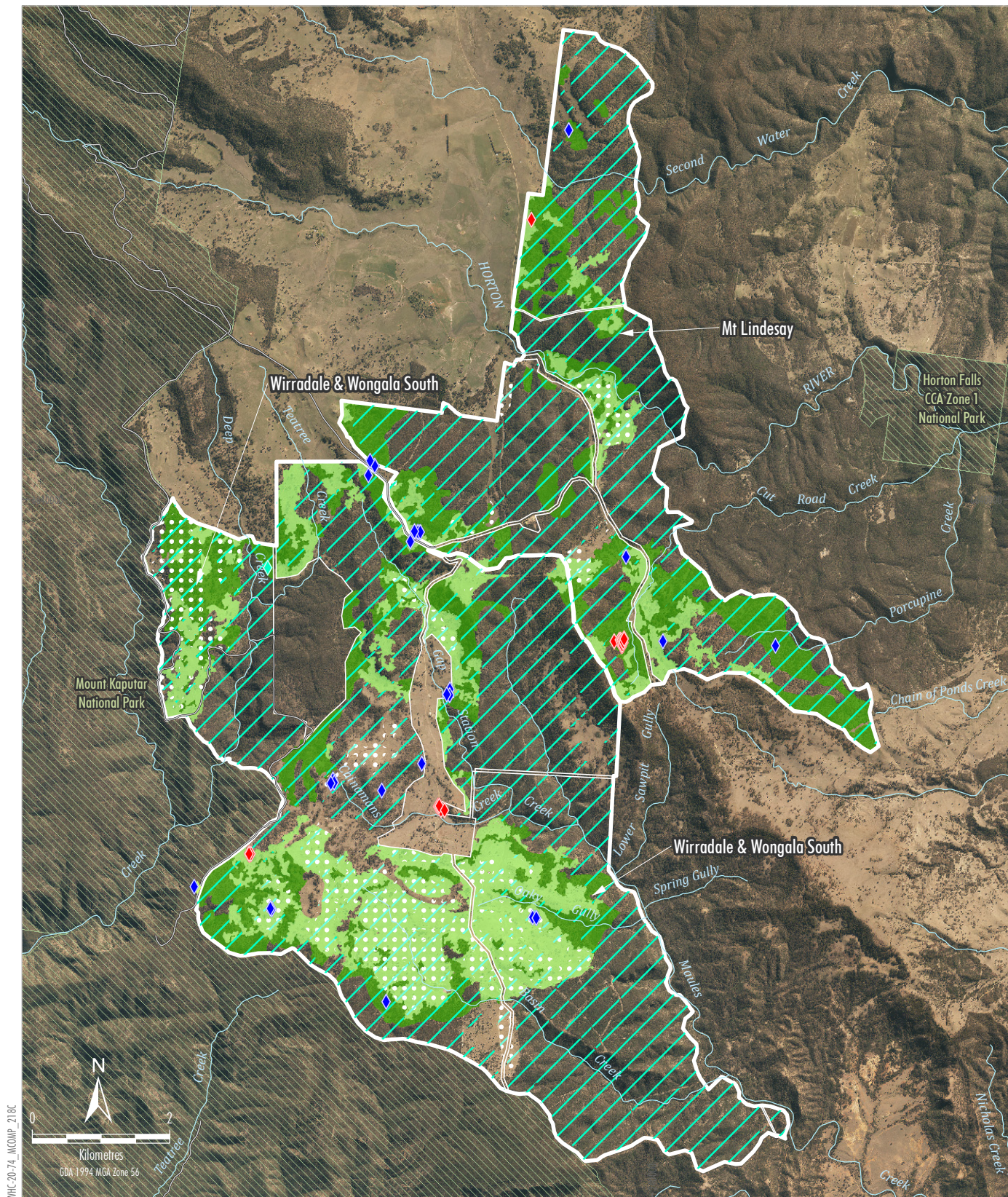
Matters of National
Environmental Significance -
Kelso, Velyama, Louenville and Teston South
Threatened Flora
Figure 7b



LEGEND

- NPWS Estate
- Offset Area
- Threatened Ecological Communities**
- Box Gum Woodland (Grassland Form) Listed under the EPBC Act
- Box Gum Woodland (Woodland Form) Listed under the EPBC Act
- Semi-evergreen Vine Thickets EEC as listed under the EPBC Act and BC Act
- Tylophora linearis Existing and Future Potential Habitat
- Area Undergoing Active Revegetation for Tylophora linearis
- Granite Homoranthus
- Tylophora linearis

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); DPIE (2021); Niche (2014); Niche Environment and Heritage (2013); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



LEGEND

- NPWS Estate
- Offset Area
- Threatened Ecological Communities
- Box Gum Woodland (Grassland Form) Listed under the EPBC Act
- Box Gum Woodland (Woodland Form) Listed under the EPBC Act
- Tylophora linearis* Existing and Future Potential Habitat
- Area Undergoing Active Revegetation for *Tylophora linearis*

Threatened Species

- Austral Toadflax
- Bluegrass
- Callistemon pungens*
- Tylophora linearis*

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); DPIE (2021); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



MAULES CREEK OFFSET MANAGEMENT PLAN

Matters of National
Environmental Significance -
Mt Lindesay, Wirradale and Wongala South
Threatened Flora
Figure 7d



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 3-2 provides the Condition States of Box-Gum Woodland according to the State and Transition Model in *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.*, 2010).

Table 3-2
Condition States of Box-Gum Woodland According to the State and Transition Model

State*	General Description*	Extent and Condition
State 1. Grassy woodlands	<ul style="list-style-type: none"> <i>Eucalypts spaced as woodland</i> <i>Large and medium tussock grasses</i> <i>High diversity of grasses and herbs</i> <i>All native species</i> <i>Mostly perennial, few annuals</i> <i>Regeneration present</i> 	The areas of Box-Gum Woodland CEEC listed under the EPBC Act in woodland form on Figures 5a to 5d are considered to be State 1, noting that areas that contain “all native species” rarely occur. Additionally, the proportion of annuals in the woodland and grassland forms is not significantly different.
State 2. Native Pastures	<ul style="list-style-type: none"> <i>Eucalypts generally present</i> <i>Medium and small tussock grasses</i> <i>High diversity of grasses and herbs</i> <i>Mostly native species, some exotics</i> <i>Many native annuals</i> <i>Regeneration usually present</i> 	The areas of Box-Gum Woodland CEEC listed under the EPBC Act in grassland form on Figures 5a to 5d is considered to be State 2, with ability to transition to State 1 with grazing removed and assisted natural regeneration.
State 3. Fertilised pastures	<ul style="list-style-type: none"> <i>Eucalypts scattered or absent</i> <i>Few small perennial tussock grasses</i> <i>Low diversity of grasses and herbs</i> <i>Mostly exotic species</i> <i>Annuals tend to dominate</i> <i>Few native species regenerating</i> 	The areas of Box-Gum Woodland CEEC listed under the BC Act in woodland form on Figures 5a to 5d (that is not of sufficient condition to be listed under the EPBC Act due to exotic species) are considered to be State 3, with ability to transition to State 2 with management of weeds and grazing.
State 4. Crops and sown pastures	<ul style="list-style-type: none"> <i>Eucalypts very scattered or absent</i> <i>Dominated by sown species</i> <i>Mostly exotic annual species</i> <i>Few or no native species present</i> <i>Native generally not regenerating</i> 	A portion of areas mapped as ‘not native’ on Figures 5a to 5d are likely to have been formerly Box-Gum Woodland CEEC and are considered State 4.
State 5. Revegetated areas	<ul style="list-style-type: none"> <i>Over storey planted at high densities</i> <i>Large perennial exotic grasses dominant</i> <i>Very low diversity of grasses and herbs</i> <i>Little or no regeneration of native species</i> 	Some areas mapped as Box-Gum Woodland CEEC listed under the EPBC Act in grassland form may be classified as State 5 due to plantings.

* Rawlings *et al.*, (2010)

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

3.3 SURVEYS TARGETING THE REGENT HONEYEATER, SWIFT PARROT AND CORBEN'S LONG-EARED BAT

Surveys targeting the Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*) and Corben's Long-eared Bat (*Nyctophilus corbeni*) were undertaken by Australian Museum Consulting (2014 and 2015a, b and c), and subsequently as part of the fauna monitoring program. The baseline surveys were undertaken in accordance with the *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment, Water, Heritage and the Arts [DEWHA], 2010a) and the *Survey Guidelines for Australian Threatened Bats* (DEWHA, 2010b).

Baseline bird surveys in the offset areas were undertaken in November 2014, February 2015, May 2015 and August 2015 (Australian Museum Consulting, 2014 and 2015a, b and c). Bat survey methods (harp traps) between October and April to target the Corben's Long-eared Bat. The co-ordinate location of all surveys sites is provided in Appendix C.

3.4 EXTENT AND QUALITY OF ALL AREAS OF HABITAT AND FUTURE POTENTIAL HABITAT FOR THE REGENT HONEYEATER, SWIFT PARROT AND CORBEN'S LONG-EARED BAT

During the baseline surveys, the Corben's Long-eared Bat was recorded on one occasion in the Kelso offset area (in November 2014) and another location in the Wirradale and Wongala South offset area (in November 2015). This species has since been recorded in numerous other locations and the records of the species are shown on Figures 8a to 8d. The Regent Honeyeater has not been recorded in the offset areas to date. A nearby record of the Regent Honeyeater is shown on Figure 8d. AMBS (2019) has detected the Swift Parrot during targeted surveys on the Wirradale and Wongala South offset area in 2018 (Figure 8d).


The area of existing potential habitat³ (woodland) for the Regent Honeyeater, Swift Parrot and Corben's Long eared Bat is quantified in Table 3-3 and shown in Figures 8a to 8d.

The area of future potential habitat (areas to be revegetated) for these three species is also quantified in Table 3-3 and shown in Figures 8a to 8d. These areas contain low or moderate condition vegetation (mostly derived native grassland including some areas with scattered trees), and will be revegetated (i.e. self-sustaining vegetation communities will be restored) in accordance with this OMP so that these areas provide potential habitat for the three species.

Active revegetation has been undertaken since 2016 as described in Section 4.4. Sections 4.14 and 4.15 provide measures to monitor the performance of the revegetation against performance criteria.

The quality of the existing potential habitat and future potential habitat is variable, with some areas of woodland and some derived native grassland.

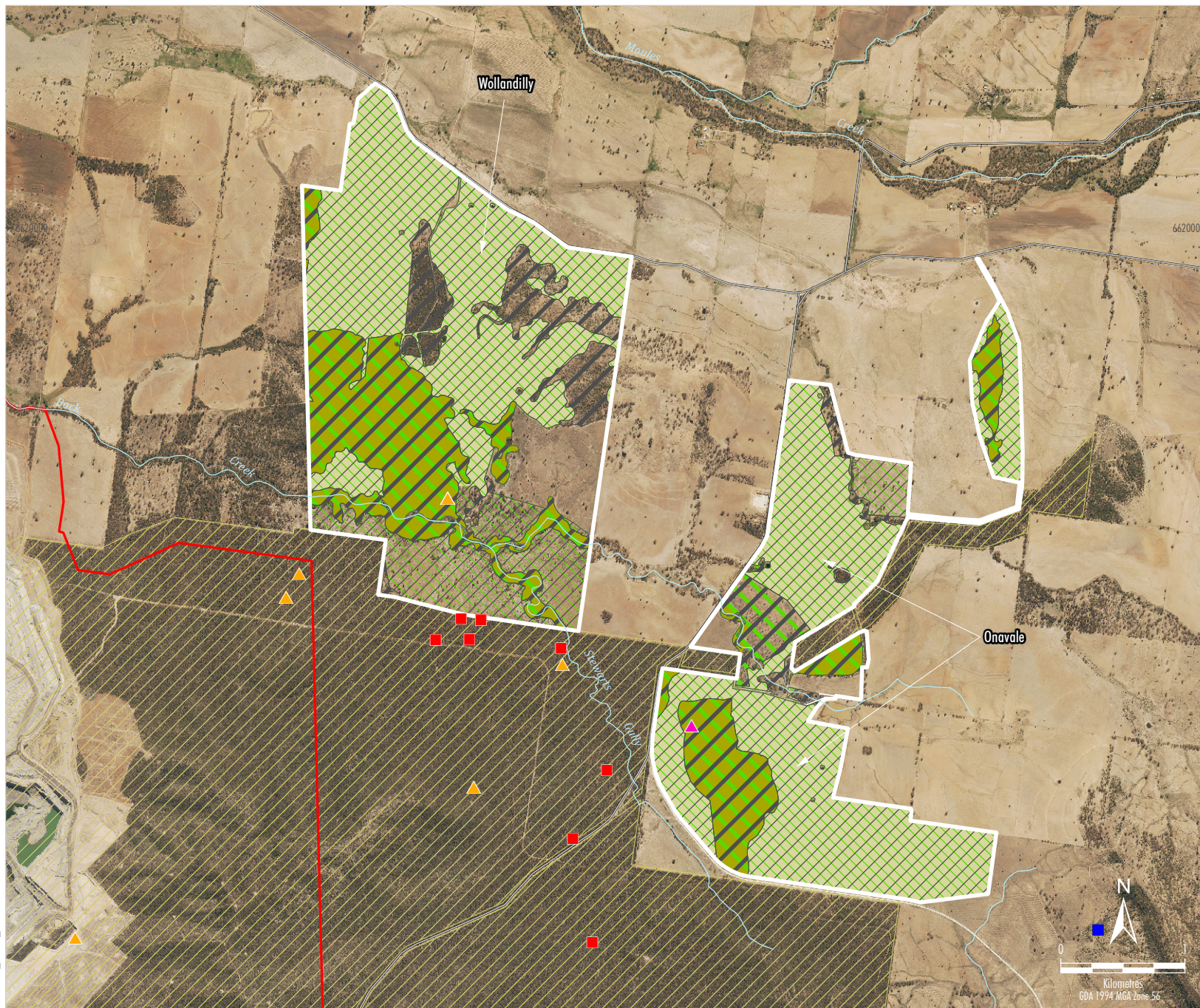
³ Under EPBC Act Approval 2010/5566, "habitat" is defined to mean "areas in which a species or community is known to occur or is thought to have the potential to occur based on the biophysical conditions prevailing in the area and the ecological requirements of the species or community".

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

3.5 OTHER SPECIES

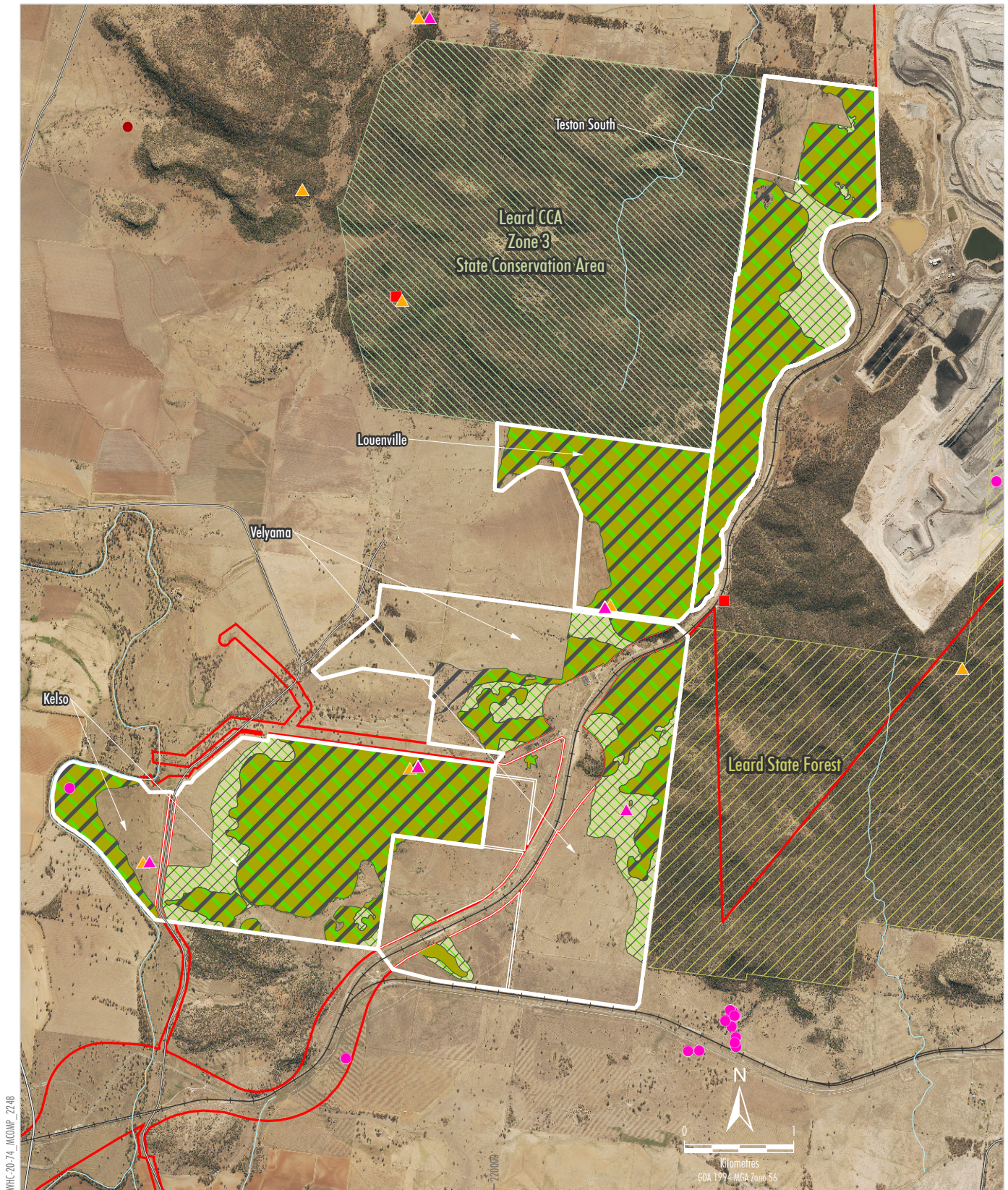
The area of existing and future potential habitat for *Tylophora linearis* is quantified in Table 3-3. The extent of existing and future potential habitat for *Tylophora linearis* is shown on Figures 7a to 7d. These figures also show the areas undergoing active revegetation for *Tylophora linearis*.

Threatened species listed under the EPBC Act and/or their habitat/future potential habitat that have been recorded in the offset areas are listed in Table 3-4 and shown on Figures 7a to 8d.



- LEGEND**
- State Forest
 - Project Boundary
 - Offset Area
 - Regent Honeyeater Existing Potential Habitat
 - Regent Honeyeater Future Potential Habitat (Areas to be Revegetated)
 - Swift Parrot Existing Potential Habitat
 - Swift Parrot Future Potential Habitat (Areas to be Revegetated)
 - Corben's Long-eared Bat Existing Potential Habitat
 - Corben's Long-eared Bat Future Potential Habitat (Areas to be Revegetated)
 - Threatened Species**
 - Koala
 - Grey-headed Flying-fox
 - Corben's Long-eared Bat
 - Large-eared Pied Bat

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); Cumberland Ecology (2011); DPIE (2021); East Coast Flora Survey (undated); Hunter Eco (2021); Niche (2014); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



LEGEND

- | | | | |
|--|------------------|--|--|
| | NPWS Estate | | Regent Honeyeater Existing Potential Habitat |
| | State Forest | | Regent Honeyeater Future Potential Habitat (Areas to be Revegetated) |
| | Project Boundary | | Swift Parrot Existing Potential Habitat |
| | Offset Area | | Swift Parrot Future Potential Habitat (Areas to be Revegetated) |
| | | | Corben's Long-eared Bat Existing Potential Habitat |
| | | | Corben's Long-eared Bat Future Potential Habitat (Areas to be Revegetated) |

Threatened Species

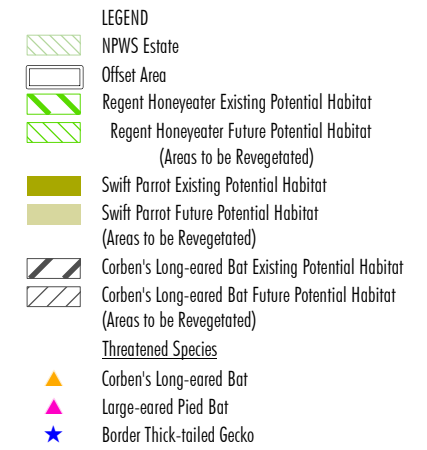
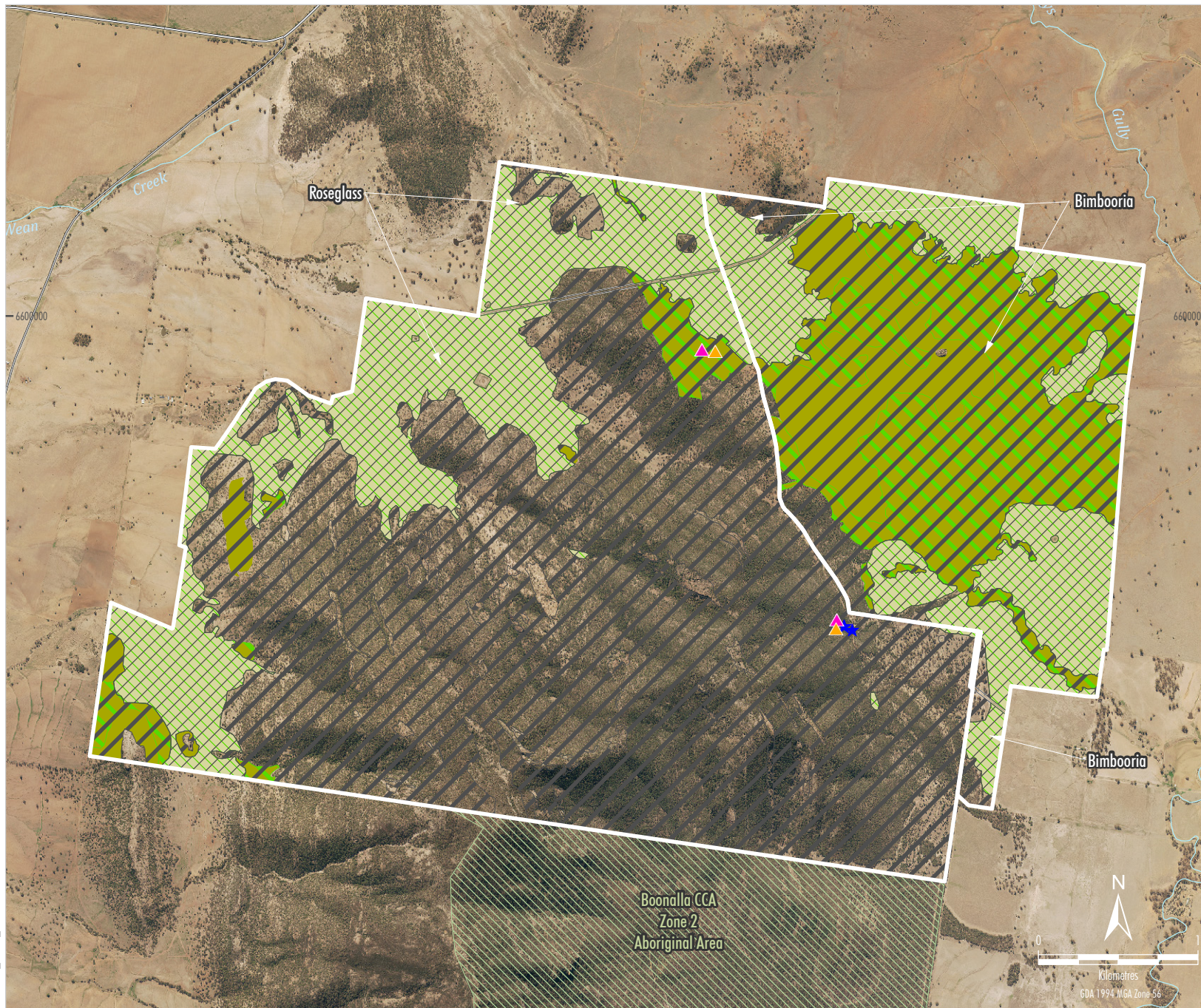
- Brolga
- Painted Honeyeater
- Koala
- Corben's Long-eared Bat
- Large-eared Pied Bat

Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); BirdLife Australia (2020); Cumberland Ecology (2011); DPIE (2021); Niche (2014); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)

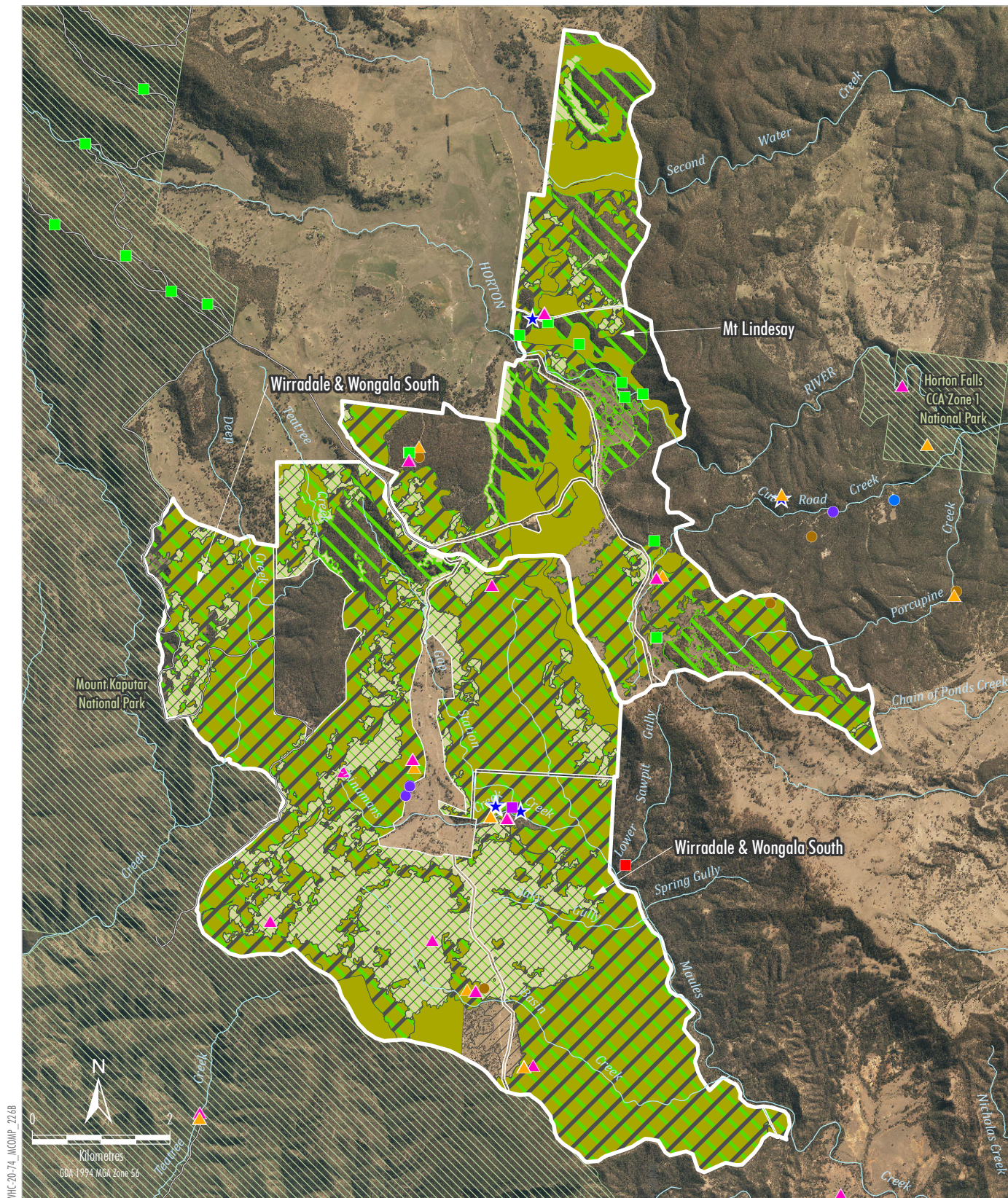


MAULES CREEK OFFSET MANAGEMENT PLAN

Matters of National Environmental Significance - Kelso, Velyama, Louenville and Teston South Threatened Fauna
Figure 8b



Source: NSW Spatial Services (2020); AMBS (2021); Atlas of Living Australia (2020); DPIE (2021); Niche (2014); Niche Environment and Heritage (2013); Department of Planning, Industry and Environment (2020)
Orthophoto Whitehaven Coal (April 2019)



WHITEHAVEN COAL

MAULES CREEK OFFSET MANAGEMENT PLAN

Matters of National
Environmental Significance -
Mt Lindesay, Wirradale and Wongala South
Threatened Fauna

Figure 8d


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 3-3

Habitat and Future Potential Habitat for Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat and *Tylophora linearis* in the Offset Areas

Offset Area	Regent Honeyeater (ha) ¹			Swift Parrot (ha) ¹			Corben's Long-eared Bat (ha) ¹			Total Existing and Future Potential Habitat for <i>Tylophora linearis</i> (ha) ²
	Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	Existing Potential Habitat (Woodland) (ha)	Future Potential Habitat (Areas to be Revegetated) (ha)	Total (ha)	
Kelso	320.6	54.3	374.9	327.7	54.3	382	327.7	54.3	382	419.3
Velyama	128.9	97.4	226.3	133.3	97.4	230.7	142.2	97.4	239.6	530.6
Louenville	186.2	0	186.2	186.9	0	186.9	186.9	0	186.9	204.7
Teston South	215.3	51.8	267.1	228.8	51.8	280.6	238.9	51.8	290.7	291.6
Wollandilly	185.5	466.2	651.7	185.5	350.3	535.8	276.1	466.2	742.3	539.6
Onavale	123.9	106.5	230.4	95.1	86.8	181.9	139.4	106.5	245.9	181.3
Roseglass	35.1	304.5	339.6	55.9	304.5	360.4	1109.4	304.5	1,413.9	1,172.1
Bimbooria	267.2	217.3	484.5	364	217.3	581.3	405.1	217.3	622.4	520.8
Wirradale and Wongala South	3027.5	1165.1	4,192.6	2975.4	1158.1	4,133.5	2864.1	1193.7	4,057.8	704.7
Mt Lindesay	1212.8	171.3	1,384.1	1110	126.2	1,236.2	686.6	83.2	769.8	392.5
Total	5703	2634.4	8,337.4	5662.6	2446.7	8,109.3	6376.4	2574.9	8,951.3	4,957.2

¹ AMBS (2021b)

² Hunter Eco (2021)



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 3-4
Threatened Species listed under the EPBC Act in the Offset Areas

Common Name	Scientific Name	Conservation Status ¹		Occurrence
		BC Act	EPBC Act	
Flora				
Bluegrass	<i>Dichanthium setosum</i>	V	V	This species was recorded in Wollandilly, Teston South, Velyama, Wirradale & Wongala South and Mt Lindesay Offset Areas (Figures 7a, 7b and 7d).
-	<i>Callistemon pungens</i>	-	V	This species was recorded within the Wirradale & Wongala South Offset Area (Figure 7d).
-	<i>Tylophora linearis</i>	V	E	This species was recorded within the Wollandilly, Onavale, Teston South, Velyama, Kelso, and Bimbooria Offset Areas (Figures 7a to 7c). It was also recorded outside of the Wirradale and Wongala South Offset Area (Figure 7d). The existing and future potential habitat for <i>Tylophora linearis</i> is also quantified in Table 3-3.
Austral Toadflax	<i>Thesium australe</i>	V	V	This species was recorded within the Wirradale & Wongala South and Mt Lindesay Offset Areas (Figure 7d).
Granite Homoranthus	<i>Homoranthus prolixus</i>	V	V	This species was recorded within the Roseglass Offset Area (Figure 7c).
Reptiles				
Border Thick-tailed Gecko	<i>Uvidicolus sphyrurus</i>	V	V	This species was recorded within the Roseglass, Wirradale & Wongala South and Mt Lindesay Offset Areas (Figures 8c and 8d).

Table 3-4 (Continued)
Threatened Species listed under the EPBC Act in the Offset Areas


Common Name	Scientific Name	Conservation Status ¹		Occurrence
		BC Act	EPBC Act	
Birds				
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Potential habitat and Future Potential Habitat within all offset areas (Figures 8a to 8d). Records of the Swift Parrot within the Wirradale & Wongala South Offset Area are shown on Figure 8d.
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE	Potential habitat and Future Potential Habitat within all offset areas (Figures 8a to 8d). Records of the Regent Honeyeater are shown on Figure 8d.
Painted Honeyeater	<i>Grantiella picta</i>	V	V	This species was recorded within the Kelso Offset Area (Figure 8b).
White-throated Needletail	<i>Hirundapus caudacutus</i>	-	V	This species was recorded within the Wirradale & Wongala South and Mt Lindesay Offset Areas (Figure 8d).
Mammals				
Koala	<i>Phascolarctos cinereus</i>	V	V	Records of the Koala are shown on Figures 8a, 8b and 8d.
Greater Glider	<i>Petauroides volans</i>	-	V	This species was recorded within the Mt Lindesay Offset Area (Figure 8d).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Common Name	Scientific Name	Conservation Status ¹		Occurrence
		BC Act	EPBC Act	
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	This species was recorded within the Wirradale & Wongala South Offset Area (Figure 8d).
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	Potential habitat and Future Potential Habitat within all offset areas (Figures 8a to 8d). This species was recorded within Wollandilly, Louenville, Kelso, Roseglass, Wirradale & Wongala South and Mt Lindesay Offset Areas (Figures 8a to 8d).
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	This species was recorded within Onavale, Louenville, Velyama, Kelso, Roseglass, Wirradale & Wongala South and Mt Lindesay Offset Areas (Figures 8a to 8d).

Current as of September 2021

¹ Threatened species conservation status V = Vulnerable, E = Endangered, CE = Critically Endangered.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4 MANAGEMENT OF THE OFFSET AREAS

This section provides short, medium and long-term measures that will be used to manage the vegetation and habitat in the offset areas. The management regime in the offset areas will be adapted over time to achieve the ecological management objectives and targets. These measures are SMART (Specific, Measurable, Achievable, Realistic, Timebound), as described below.

4.1 OBJECTIVES AND IMPLEMENTATION SCHEDULE

4.1.1 Ecological Management Objectives

The objectives of the offset areas are to:

- protect and enhance existing Box-Gum Woodland CEEC (woodland form);
- restore self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland);
- protect and enhance existing woodland and forest habitat for threatened species listed under the EPBC Act, namely Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*; and
- restore self-sustaining woodland and/or forest within derived native grasslands and 'non-native' areas to provide habitat for Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*.

These objectives have informed the designation of management zones, final completion criteria and annual management performance criteria, and the design of the monitoring program.

4.1.2 Implementation Schedule

Table 4-1 summarises the management actions described and the frequency/timing of when those actions are to occur.

Table 4-1
OMP Implementation Schedule

Section	Management Action	Frequency and/or Timing
4.3	Seed collection	As required, and based on seasonal assessment results and revegetation requirements
4.4	Revegetation	As required, and based on annual assessment results
4.5	Ecological thinning	As required, and based on thinning assessment results
4.6	Habitat augmentation	As required, and based on habitat needs assessment results


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-1 (Continued)
OMP Implementation Schedule

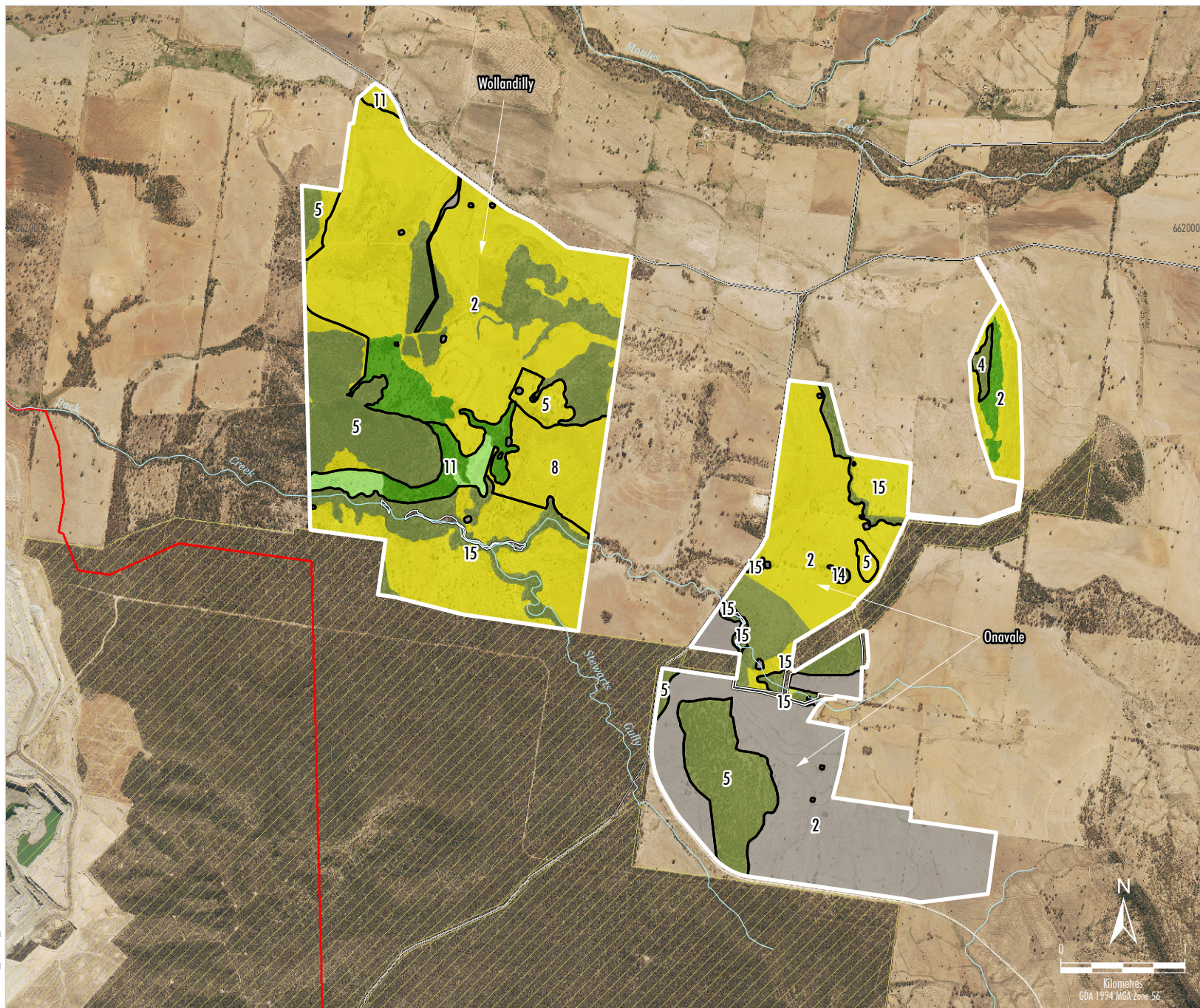
Section	Management Action	Frequency and/or Timing
4.7	Weed control	As required, and based on seasonal assessment results and/or from other opportunistic observations
4.8	Pest animal control	As required, and based on seasonal assessment results and/or from other opportunistic observations
4.9	Erosion management	As required, and based on annual assessment results
4.11	Fencing, gates, access tracks/fire trails and signage inspections	Annually
4.12	Inspection of fire breaks and access trails	Annually, prior to the fire season
	Maintenance of fire breaks and access trails	As required
	Fuel load monitoring	Annually
	Controlled (Ecological) burns	As required (subject to consultation with NSW Rural Fire Services, Environmental Protection Agency and Biodiversity Conservation Trust)
4.15.1	Flora Monitoring Program	Annually
4.15.2	Fauna Monitoring Program	Annual/Biennial
	Monitoring for Regent Honeyeater and Swift Parrot	Annually
	Monitoring for Corben's Long-eared Bat	Annually

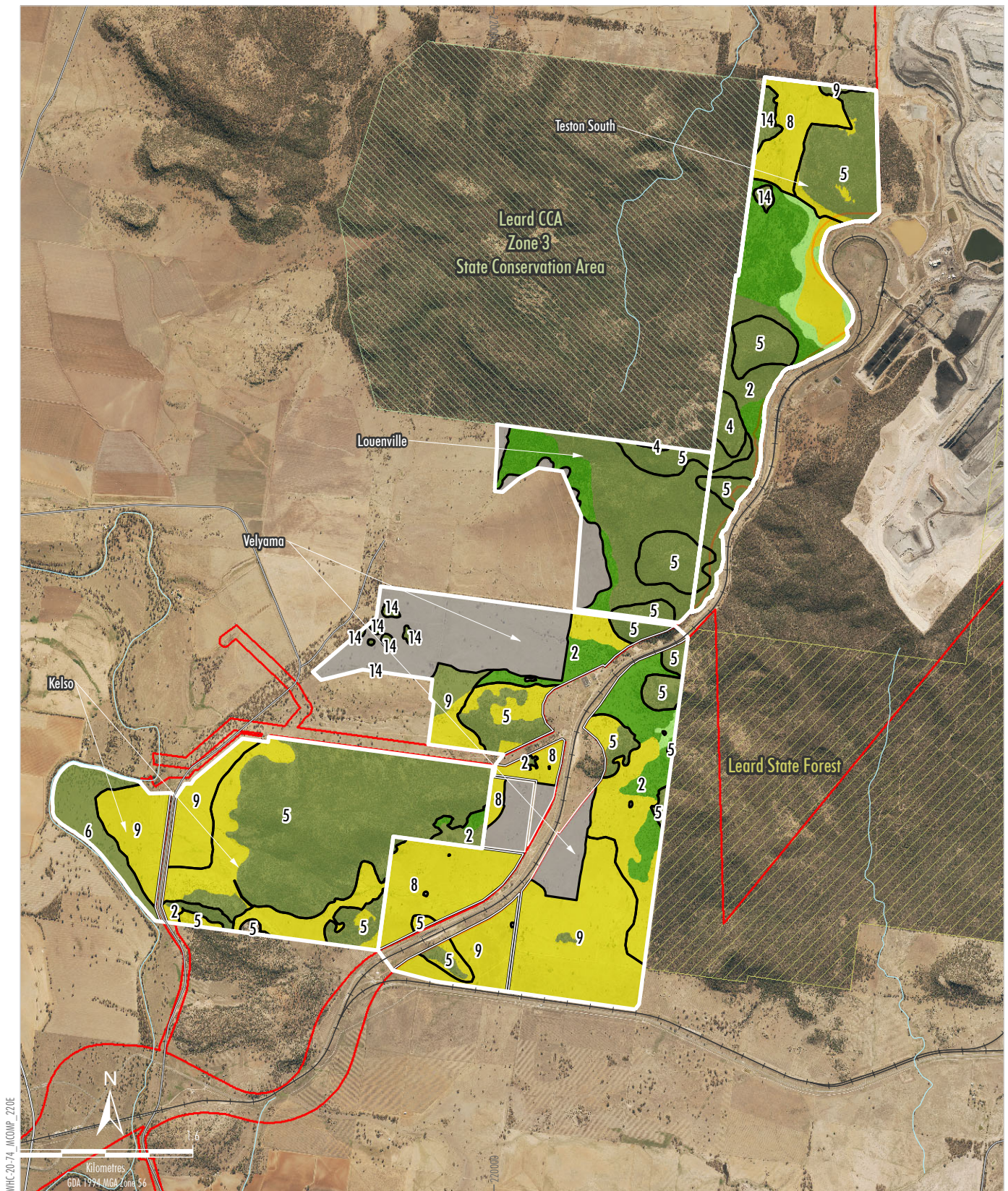
4.2 MANAGEMENT ZONES

The offset areas will be managed to achieve the ecological management objectives in Section 4.1.1. In order to facilitate the management of the offset areas and track progress towards meeting the objectives, the offset areas have been stratified into broad management zones based on (Figures 9a to d):

- presence of Box-Gum Woodland CEEC and its condition 'state' (i.e. woodland or derived native grassland);
- presence of other native vegetation and its condition (woodland/forest or derived native grassland); and
- presence of 'non-native' areas.

Existing woodland and forest would be mostly subject to a low level of management intervention, focusing on natural regeneration (except for some areas that have been assisted with active revegetation), whereas the derived native grassland and non-native areas will be subject to more intensive management intervention and active revegetation.





LEGEND

- NPWS Estate
- State Forest
- Project Boundary
- Offset Area
- Box Gum Woodland (Grassland Form)
- Box Gum Woodland (Woodland Form)
- Other Derived Native Grassland
- Other Existing Woodland/Forest
- Not Native Area

Vegetation Class

- 2 North-west Slopes Dry Sclerophyll Woodlands
- 4 Western Slopes Dry Sclerophyll Forests
- 5 Western Slopes Dry Sclerophyll Forests
- 6 Inland Riverine Forests
- 8 Western Slopes Grassy Woodlands
- 9 Floodplain Transition Woodlands
- 14 Northwest Floodplain Woodlands

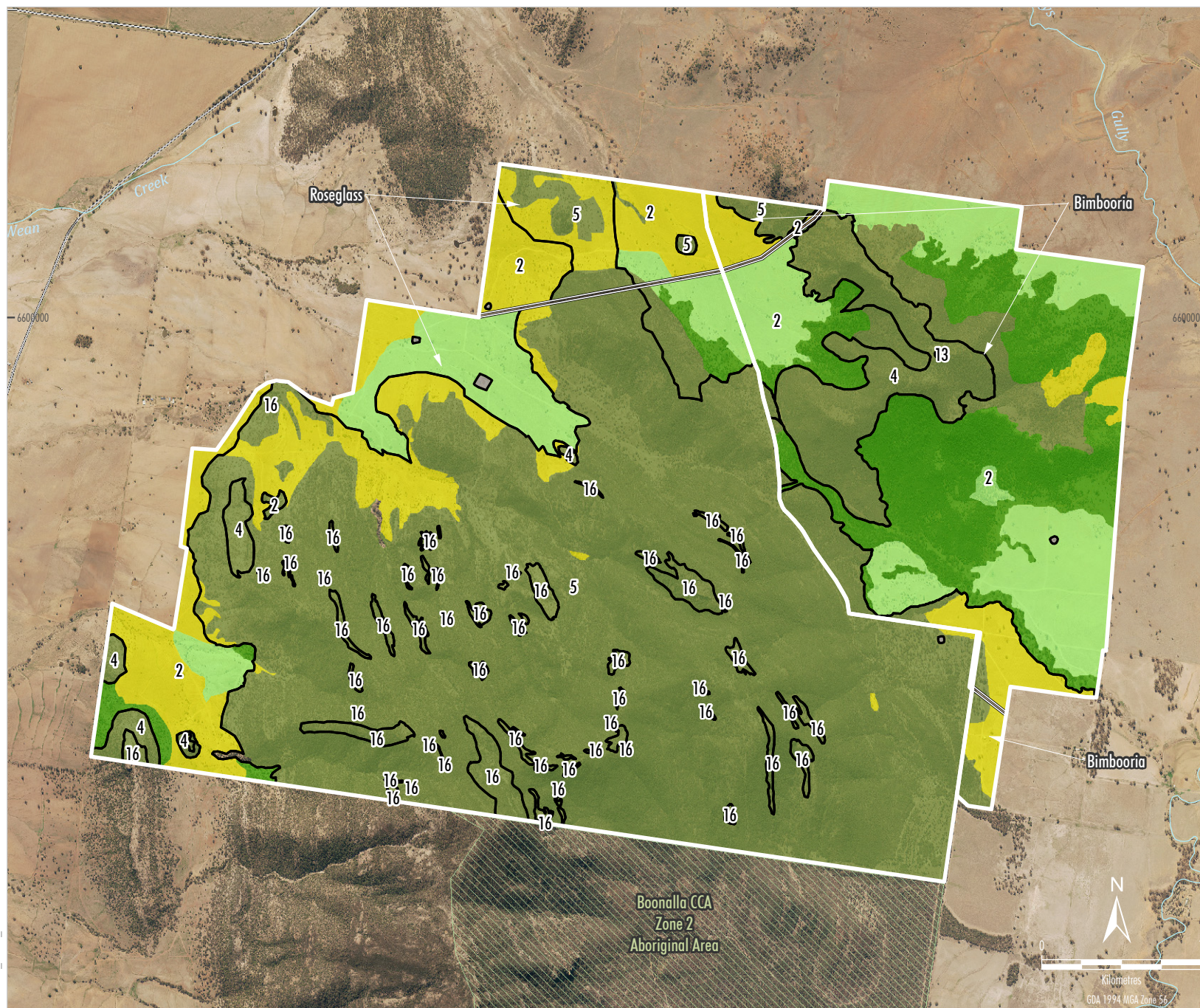
Source: NSW Spatial Services (2020); AMBS (2021)
Orthophoto Whitehaven Coal (April 2019)



MAULES CREEK OFFSET MANAGEMENT PLAN

Management Zones
Kelso, Velyama, Louenville
and Teston South

Figure 9b



- LEGEND**
- NPWS Estate
 - Offset Area
 - Box Gum Woodland (Grassland Form)
 - Box Gum Woodland (Woodland Form)
 - Other Derived Native Grassland
 - Other Existing Woodland/Forest
 - Not Native Area
- Vegetation Class**
- 2 North-west Slopes Dry Sclerophyll Woodlands
 - 4 Western Slopes Dry Sclerophyll Forests
 - 5 Western Slopes Dry Sclerophyll Forests
 - 13 Western Vine Thickets
 - 16 Inland Rocky Hill Woodlands

Source: NSW Spatial Services (2020); AMBS (2021)
Orthophoto Whitehaven Coal (April 2019)

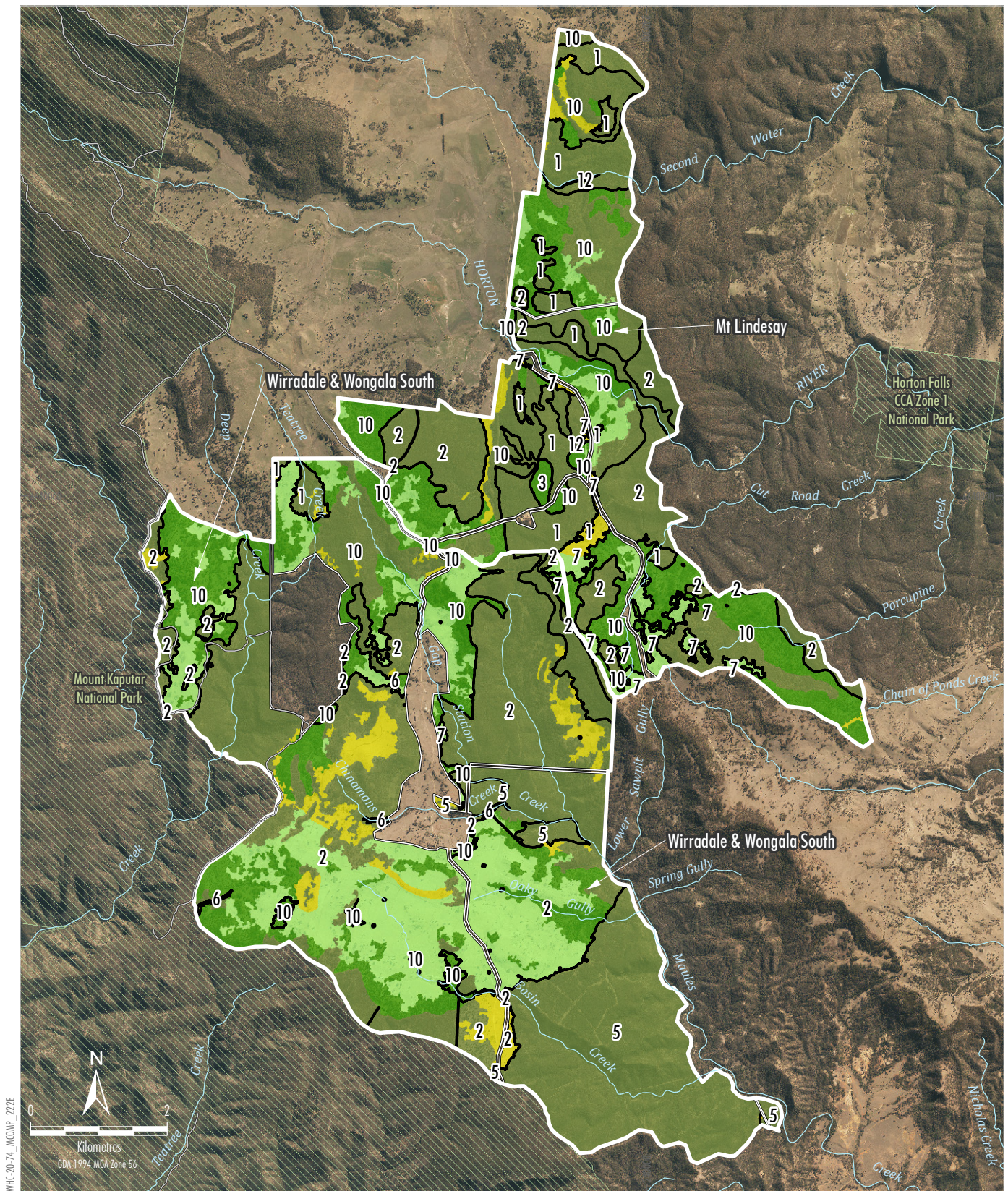
WHITEHAVEN COAL

MAULES CREEK OFFSET MANAGEMENT PLAN

Management Zones

Roseglass and Bimbooria

Figure 9c




WHITEHAVEN COAL

MAULES CREEK OFFSET MANAGEMENT PLAN

Management Zones
Mt Lindesay, Wirradale
and Wongala South

Figure 9d

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4.3 SEED COLLECTION

Whitehaven coordinates routine seed assessment programs designed to identify on a seasonal basis the life cycle and development stages of native plants across a range of offset areas to determine the best strategy in order to collect seeds for future revegetation programs. The format of the seed assessments ensures that timely and prioritised seed collection is implemented and that reporting includes spatial information required by seed collection contractors to undertake the required works. Seed collection will be based on seed assessment results and from other opportunistic observations, but the collection and propagation will only be undertaken as required depending on the revegetation needs.

Seed collection, management and storage will be undertaken in consideration of Greening Australia (various dates) *Florabank Guidelines* and Conservation Agreement limitations and permissions. Currently accepted best practice, as described in Rawlings *et al.* (2010) for local provenance seed collection, which will be implemented includes:

- Collection of seed from several source sites with similar rainfall, soil, altitude, aspect, and slope position to the revegetation site to ensure they are most adapted to the landscape and environmental conditions;
- Collection of seed from between 20-50 plants of each species for genetic diversity; and
- Collection of seed from plants spaced approximately three plant-heights apart to prevent collection of too many closely related seeds.

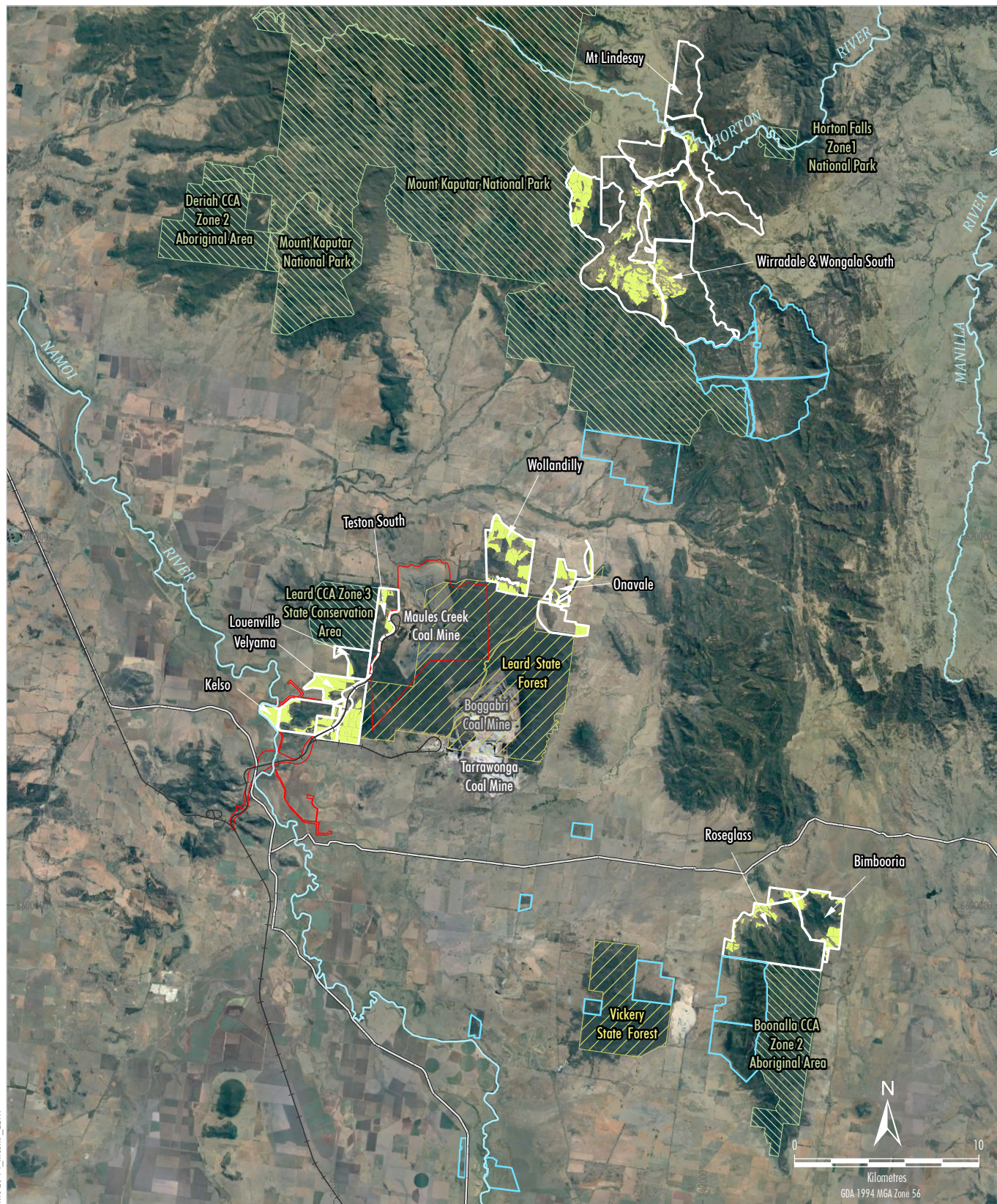
A summary of annual seed collection activities will be reported in the MCCM Annual Review but details such as records of species, quantities, dates and locations will be reported separately.

4.4 REVEGETATION

Revegetation is undertaken to restore self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland) and restore self-sustaining woodland and/or forest within derived native grasslands and 'non-native' areas to provide a significant area of additional habitat for the Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*.

The objective of the revegetation program is to increase the area, quality and connectivity of native vegetation and habitats focusing on assisted natural regeneration and targeted vegetation community establishment using active revegetation methods such as direct seeding or seedling planting in consideration of Conservation Agreement conditions. This revegetation program is being implemented in consideration of the *Florabank Guidelines* (Greening Australia, various dates) and *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.*, 2010).

Primary revegetation planting within the offset areas commenced in 2016 and the majority is now complete (Figure 10) (Plate 3). Figures 7a to 7d also show the area undergoing active revegetation for *Tylophora linearis*.



- LEGEND**
- NPWS Estate
 - State Forest
 - Railway
 - Project Boundary
 - Maules Creek Offset Area
 - Other Whitehaven Offset Area
 - Area Undergoing Active Revegetation 2016-2021

Source: NSW Spatial Services (2020)
Orthophoto: Google Earth (2020)



MAULES CREEK OFFSET MANAGEMENT PLAN

Area Undergoing Active
Revegetation 2016-2021

Figure 10


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			




Plate 3 Example of Areas Undergoing Active Revegetation across MCCM Offset Areas

A secondary revegetation program involving passive or assisted natural regeneration (i.e. maintenance revegetation, ecological burns, weed and pest animal control) and ongoing revegetation maintenance programs will also be undertaken. Whitehaven will undertake annual assessments of previous revegetation areas to determine what and where any active maintenance revegetation is required for the upcoming season of the annual revegetation program.

Annual revegetation assessments will consider key species required to match the target vegetation communities as well as natural or physical constraints to revegetation. The information from the annual revegetation assessments will be used to determine what tree, shrub and ground cover species and the quantity of seed and hiko seedlings that need to be ordered for the annual revegetation program. Orders will be placed in advance to allow sufficient time for additional seed collection (if required, Section 4.3) and for seedling germination/propagation to occur in time for the upcoming annual revegetation program. Flora species indicatively used in areas under active revegetation (Table 4-2) include a variety of grasses, shrubs and trees (including species associated for Box-Gum Woodland CEEC) to create a structurally diverse habitat (for the Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*). The annual revegetation program timing is to occur during periods of desirable seasonal conditions (times of opportunistic high soil moisture and moderate diurnal temperature variation) and/or will be undertaken between autumn and spring seasons when conditions are closest to optimal for revegetation.

Ground truthing and mapping of proposed revegetation paddocks will determine what preparation and maintenance works are required for individual revegetation paddocks. Ground preparation methods that can be implemented (where required) include weed control, grass competition maintenance, soil disturbance (i.e. augering, mounding, ripping, harrowing or ploughing) as well as consideration of other ancillary items (i.e. tree guards) that are going to be needed to optimise revegetation success and growth/development of seedlings and seeding areas. Post planting inspections will be undertaken progressively to surveil performance/quality, methods and results to date, including a final end of season survival count of the previous annual revegetation program. All these processes and steps allow progressive learning and adaptive management to be implemented as part of future revegetation programs (Plate 3).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

**Table 4-2
Indicative Revegetation Species List**

Common Name	Scientific Name	Common Name	Scientific Name
Trees		Grasses	
Western Rosewood	<i>Alectryon oleifolius</i>	Kangaroo Grass	<i>Themeda triandra</i>
Red Ash	<i>Alphitonia excelsa</i>	Wallaby Grass	<i>Rytidosperma spp.</i>
Rough-barked Apple	<i>Angophora floribunda</i>	Plains Grass	<i>Austrostipa aristiglumis</i>
Whitewood	<i>Atalaya hemiglauc</i>	Barbed Wire Grass	<i>Cymbopogon refractus</i>
Kurrajong	<i>Brachychiton populneus</i>	Slender Bamboo Grass	<i>Austrostipa verticillata</i>
*White Cypress Pine	<i>Callitris glaucophylla</i>	Slender Rats Tail Grass	<i>Sporobolus creber</i>
*Belah	<i>Casuarina cristata</i>	Tall Oats Grass	<i>Themeda avenacea</i>
**White Box	<i>Eucalyptus albens</i>	Silky Browntop	<i>Eulalia aurea</i>
*Apple Box	<i>Eucalyptus bridgesiana</i>	Shrubs and Sub-shrubs	
**Blakely's Red Gum	<i>Eucalyptus blakelyi</i>	Western Silver Wattle	<i>Acacia decora</i>
*Narrow-leaved Ironbark	<i>Eucalyptus crebra</i>	Sticky Wallaby Bush	<i>Beyeria viscosa</i>
*River Red Gum	<i>Eucalyptus cunninghamiana</i>	Sticky Hop-Bush	<i>Dodonaea viscosa ssp. angustifolia</i>
Tumbledown Red Gum	<i>Eucalyptus dealbata</i>	Wilga	<i>Geijera parviflora</i>
Dwyers Red Gum	<i>Eucalyptus dwyeri</i>	Black Tea-tree	<i>Melaleuca bracteata</i>
Silver-top Stringybark	<i>Eucalyptus laevopinea</i>	Forbs	
Red Stringybark	<i>Eucalyptus macrorhyncha</i>	Yellow Burr-daisy	<i>Calotis spp.</i>
*Silver-leaved Ironbark	<i>Eucalyptus melanophloia</i>	Common Everlasting	<i>Chrysocephalum apiculatum</i>
**Yellow Box	<i>Eucalyptus melliodora</i>	Ruby Saltbush	<i>Enchylaena tomentosa</i>
*Western Grey Box	<i>Eucalyptus microcarpa</i>	Winter Apple	<i>Eremophila debilis</i>
Pilliga Box	<i>Eucalyptus pilligaensis</i>	Narrawa Burr	<i>Solanum cinereum</i>
Poplar Box	<i>Eucalyptus populnea</i>	Fuzz Weed	<i>Vittadinia spp.</i>
Manna Gum	<i>Eucalyptus viminalis</i>	Blue Bells	<i>Wahlenbergia spp.</i>


* Species associated with the Box-Gum Woodland CEEC to create structurally diverse habitat (as per the NSW Final Determination and Commonwealth Listing Advice for these communities).

Species associated with habitat for the Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and/or *Tylophora linearis*.

A summary of annual revegetation activities will be reported in the MCCM Annual Review.

4.5 ECOLOGICAL THINNING

Ecological thinning will only be considered in habitats identified as having dense regrowth in particular *Callitris* species. Whitehaven will undertake ecological thinning assessments to identify across the offset areas where dense regrowth is impacting on flora and fauna habitat condition or is adverse to natural regeneration/ecological restoration. If determined that ecological thinning is required; it will be staged reflective of existing flora and fauna habitat condition in consideration of Conservation Agreement conditions. A summary of annual ecological thinning activities will be reported in the MCCM Annual Review.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4.6 HABITAT AUGMENTATION

Habitat augmentation (using salvaged resources or nest boxes) will be undertaken in habitats identified as having low habitat resources. Whitehaven will undertake habitat needs assessments to identify across the offset areas where low habitat resources are to determine what habitat augmentation is required. Habitat augmentation will be staged reflective of existing fauna habitat condition and will utilise available salvaged resources such as coarse woody debris, rocky debris and artificial hollows (including nest boxes) in consideration of Conservation Agreement conditions.

Where nest boxes are to be installed; they will be made from high quality and durable materials that provide for a long lifespan and of designs that are targeted for hollow-dependent threatened species known to occur in the locality of the offset site such as woodland birds, arboreal mammals and micro-bats.

Salvaged resources located in the offset areas will be monitored for their use and condition in conjunction with other annual fauna monitoring. Monitoring of nest boxes will commence the year following installation for their signs of use and condition at consistent times of the year (preferably spring) across the offset areas targeting species type based on nest box design.

Signs of use may be monitored using a pole camera that allows viewing of the inhabitants of the boxes as well as a view of the condition of the top of the boxes from the ground with minimal disturbance to the fauna occupying the boxes.


A summary of annual habitat augmentation activities will be reported in the MCCM Annual Review.

4.7 WEED MANAGEMENT

Whitehaven aim to promote natural regeneration by reducing weeds so that perennial exotic plant cover does not comprise more than 20% of flora monitoring plots (aligned with the *Leard Forest Mining Precinct Regional Biodiversity Strategy* [Umwelt 2017]) by implementing measures aiming to exclude Weeds of National Significance [WONS]) from the offset areas (EPBC 2010/5566 Condition 12C iv).

Whitehaven will manage weeds in accordance with the NSW *Biosecurity Act 2015* that introduced the “General Biosecurity Duty” (GBD) which requires all land managers and users to ensure as far as is reasonably practicable, that biosecurity risks are prevented, eliminated or minimised. In addition to Whitehaven’s GBD responsibility, weed management will be implemented aligned with the *North West Regional Strategic Weed Management Plan* (NWRSWMP) 2017 – 2022 (North West Local Land Services, 2017) and weed control measures will be guided by published control measures (e.g. DPI, 2018a). The NWRSWMP introduces a risk management approach (based on the weed invasion curve stages of prevention, eradication, containment and asset protection) to prioritise weeds for management based on those weeds that are “State Level Determined Priority Weeds for the North West Local Land Services Region” and additional “Regional Priority Weeds”.

The spread and introduction of weeds can be prevented by the practice of weed hygiene measures. Whitehaven will instruct contractor vehicles and equipment entering the offset areas to be clean and free from weeds and/or seeds. Access to the offset areas will also be controlled as described in Section 4.11.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Seasonal weed assessment programs are undertaken across the offset areas to identify weed species, extent and condition of any infestations and the opportunity for control/management depending on seasonal conditions. The weed assessments ensure that timely and prioritised weed control is undertaken on a seasonal basis with the information directly given to contractors to identify what, where, when and how to target appropriate resources across the offset areas for weed control.

A number of environmental and priority weeds are known to occur in the offset areas as listed in Table 4-3. Based on seasonal weed assessment results; weed control will take place targeting the priority weeds (Table 4-3) and as well as any other environmental weeds present in the offset areas. However, if new weeds species are found, those new weeds species will also be managed in accordance with this OMP.


Recommended techniques for removal of priority weeds that have been published by DPI will be consulted prior to weed control, e.g. *New South Wales Weed Control Handbook* (DPI, 2018a). Relevant methods for controlling priority weeds known to occur in the offset areas are summarised in Table 4-3.

Table 4-3
Control of Example Target Priority Weeds

Common Name	Scientific Name	Example Control Methods (DPI, 2018a)
Mother of Millions	<i>Bryophyllum delagoense</i>	<ul style="list-style-type: none"> herbicide application
Paterson's Curse	<i>Echium plantagineum</i>	<ul style="list-style-type: none"> herbicide application
African Boxthorn	<i>Lycium ferocissimum</i>	<ul style="list-style-type: none"> physically remove herbicide application
Prickly Pear	<i>Opuntia</i> sp.	<ul style="list-style-type: none"> physical removal herbicide application
Tiger Pear	<i>Opuntia aurantiaca</i>	<ul style="list-style-type: none"> physical removal herbicide application
Sweet Briar	<i>Rosa rubiginosa</i>	<ul style="list-style-type: none"> physical removal herbicide application
Fireweed	<i>Senecio</i> spp.	<ul style="list-style-type: none"> herbicide application
Cockle Burr	<i>Xanthium occidentale</i>	<ul style="list-style-type: none"> physical removal herbicide application
Bathurst Burr	<i>Xanthium spinosum</i>	<ul style="list-style-type: none"> physical removal herbicide application

In addition to species listed in Table 4-3, Coolatai Grass (*Hyparrhenia hirta*) is a recognised threat to Box-Gum Woodland CEEC (DECCW, 2011), although it is not a priority weed relevant to the offset areas. In the event that Coolatai Grass is found in the offset areas, individual plants can be physically removed or treated with herbicide (DPI, 2018a).

All personnel involved in weed management will be required to hold relevant and valid licences/ permits for weed management works, including a chemical licence to use herbicides and a chainsaw certificate to operate chainsaws (where applicable).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

A summary of annual weed management activities will be reported in the MCCM Annual Review. Guidance on weed control will be available to employees and/or contractors through ongoing communications and training to raise awareness of biodiversity issues in the region (e.g. weed spread prevention through the washing of vehicles and equipment).

4.8 PEST ANIMAL MANAGEMENT

The goal of pest animal management is to achieve an overall reduction in pest animal species and population sizes targeted by control measures implemented across the offset areas (in consideration of potential drought conditions and seasonal trends).

Whitehaven has adopted a “monitor, measure and manage” approach to pest animal management that allows Whitehaven to implement adaptive management in response to changes being measured through monitoring in pest animal abundance specific to the different geographical regions of the offset area. Pest animal monitoring utilises quarterly vertebrate fauna motion detection camera surveys (Section 4.15.2). The planning of control programs is informed by quarterly camera results and will also consider sighting records maintained by the pest animal contractor and other observations of target pest animals within offset areas to inform when and where upcoming control programs are required.

Pest animal management will focus on the pest animals recorded from the offset areas (Table 4-4). However, if new pest animals are found, those new pest animals will also be managed in accordance with this OMP.

Control measures described in Table 4-4 will be implemented by Whitehaven staff or by an appropriate Pest Control Contractor(s) as required. All personnel involved in pest animal control will be required to hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use or a firearms licence for shooting. Pest animal control will be undertaken in consideration of the control recommendations outlined in the *Ecology and Management of Vertebrate Pests in NSW* (DPI, 2018b).

A summary of annual pest animal management activities will be reported in the MCCM Annual Review. Key messages on pest animal prevention should be available to employees and/or contractors through ongoing communications and training to raise awareness of biodiversity issues in the region (e.g. reporting pest animal observations via Pest Control Contractors online sightings webpage).



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-4
Control Methods for Target Pest Animals

Common Name	Scientific Name	Example Control Method	Relevant Documents ²
Feral Pig	<i>Sus scrofa</i>	<ul style="list-style-type: none"> trapping/ground shooting; and/or ground baiting (using poison). 	<ul style="list-style-type: none"> <i>Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs</i> (DEE, 2017); <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
Feral Goat	<i>Capra hircus</i>	<ul style="list-style-type: none"> trapping/mustering; and/or ground shooting. 	<ul style="list-style-type: none"> <i>Threat Abatement Plan for Competition and Land Degradation by Unmanaged Goats</i> (DEWHA, 2008b); and <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021).
European Red Fox	<i>Vulpes vulpes</i>	<ul style="list-style-type: none"> trapping/ground shooting; and/or ground baiting (using poison). 	<ul style="list-style-type: none"> <i>Threat Abatement Plan for Predation by European Red Fox</i> (DEWHA, 2008a); <i>NSW Threat Abatement Plan For Predation by The Red Fox (Vulpes vulpes)</i> (OEH, 2011); <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
European Rabbit	<i>Oryctolagus cuniculus</i>	<ul style="list-style-type: none"> warren ripping/fumigation; ground shooting; and/or ground baiting (using poison). 	<ul style="list-style-type: none"> <i>Threat Abatement Plan for Competition and Land Degradation by Rabbits</i> (DEE, 2016); <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
Brown Hare	<i>Lepus capensis</i>	<ul style="list-style-type: none"> ground shooting. 	<ul style="list-style-type: none"> <i>Integrated Hare Control</i> (Department of Environment and Primary Industries [VIC], 2015); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
Feral Deer	<i>Cervus spp.</i> , <i>Axis spp.</i> , or <i>Dama spp.</i>	<ul style="list-style-type: none"> trapping; and/or ground shooting. 	<ul style="list-style-type: none"> <i>Feral Deer</i> (DotE, 2011); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
Feral Cat	<i>Felis catus</i>	<ul style="list-style-type: none"> trapping; ground baiting (using poison) and/or ground shooting. 	<ul style="list-style-type: none"> <i>Threat Abatement Plan for Predation by Feral Cats</i> (DotE, 2015); <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).
Wild Dog	<i>Canis familiaris</i>	<ul style="list-style-type: none"> trapping/ground baiting (using poison); and/or ground shooting. 	<ul style="list-style-type: none"> <i>New South Wales Wild Dog Management Strategy 2017-2021</i> (DPI, 2017); <i>PestSmart Toolkit</i> (Centre for Invasive Species Solutions, 2021); and <i>Ecology and Management of Vertebrate Pests in NSW</i> (DPI, 2018b).

¹ Local Land Services Act 2013

² An alternative published method may be used as required.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4.9 EROSION MANAGEMENT

Erosion management is determined by annual inspection programs of known erosion sites, unsealed tracks and associated drainage structures across the offset areas to review appropriate erosion and sediment control measures required in accordance with the Blue Book (Managing Urban Stormwater: Soils and Construction Volume 1 [Landcom 2004]) and in consideration of Conservation Agreement conditions. Should annual inspection programs identify areas of unstable and active erosion, the erosion register will be updated including what (if any) active remediation works are required to be undertaken. Any erosion and sedimentation identified with tracks and associated drainage structures will be maintained through annual fire break track maintenance program. A summary of annual erosion management activities will be reported in the MCCM Annual Review.

4.10 AGRICULTURE MANAGEMENT

Agriculture/grazing has been excluded from the offset areas. Inadvertent grazing from stray neighbouring stock will be removed as soon as practicable. Any proposed grazing for high threat weed infestations must be planned in consideration of Conservation Agreement conditions and aligned with the Biodiversity Conservation Trust Grazing Guideline.

4.11 CONTROL OF ACCESS


Vehicle access will be restricted to designated tracks to minimise ground disturbance (e.g. compaction); with the exception for biodiversity management actions and inspections which unavoidably result in vehicles and machinery travelling off-tracks within the offset area.

Fencing, gates, access tracks/fire trails and signage inspections will occur annually. Maintenance of all access tracks, fire trails, fences and gates will be undertaken as required. If inspections note that any fences are causing impacts to the flight paths of birds, bats and gliders, alternatives to barbed wire fencing will be considered. Where offset areas share common boundaries, fencing designs will not be restrictive to native fauna movement or connectivity between habitats. Wherever the need to restrict livestock is not required, new fencing will be plain strand wire fencing to minimise the use of barbed wire.

Visitor impacts will be managed such that disturbance to the offset areas is minimised. Visitors must keep to designated tracks and trails except for management purposes, and equipment entering the area must be clean from weeds and/or seeds.

4.12 BUSHFIRE MANAGEMENT

Whitehaven will annually quantify bushfire fuel loads and threats of the offset areas to assess the hazard of various offset areas prior to each bushfire season. The assessment will consider human, environment and infrastructure assets within and adjacent to offset areas to quantify an overall bushfire risk. The feasibility of various hazard reduction methods will then be considered (for example, but not limited to, fire exclusion, mechanical fuel reduction such as slashing, or undertaking ecological burns) prior to determining annual treatment/actions for each offset property.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Offset areas with moderate to high overall bushfire risks will be prioritised as part of an annual ecological burn program and will be subject to conceptual and strategic fire planning and mapping. Once annual fire planning has identified individual paddocks in which ecological burns can feasibly be undertaken, and a burn plan has been prepared; Whitehaven will consult where required with relevant stakeholders such as NSW Rural Fire Services (RFS), Councils and neighbours/local community as well as NSW Environment Protection Authority (EPA Approval for Open Burning is required for ecological burns) and NSW Biodiversity Conservation Trust (BCT) in consideration of Conservation Agreement conditions.

Whitehaven will establish and maintain fire breaks (such as access tracks and fire trails) around the perimeter of and internally within offset areas (where practicable) to passively mitigate fire spreading onto or off the offset property, as well as for active ecological burning and bushfire containment purposes, in consideration of Conservation Agreement conditions. Fire breaks will be periodically maintained as zero fuel barriers (preferably mineral earth barriers up to 6m total width of clearing); acknowledging that some fuel accumulation will occur in between maintenance. Fire breaks will be inspected annually prior to the fire season and the maintenance of fire breaks will be prioritised as required by the inspection.

Whitehaven will undertake an annual ecological burn program within the feasible paddocks/burn blocks identified through the above assessment within the prioritised offset areas. The burn program will be conducted by suitably experienced and capable professionals with adequate firefighting resources and training to safely and competently light and extinguish ecological burns.


The location of ecological burns will consider existing fire intervals (in consideration of NSW RFS Bush Fire Coordinating Committee 2008 Bushfire Fire Risk Management Guideline intervals for grassy woodlands of 8 to 40 years; grasslands of 3 to 10 years; and dry sclerophyll forest shrub/grass sub-formation of 8 to 50 years) within non-woody (any areas considered with revegetation will be sufficiently mature to avoid fire impacts) and woody (existing remnant vegetation) areas, in consideration of Conservation Agreement conditions. Ecological burns will aim for low to moderate fire intensity burns by undertaking cool-season burns when conditions are suitable (generally autumn to spring), as well as undertaking other burn preparations to mitigate impacts to environmental assets (such as hollow bearing trees) and other constraints identified within mapped burn blocks.

In the event of a bushfire within or adjacent to offset areas; Whitehaven will assist bushfire emergency services and neighbours (such as RFS, NPWS and Forestry Corporation NSW) as much as practicable, including, but not limited to, coordinating access to offset areas and facilitating available water sources.

A summary of annual bushfire management activities will be reported in the MCCM Annual Review.

4.13 TYLOPHORA LINEARIS

Tylophora linearis (a threatened flora species listed under the BC Act and EPBC Act) was identified in the MCCM Project Boundary during pre-clearing flora surveys during 2014. Following the identification of *Tylophora linearis* in the MCCM Project Boundary, Whitehaven engaged Niche to undertake regional targeted surveys for *Tylophora linearis* within seven NPWS reserves and six State Forests within northern NSW. The study area was approximately 371,629 ha (Niche, 2014a).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

These surveys confirmed the presence of *Tylophora linearis* in six NPWS reserves and six State Forests, all of which were modelled as containing suitable habitat, namely: Bibblewindi State Forest; Pilliga East State Forest; Pilliga National Park; Pilliga Nature Reserve; Pilliga State Conservation Area; Timallallie National Park; Breeza State Forest; Boonalla Aboriginal Area; Kerringle State Forest; Baradine State Forest; Euligal State Forest; and Trinkey State Conservation Area.

Following the identification of *Tylophora linearis*, a propagation and translocation program was prepared for the species in consultation with Dr Colin Driscoll (Hunter Eco), OEH (now Biodiversity Conservation and Science), DP&E (now DPIE) and DotE (now DAWE). The propagation and translocation program is provided in Appendix D.

There are multiple stages to the propagation and translocation program:


- Stage 1 - Root Architecture and Growth Study;
- Stage 2 - Seed Production Monitoring;
- Stage 3 - Seed Collection and Storage;
- Stage 4 - Seed Propagation; and
- Stage 5 - Translocation Trials.

Stages 1 to 4 were undertaken in the second half of 2014. This research approach has resulted in the examination of *Tylophora linearis* root architecture and species phenology; as well as and the successful collection and germination of seed from *Tylophora linearis* plants and subsequent translocation of 77 seedlings within the Wollandilly offset area in December 2015.

The threatened flora program will continue to inspect existing and translocated *Tylophora linearis* sites within offset areas and attempt to identify reproductive material for future potential translocation and/or transplantation opportunities.

Overall, the direct and other compensatory measures for the species as part of the offsets package include:

1. Conservation of existing habitat for *Tylophora linearis* within offset areas (Section 3.3);
2. Revegetation of woodland/forest within areas of former *Tylophora linearis* habitat (Section 3.3 and 4.4);
3. Implementation of a root architecture and growth study for *Tylophora linearis* (Appendix D);
4. Seed production monitoring for *Tylophora linearis* (Appendix D);
5. Collection and storage of seed (Appendix D);
6. *Tylophora linearis* propagation (Appendix D);
7. Translocation trials (Appendix D); and
8. Regional surveys (Section 3.3).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Tylophora linearis was recognised as a little known and cryptic species (OEH, 2014b) and the measures have led to a greater understanding of the species and how it can be managed for conservation purposes.

The approved *Tylophora linearis* offset package (Hunter Eco, 2021) provides a significant addition to the reserved *Tylophora linearis* habitat (including additional confirmed records). A summary of annual threatened flora management activities will be reported in the MCCM Annual Review.

4.14 PERFORMANCE AND COMPLETION CRITERIA

4.14.1 Box-Gum Woodland CEEC listed under the EPBC Act

Condition 12C(e) i of EPBC Act Approval 2010/5566 requires a set of measurable ecological indicators for detecting changes to the Box-Gum Woodland CEEC. Table 4-5 outlines the ecological indicators relevant to the offset areas.


Table 4-5
Ecological Indicators for Detecting Changes to the Box-Gum Woodland CEEC

Ecological Indicators for Detecting Changes to the Box-Gum Woodland CEEC	Measure	Monitoring Method (Section 4.15)
Overstorey		
Native overstorey cover	Projected foliage cover %	Native overstorey cover
Overstorey regeneration	Proportion of over-storey species occurring as regeneration	Recruitment of saplings
Vegetation water stress	Projected foliage cover %	Native overstorey cover
Understorey		
Understorey cover	Cover of perennial native groundcover species	Native plant species richness (estimate % cover and abundance of each species)
Understorey diversity	Number of native and exotic understorey species present (excluding grasses)	Native plant species richness
Important species	Number of important species present	Native plant species richness
Native groundcover (grasses and weeds)	Measured proportionately as a presence/absence metric	Native groundcover grasses

As described in Section 4.1.1, the ecological management objectives for Box-Gum Woodland CEEC are to:

- protect and enhance existing Box-Gum Woodland CEEC (woodland form); and
- restore self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland).

The outcome being targeted is a reduction in weeds and evidence of natural regeneration in the woodland form of the Box-Gum Woodland CEEC and the establishment of additional woodland within existing areas of derived native grassland.


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

The performance of the offset areas towards meeting the ecological management objectives for the Box-Gum Woodland CEEC will be monitored against the measurable performance and completion criteria provided in Table 4-6. Table 4-6 links the above specific ecological indicators with the performance and completion criteria relevant to the two management objectives. More ecological indicators and criteria are provided for the restoration of the Box-Gum Woodland CEEC due to higher intensity of management and expected change. The performance criteria have been measured annually since 2017 and the target is to meet the completion criteria within 20 years and prior to the expiry date of the EPBC Act approval (2037).

Table 4-6
Performance and Completion Criteria for Box-Gum Woodland CEEC

Management Objective	Ecological Indicators	Performance Criteria	Completion Criteria
Maintenance and enhancement of existing Box-Gum Woodland CEEC (woodland form)	Overstorey regeneration	Natural regeneration of all dominant overstorey Eucalypts relevant to the PCT within each patch sampled by a monitoring plot	Natural regeneration in >50% of plots in vegetation zone have dominant overstorey Eucalypts relevant to the PCT
	Weeds (as perennial exotic plant cover)	An overall decrease in weed (perennial exotic plant) cover compared to the baseline condition	Weed (perennial exotic plant) cover is less than 20% on average across monitoring plots
Restoration of self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland)	Native overstorey cover	Native overstorey cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Native overstorey cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Native midstorey cover	Native midstorey cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Native midstorey cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Native species diversity (also indicator for: <ul style="list-style-type: none"> perennial native groundcover Important species Weed Richness 	Native species diversity trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Native species diversity within benchmark range for the relevant Vegetation Class (Appendix E)
	Native groundcover grass cover	Cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Native groundcover grass cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Weeds (as perennial exotic plant cover)	An overall decrease in weed (perennial exotic plant) cover compared to the baseline condition	Weed (perennial exotic plant) cover is less than 20% on average across monitoring plots

* Annual performance criteria in Appendix F are calculated by back-extrapolating lower and upper threshold completion criteria over 20 years to Year 0.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

The benchmark ranges for four ecological indicators in Table 4-6 and Appendix E (i.e. native overstorey cover, native midstorey cover, native species diversity and native groundcover grasses) are sourced from the *BioMetric Vegetation Condition Benchmarks* (OEH, 2017). These benchmarks are relevant as these are compatible with the baseline data, subsequent monitoring data, and data collected by Whitehaven in other company-owned offset areas which is based on the BioBanking Assessment Methodology (BBAM) (OEH, 2014a). These benchmarks have an upper and lower threshold value (Appendix E).

Annual performance criteria in Appendix F are calculated by back-extrapolating lower and upper threshold completion criteria over 20 years to Year 0. Analysis of annual performance data aims to track progress towards the vegetation management objectives and allows for timely intervention with remedial action. Plots that fall below upper or lower threshold annual performance criteria will trigger a review of contingency measures as outlined in Section 4.16.

4.14.2 Habitat for Threatened Species listed under the EPBC Act

As described in Section 4.1.1, the ecological management objectives for threatened species listed under the EPBC Act are to:

- protect and enhance existing woodland and forest habitat for threatened species listed under the EPBC Act, namely Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*; and
- restore self-sustaining woodland and/or forest within derived native grasslands and 'non-native' areas to provide habitat for the above listed threatened species listed under the EPBC Act.

The existing woodland and forest habitat will be enhanced by reducing weeds and achieving natural regeneration. Restoration in derived native grasslands and 'non-native' areas will aim to provide potential foraging habitat for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat and structure suitable to provide potential habitat for *Tylophora linearis*.

Box-Gum Woodland CEEC also provides habitat for Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat and *Tylophora linearis*. The performance of the offset areas to meet these ecological management objectives for the Box-Gum Woodland CEEC will be monitored against the performance and completion criteria provided in Table 4-6. Habitat areas not associated with the Box-Gum Woodland CEEC will be monitored against the measurable interim performance and completion criteria provided in Table 4-7.


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-7
Performance and Completion Criteria for Habitat

Management Objective	Ecological Indicators	Performance Criteria	Completion Criteria
Enhancement of existing woodland/forest	Overstorey regeneration	Natural regeneration of all dominant overstorey Eucalypts relevant to the PCT within each patch sampled by a monitoring plot	Natural regeneration in >50% of plots in vegetation zone have dominant overstorey Eucalypts relevant to the PCT
	Weeds (as perennial exotic plant cover)	An overall decrease in weed (perennial exotic plant) cover compared to the baseline condition	Weed (perennial exotic plant) cover is less than 20% on average across monitoring plots
Restoration of self-sustaining woodland/forest	Native overstorey cover	Cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Native midstorey cover	Cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Native species diversity	Native species diversity trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Native species diversity within benchmark range for the relevant Vegetation Class (Appendix E)
	Native groundcover grasses	Cover trending towards benchmark range for the relevant Vegetation Class (Appendix F*)	Cover within benchmark range for the relevant Vegetation Class (Appendix E)
	Weeds (as perennial exotic plant cover)	An overall decrease in weed (perennial exotic plant) cover compared to the previous year.	Weed (perennial exotic plant) cover is less than 20% on average across monitoring plots


* Annual performance criteria in Appendix F are calculated by back-extrapolating lower and upper threshold completion criteria over 20 years to Year 0.

4.15 ECOLOGICAL MONITORING PROGRAM

Condition 12C(e) ii of EPBC Act Approval 2010/5566 requires a monitoring plan to assess the success of the management activities for Box-Gum Woodland CEEC and habitat for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat measured against the baseline condition. The monitoring program has also been designed to quantify changes in the condition of the habitat for *Tylophora linearis*.

Australia Museum Consulting commenced the monitoring data collection in November 2014. The monitoring program described below is based on the continuation of the most relevant, and effective, components of the existing monitoring program for continuity of data collection and analysis, and to allow comparison against baseline data.

Qualified ecologists will be engaged to undertake the monitoring program in accordance with Condition 12C(e) ii of EPBC Act Approval 2010/5566.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4.15.1 Vegetation and Habitat Monitoring

Purpose

Vegetation and habitat monitoring will be undertaken to track changes in vegetation and habitat in the offset areas in response to management measures. The data collected will be used to evaluate the progress of the offset areas towards meeting the performance and completion criteria (Section 4.14).

Monitoring Design

The monitoring program has been designed to quantify change in the condition of the Box-Gum Woodland CEEC and habitat for the Regent Honeyeater, Swift Parrot, Corben's Long-eared Bat and *Tylophora linearis*.

Relevant ecological indicators (outlined in Table 4-8) are monitored annually at treatment plots (within the offset areas) and compared to control plot and reference zone data (outside the offset areas) over time.

Table 4-8
Vegetation and Habitat Monitoring Methods

Management Objective	Ecological Indicators	Measure	Monitoring Method	
Maintenance and enhancement of existing Box-Gum Woodland CEEC (woodland form)	Over-storey regeneration	Proportion of over-storey species occurring as regeneration	Recruitment of saplings	Observation 20 x 50 m plot.
	Weeds	Number and percentage cover of non-native weed species	Mid-storey cover	10 points along a 50 m transect
			Ground cover	50 points along a 50 m transect
			Species richness	Count utilising a species list recorded within 20 x 20m sub-plot (estimate % cover and abundance of each species)
Restoration of self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland)	Native overstorey cover	Projected foliage cover %	Native overstorey cover	10 points along a 50 m transect (source BBAM [OEH, 2014a])
	Vegetation water stress	Projected foliage cover %	Native overstorey cover	10 points along a 50 m transect (source BBAM [OEH, 2014a])
	Native midstorey cover	Projected foliage cover %	Native midstorey cover	10 points along a 50 m transect (source BBAM [OEH, 2014a])
	Native species diversity	Number of native understorey species present (excluding grasses)	Native plant species richness	Count utilising a species list recorded within 20 x 20m sub-plot (source BBAM [OEH, 2014a])


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-8 (Continued)
Vegetation and Habitat Monitoring Methods

Management Objective	Ecological Indicators	Measure	Monitoring Method	
Restoration of self-sustaining woodland within existing areas of Box-Gum Woodland CEEC (derived native grassland) (Cont.)	Understorey cover	Cover of perennial native groundcover species	Native plant species richness	Count utilising a species list recorded within 20 x 20m sub-plot (estimate % cover and abundance of each species) (source BBAM [OEH, 2014a])
	Important species	Number of important species present	Native plant species richness	Count utilising a species list recorded within 20 x 20m sub-plot (source BBAM [OEH, 2014a])
	Native groundcover grass cover	Measured proportionately as a presence/absence metric	Native groundcover grasses	10 points along a 50 m transect (source BBAM [OEH, 2014a])
	Weeds	Number and percentage cover of non-native weed species	Mid-storey cover	10 points along a 50 m transect (source BBAM [OEH, 2014])
			Ground cover	10 points along a 50 m transect (source BBAM [OEH, 2014]).
			Species richness	Count utilising a species list recorded within 20 x 20m sub-plot (estimate % cover and abundance of each species)

Control plots will be established in accordance with Condition 12C(e) ii of EPBC Act Approval 2010/5566 and are located outside the biodiversity offset area (called the ‘control zone’), within the same IBRA region as the dominant Vegetation Classes (Keith 2004) and representing a ‘business as usual’ land management scenario (as per BCT 2021), where agricultural management continues.

The comparison of treatment and control plot data aims to account for changes that occur due to background environmental change and subsequently determine to what extent biodiversity management actions within vegetation zones are trending away from control plots still subject to agricultural management. Each control zones are to have a minimum of three plots to allow for statistically robust data analysis.

The flora monitoring plot layout is shown in Figure 11 based on the BBAM (OEH 2014a). Treatment and control plots are permanently marked with star pickets at the start and end of the 50 m transect and at the four corners of the 20 m x 20m floristic plot. The location of the start and end of the 50m transect will be recorded using a GPS.


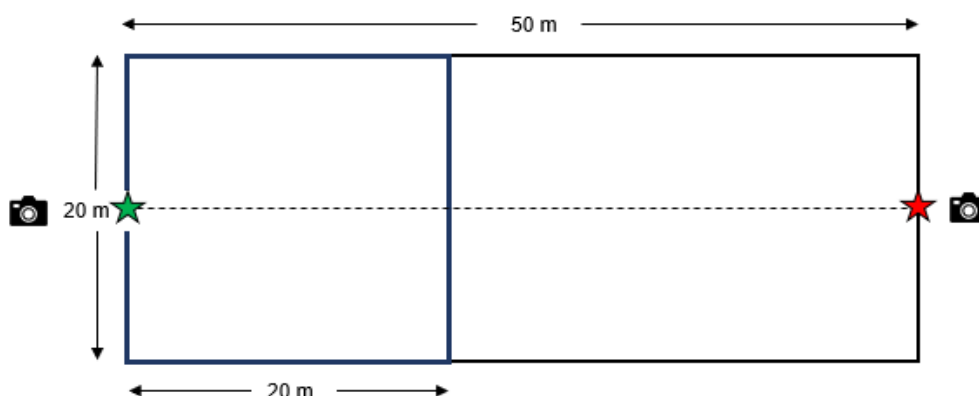
	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Figure 11
Layout of Flora Monitoring Plot



Treatment monitoring plots will be located across Vegetation Classes (Keith, 2004) in Table 4-9. The aim is not to sample every vegetation community, but to adequately sample to detect trends and changes in the vegetation condition.

Table 4-9
Schedule of Flora Monitoring Sites

Vegetation Classes	Total Area (ha)	Performance and Completion Criteria
<i>Maintenance and Enhancement of Existing Woodland and Forest</i>		
New England Dry Sclerophyll Forests	540	Table 4-6
North-west Slopes Dry Sclerophyll Woodlands	2984.6	
Western Slopes Dry Sclerophyll Forests	139.6	Table 4-7
Northern Tableland Dry Sclerophyll Forests	15.5	Table 4-6
Western Slopes Dry Sclerophyll Forests	2584.4	Table 4-7
Inland Riverine Forests	48.4	
Floodplain Transition Woodlands	16.8	
New England Grassy Woodlands	1679.2	Table 4-6
Western Slopes Grassy Woodlands	21.5	
Northern Montane Heaths	1.9	Table 4-7
Western Vine Thickets	0.3	
Northwest Floodplain Woodlands	17.6	
Brigalow Clay Plain Woodlands	70.9	
Inland Rocky Hill Woodlands	9.2	


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-9 (Continued)
Schedule of Flora Monitoring Sites

Vegetation Classes	Total Area (ha)	Performance and Completion Criteria
<i>Restoration of Self-sustaining Woodland/Forest</i>		
New England Dry Sclerophyll Forests	6.1	Table 4-6
North-west Slopes Dry Sclerophyll Woodlands	2008	
Western Slopes dry Sclerophyll Forests	248.3	Table 4-7
Temperate Montane Grasslands	133.9	Table 4-6
Western Slopes Grassy Woodlands	221.5	Table 4-7
Floodplain Transition Woodlands	255.8	
New England Grassy Woodlands	437.8	Table 4-6
Western Slopes Grassy Woodlands	24.8	
Brigalow Clay Plain Woodlands	135.6	Table 4-7
Inland Rocky Hill Woodlands	49.6	

Highlight = Vegetation Classes relevant to the Box Gum Woodland CEEC

Photographic Monitoring

Photos will be taken at chest height at the start and end of each plots transect.

General Observations


General observations on vegetation and habitat outside monitoring sites will also be made during monitoring activities.

Tylophora linearis

Monitoring of *Tylophora linearis* in the offset areas will also occur as part of the threatened flora management program as described in Section 4.13.

Timing and Frequency

Vegetation and habitat will be monitored on an annual basis in spring, when the highest diversity of plants is expected to be present (after Rawlings *et al.*, 2010). The season of monitoring sites will be consistent (not rotated) in order to monitor trends in the data.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

4.15.2 Fauna Monitoring

Purpose

Condition 12D of EPBC Act Approval 2010/5566 requires annual monitoring for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat in the offset areas, unless otherwise agreed to in writing by DAWE. These species are known to use habitat within, or connected to, the offset areas (Sections 3.2 and 3.3). The Corben's Long-eared Bat is likely to breed and forage in the offset areas, whereas the Regent Honeyeater and Swift Parrot are known to breed elsewhere and have potential to forage in the offset areas.

Corben's Long-eared Bat

Ongoing monitoring for the Corben's Long-eared Bat will be undertaken between October to April, consistent with the *Survey Guidelines for Australian Threatened Bats* (DEWHA, 2010a). Baseline surveys for the Corben's Long-eared Bat were undertaken within this period, in November 2014 by Australia Museum Consulting.

The monitoring program is designed to measure abundance, occupancy and habitat use of Corben's Long-eared Bat to assess suitability and can be used to identify important areas of habitat for population connectivity and movement.

Captured bats will be uniquely marked using bat bands or microchips. Morphometric data (limb lengths, head measurements, body measurements) will be collected and animals will have their sex, age and reproductive condition recorded.


Regent Honeyeater and Swift Parrot

Baseline bird surveys in the offset areas were undertaken in November 2014, February 2015, May 2015 and August 2015. The ongoing monitoring for the Regent Honeyeater and Swift Parrot will be undertaken between May and August, coinciding with the likely flowering period for winter-flowering Eucalypts, such as White Box.

The monitoring program is designed to detect and confirm presence (or absence) of Regent Honeyeater and Swift Parrot in targeted areas with flowering resources to identify its use over time.

The monitoring program is summarised as follows:

1. Trigger point for survey - Starting May each year, relevant WHC staff to report on any observed presence of Winter flowering eucalypts. This will provide a trigger to initiate the scoping survey. If no trigger is provided, scoping survey to be initiated by the last week in July.
2. Scoping survey - Ecologists traverse the study area noting indicators for survey, such as flowering eucalypts and/or congregations of nectar feeding birds. Linear, well-connected patches will also be noted. Flower intensity score and patch quality to be used to inform subsequent surveys.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

3. Field survey - Ecologists to traverse the study area and conduct bird surveys at previously identified sites (as in the Scoping survey above). Survey effort will be guided by the intensity score at a site. At each site, flowering intensity scores are to be recorded and all bird species (sighted or heard) are to be recorded. A total survey effort cannot be prescribed because this is ultimately dependant on flowering intensity in any one year. However, to meet Commonwealth survey guidelines for targeted surveys (DEWHA 2010b), there will be a minimum of 20 hours of bird surveys across 8 days targeted to sampling winter flowering species across all Whitehaven offset areas.

The application of the above method targeted to the location of and timing for winter flowering trees will enable increased survey effort for nectarivorous birds during the optimum seasonal conditions increasing the chance of detection for rare species like Regent Honeyeater and Swift Parrot.

4.16 POTENTIAL RISKS AND CONTINGENCY MEASURES

A risk assessment was undertaken to confirm that appropriate measures are included in the OMP to manage risks (impediments) to achieving the objectives of the offset areas. A table analysing the risks and measures is provided in Appendix G in consideration of the *Environmental Management Plan Guidelines* (DotE, 2014).

Annual flora performance criteria (Section 4.14 and Appendix F) established interim yearly targets for tracking change in condition and activating management response. Table 4-10 outlines the offset areas Trigger, Action, Response Plan (TARP) which provides trigger points for contingency measures (corrective actions/response) to be implemented if the flora monitoring program identifies that the annual performance criteria are not being met. Contingency measures may not be limited to those listed in Table 4-10, and will only be implemented if in accordance with the relevant Conservation Agreements.



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table 4-10
Trigger, Action, Response Plan (TARP)

Aspect	Trigger	Action/Response
Native species richness (NPS)	1st TIER - Offset treatment plots are below 80% annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Review factors leading to below benchmark performance. Evaluate whether supplementary planting of appropriate tubestock or seeding is required.
	2nd TIER - Offset treatment plots are below 100% annual performance benchmark value but above 80% annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Determine whether NPS is increasing or decreasing. If decreasing, investigate factors leading to decrease and monitor for further change.
Native overstorey cover (NOS)	1st TIER - Offset treatment plots are below lower annual performance criteria following offset establishment	<ul style="list-style-type: none"> For revegetation younger than five years - no action required, continue to monitor. For revegetation older than five years – Review factors leading to below benchmark performance. For revegetation older than five years – Evaluate whether supplementary planting of appropriate tubestock is required.
	2nd TIER - Offset treatment plots are above upper annual performance criteria following offset establishment	<ul style="list-style-type: none"> Review factors leading to above benchmark performance such as BVT/PCT assigned to the treatment plot and/or management zone. If shown to be an increasing trajectory overtime, evaluate whether additional management is required.
Native midstorey cover (NMS)	1st TIER - Offset treatment plots are below lower annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Review factors leading to below benchmark performance. Evaluate whether supplementary planting of appropriate tubestock is required.
	2nd TIER - Offset treatment plots are above upper annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Review factors leading to above benchmark performance such as BVT/PCT assigned to the treatment site and/or management zone. Evaluate whether additional management is required.
Native groundcover – Grass (NGCG)	1st TIER - Offset treatment plots are below lower annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Review factors leading to below benchmark performance. If shown to be a decreasing trajectory overtime, evaluate whether additional management (i.e. supplementary seeding or weed control) is required.
	2nd TIER - Offset treatment plots are above upper annual performance benchmark following offset establishment	<ul style="list-style-type: none"> Review factors leading to above benchmark performance such as BVT/PCT assigned to the treatment site and/or management zone. Evaluate whether additional management (i.e. burning) is required.
Perennial exotic plant cover (PEPC)	1st TIER - All offset treatment plots across a management zone show an increase in PEPC	<ul style="list-style-type: none"> Review factors leading to increase in perennial weed cover. Identify the location of weed infestations and review additional management (i.e. the need for control measures such as broad-acre spraying, spot-spraying, slashing, hand-removal or controlled burns).
	2nd TIER - Offset treatment plots record PEPC above 20%	<ul style="list-style-type: none"> Review factors leading to high perennial weed cover. Identify the location of weed infestations and review additional management (i.e. the need for control measures such as broad-acre spraying, spot-spraying, slashing, hand-removal or controlled burns).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

5 REPORTING AND REVIEW

5.1 REPORTING SURVEY DATA

In accordance with Condition 31 of the EPBC Act Approval 2010/5566, survey data will be recorded so as to conform to data standards notified from time to time by DAWE. When requested by the DAWE, MCC will provide all species and ecological survey data and related survey information from ecological surveys undertaken for MNES. This survey data will be provided within 30 business days of request, or in a timeframe agreed to by DAWE in writing.

In accordance with Condition 39 of EPBC Act Approval 2010/5566, MCC will maintain accurate records substantiating all activities and outcomes associated with or relevant to EPBC Act Approval 2010/5566, including measures taken to implement OMP, and make them available upon request to the DAWE.

5.2 OMP PUBLISHING

This OMP will be published on the MCC website in accordance with Condition 40 of EPBC Act Approval 2010/5566. Any revisions to this OMP will be published on the MCC website within one month of being approved.


5.3 COMMONWEALTH APPROVAL COMPLIANCE REPORTS

A report pertaining to the annual compliance with EPBC Act Approval 2010/5566 will be published on the MCC website by the end of March each year after the commencement of the MCCM in accordance with Condition 34 of EPBC Act Approval 2010/5566. Non-compliance with any of the conditions will be reported to DAWE at the same time as the compliance report is published.

5.4 MCCM ANNUAL REVIEW REPORT

Each year by the end of March, MCCM must produce Annual Review Report in accordance with PA10_0138 for the previous calendar year. In this report, a detailed section on Biodiversity Offset Management is included each year that will be the process by which Whitehaven will report to DAWE (in accordance with Condition 12C(vi) of EPBC Act Approval 2010/5566):

- the progress of management activities undertaken in the offset areas;
- the outcome of those management activities;
- any need for improved management; and
- activities to undertake such improved management.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

5.5 REVISION OF THE OFFSET MANAGEMENT PLAN


In accordance with Condition 12B of EPBC Act Approval 2010/5566, an updated OMP including the additional offset areas will be submitted to Department of Agriculture, Water and the Environment (DAWE) within 6 months of approval of the additional offset areas under Condition 11A.

In accordance with Condition 36 of EPBC Act Approval 2010/5566, if MCC wishes to carry out any activity otherwise than in accordance with this OMP (as it pertains to EPBC Act Approval 2010/5566), MCC will submit a revised OMP to DAWE for the Minister's written approval. The varied activity shall not commence until the Minister has approved the revised plan in writing. The Minister will not approve a revised plan, unless the revised plan would result in an equivalent or improved environmental outcome.

In accordance with Condition 37 of EPBC Act Approval 2010/5566, if the Commonwealth Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities or listed migratory species to do so, the Minister may request MCC to make specified revisions to this OMP and submit the revised plan for the Minister's written approval. MCC must comply with any such request. The revised approved plan must be implemented. Unless the Minister has approved the revised plan, MCC must continue to implement the originally approved plan, as specified in the conditions.

5.6 BIODIVERSITY AUDIT

In accordance with Condition 35 of EPBC Act Approval 2010/5566, upon the direction of the Commonwealth Minister, MCC will ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Commonwealth Minister. The independent auditor will be approved by the Commonwealth Minister prior to the commencement of the audit. Audit criteria will be agreed to by the Commonwealth Minister and the audit report will address the criteria to the satisfaction of the Commonwealth Minister.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

6 REFERENCES

AMBS Ecology and Heritage (2021a) *Maules Creek Coal Mine Offset Area Vegetation Mapping*. Prepared for Whitehaven Coal Limited.

AMBS Ecology and Heritage (2021b) *Review of Habitat for Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat in the Existing Offset Areas*. Prepared for Whitehaven Coal Limited.

AMBS Ecology and Heritage (2019) *Bird Surveys in Whitehaven Offset Areas, Winter 2018. Final Report* prepared for Whitehaven Coal Limited.

Australian Museum Consulting (2015) *Maules Creek Coal Mine: Flora and Fauna Monitoring of the Offset Areas – Spring 2014*. Report prepared for Whitehaven Coal Limited.

Australian Museum Consulting (2014) *Maules Creek Coal Mine: Flora and Fauna Monitoring of the Offset Areas – Spring 2014*. Consultancy report to Whitehaven Coal Limited.

Australian Museum Consulting (2015a) *Maules Creek Coal Mine: Fauna Monitoring of the Offset Areas – Summer 2015*. Consultancy report to Whitehaven Coal Limited.

Australian Museum Consulting (2015b) *Maules Creek Coal Mine: Fauna Monitoring of the Offset Areas – Autumn 2015*. Consultancy report to Whitehaven Coal Limited.

Australian Museum Consulting (2015c) *Maules Creek Coal Mine: Fauna Monitoring of the Offset Areas – Winter 2015*. Consultancy report to Whitehaven Coal Limited.

Centre for Invasive Species Solutions (2021) *PestSmart Toolkit*.
Website: <https://pestsmart.org.au/>


Department of Environment, Climate Change and Water (2011) *National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Department of Environment, Climate Change and Water, Sydney, New South Wales.

Department of Environment and Primary Industries (Victoria) (2015) *Integrated Hare Control*.
Website: <http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-animals/invasive-animal-management/established-invasive-animals/integrated-hare-control>

Department of Environment, Water, Heritage and the Arts (2008a) *Threat Abatement Plan for Predation by the European Red Fox*. Canberra.

Department of Environment, Water, Heritage and the Arts (2008b) *Threat Abatement Plan for Competition and Land Degradation by Unmanaged Goats*.
Website: <http://www.environment.gov.au/resource/competition-and-land-degradation-unmanaged-goats>

Department of Environment, Water, Heritage and the Arts (2008c) *Approved Conservation Advice for Tylophora linearis*. Canberra: Department of the Environment, Water, Heritage and the Arts.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/55231-conservation-advice.pdf>. In effect under the EPBC Act from 01-Oct-2008.

Department of Environment, Water, Heritage and the Arts (2010a) *Survey Guidelines for Australia's Threatened Birds*.

Website: <http://www.environment.gov.au/system/files/resources/107052eb-2041-45b9-9296-b5f514493ae0/files/survey-guidelines-birds.pdf>

Department of Environment, Water, Heritage and the Arts (2010b) *Survey Guidelines for Australian Threatened Bats*.

Website: <http://www.environment.gov.au/system/files/resources/2f420bf1-d9e4-44ec-a69c-07316cb81086/files/survey-guidelines-bats.pdf>

Department of Planning, Industry and Environment (2020) *BioNet Vegetation Classification*.

Website:

<http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx?ReturnUrl=%2fNSWVCA20PRap%2fdefault.aspx>.

Department of Primary Industries (2017) *New South Wales Wild Dog Management Strategy 2017-2021*.

Website: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/445234/NSW-Wild-Dog-Management-Strategy-2017-2021.pdf

Accessed: June 2021.

Department of Primary Industries (2018a) *New South Wales Weed Control Handbook*.

Department of Primary Industries (2018b) *Ecology and Management of Vertebrate Pests in NSW* (DPI, 2018).

Department of the Environment (2011) *Feral Deer*.

Website: <http://www.environment.gov.au/system/files/resources/c6679b32-5f03-4839-aa57-9c5723153b0f/files/fs-feral-deer.pdf>

Department of the Environment (2014) *Environmental Management Plan Guidelines*.

Department of the Environment (2015a) *Conservation Advice Anthochaera phrygia regent honeyeater*.


Canberra: Department of the Environment.

Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/82338-conservation-advice.pdf>. In effect under the EPBC Act from 08-Jul-2015.

Department of the Environment (2015b) *Threat Abatement Plan for Predation by Feral Cats*. Commonwealth of Australia, Canberra. In effect under the EPBC Act from 23-Jul-2015.

Department of the Environment (2016) *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)*.

Department of the Environment and Energy (2016) *Threat abatement plan for competition and land degradation by rabbits*. Commonwealth of Australia, Canberra, January 2016.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Department of the Environment and Energy (2017) *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa)*. Commonwealth of Australia, Canberra, March 2017.

Greening Australia (various dates) *Florabank Guidelines*.

Website: <https://www.greeningaustralia.org.au/publications/>

Hansen Bailey (2011) *Maules Creek Coal Project Environmental Assessment*. Prepared for Aston Coal 2 Pty Ltd.

Hunter Eco (2021) *Maules Creek Tylophora linearis Offset Package*.

Keith, D. (2004) *Ocean shores to desert dunes: The native vegetation of New South Wales and the ACT*. Department of Environment and Conservation.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Volume 1*. NSW Government.

Niche Environment and Heritage (2014) *Maules Creek Coal - Tylophora linearis Survey Report*. Prepared for Whitehaven Coal.

North West Local Land Services (2017) *North West Regional Strategic Weed Management Plan (NWRSWMP) 2017 – 2022*.

NSW Rural Fire Service Bush Fire Coordinating Committee (2008) *Bushfire Fire Risk Management Guideline*.

Office of Environment and Heritage (2011) *NSW Threat Abatement Plan For Predation by The Red Fox (Vulpes vulpes)*.


Office of Environment and Heritage (2014a) *BioBanking Assessment Methodology (BBAM)*.

Office of Environment and Heritage (2014b) *Tylophora linearis – profile*. NSW Government.

Office of Environment and Heritage (2017) *BioMetric Vegetation Condition Benchmarks*.

Rawlings, K., Freudenberger, D. and Carr, D. (2010) *A Guide to Managing Box Gum Grassy Woodlands*. Caring for our Country Environmental Stewardship. Department of the Environment, Water, Heritage and the Arts, Canberra.

Saunders, D. L. and Tzaros, C. L. (2011) *National Recovery Plan for the Swift Parrot (Lathamus discolor)*. Birds Australia, Melbourne.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Threatened Species Scientific Committee (2016) *Conservation Advice* *Lathamus discolor swift parrot*. Canberra: Department of the Environment.


Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/744-conservation-advice-05052016.pdf>. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (2015) *Conservation Advice* *Nyctophilus corbeni south-eastern long-eared bat*. Canberra: Department of the Environment.

Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83395-conservation_advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2006). *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/box-gum.html>. In effect under the EPBC Act from 18-May-2006.

Umwelt (2017) *Leard Forest Mining Precinct Regional Biodiversity Strategy*.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX A

RECONCILIATION OF THE OFFSET MANAGEMENT PLAN AGAINST THE LEARD FOREST MINING PRECINCT REGIONAL BIODIVERSITY STRATEGY




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table A1
Strategic Biodiversity Offset Management Actions


Management Component	Management Actions	Section of this OMP
Strategic Focus Area 1 - Enhance the quality of habitats and landscapes at the offset sites for White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC		
1.1 Natural regeneration (undertaken in semi-cleared and remnant native woodland vegetation in good condition)	<ul style="list-style-type: none"> Natural regeneration is promoted through management of threatening processes including: <ul style="list-style-type: none"> the management of weeds (refer to Strategic Focus Area 3) the management of pest animals (refer to Strategic Focus Area 3) livestock restriction (where appropriate, in conjunction with strategic grazing). Natural regeneration management options (such as thinning, slashing, controlled burning) can be undertaken to promote canopy species regeneration in dense grasslands and cypress pine regrowth areas. Methods and results of this should be communicated and made available for future similar regeneration efforts in the region. 	Sections 4.4, 4.5 4.7, 4.8, 4.10, 4.12
1.2 Collect and propagate seed	<ul style="list-style-type: none"> Seed collection, management and storage should be undertaken in consideration of the Florabank Guidelines (www.florabank.org.au/). 	Section 4.3
1.3 Active revegetation (undertaken in semi-cleared woodland, derived native grasslands and cleared land)	<ul style="list-style-type: none"> When restoring areas of White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC, active revegetation should be undertaken generally in accordance with the Guide to Managing Box Gum Grassy Woodlands (Rawlings et al. 2010). Direct seeding and/or tubestock planting should be undertaken in areas where natural regeneration is unlikely to occur (such as low-diversity derived native grassland, pasture and cultivated land) and where natural regeneration areas require supplementary actions (as per TARPs in Table 4-10). Seed and tubestock used in revegetation should include a variety of grasses, low shrubs, mid-sized shrubs and trees, characteristic of White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC (as per the NSW Final Determination and Commonwealth Listing Advice for the communities), to create structurally diverse habitat. 	Section 4.4

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
Strategic Focus Area 2 – Provide ongoing management and enhancement of existing habitats at the offset sites for threatened species		
2.1 Salvage of habitat resources	<ul style="list-style-type: none"> Salvage of habitat resources should be undertaken within approved disturbance areas for re-use in the areas surrounding the disturbance areas, rehabilitation areas and offset sites. This should include the salvage of one or more of the following habitat features where they are available and of suitable structural integrity: <ul style="list-style-type: none"> fallen timber arboreal hollows hollow logs bush rock. 	Section 4.6
2.2 Habitat augmentation and nest box installation	<ul style="list-style-type: none"> Habitat augmentation, using salvaged resources or nest boxes, should be undertaken in habitats identified as having low habitat resources. Where nest boxes are to be installed: <ul style="list-style-type: none"> they are to be made from high quality and durable materials that, ideally, provide for a long lifespan. designs should be targeted to the hollow-dependent threatened species known to occur in the locality of the offset site such as woodland birds, arboreal mammals and micro-bats. The total number of hollows (existing hollows and nest boxes combined) at the offset sites should be at least the same as the number of hollows with signs of use (nesting material, feathers, fur, scratches, etc) and of suitable dimensions for species occupancy (suitable entrance size and a hollow chamber extending into the branch/trunk) removed from the impact site. It is expected that the installation of nest boxes would be staged over time to mirror the regeneration of the woodland and the species that are utilising each site. 	Section 4.6
2.3 Access control	<ul style="list-style-type: none"> Where offset sites share common boundaries fencing designs should not be restrictive to native fauna movement or connectivity between habitats. The need for fencing between contiguous offset sites that are managed in the same way should be investigated and wherever possible removed/avoided. Alternatives to barbed-wire fencing should be used, where appropriate, to avoid obstructing the flight paths of birds, bats and gliders. Any new fencing, where fence lines do not currently exist, should be installed in a way to avoid, or minimise clearing of any native trees or shrubs, where appropriate (Note: clearing/maintenance may still be required in accordance with relevant legislation of the time such as the Native Vegetation Act 2003 or Rural Fires Act 1997). 	Section 4.11

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
Strategic Focus Area 3 - Promote a consistent and coordinated approach to weed management and pest animal control		
3.1 Weed and pest prevention and communication	<ul style="list-style-type: none"> Weed management and pest control conditions and trends are to be communicated across the BTM Complex and should include: <ul style="list-style-type: none"> reviewing monitoring reports for up-to-date information on weeds and pests discussing and prioritising weed and pest animal prevention, control methods and target species across the BTM Complex for the following year liaising with local land managers and stakeholders on control measures and schedules. Develop a feedback loop to notify Boggabri Coal of any new or emerging weeds or pest animal species recorded to be occurring on any of the offset sites. Public communication on pest animal records may be reported through FeralScan (www.feralscan.org.au). 	Reported in the MCCM Annual Review
3.2 Weed control	<ul style="list-style-type: none"> Weed control should be undertaken in consideration of the control recommendations outlined in: <ul style="list-style-type: none"> Noxious and Environmental Weeds Control Handbook (6th Edition) (DPI 2014) Narrabri Shire Council Weed Management Plans (http://www.narrabri.nsw.gov.au/weeds-management-plans-1115.html) resources on the NSW WeedWise website (http://weeds.dpi.nsw.gov.au/). Adopt best-practice active and adaptive management of the density of invasive native plants such as white cypress pine (<i>Callitris glaucophylla</i>) and black cypress pine (<i>Callitris endlicheri</i>) such as ecological thinning, targeted grazing and prescribed fire as per the recommendations set out in Actively Managing for Better Ecological Outcomes for the Brigalow and Nandewar State Conservation Areas (NRC 2014). Undertake a coordinated approach to weed monitoring across the offset sites for consistent reporting and data analysis. 	Section 4.7 Section 4.5, 4.12 Section 4.7
3.3 Pest animal control	<ul style="list-style-type: none"> Pest animal control should be undertaken in consideration of the control recommendations outlined in the Department of Primary Industries Ecology and Management of Vertebrate Pests in NSW (DPI 2014). Control strategies may include the destruction of burrows, shooting, trapping and baiting and should be undertaken following the NSW Codes of Practices (COPs) and Standard Operating Procedures (SOPs) (http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/publications/model-codes-of-practice). A coordinated approach to pest animal monitoring should be undertaken across the offset sites for consistent reporting and data analysis. 	Section 4.8

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
Strategic Focus Area 4 - Promote a consistent and coordinated approach to fire management for biodiversity		
4.1 Managing fuel loads	<ul style="list-style-type: none"> The accessibility of fire trails and access tracks should be regularly maintained within the offset sites in accordance with relevant legislation of the time such as the Native Vegetation Act 2003 or Rural Fires Act 1997. A fuel load assessment and an assessment of the feasibility of completing fuel load reduction should be undertaken as identified on a risk basis or as recommended by the Rural Fire Service (RFS). Fuel reduction in the form of strategic grazing could be trialled in appropriate management zones within the offset sites. The timing of any fuel reduction strategies should be determined based on fuel loads, vegetation maturity and weather/seasonal conditions; however it should generally be undertaken in autumn to encourage native species recruitment. 	Section 4.12
4.2 Ecological control burns	<ul style="list-style-type: none"> Control burns should consider the recommendations outlined in Section 9 of the Guide to Managing Box Gum Grassy Woodlands (Rawlings <i>et al.</i>, 2010). Control burns should avoid burning trees containing hollow resources, where possible, to minimise impacts on roosting and nesting availability in the landscape. If controlled burning is undertaken, implement mosaic burning to reduce the extent of any negative outcomes, provide refuge for wildlife and promote structural and species diversity. 	Section 4.12
Strategic Focus Area 5 – Enhance the connectivity of habitats through corridor establishment and management		
5.1 Connected landscapes and broader regional corridors	<ul style="list-style-type: none"> Offset sites and conservation areas should be managed to improve habitat connectivity and corridor function using management actions techniques such as: <ul style="list-style-type: none"> targeted revegetation including supplementary tubestock planting and seeding, targeted weed and pest management, and habitat augmentation with nest boxes and salvaged habitat resources. Enhancement efforts should be focused to improve habitat connectivity within and between existing offset areas in the region. These broad areas of BTM complex managed land include: <ul style="list-style-type: none"> land south of Mount Kaputar National Park linking offset areas east of Leard State Forest, land south of Leard State Forest linking areas to Boonalla Aboriginal Area and Vickery State Forest, land west and northwest of Leard State Forest linking to Pilliga East. 	Sections 4.4, 4.6, 4.7 and 4.8




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table A2
Strategic Biodiversity Offset Monitoring Opportunities


Management Component	Management Actions	Section of this OMP
Strategic Focus Area 1 - Enhance the quality of habitats and landscapes at the offset sites for White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC		
1.1 Natural regeneration (undertaken in semi-cleared and remnant native woodland vegetation in good condition)	<ul style="list-style-type: none"> Monitoring of regenerating White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC should be undertaken annually and across offset sites. It is recommended that the season for the monitoring sites is rotated every year to assess the community during different seasons. For example: <ul style="list-style-type: none"> half of the monitoring sites surveyed in autumn (to maximise the detection of native perennials); and half of the monitoring sites surveyed in spring (to identify the extent of exotic annuals in the community). Monitoring should be undertaken in accordance with either the BioBanking Assessment Methodology (BBAM) (2014) or Biodiversity Assessment Method (BAM), whichever is determined to be the most appropriate through consultation with OEH, to analyse trends against benchmark data by: <ul style="list-style-type: none"> undertaking plot and transect surveys, undertaking at least the minimum number of plots and transects per vegetation zone, and photographic monitoring at permanent monitoring points conducted using a consistent methodology across the offset sites. During monitoring surveys, specific notes should be taken on any dense or emerging stands of exotic plant species, such as Coolatai grass (<i>Hyparrhenia hirta</i>) and invasive native species such as white cypress pine (<i>Callitris glaucophylla</i>) or black cypress pine (<i>Callitris endlicheri</i>), that may result in the suppression of native understorey species establishment. Monitoring should be undertaken within the offset sites at least annually for the first five years and then every two years until preliminary completion criteria (refer to Tables 4-6 and 4-7) are met. For the BTM Complex, monitoring results should be outlined in a consistent summary report template to allow for the comparison of results and a consistent understanding of the condition of naturally regenerating White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC broadly across the offset sites. 	Section 4.15.1
1.2 Collect and propagate seed	<ul style="list-style-type: none"> The completion of an Annual Summary Report should be undertaken following each collection event. This should include records of species, qualities, dates and locations as per the Florabank Guideline 4 (www.florabank.org.au/). 	Section 4.3

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
1.3 Active revegetation (undertaken in semi-cleared woodland, derived native grasslands and cleared land)	<ul style="list-style-type: none"> Monitoring of revegetated White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC should be undertaken annually and across the BTM Complex offset sites. It is recommended that the season for the monitoring sites is rotated every year to assess the community during different seasons. For example: <ul style="list-style-type: none"> half of the monitoring sites surveyed in autumn (to maximise the detection of native perennials) half of the monitoring sites surveyed in spring (to identify the extent of exotic annuals in the establishing community). Monitoring should be undertaken in accordance with either the BioBanking Assessment Methodology (BBAM) (2014) or Biodiversity Assessment Method (BAM) (in prep.), whichever is determined to be the most appropriate through consultation with OEH, to analyse trends against benchmark data by: <ul style="list-style-type: none"> undertaking plot and transect surveys undertaking the minimum number of plots and transects per vegetation zone photographic monitoring at permanent monitoring points conducted using a consistent methodology across the offset sites. During monitoring surveys, specific notes should be taken on any dense or emerging stands of exotic plant species, such as Coolatai grass (<i>Hyparrhenia hirta</i>) and invasive native species such as white cypress pine (<i>Callitris glaucophylla</i>) or black cypress pine (<i>Callitris endlicheri</i>), that may result in the suppression of native understorey species establishment. Monitoring should be undertaken within the offset sites at least annually for the first five years and then every two years until the preliminary completion criteria (refer to Tables 4-6 and 4-7) are met. For the BTM Complex, monitoring results should be outlined in a consistent summary report template to allow for the comparison of results and a consistent understanding of the condition of naturally regenerating White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC broadly across the offset sites. 	Section 4.15.1
Strategic Focus Area 2 – Provide ongoing management and enhancement of existing habitats at the offset sites for threatened species and communities		
2.1 Salvage of habitat resources	<ul style="list-style-type: none"> Salvaged arboreal hollows located within areas surrounding the disturbance areas, rehabilitation areas and the offset sites should be monitored for their use and condition in conjunction with other annual fauna monitoring. Monitoring may include the use of remote camera surveys targeting areas where salvaged hollows and fallen timber is installed into habitat. Detailed monitoring techniques are to be outlined in the relevant management plans. 	Section 4.6

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
2.2 Habitat augmentation and nest box installation	<ul style="list-style-type: none"> An assessment of the number of nest boxes required should be undertaken (the total number of hollows (existing hollows and nest boxes combined) at the offset sites should be at least the same as the number of hollows with signs of use (nesting material, feathers, fur, scratches, etc) and of suitable dimensions for species occupancy (suitable entrance size and a hollow chamber extending into the branch/trunk) removed from the impact site). Nest boxes installed within the offset sites should be monitored for their signs of use and condition at consistent times of the year (preferably spring) across the offset sites targeting species type based on nest box design. Signs of use monitoring may be undertaken using a pole camera that allows viewing of the inhabitants of the boxes as well as a view of the condition of the top of the boxes from the ground with minimal disturbance to the fauna occupying the boxes. Detailed monitoring techniques are to be outlined in the relevant management plans. Monitoring results of next box usage should be reported in the relevant Annual Summary Report. 	Section 4.6
2.3 Access control	<ul style="list-style-type: none"> Ongoing monitoring and site inspections should note any damage or disrepair of fences and must be communicated to the Environmental Representative of the relevant site. If, during the course of monitoring, the use of barbed-wire fencing is found to be damaging to local wildlife (e.g. gliders/bats caught in fencing), this is to be communicated to the Environmental Representative of the relevant site and ecologically-friendly alternatives are to be investigated. 	Section 4.11
Strategic Focus Area 3 - Promote a consistent and coordinated approach to weed management and pest animal control		
3.1 Weed and pest prevention and communication	<ul style="list-style-type: none"> Key messages on weed control and pest prevention should be available to employees via toolbox talks and inductions to raise awareness of biodiversity issues in the region (e.g. weed spread prevention through the washing of vehicles and equipment). 	Sections 4.7 and 4.8
3.2 Weed control	<ul style="list-style-type: none"> Weed occurrences in the offset sites should be identified as part of the annual flora monitoring, but also opportunistically recorded during any other offset site inspections to examine the effectiveness of control measures. For major weed infestations or newly recorded species, the location, size, density and species should be recorded and communicated to the Environmental Representative of the relevant site. During monitoring surveys, specific notes should be taken on any dense or emerging stands of exotic plant species, such as Coolatai grass (<i>Hyparrhenia hirta</i>) and invasive native species such as white cypress pine (<i>Callitris glaucophylla</i>) or black cypress pine (<i>Callitris endlicheri</i>), that may result in the suppression of native understorey species established in White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC. For the BTM Complex, monitoring results should be outlined in a consistent summary report template to allow for the comparison of results and a consistent understanding of the key weed issues in a broad regional context. 	Sections 4.7 and 4.15

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Management Component	Management Actions	Section of this OMP
3.3 Pest animal control	<ul style="list-style-type: none"> Observations of pest animals should be undertaken as part of the annual fauna monitoring, but also opportunistically recorded during any other offset site inspections. Monitoring of pest animals should be undertaken prior to and following the application of control measures to examine the effectiveness of these measures. Monitoring for pest animals should consider the recommendations in the Department of Primary Industries Monitoring Techniques for Vertebrate Pests (http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/publications/monitoring-techniques). For significant pest animal occurrences or observed pest animal damage, the date, location, activity, density and pest animal species should be recorded and communicated to the Environmental Representative of the relevant site. For the BTM Complex, monitoring results should be outlined in a consistent summary report template to allow for the comparison of results and a consistent understanding of the key pest animal issues in a broad regional context. 	Section 4.8
Strategic Focus Area 4 - Promote a consistent and coordinated approach to fire management for biodiversity		
4.1 Managing fuel loads	<ul style="list-style-type: none"> Monitoring of fuel levels will take place as part of the overall annual inspection of the offset sites but also as identified on a risk basis or as recommended by the RFS. The accessibility and functionality of fire trails and access tracks should be regularly monitored within the offset sites. 	Section 4.12
4.2 Ecological control burns	<ul style="list-style-type: none"> If fuel reduction is undertaken in the form of controlled burning, additional flora monitoring points will be required to assess the impacts of control measures on native vegetation communities (particularly within White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC). In habitat restoration areas and regeneration/revegetation zones, monitoring will be required to record the response to a fire event and guide the need for potential active and adaptive management. 	Section 4.12
Strategic Focus Area 6 – Consult and workshop biodiversity issues with local stakeholders and land managers		
6.1 Biodiversity management consultation	<ul style="list-style-type: none"> Minutes, actions and key recommendations from biodiversity management consultation forums should be made available to attendees. Any research or monitoring data in relation to biodiversity should be made available across the BTM Complex to facilitate the sharing of knowledge for the broader conservation of the offset sites. This may include reports, guidelines and/or expert input into management of cypress pine regrowth, species translocation success, pest animal and weed outcomes and control and techniques. The Annual Summary Report will detail the overall biodiversity performance and outcomes of the offset sites using the information provided from the monitoring reports. 	<p>N/A</p> <p>The MCCM Annual Review is described in Section 5.4</p>




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table A3
Strategic Biodiversity Performance Measures and Preliminary Completion Criteria


Strategic Focus Areas / Management Component	Performance Measures and Preliminary Completion Criteria	Timeframe (following offset establishment)*		Section of this OMP
		Ongoing Performance Measures	Completion Timeframe	
Strategic Focus Area 1 - Enhance the quality of habitats and landscapes at the offset sites for White Box – YellowBox – Blakely’s Red Gum Woodland EEC and CEEC				
1.1 Natural regeneration (in semi-cleared and remnant native woodland vegetation in good condition)	<ul style="list-style-type: none">100% of the White Box – Yellow Box – Blakely’s Red Gum Woodland EEC and CEEC monitoring sites across the relevant vegetation zones in each offset site show all locally-occurring canopy species recruiting³ (i.e. canopy tree species occurring in the moderate to good condition PCT at the offset site or surrounds are recruiting in the semi-cleared and remnant native woodland vegetation). Where monitoring is undertaken according to the BBAM sampling should occur across each entire vegetation zones. Where monitoring is undertaken according to the BAM sampling should be undertaken in the monitoring sites of each vegetation zone.	Annually	By year 10	4.14 and 4.15
	<ul style="list-style-type: none">Naturally regenerated areas of White Box – Yellow Box – Blakely’s Red Gum Woodland EEC and CEEC monitoring sites conform to the condition assessment outlined on page 5 of the EPBC Policy Statement 3.5 White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grasslands across the relevant vegetation zones in each offset site.	Annually	By year 10	4.14 and 4.15
	<ul style="list-style-type: none">100% of the White Box – Yellow Box – Blakely’s Red Gum Woodland EEC and CEEC across the relevant vegetation zones in each offset site show evidence of occupation or presence of at least 80% of the native fauna species comparative to approved benchmark or monitoring reference sites.	Annually	By year 10	N/A
	<ul style="list-style-type: none">100% of the White Box – Yellow Box – Blakely’s Red Gum Woodland EEC and CEEC monitoring sites across the relevant vegetation zones in each offset site is within the benchmark ranges for the cover scores (i.e. overstorey, midstorey and groundcover) and at 80% or above for species richness benchmarks.	Annually	By year 10	4.14 and 4.15
1.2 Collect and propagate seed	<ul style="list-style-type: none">Seed collection records, including location of plantings and success rates (where available), are reported on in the Annual Summary Report.	Annually	-	4.3
	<ul style="list-style-type: none">Seed is collected over a range of sites across the locality to adequately capture local variations within the offset sites and disturbance areas.	Annually	-	4.3

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			


Strategic Focus Areas / Management Component	Performance Measures and Preliminary Completion Criteria	Timeframe (following offset establishment)*		Section of this OMP
		Ongoing Performance Measures	Completion Timeframe	
1.3 Active revegetation (in semi-cleared woodland, derived native grasslands and cleared land)	<ul style="list-style-type: none"> 100% of the White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC monitoring sites across the relevant vegetation zones in each offset site show all locally-occurring canopy species recruiting³ (i.e. canopy tree species occurring in the moderate to good condition PCT at the offset site or surrounds are recruiting in the semi-cleared woodland, derived native grasslands and cleared land). Where monitoring is undertaken according to the BBAM sampling should occur across each entire vegetation zones. Where monitoring is undertaken according to the BAM sampling should be undertaken in the monitoring sites of each vegetation zone. 	Annually following active revegetation	By year 15 following active revegetation	4.14 and 4.15
	<ul style="list-style-type: none"> Active regeneration areas of White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC monitoring sites conform to the condition assessment outlined on page 5 of the EPBC Policy Statement 3.5 White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands areas across the relevant vegetation zones in each offset site. 	Annually following active revegetation	By year 15 following active revegetation	4.14 and 4.15
	<ul style="list-style-type: none"> 100% of the White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC across the relevant vegetation zones in each offset site show evidence of occupation or presence of at least 80% of the native fauna species comparative to approved benchmark or monitoring reference sites. 	Annually following active revegetation	By year 20 following active revegetation	N/A
	<ul style="list-style-type: none"> 100% of the White Box – Yellow Box – Blakely's Red Gum Woodland EEC and CEEC monitoring sites across the relevant vegetation zones in each offset site is within the benchmark ranges for the cover scores (i.e. overstorey, midstorey and groundcover) and at 80% or above for species richness benchmarks. 	Annually following active revegetation	By year 20 following active revegetation	4.14 and 4.15
Strategic Focus Area 2 – Provide ongoing management and enhancement of existing habitats at the offset sites for threatened species and communities				
2.1 Salvage of habitat resources	<ul style="list-style-type: none"> Salvaged resources that are reused or relocated in rehabilitated areas or offset sites are in structurally good condition. 	Annually following placement	By year 5 following placement.	4.6

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Strategic Focus Areas / Management Component	Performance Measures and Preliminary Completion Criteria	Timeframe (following offset establishment)*		Section of this OMP
		Ongoing Performance Measures	Completion Timeframe	
2.2 Habitat augmentation and nest box installation	<ul style="list-style-type: none"> 80% of the nest boxes installed are being utilised or show signs of use by native species across the offset sites. Utilisation of nest boxes by pest species such as European honey bee (<i>Apis mellifera</i>), common myna (<i>Acridotheres tristis</i>), common starling (<i>Sturnus vulgaris</i>) and feral rodent species (<i>Rattus</i> and <i>Mus</i> spp.) should be recorded. 	Each nest box should be monitored at least once every 5 years	Ongoing	4.6
	<ul style="list-style-type: none"> Each nest box installed within the offset sites should be in good structural condition and functioning in the landscape. 	Annually following installation	Ongoing	4.6
2.3 Access control	<ul style="list-style-type: none"> Livestock are excluded from restoration areas following planting and high quality woodland vegetation at the offset sites (it is acknowledged that strategic grazing may be required in some areas). 	Annually	Ongoing	4.10
	<ul style="list-style-type: none"> Wildlife-friendly fencing is utilised, where appropriate, within the offset sites. 	1 year	By year 10	4.11
3.1 Weed and pest prevention and communication	<ul style="list-style-type: none"> Weed trends and control schedules are communicated across the BTM Complex in the relevant forums. 	Annually	Ongoing	4.7 and 4.8
	<ul style="list-style-type: none"> The most recent offset monitoring summary reports containing information on weed and pest records, trends and issues are provided across the BTM Complex and reported on in the Annual Summary Report. 	Annually	Ongoing	4.7 and 4.8
	<ul style="list-style-type: none"> Key messages on weeds are effectively communicated, where appropriate, with relevant local land holders, managers and stakeholders. 	Annually	Ongoing	4.7
3.2 Weed control	<ul style="list-style-type: none"> Offset site flora monitoring shows an overall reduction in exotic plant cover following control measures implemented across the offset sites. 	Annually	Ongoing	4.7 and 4.15
	<ul style="list-style-type: none"> Weed species do not comprise more than 20% of any strata in the native vegetation communities within the offset sites. 	Annually	Ongoing	4.7, 4.14 and 4.15

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			


Strategic Focus Areas / Management Component	Performance Measures and Preliminary Completion Criteria	Timeframe (following offset establishment)*		Section of this OMP
		Ongoing Performance Measures	Completion Timeframe	
	<ul style="list-style-type: none"> Weed control is undertaken across the offset sites using methods outlined in the Noxious and Environmental Weeds Control Handbook (6th Edition) (DPI 2014), Narrabri Shire Council Weed Management Plans, and/or the NSW WeedWise website. 	Annually	Ongoing	4.7
	<ul style="list-style-type: none"> Significant weed infestations or newly identified weed species within the offset sites are reviewed and control measures implemented within 1 year of identification of the issue. 	Annually	Ongoing	4.7
3.3 Pest animal control	<ul style="list-style-type: none"> Offset site fauna monitoring shows an overall reduction in pest animal species and population sizes targeted by control measures implemented across the offset sites (in consideration of potential drought conditions and seasonal trends). 	Annually	By year 5	4.8
	<ul style="list-style-type: none"> Pest animal control is undertaken across the offset sites using methods approved under the NSW Codes of Practices (COPs) and Standard Operating Procedures (SOPs). 	Annually	Ongoing	4.8
	<ul style="list-style-type: none"> Significant pest animal occurrences or newly identified pest species within the offset sites are reviewed and control measures implemented (if required) within 1 year of identification of the issue. 	Annually	Ongoing	4.8
Strategic Focus Area 4 - Promote a consistent and coordinated approach to fire management for biodiversity				
4.1 Managing fuel loads	<ul style="list-style-type: none"> If determined to be suitable following recommendations from monitoring or the RFS, strategic grazing in appropriate management zones is undertaken to manage fuel loads. 	Every 2 years	Ongoing	N/A
4.3 Ecological control burns	<ul style="list-style-type: none"> Fuel reduction is undertaken in the form of controlled burning (as per recommendations in Rawlings et al. 2010) as deemed required and in consultation with the RFS. 	Every 5 years	Ongoing	4.12
	<ul style="list-style-type: none"> The impacts of control and mosaic burning on native and weed species diversity is reported on and information made available to all BTM Complex sites. 	Within 1 year of completed monitoring reports.	Ongoing	N/A

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Strategic Focus Areas / Management Component	Performance Measures and Preliminary Completion Criteria	Timeframe (following offset establishment)*		Section of this OMP
		Ongoing Performance Measures	Completion Timeframe	
Strategic Focus Area 6 – Consult and workshop biodiversity issues with local stakeholders and land managers				
6.1 Biodiversity management consultation	<ul style="list-style-type: none">Targeted consultation with key stakeholders, land managers and agencies regarding biodiversity issues is demonstrated through the development of resources and workshops involving stakeholders.	Annually	Ongoing	N/A
	<ul style="list-style-type: none">An annual summary report is to be prepared detailing the overall biodiversity performance and outcomes of the offset sites across the region.	Annually	Ongoing	N/A

* Where a specific completion timeframe is specified (such as by Year 15), for the BTM mines this means:

- for offsets identified in the relevant project approval, the timeframe from commencement of the project;
- for offsets approved in subsequent project modifications, the timeframe from approval of the modification, and
- for offsets identified in any revised Biodiversity Offset Strategy required under the relevant project approval, the timeframe from approval of the revised offset strategy.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX B

MAULES CREEK COAL MINE OFFSET AREA VEGETATION MAPPING REPORT



Maules Creek Coal Mine Offset Area Vegetation Mapping

Prepared by AMBS Ecology & Heritage Pty Ltd
for Whitehaven Coal Limited

October 2021

AMBS Reference: 19764

Document Information

Citation:	AMBS Ecology & Heritage (2021) <i>Maules Creek Coal Mine Offset Area Vegetation Mapping</i> . Consultancy report for Whitehaven Coal Limited.
AMBS Reference:	19764
Versions:	Report issued 18 October 2021

Executive Summary

AMBS Ecology & Heritage Pty Ltd (AMBS) was engaged to undertake vegetation surveys across the Maules Creek Coal Mine offset areas. The study involved a desktop review of relevant information and field surveys.

A number of previous surveys within and surrounding the offset areas were considered, as was the data from contemporary databases and mapping layers.

Several field surveys were undertaken across the study area by AMBS between 26 May 2020 and 21 August 2020 and an additional survey of selected areas was undertaken on 26 March 2021. The primary tasks included verifying and mapping plant community types (PCTs), identifying vegetation condition, collecting floristic data and identifying threatened ecological communities (TECs) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act).

The survey methods included 117 “full floristic” 20 metre (m) x 20 m quadrats (nested within a 20 m x 50 m transect) and 197 rapid data points. A cluster analysis of full floristic plot data was undertaken, utilising a number of additional plots outside the present study areas. The identification of TECs was undertaken in accordance with the relevant listings under the EPBC Act and BC Act.

A total of 733 plant species in 87 families were recorded during surveys to determine the PCTs in the offset areas (Appendix A). Of these, 519 were native plant species.

This study has confirmed the following range of PCTs within the offset areas:

- 55: *Belah woodland on alluvial plains and low rises*
- 78: *River Red Gum riparian tall woodland / open forest wetland*
- 81: *Western Grey Box - cypress pine shrub grass shrub tall woodland*
- 101: *Poplar Box - Yellow Box - Western Grey Box grassy woodland*
- 112: *Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland*
- 147: *Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket*
- 244: *Poplar Box grassy woodland*
- 413: *Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland*
- 427: *Cypress pine - Tumbledown Red Gum low open woodland to grassland*
- 429: *White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland*
- 435: *White Box - White Cypress Pine shrub grass hills woodland*
- 439: *Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland*
- 492: *Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest*
- 508: *Blakely's Red Gum - Stringybark - Rough-barked Apple open forest*
- 510: *Blakely's Red Gum - Yellow Box grassy woodland*
- 563: *White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest*
- 569: *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland*
- 571: *Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland*

- 572: *Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest*
- 574: *Tea-tree riparian shrubland / heathland wetland*
- 581: *Tumbledown Red Gum - Dwyer's Red Gum - Wallaby Bush shrubby woodland*
- 588: *White Box - White Cypress Pine shrubby hills open forest*
- 592: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest*
- 599: *Blakely's Red Gum - Yellow Box grassy tall woodland*
- 619: *Derived Wire Grass grassland*
- 736: *Broad-leaved Stringybark - Mountain Gum - Apple Box open forest*
- 1165: *Silvertop Stringybark - Orange Gum shrubby open forest*
- 1306: *White Box - Red Stringybark shrubby woodlands*

Four TECs listed under the EPBC Act were identified in the offset areas:

- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (comprising 1,847.6 hectares [ha] of woodland and 1,512.6 ha of Derived Native Grassland [DNG], total of 3,360.2 ha);
- *Poplar Box Grassy Woodland on Alluvial Plains Endangered Ecological Community* (comprising 63.6 ha of woodland);
- *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia Endangered Ecological Community* (comprising 2.2 ha of woodland); and
- *Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions Endangered Ecological* (comprising 0.3 ha of woodland).

Three TECs listed under the BC Act were identified in the offset areas:

- *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions Critically Endangered Ecological Community* (comprising 1,858.6 ha of woodland and 1,512.6 ha of DNG, total of 3,371.2 ha);
- *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community* (comprising 2.2 ha of woodland); and
- *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions Endangered Ecological Community* (comprising 0.3 ha of woodland).

Two threatened plant species were recorded in the offset areas, one of which is listed as threatened under the BC Act and both under the EPBC Act:

- *Dichanthium setosum* (Bluegrass).
- *Callistemon pungens*.

An additional four threatened species have been previously recorded in the offset areas, namely, *Tylophora linearis*, *Thesium australe*, *Digitaria porrecta* and *Homoranthus prolixus*.

Contents

Executive Summary	1
1 Introduction.....	1
1.1 Background	1
1.2 Scope and Objectives	1
1.3 Location of the Study Area	1
1.4 Bioregion and Landscape	3
1.5 Climate	3
1.6 Topography and Drainage.....	4
1.7 Geology and Soils	5
1.8 Land Use and Disturbance	6
1.9 Fire History.....	6
1.10 Previous Vegetation Surveys	11
2 Methods	13
2.1 Desktop and Literature Review.....	13
2.2 Field Surveys	13
2.2.1 Timing.....	14
2.2.2 Weather Conditions.....	15
2.2.3 Floristic Plots	15
2.2.4 Rapid Data Points	20
2.2.5 Plant Community Type Identification	20
2.2.6 Box-Gum Woodland CEEC Identification and Mapping.....	20
2.3 Quantitative Data Analysis.....	22
2.4 Rounding.....	22
3 Results	23
3.1 Overview	23
3.2 Roseglass and Bimbooria	25
3.2.1 Plant Community Types and Descriptions	25
3.2.2 Threatened Ecological Communities	29
3.3 Teston South	31
3.3.1 Plant Community Types and Descriptions	31
3.3.2 Threatened Ecological Communities	34
3.4 Kelso, Velyama and Louenville.....	36
3.4.1 Plant Community Types and Descriptions	36
3.4.2 Threatened Ecological Communities	42
3.5 Onavale	44
3.5.1 Plant Community Types and Descriptions	44
3.5.2 Threatened Ecological Communities	48
3.6 Wollandilly	50
3.6.1 Plant Community Types and Descriptions	50
3.6.2 Threatened Ecological Communities	54
3.7 Mt Lindesay.....	56
3.7.1 Plant Community Types and Descriptions	56
3.7.2 Threatened Ecological Communities	61
3.8 Wirradale and Wongala South.....	63
3.8.1 Plant Community Types and Descriptions	63
3.8.2 Threatened Ecological Communities	70
4 Summary of the Threatened Ecological Communities	72
4.1 Box-Gum Woodland CEEC (EPBC Act).....	72
4.2 Box-Gum Woodland CEEC (BC Act).....	72
4.3 Grey Box Woodland EEC (EPBC Act and BC Act).....	73
4.4 Poplar Box Grassy Woodland EEC (EPBC Act).....	73
4.5 Semi-evergreen Vine Thicket EEC (EPBC Act and BC Act).....	73

5	Summary of the Threatened Plant Species.....	74
6	Conclusions.....	76
	References	78
	Appendix A: Plant Species List.....	81
	Appendix B: Output of Floristic Analysis.....	98
	Appendix C: PCT Photographs	112
	Appendix D: PCT and TEC Areas by Conservation Agreement Group	126

Tables

Table 1.1	Summary of Study Area by Conservation Agreement Group and Offset Group.....	1
Table 1.2	Summary of Elevation within Offset Groups Derived from Geoscience Australia 1 Second DEMs.....	4
Table 1.3	Summary of GSG and ASC Soils Mapped within the Offset Areas	6
Table 2.1	Experience and Qualifications of Survey Personnel	14
Table 2.2	Survey Timing and Personnel	14
Table 2.3	Weather Conditions During Survey Periods	15
Table 2.4	Attributes Collected in Full Floristic Plots.....	15
Table 3.1	Mapped Plant Community Types for All Offset Areas.....	23
Table 3.2	Mapped Plant Community Types for Roseglass and Bimbooria	25
Table 3.3	Mapped Plant Community Types for Teston South	31
Table 3.4	Mapped Plant Community Types for Kelso, Velyama and Louenville	36
Table 3.5	Mapped Plant Community Types for Onavale	44
Table 3.6	Mapped Plant Community Types for Wollandilly.....	50
Table 3.7	Mapped Plant Community Types for Mt Lindesay	56
Table 3.8	Mapped Plant Community Types for Wirradale and Wongala South	63
Table 4.1	Area of Box-Gum Woodland CEEC Listed Under the EPBC Act Mapped by Offset Group ..	72
Table 4.2	Area of Box-Gum Woodland CEEC Listed Under the BC Act Mapped by Offset Group	73
Table 4.3	Area of Other TECs Mapped by Offset Group	73
Table 5.1	Threatened Species Recorded.....	74

Figures

Figure 1.1	Location of the Study Area.....	2
Figure 1.2	Annual Rainfall at Boggabri (Kanownda) (Station ID 55076) from 1960 to 2019 and Long-term Average of 575.5 mm	4
Figure 1.3	Rainfall at Boggabri (Kanownda) (Station ID 55076) from 2020 (Source: BoM, 2020)	4
Figure 1.4:	Fire History for the Southern Offsets.....	7
Figure 1.5	Fire History for the Northern Offsets.....	8
Figure 1.6:	Fire History for the Eastern Offsets.....	9
Figure 1.7:	Fire History for the Western Offsets.....	10
Figure 2.1	Plot Locations for the Northern Offsets.....	16
Figure 2.2	Plot Locations for the Eastern Offsets.....	17
Figure 2.3	Plot Locations for the Western Offsets	18
Figure 2.4	Plot Locations for the Southern Offsets.....	19
Figure 3.1	Plant Community Type Map for Roseglass and Bimbooria.....	30
Figure 3.2	Plant Community Type Map for Teston South.....	35
Figure 3.3	Plant Community Type Map for Kelso, Velyama and Louenville	43
Figure 3.4	Plant Community Type Map for Onavale.....	49
Figure 3.5	Plant Community Type Map for Wollandilly	55
Figure 3.6	Plant Community Type Map for Mt Lindesay	62
Figure 3.7	Plant Community Type Map for Wirradale and Wongala South.....	71
Figure 5.1	Records of Threatened Plant Species within the Offset Areas	75

1 Introduction

1.1 Background

AMBS Ecology & Heritage Pty Ltd (AMBS) was engaged to undertake vegetation surveys across various offset areas for the Maules Creek Coal Mine (MCCM).

1.2 Scope and Objectives

The scope of work for this study involves the survey and documentation of native vegetation communities and threatened ecological communities (TECs) within the study area. The objectives of the study include the following:

- description of plant community types (PCTs) within the study area, including:
 - species relied upon for identification of vegetation type and relative abundance;
 - justification of evidence used to identify a PCT;
 - mapping of the extent of vegetation communities within the study area, including cleared areas; and
- identification and mapping of TECs according to the relevant State and Commonwealth listings under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.3 Location of the Study Area

The study area contains numerous properties grouped and identified as Northern, Eastern, Western and Southern Offsets occurring in the Narrabri Shire Council (Eastern and Western Offsets), Gunnedah Shire Council (Southern Offsets) and Tamworth Regional Council (Northern Offsets) Local Government Areas of NSW.

The offset areas are adjacent to various State Forests and Protected Areas (Figure 1.1). Parts of the Eastern and Western Offsets are adjacent to Leard State Forest. Parts of the Western Offsets are adjacent to Leard State Conservation Area. The Northern Offsets are adjacent to Mount Kaputar National Park and the Southern Offsets are adjacent to Boonalla Community Conservation Area Zone 2 Aboriginal Area (Figure 1.1).

In some cases, adjacent properties have been grouped for the purposes of preparing Conservation Agreements. Table 1.1 provides a breakdown of the size of each offset area and corresponding Conservation Agreement Group. The total study area is approximately 11,974.9 hectares (ha) (Table 1.1).

Table 1.1 Summary of Study Area by Conservation Agreement Group and Offset Group

Conservation Agreement Group	Offset Area	Total Size of the Offset Area (ha)
Kelso, Velyama, Louenville	Kelso	489.4
	Velyama	702.6
	Louenville	213.1
Teston South	Teston South	336.2
Wollandilly	Wollandilly	804.4
Onavale	Onavale	557.7
Roseglass, Bimbooria	Roseglass	1,465.3
	Bimbooria	622.5
Wirradale and Wongala South	Wirradale and Wongala South	4,446.6
Mt Lindesay	Mt Lindesay	2,337.1
	Total	11,974.9

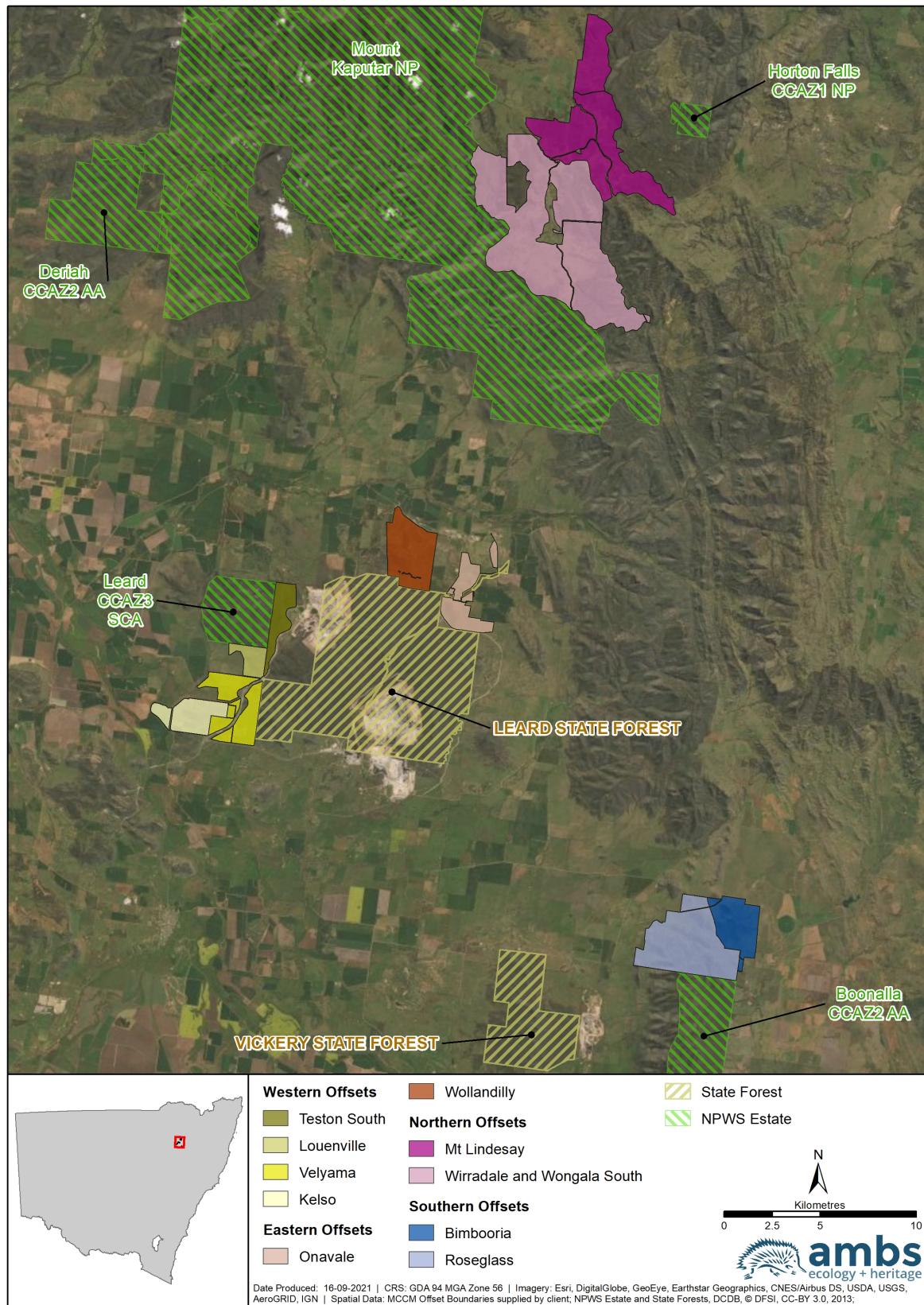


Figure 1.1 Location of the Study Area

1.4 Bioregion and Landscape

The Eastern and Western Offsets occur wholly within the Liverpool Plains Interim Biogeographic Regionalisation for Australia (IBRA) Sub-region of the Brigalow Belt South IBRA Region (Department of Agriculture, Water and Environment [DAWE], 2020).

The Northern Offsets occur across the Kaputar and Peel IBRA Sub-regions of the Nandewar IBRA Region. The majority of the Southern Offsets also occur in the Peel IBRA Sub-region of the Nandewar IBRA Region, with small areas within the Liverpool Plains Sub-region, of the Brigalow Belt South IBRA Region (DAWE, 2020).

Eastern and Western Offsets are predominantly mapped as Bugaldie Uplands Mitchell Landscape with minor occurrence of Liverpool Alluvial Plains (Mitchell, 2002). The Northern Offsets are predominantly mapped as Kaputar Slopes and Tamworth Keepit Slopes and Plains, with minor occurrence of Split Yard Plateau Mitchell Landscapes and the Southern Offsets consist of the Kelvin Range landscape and Liverpool Alluvial Plains to a lesser extent (Mitchell, 2002).

The vegetation occurring throughout the study area largely consists of Dry Sclerophyll Forests with grassy and/or shrubby sub-formation, Grassy Woodlands, and secondary grasslands due to historical clearing (Keith and Simpson, 2020).

1.5 Climate

Weather records were obtained from the nearby Bureau of Meteorology (BoM) weather stations at Boggabri (Kanownda) (Station ID 55076), Boggabri Post Office (Station ID 55007) and Narrabri Airport Automatic Weather Station (AWS) (Station ID 54038), located approximately 3 kilometres (km), 25 km and 40 km away from the centre of the study areas, respectively. Data displayed in Figure 1.2 below is taken from the Boggabri (Kanownda), except for various years from 2002 to 2019 where data was incomplete and data from the Boggabri Post Office or Narrabri Airport AWS was used.

The locality receives an average of about 575.5 millimetres (mm) of rainfall per annum (as shown by the orange line on Figure 1.2), based on long-term data from 1899 to the most recent available records (BoM, 2020). Rainfall varies widely from year to year, as shown in Figure 1.2 with a lowest recorded total annual rainfall of 206.2 mm recorded in 2019 (at Narrabri Airport AWS) and highest of 938.7 mm in 2004 (at Boggabri Post Office). The seven years from 2013 to 2019 had mostly below average annual rainfall, with 2019 being the lowest on record. During February, March and April of 2020, monthly rainfall was greater than average monthly rainfall (Figure 1.3).

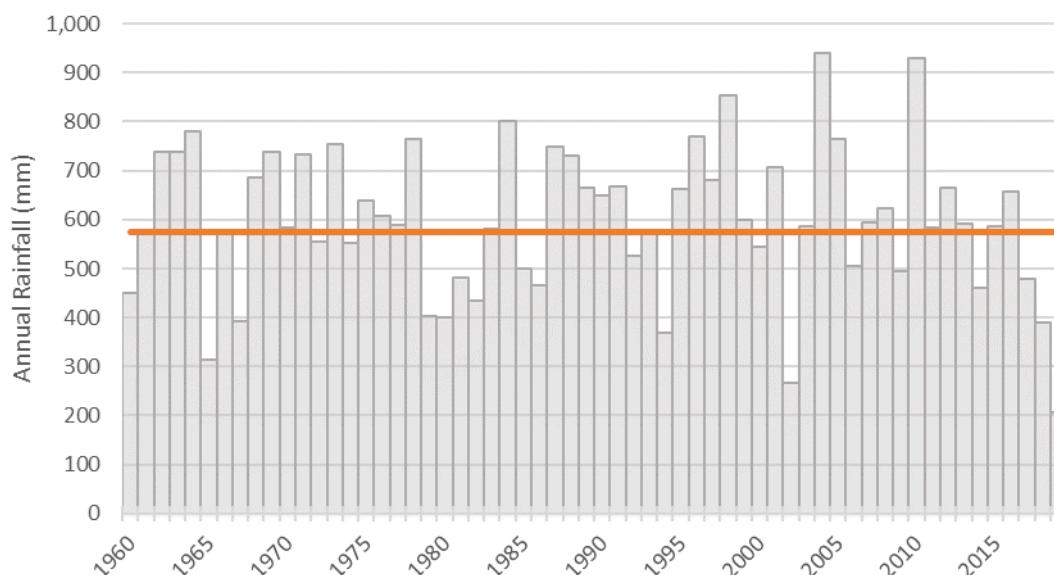


Figure 1.2 Annual Rainfall at Boggabri (Kanownda) (Station ID 55076) from 1960 to 2019 and Long-term Average of 575.5 mm

Note that missing data has been supplemented using Boggabri Post Office (Station ID 55007) and Narrabri Airport AWS (Station ID 54038) records.

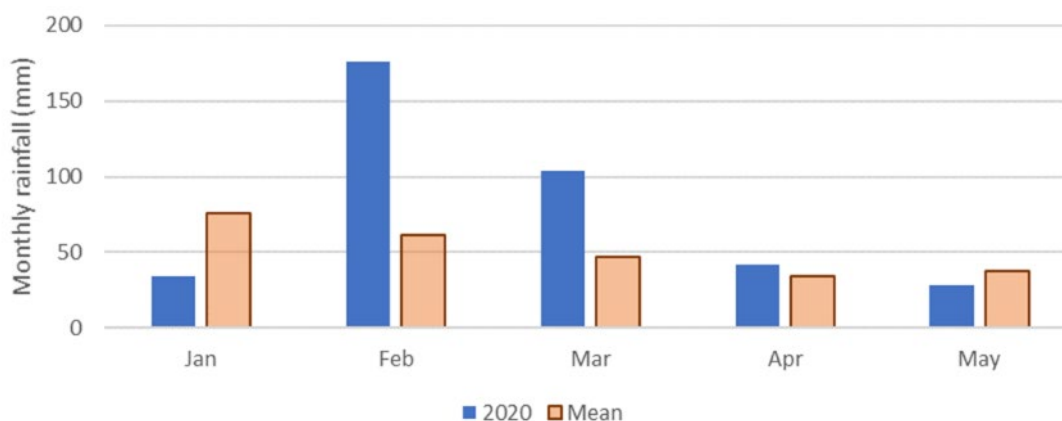


Figure 1.3 Rainfall at Boggabri (Kanownda) (Station ID 55076) from 2020 (Source: BoM, 2020)

Average temperatures range from between 4 degrees Celsius (°C) to 18.1 °C in the coldest month of July and between 20.7 °C to 35 °C in the warmest month of January (Narrabri Airport AWS; BoM, 2020).

1.6 Topography and Drainage

The topography of the study area is variable. Table 1.2 provides the minimum and maximum elevation within each offset group.

Table 1.2 Summary of Elevation within Offset Groups Derived from Geoscience Australia 1 Second DEMs

Offset Group	Min (m)	Max (m)
Northern	568	1069
Eastern	263	396
Western	231	448
Southern	323	810

Note: m = metres.

The Eastern, Western and Southern Offsets are within the Namoi River Catchment (Murray Darling Basin Authority [MDBA], 2019) and natural drainage generally flows to the west. There are a number of named watercourses within the study area. Back Creek (Stream Orders 5 and 6), Whiskey Creek (Stream Order 4) and Stewarts Gully (Stream Orders 4 and 3) traverse the Eastern Offsets. Part of the Western Offsets (Kelso) occurs on the floodplain of the Namoi River (Stream Order 9) (Department of Primary Industries – Water [DPI-Water], 2020).

The Northern Offsets are partly in the Namoi River Catchment (which drains to the south-west) and partly within the Gwydir River Catchment (which drains to the north-east) (MDBA, 2019). The Northern Offsets have a number of named watercourses, namely, Second Water Creek (Stream Order 5), Horton River (Stream Order 5), Cut Road Creek (Stream Orders 2, 3 and 4), Gap Station Creek (Stream Orders 4 and 3), Oaky Gully (Stream Orders 3 and 2), Teatree Creek (Stream Order 3), Deep Creek (Stream Orders 4 and 3), Maules Creek (Stream Orders 5 and 3), and Basin Creek (Stream Orders 3 and 2) (DPI-Water, 2020).

1.7 Geology and Soils

As mentioned above, the Eastern and Western Offsets are predominantly mapped as Bugaldie Uplands Mitchell Landscape with minor occurrence of Liverpool Alluvial Plains (Mitchell, 2002). In regard to geology and soils, the Bugaldie Uplands Mitchell Landscape consists of (Mitchell, 2002):

Stepped stony ridges on Jurassic quartz sandstone with some conglomerate, shale and occasional interbedded basaltic volcanic rocks. Abundant outcrop on ridge tops with thin discontinuous soils with stony, sandy profiles and low nutrients. Down slope texture-contrast soils are more common typically with harsh clay subsoils and deep uniform or gradational yellow-brown sands on the valley floors.

The Liverpool Alluvial Plains Mitchell Landscape consists of (Mitchell, 2002):

Quaternary alluvial plains and outwash fans derived from Tertiary basalts. Permian and Triassic quartz sandstones with minor basalt caps. Undulating hills and sloping plains with alluvial channels and floodplains. Extensive black earths on low angle slopes. Deep black and brown cracking clays, alluvial soils and red or brown texture-contrast soils on slopes below sandstone.

The Northern Offsets are predominantly mapped as Kaputar Slopes and Tamworth Keepit Slopes and Plains, with minor occurrence of Split Yard Plateau Mitchell Landscapes and the Southern Offsets consist of the Kelvin Range landscape and Liverpool Alluvial Plains to a lesser extent (Mitchell, 2002).

In regard to geology and soils, the Kaputar Slopes Mitchell Landscape consists of (Mitchell, 2002):

Lower slopes of the Kaputar volcanic complex with radiating finger-like ridges capped by basalt over lower Permian and Triassic quartz sandstone, lithic sandstone, silty sandstone, conglomerate and thin coal measures. Shallow stony red-brown loam and clay loam in uniform profiles on basalt, yellow and yellow-brown texture-contrast profile on sandstone, deep black earths in lowest valleys.

The Tamworth Keepit Slopes and Plains Mitchell Landscape consists of (Mitchell, 2002):

Extensive area of undulating to rolling slopes and plains with low hills and low ranges forming the western fall of the New England plateau. Complex geology of folded and faulted sedimentary and metamorphic rocks with minor interbedded volcanics. Rock types include; Silurian-Devonian chert, slate, phyllite, tuff, schist and Carboniferous conglomerate, sandstone, mudstone, andesite and small areas of limestone. Shallow stony soils on ridges. Texture-contrast soils on almost all slopes shifting in colour from red-brown on upper slopes to yellow with harsh subsoils prone to gully development on lower slopes.

The Split Yard Plateau Mitchell Landscape consists of (Mitchell, 2002):

Complex ranges and steep sided peaks on folded and faulted Devonian and Carboniferous conglomerate, sandstone, mudstone, andesite and tuff. The main range has a central valley within a synclinal fold and the high peaks are formed by a rhyodacite unit. Shallow stony sandy loam on ridges, stony gradational loam and red-yellow texture-contrast on lower slopes.

The Kelvin Range Mitchell Landscape consists of (Mitchell, 2002):

Steep ranges with wide debris aprons on moderately dipping Carboniferous sandstone, conglomerate, rhyodacite and tuff. General elevation 300 to 890m, local relief 500m. Shallow stony sandy loam on ridges and slopes, texture-contrast in rubbly debris on the colluvial apron shifting in colour from red brown on upper slopes to yellow on lower slopes.

A summary of Greater Soil Group (GSG) and Australian Soil Classification (ASC) soils mapped within the offset areas is provided in Table 1.3 (Department of Planning, Industry and Environment [DPIE], 2020b, 2020c).

Table 1.3 Summary of GSG and ASC Soils Mapped within the Offset Areas

Offset Group	GSG	ASC
Northern	[Lithosols, Euchrozems] , Chocolate Soils, Brown Podzolic Soils, Yellow Podzolic Soils, Black Earths, Kraznozems, Prairie Soils	[Ferrosols, Rudosols and Tenosols] , Kurosols, Chromosols, Vertosols, Sodosols
Eastern	[Non-Calcic Brown Soils, Solodic Soils] , Lithosols, Grey Brown and Red Clays	[Chromosols, Sodosols] , Rudosol and Tenosol, Vertosols
Western	[Lithosols, Solodic Soils] , Grey Brown and Red Clays	[Rudosols and Tenosols, Sodosols] , Vertosols
Southern	[Lithosols] , Non-Calcic Brown Soils, Grey Brown and Red Clays, Black Earths, Red Brown Earth	[Rudosols and Tenosols] , Chromosols, Vertosols

Note: Bold soil types enclosed in square brackets comprise at least 80% of the area for the corresponding Offset Group.

1.8 Land Use and Disturbance

All of the offset areas are located on properties that were formerly used for farming, mainly livestock grazing but with some dryland cropping. The offset areas have varying amounts of cleared land, with more cleared land in the Eastern and Western Offsets. Livestock grazing has progressively been removed from the offset areas.

Revegetation works in the offset areas have been ongoing since 2016, with targeted plantings completed on large areas within the Eastern, Western, Southern and Northern Offsets.

1.9 Fire History

Based on the fire history supplied by the National Parks and Wildlife Service (NPWS) (2020), the southern portion of the Southern Offsets were burnt by a wildfire in November 2009 (Figure 1.4) and a portion of the Northern Offsets were burnt by a wildfire, the Kaputar Fire, in November 2019 (Figure 1.5). Several controlled burns were undertaken within the Eastern and Western Offsets in 2017, and the Southern and Northern Offsets in 2018, and a fire ignited by lightning strike in the northern portion of the Northern Offsets was recorded in 2016 (Whitehaven supplied data) (Figures 1.5, 1.6, and 1.7). A prescribed burn within the Leard State Conservation Area to the west of the Western Offsets was undertaken in 2014 and several other fires are recorded within Mount Kaputar National Park bordering the Northern Offsets in 1993, 2009, and 2019 (NPWS, 2020) (Figure 1.5).

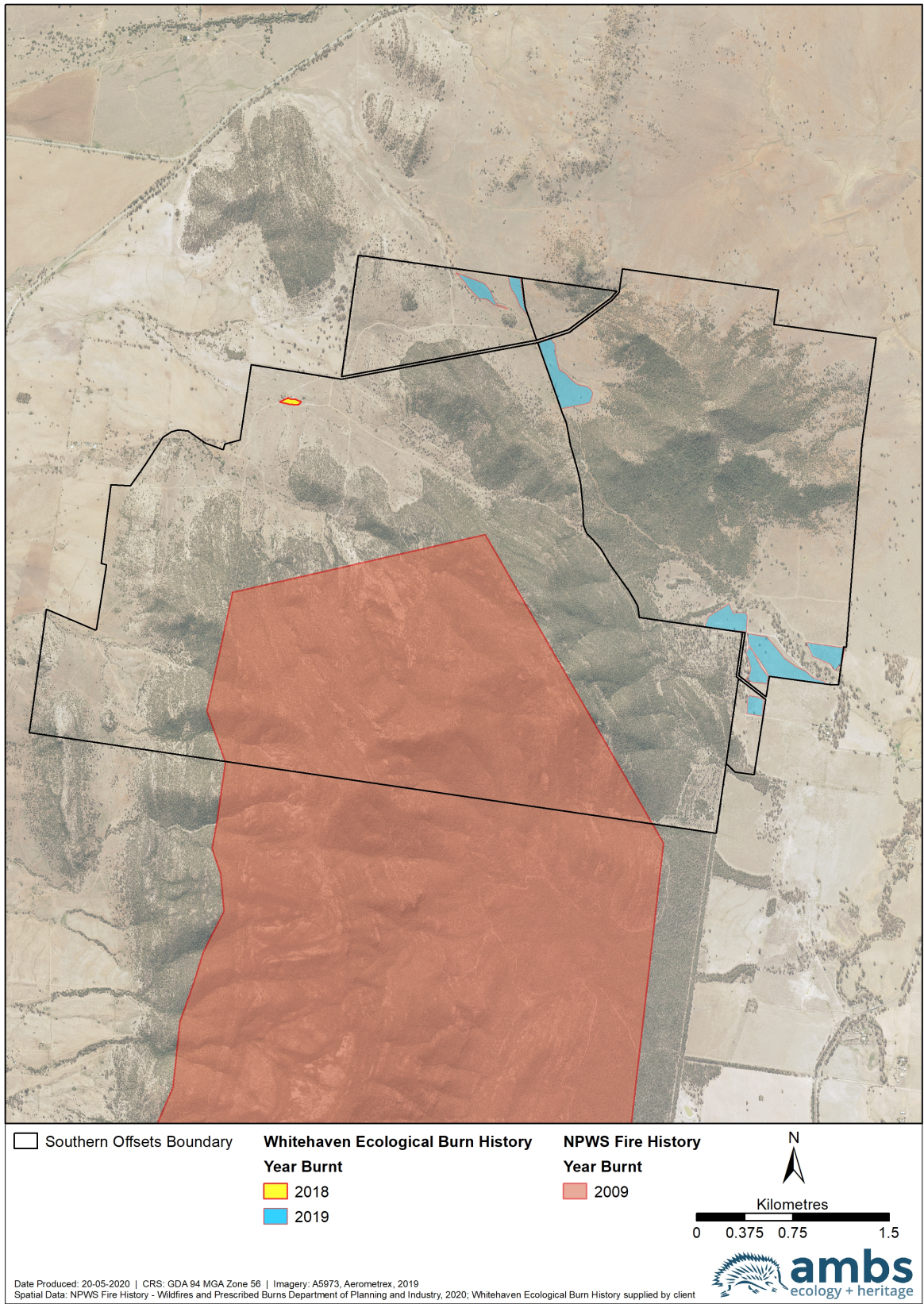


Figure 1.4: Fire History for the Southern Offsets

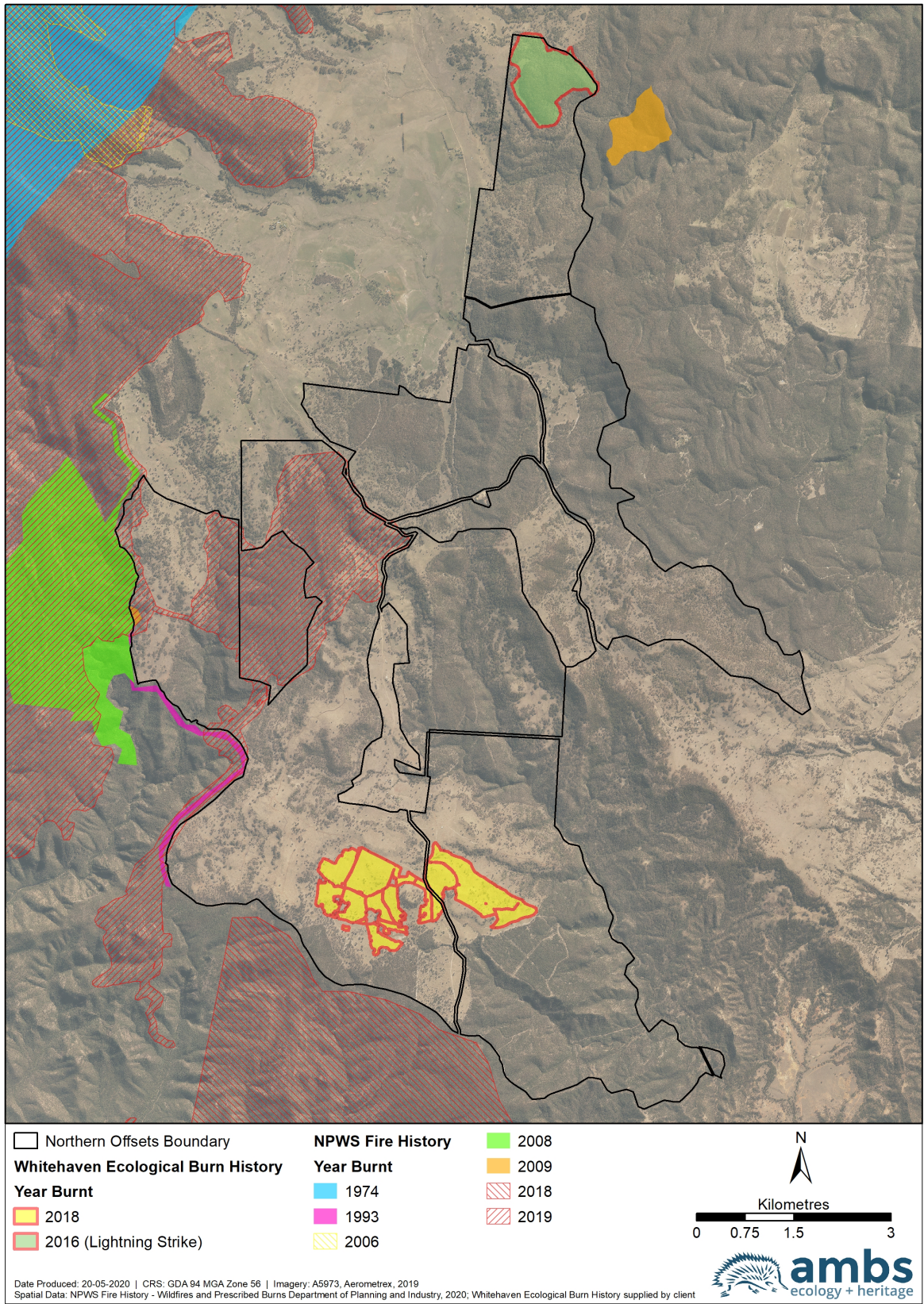


Figure 1.5 Fire History for the Northern Offsets

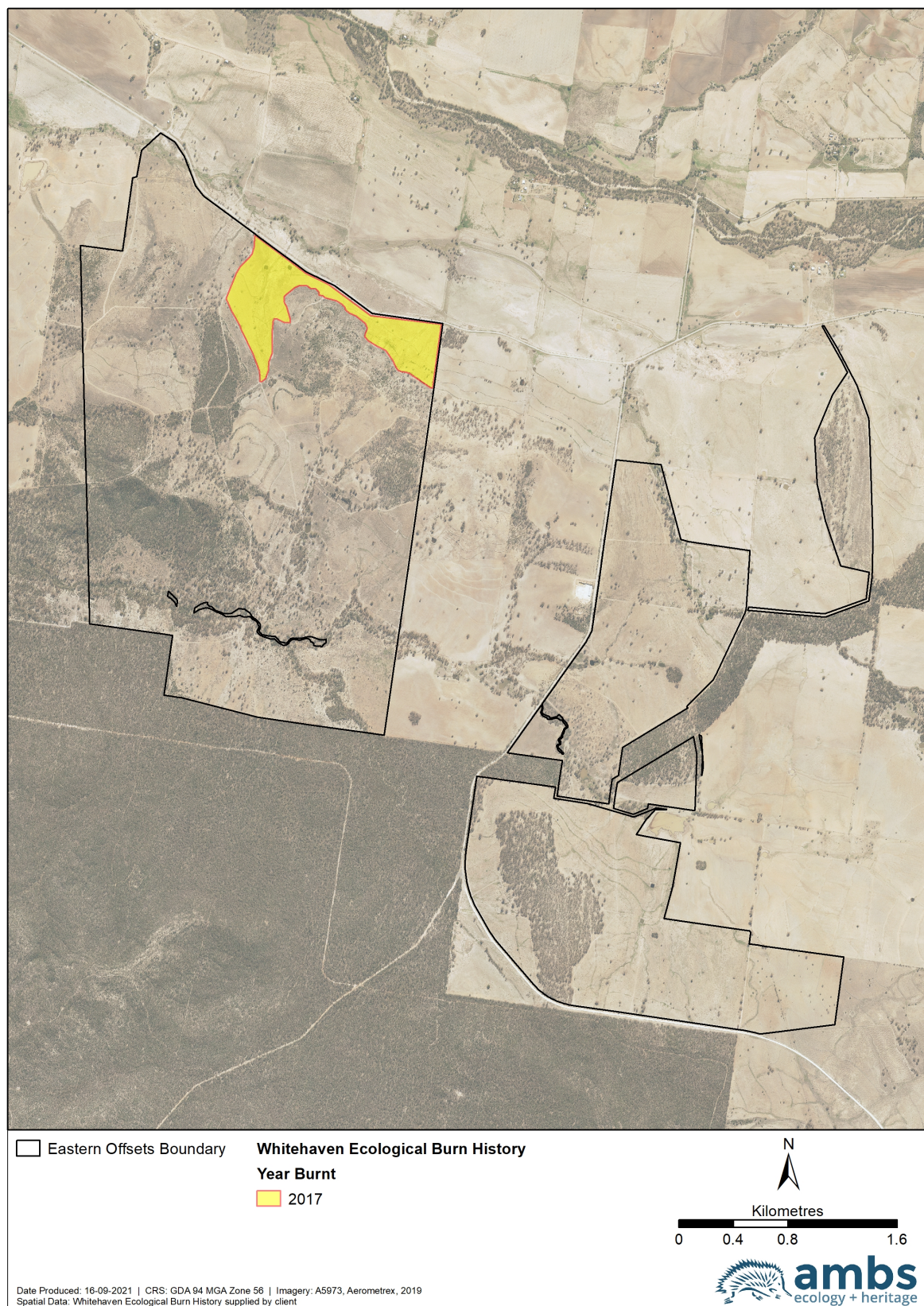


Figure 1.6: Fire History for the Eastern Offsets

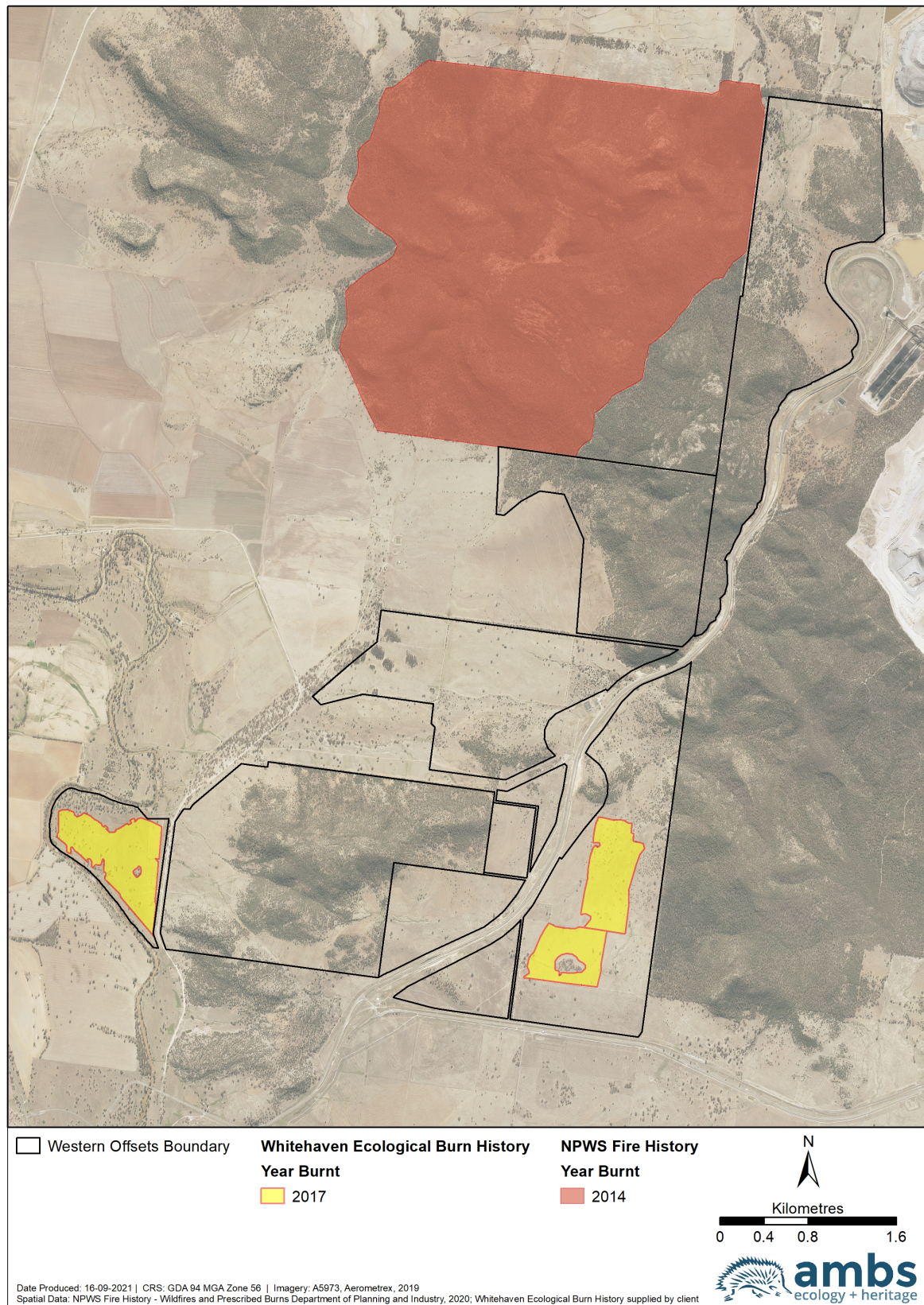


Figure 1.7: Fire History for the Western Offsets

1.10 Previous Vegetation Surveys

An overview of previous surveys is provided below.

Maules Creek Coal Project Ecological Assessment (Cumberland Ecology, 2011a)

As part of the Environmental Impact Assessment (EIA) (Hansen Bailey, 2011), Cumberland Ecology (2011a) undertook preliminary site inspections between September 2010 and May 2011 to identify potential offset receiving sites. Site inspections included limited ground surveying and assessments of the vegetation type and condition. Additional notes were about threatened species and their associated habitat, key habitat features, and weed infestations.

Maules Creek Coal Project Biodiversity Offset Management Plan (Cumberland Ecology, 2011b)

Additional survey work was undertaken by Cumberland Ecology in September 2011 for the *Maules Creek Coal Project Biodiversity Offset Management Plan* (Cumberland Ecology, 2011b) in responses to submissions on the EIA (Hansen Bailey, 2011). Quadrat data sampled from the offsets was included in the plan along with information about the condition classes of Box Gum Woodland. The details on the survey methods were provided in Cumberland Ecology (2011b). Updated versions of the Biodiversity Offset Management Plan were subsequently provided including in 2013 and 2014.

Roseglass Offset Area Flora and Fauna Assessment (Niche Environment and Heritage, 2012)

Niche Environment and Heritage (2012) undertook a desktop assessment (preliminary vegetation map derived from aerial phot interpretation; threatened entities database search) and seven days of vegetation surveys in 2012 that included full floristic plots, rapid data points (RDPs) and random meanders searching for threatened flora. Niche Environment and Heritage (2012) identified twenty [20] vegetation types, provided a map and interpreted their map units in the context of TECs.

Maules Creek Coal Project: Analysis of Offset Potential of the Brennan Property (Cumberland Ecology, 2013a)

Cumberland Ecology (2013a) undertook reconnaissance surveys on the Brennan Property, “Onavale”, in December 2013. The field survey methods predominantly involved rapid assessment points. The mapping was described by Cumberland Ecology (2013a) as broadly indicative and likely to change with more detailed study. Greenloining Biostudies (2014) describes that the vegetation mapping by Cumberland Ecology (2013a) was undertaken in severe drought conditions.

Maules Creek Coal Project: Analysis of Offset Potential of the Phillips Property (Cumberland Ecology, 2013b)

Cumberland Ecology (2013b) undertook a desktop review including integrating mapping layers and brief field verification to assess the Phillips Property, “Bimbooria”, for the presence of Box-Gum Woodland Critically Endangered Ecological Community (CEEC). The broad vegetation identified and mapped includes Woodlands (4 types) and Derived Native Grasslands (DNG) (2 types). Cumberland Ecology (2013b) calculated the area of Box-Gum Woodland CEEC (woodland form and DNG form). Cumberland Ecology (2013b) state under survey limitations that a subsequent detailed survey may alter vegetation and habitat boundaries.

Independent Peer Review of Offsets for the Maules Creek Coal Project – EPBC 2010/5566 (Greenloaning Biostudies, 2013)

Greenloaning Biostudies (2013) undertook an independent review to verify the quantity and condition class of Box-Gum Woodland CEEC in the Eastern, Northern and Western offsets and habitat values for targeted threatened fauna (Swift Parrot, *Lathamus discolor*; Regent Honeyeater, *Anthochaera phrygia*); and South-Eastern [or Corben's] Long-eared Bat, *Nyctophilus corbeni*). The review entailed a desktop review, field surveys (plot based and rapid assessments), and adjustments to existing mapping, particularly regarding Box-Gum Woodland CEEC (woodland form and DNG form) in the context of consent conditions and habitat quality/condition.

Greenloaning Biostudies (2013) concluded that 3,827.7 ha of the CEEC conformed as being in good condition and that 1,874.2 ha was of low to moderate condition with the ultimate conclusion that the offsets complied with consent conditions and that were of equivalent or better condition than the mine site project area.

Independent Peer Review of Offsets for the Maules Creek Coal Project – EPBC 2010/5566 Verification Report for Additional Offsets (Greenloaning Biostudies, 2014)

Greenloaning Biostudies (2014) undertook an independent review to verify the quantity and condition class of Box-Gum Woodland CEEC on additional offset areas including Bimbooria, Roseglass, Onavale and Wongala. The study included field surveys predominantly involving rapid assessment points but also a small number of plots (20 x 50 m), verification of vegetation mapping boundaries and a review of additional information sources (e.g. Niche Environment and Heritage, 2012).

Greenloaning Biostudies (2014) concluded that within the additional offsets there was a total CEEC area of 5,660 ha comprising 1,862 ha of low to moderate condition DNG and 3,798 ha of good condition Box-Gum Woodland.

Maules Creek Coal Mine Biodiversity Offset Areas - Vegetation Descriptions (Greenloaning Biostudies, 2015)

Greenloaning Biostudies (2015) prepared descriptions of the vegetation communities in the offset areas and these were included in the *Maules Creek Coal Project Biodiversity Offset Management Plan* (Whitehaven, 2017).

Conservation Agreements (Greenloaning Biostudies, 2019-2020)

Greenloaning undertook vegetation mapping on several properties for Conservation Agreements (dated 2019) as directed by the NSW Biodiversity Conservation Trust.

Flora Monitoring (AMBS, 2015-2019, 2020)

Flora monitoring of 52 plot locations across the offset areas commenced in 2015 and has been regularly undertaken in spring and more recently in autumn at some sites (AMBS, 2015-2019, 2020). The sample design was before-after-control-impact design and collected data sets from nested subplots within 20 m x 20 m plots in offset management areas, with reference plot data also collected (AMBS, 2020a). The sampling design was developed to test management treatments and the plots were a compatible size to standard survey methods.

2 Methods

2.1 Desktop and Literature Review

A desktop assessment and review of previous vegetation mapping and reports for the offset areas was undertaken. A range of other data sources, relevant to vegetation, were also reviewed. The desktop assessment included a review of the following sources:

- *Maules Creek Coal Project Ecological Assessment* (Cumberland Ecology, 2011a).
- *Maules Creek Coal Project Biodiversity Offset Management Plan* (Cumberland Ecology, 2011b).
- *Maules Creek Coal Project: Analysis of Offset Potential of the Brennan Property* (Cumberland Ecology, 2013a).
- *Maules Creek Coal Project: Analysis of Offset Potential of the Phillips Property* (Cumberland Ecology, 2013b).
- *Independent Peer Review of Offsets for the Maules Creek Mine Project – EPBC 2010/5566* (Greenloaning Biostudies, 2013).
- *Independent Peer Review of Offsets for the Maules Creek Mine Project – EPBC 2010/5566 Verification Report for Additional Offsets* (Greenloaning Biostudies, 2014).
- *NSW Office of Environment and Heritage (OEH) regional vegetation mapping for the Border River/ Gwydir and Namoi regions* (OEH, 2015).
- *BioNet Atlas Systematic Flora Survey Database* (DPIE, 2020a).
- *MCCM Offset Vegetation Monitoring Data* (AMBS, 2015 - 2019, 2020).
- Threatened plant records from a survey undertaken in Wirradale (AMBS, 2017).
- *Australian Soil Classification Mapping, NSW* (DPIE, 2020b).
- *Great Soils Group Mapping, NSW* (DPIE, 2020c).
- *Geoscience Australia 1:250 000 geological map series* (Geoscience Australia, 2020a).
- *Geoscience Australia Surface Hydrology Lines- Regional* (Geoscience Australia, 2020b).
- *Fires in Australia's Forests 2011-16* (Australian Bureau of Agriculture and Resource Economics and Sciences, 2018).
- *NPWS Fire History - Wildfires and Prescribed Burns* (NPWS, 2020);
- *Atlas of Living Australia (ALA)* (ALA, 2020).

2.2 Field Surveys

Field surveys were undertaken across the study area between 26 May 2020 and 13 August 2020, with an additional day of field survey at selected sites on 26 March 2021. Target plot locations were selected based on previous vegetation mapping, visual assessment of vegetation patterns, topographic position, and condition to ensure the full range of vegetation types and condition states was sampled. The flora surveys primarily involved identification and mapping of PCTs and identification and assessment of areas of TECs listed under the BC Act and EPBC Act.

Field surveys were supervised by Michael Somerville. Michael is a botanist with over 14 years' professional experience and specialist technical knowledge in the field. Michael is an accredited Biodiversity Assessment Method (BAM) assessor. Field data were collected by Michael Somerville, Belinda Pellow, Mark Robinson, Michael Doherty, Dr James Schlunke, Tom O'Sullivan and Dan Clarke with the assistance of Gabriella Hoban, Corey O'Brien and Noel Ruting. The experience and qualifications of the ecologists collecting the field data are provided in Table 2.1.

Table 2.1 Experience and Qualifications of Survey Personnel

Name	Qualifications	Experience
Michael Somerville	Bachelor of Science	14 years' experience
	Graduate Diploma in Natural Resource Management	
	Accredited BAM Assessor	
Belinda Pellow	Diploma in Applied Science (Agriculture)	30 years' experience
	Associate Diploma in Arts (Aboriginal Studies)	
	Accredited BAM Assessor	
	Certified Practising Ecological Consultant (ECA NSW No:3)	
Mark Robinson	Associate Diploma in Horticulture	30 years' experience
	Graduate Diploma in Environment Management	
	Master of Environment & Restoration	
Michael Doherty	Ongoing Part-time PhD	30 years' experience
	Fenner School of Environment and Society, ANU	
	BSc. (Hons.), Botany Department, University of Sydney	
	Undergraduate Science Degree, University of Sydney	
James Schlunke	Bachelor of Science (Honours)	10 years' experience
	PhD	
	Accredited BAM Assessor	
Tom O'Sullivan	Master of Environmental Studies	24 years' experience
Daniel Clarke	Bachelor of Science (Honours)	14 years' experience
	Certificate IV General Horticulture	
Gabriella Hoban	Bachelor of Environmental Management (Ecology)	4 years' experience
Corey O'Brien	Bachelor of Science (Advanced; General Biology)	2 years' experience
	Master of Research	
Noel Ruting	Master of Philosophy (Natural & Physical Sciences)	30 years' experience
	Environment & Sustainability Science	
	Bachelor of Landscape Architecture	

2.2.1 Timing

A summary of the field survey dates, areas surveyed, and personnel are provided in Table 2.2.

Table 2.2 Survey Timing and Personnel

Dates	Offsets Surveyed	Personnel
26-29 May 2020	Southern Offsets (Bimbooria)	Michael Somerville, Mark Robinson
16-20 June 2020	Northern Offsets	Michael Somerville, James Schlunke, Tom O'Sullivan, Mark Robinson, Gabby Hoban, Corey O'Brien, Noel Ruting
30 June to 2 July 2020	Northern Offsets	Belinda Pellow, Mark Robinson, Tom O'Sullivan, Dan Clarke, Gabby Hoban, Corey O'Brien
7-14 July 2020	Eastern, Western and Southern Offsets	Michael Somerville, James Schlunke, Michael Doherty, Mark Robinson, Tom O'Sullivan, Gabby Hoban, Corey O'Brien, Noel Ruting
21-24 July 2020	All Offsets	James Schlunke, Mark Robinson, Tom O'Sullivan, Gabby Hoban
11-13 August 2020	Eastern and Western Offsets	James Schlunke, Tom O'Sullivan
26 March 2021	Northern Offsets	Michael Somerville

2.2.2 Weather Conditions

Weather data were obtained from the Tarrawonga Meteorological Station (Coordinates 230878 E, 6605850 S). Total rainfall, average maximum temperatures and average minimum temperatures for each survey period are given in Table 2.3.

Table 2.3 Weather Conditions During Survey Periods

Dates	Offsets Surveyed	Rainfall Total (mm)	Temp Av. Max (°C)	Temp Av. Min (°C)
26-29 May 2020	Southern Offsets (Bimbooria)	0.3	21.7	20.7
16-20 June 2020	Northern Offsets	0.1	20.8	0.1
30 June to 2 July 2020	Northern Offsets	0.1	22.6	21.6
7-14 July 2020	Eastern, Western and Southern Offsets	7.9	20.8	-1.4
21-24 July 2020	All Offsets	0	21.2	-4
11-14 August 2020	Eastern & Western Offsets	6.2	19.1	5.14

2.2.3 Floristic Plots

A total of 117 full floristic surveys were undertaken across the offset areas and their locations are shown in Figures 2.1 to 2.4. Each full floristic plot was a 20 m x 20 m quadrat, nested within a 20 m x 50 m transect. The attributes listed in Table 2.4 were recorded in the full floristic plots. Additional plots sourced from the *MCCM Offset Vegetation Monitoring Data* (AMBS, 2015-2019, 2020) and the *BioNet Atlas Systematic Flora Survey Database* (DPIE, 2020a) were also used during this study (see Figures 2.1 to 2.4).

Table 2.4 Attributes Collected in Full Floristic Plots

Attribute	20 m x 20 m	20 m x 50 m
Notes on landform	Yes	
Notes on soils and parent geology	Yes	
Overall cover of each stratum	Yes	
All flora species along with cover, abundance, stratum and growth form	Yes	
Assessment of native shrub cover at 5 m intervals		Yes
Assessment of native grass cover at 5 m intervals		Yes
Count of total number of regenerating overstorey individuals <5 m Diameter at Breast Height (DBH) (also recorded by species)		Yes
Count of total number of regenerating overstorey individuals 5-40 centimetre (cm) DBH (also recorded by species)		Yes
Count of total number of mature overstorey individuals >40 cm DBH (also recorded by species)		Yes
Total length of fallen logs		Yes
Count of trees with hollows		Yes
Landscape and portrait photo taken from each end of transect		Yes

Threatened plant species were opportunistically recorded (rather than targeted) during the survey work.

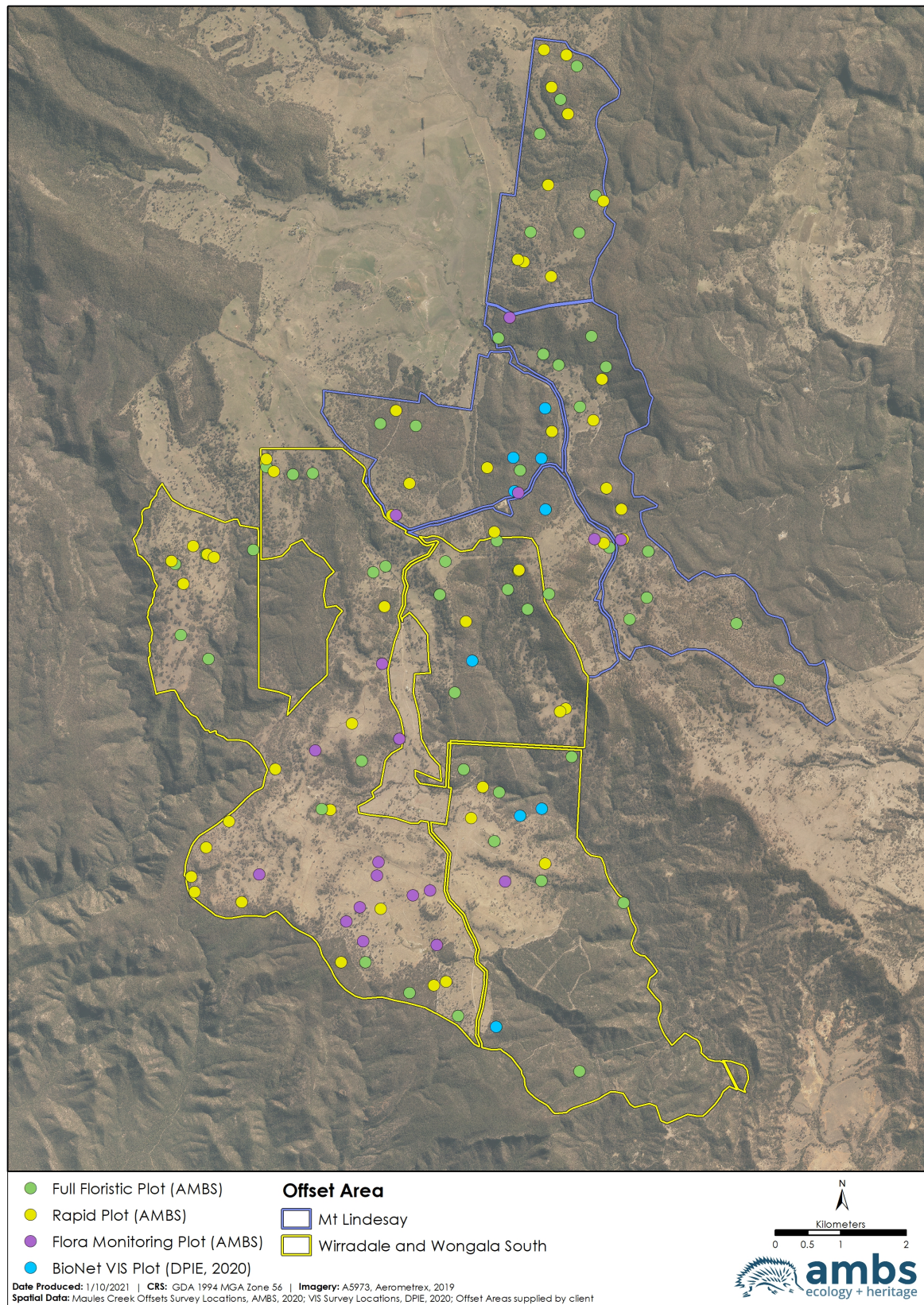


Figure 2.1 Plot Locations for the Northern Offsets

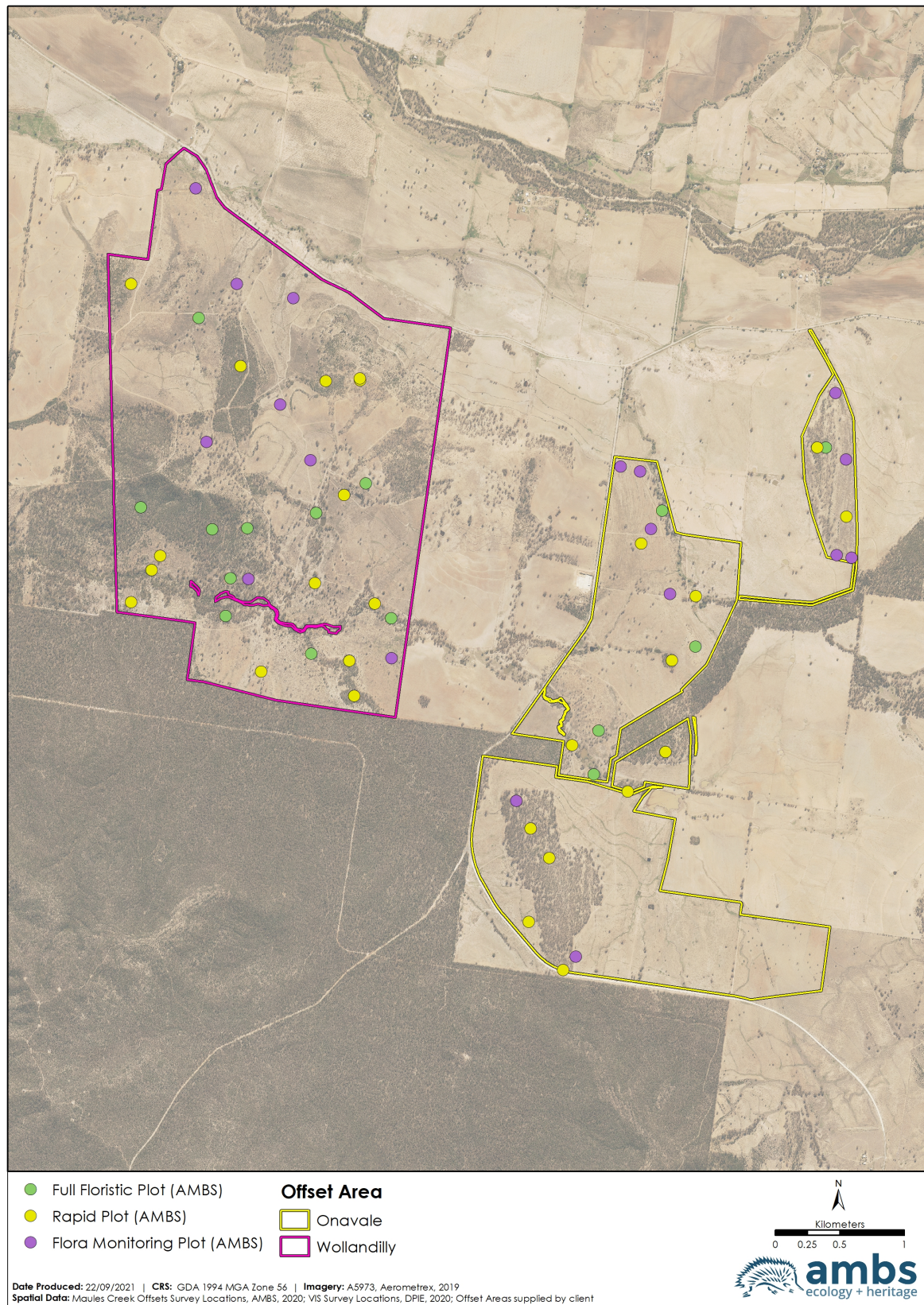


Figure 2.2 Plot Locations for the Eastern Offsets

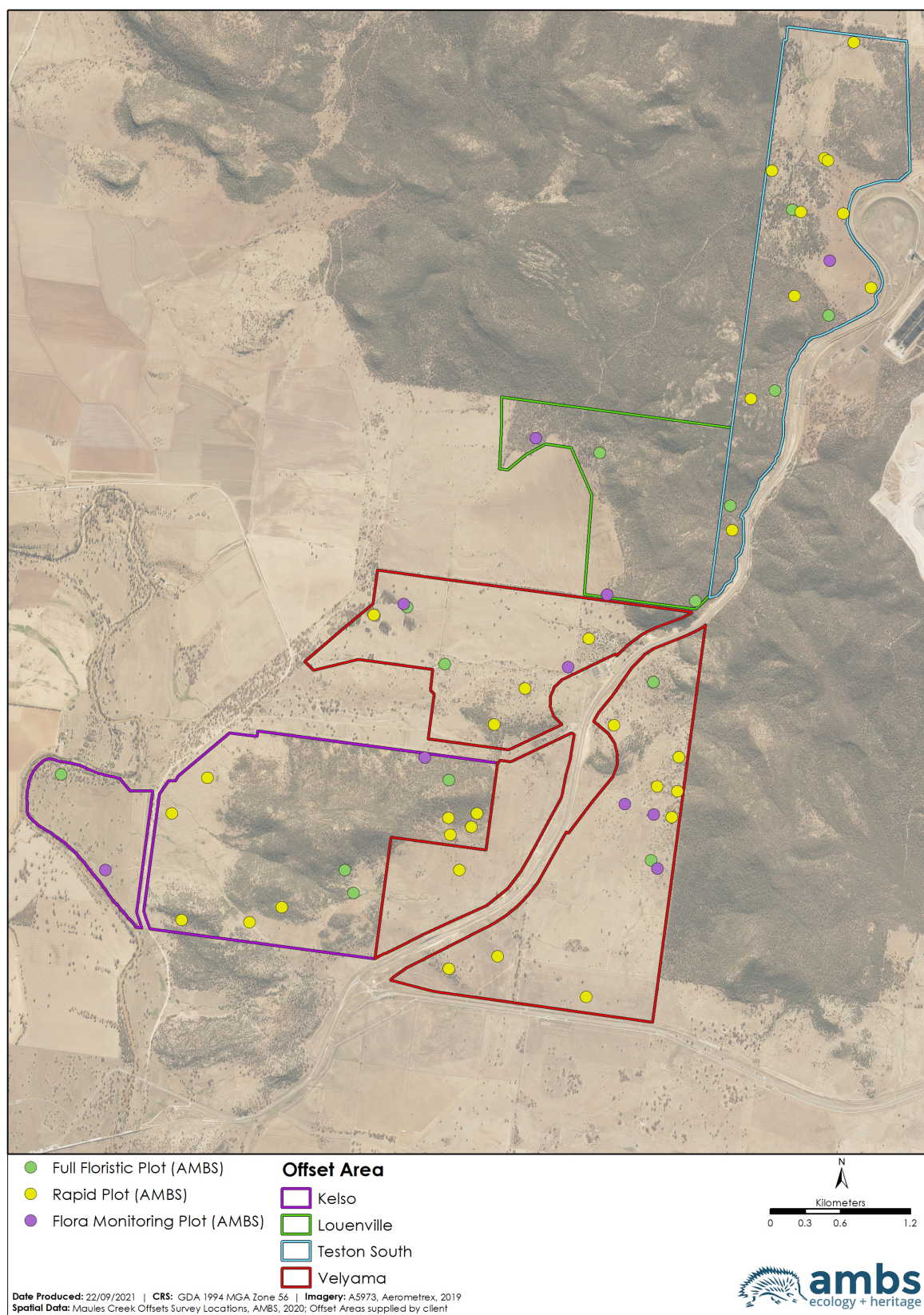


Figure 2.3 Plot Locations for the Western Offsets

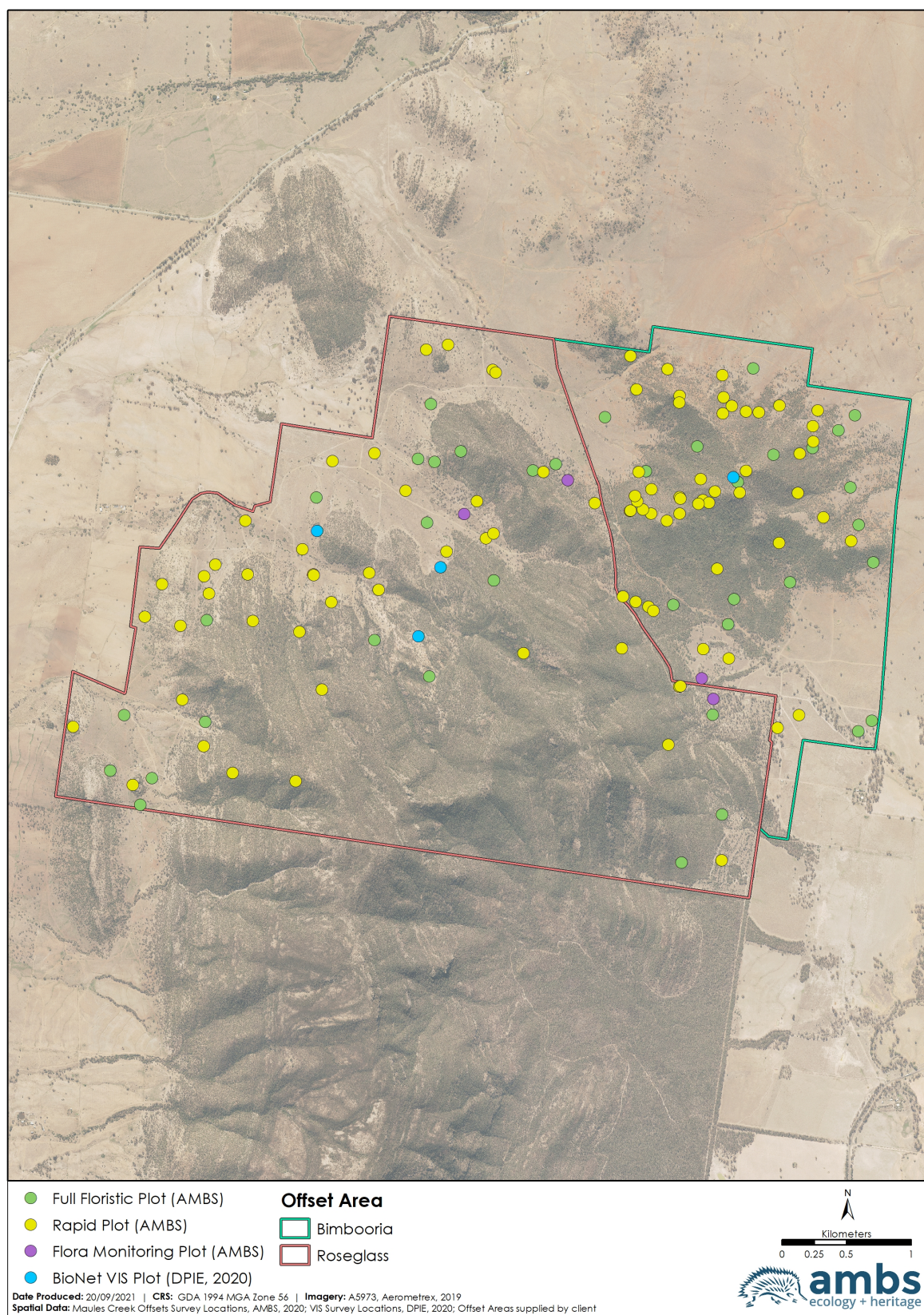


Figure 2.4 Plot Locations for the Southern Offsets

2.2.4 Rapid Data Points

A total of 197 RDPs were used to assist in the delineation of vegetation mapping boundaries and to provide additional information for the identification of TECs listed under the BC Act and EPBC Act. An assessment of native cover and height of each stratum, and the dominant native species in each stratum, was recorded at each rapid plot as well as information on abiotic variables (soils, landform, aspect and slope), notes on other relevant features and a photograph of the vegetation. The locations of RDPs sampled by AMBS within the offset areas are shown in Figures 2.1 to 2.4.

2.2.5 Plant Community Type Identification

A multivariate cluster analysis of full floristic plot data was undertaken to develop a set of floristic groups. The cluster analysis is described in more detail in Section 2.3. The resulting groups were then assigned to PCTs based on the characteristic species of the group as well as abiotic variables of the associated plot locations, including soils, geology and topography. Assignment of groups to PCTs was based on the published descriptions and associated data for PCTs included in the *BioNet Vegetation Classification Database* (DPIE, 2020d). RDPs and a small number of full floristic plots that were surveyed after the cluster analysis were then assigned individually to PCTs based on dominant species and abiotic features.

2.2.6 Box-Gum Woodland CEEC Identification and Mapping

Box-Gum Woodland CEEC listed under the EPBC Act

Areas with the potential to fit the criteria for the *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (Box-Gum Woodland CEEC) were sampled with both full floristic plots and RDPs. This data was used to assess patches against the *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box-Gum Woodland CEEC Listing Advice) (Threatened Species Scientific Committee [TSSC], 2006). Vegetation community boundaries were assigned on the basis of data and observations collected in the field and aerial photograph interpretation. The following criteria, taken from the Box-Gum Woodland CEEC Listing Advice (TSSC, 2006), were used to assess areas for mapping as the Box-Gum Woodland CEEC:

- *Box – Gum Grassy Woodlands and Derived Grasslands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. In the Nandewar Bioregion, Grey Box (*Eucalyptus microcarpa* or *E. moluccana*) may also be dominant or codominant. The tree-cover is generally discontinuous and consists of widely-spaced trees of medium height in which the canopies are clearly separated.*
- *Associated, and occasionally co-dominant, trees include, but are not restricted to: Grey Box (*Eucalyptus microcarpa*), Fuzzy Box (*E. conica*), Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Red Stringybark (*E. macrorhyncha*), White Cypress Pine (*Callitris glaucophylla*), Black Cypress Pine (*C. endlicheri*), Long-leaved Box (*E. goniocalyx*), New England Stringybark (*E. caliginosa*), Brittle Gum (*E. mannifera*), Candlebark (*E. rubida*), Argyle Apple (*E. cinerea*), Kurrajong (*Brachychiton populneus*) and Drooping She-oak (*Allocasuarina verticillata*).*
- *Ecological community occurs in areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 metres to 1200 metres.*

- *Shrub cover in this ecological community is naturally patchy, and shrubs may be dominant only over a very localised area. Shrub cover should therefore be assessed over the entire remnant, not just in a localised area. A remnant with a significant ground layer of tussock grasses, and where the distribution of shrubs is scattered or patchy, is part of the ecological community. In shrubby woodlands, the dominance of native tussock grasses in the ground layer of vegetation is lost. Therefore, a remnant with a continuous shrub layer, in which the shrub cover is greater than 30%, is considered to be a shrubby woodland and so is not part of the listed ecological community.*
- *Remnant attributes, such as shrubbiness, should be measured on a scale of 0.1 hectares or greater.*
- *Areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. Although some native species may remain, in most of these areas the native understorey is effectively irretrievable. In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey.*
- *Therefore, in order to be the listed ecological community, an understorey patch, in the absence of overstorey trees, must have a high level of native floral species diversity, but only needs to be 0.1 hectares or greater in size. A patch in which the perennial vegetation of the ground layer is dominated by native species, and which contains at least 12 native, non-grass understorey species (such as forbs, shrubs, ferns, grasses and sedges) is considered to have a sufficiently high level of native diversity to be the listed ecological community. At least one of the understorey species should be an important species (e.g. grazing-sensitive, regionally significant or uncommon species; such as Kangaroo Grass or orchids) in order to indicate a reasonable condition.*
- *Areas with both an overstorey and understorey present are also considered of sufficiently good condition to be part of the listed ecological community if the understorey meets any of the conditions above, or if they have a predominantly native understorey, are two hectares or above in size, and have either natural regeneration of the overstorey species or 20 or more mature trees per hectare.*

Box-Gum Woodland CEEC listed under the BC Act

Areas of potential Box-Gum Woodland CEEC were also assessed against the criteria set out in the *White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered Ecological Community listing NSW Threatened Species Scientific Committee – Final Determination* (TSSC, 2020). The key difference between the NSW BC Act listing and the Commonwealth EPBC Act listing is that the latter requires one of the following:

- An intact tree layer and predominately native ground layer; or
- An intact native ground layer with a high diversity of native plant species but no remaining tree layer.

For listing under the BC Act, areas with predominately native canopy, dominated by the relevant species, but with a predominately non-native ground layer, are also included within the Box-Gum Woodland CEEC.

2.3 Quantitative Data Analysis

A hierarchical cluster analysis of full floristic plot data was undertaken to group plots into floristic groups and inform the assignment of plots to PCTs (Appendix B). Full floristic plots used in this analysis included plots collected by AMBS for this study, as well as AMBS vegetation monitoring plots on the offset areas (AMBS, 2015-2019; 2020), full floristic plots held in the *BioNet Systematic Flora Survey Database* (DPIE, 2020a), and some additional plots surveyed for the *Maules Creek Coal Mine Vegetation Mapping on Areas External to the Maules Creek Offset Areas* report (AMBS, 2021). Only native flora species were included in the analysis and species which occurred in only a single plot were removed. All cover and abundance scores were converted to a Braun-Blanquet style cover score of 1-6.

The cluster analysis was undertaken using the PATN software package (Belbin, 2003) based on Bray-Curtis dissimilarity values. An agglomerative hierarchical classification using a flexible unweighted pair group method with arithmetic mean clustering strategy was applied to derive 40 groups. The resulting groups were assigned to the best fit PCT based on dominant species and abiotic variables of the member plots. Additional PCTs, which were not returned in the output of the cluster analysis due to the level of sampling, were added intuitively based on plot data. Some plots were reassigned to a different PCT than the original statistical group based on consideration of landscape position, soils, geology and dominant flora species.

2.4 Rounding

All of the PCT areas, CEEC areas and Endangered Ecological Community (EEC) areas tabled in this report are expressed to one decimal place and have been rounded down to be conservative. This results in a cumulative rounding down effect in some of the totals.

3 Results

3.1 Overview

A total of 11,438.9 ha of native vegetation in 28 different PCTs was mapped across all offset areas. This included four TECs listed under the EPBC Act and three TECs listed under the BC Act. Table 3.1 below lists all mapped PCTs and associated TECs. Photographs of PCTs are provided in Appendix C. A detailed record of the area of the PCTs and TECs mapped in each offset property is provided in Appendix D.

Table 3.1 Mapped Plant Community Types for All Offset Areas

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
55: Belah woodland on alluvial plains and low rises			17.6
78: River Red Gum riparian tall woodland / open forest wetland			40.9
81: Western Grey Box - cypress pine shrub grass shrub tall woodland	E ¹	E ¹	2.2
101: Poplar Box - Yellow Box - Western Grey Box grassy woodland		E ²	70.9
101: Derived Native Grassland			135.6
112: Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland			7.5
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket	E ³	E ³	0.3
244: Poplar Box grassy woodland		E ⁴	14.6
244: Derived Native Grassland			255.8
413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland			143.4
413: Derived Native Grassland			324.3
427: Cypress pine - Tumbledown Red Gum low open woodland to grassland			49.6
429: White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland			7.1
435: White Box - White Cypress Pine shrub grass hills woodland	CE ⁵	CE ⁶	987.4
435: Derived Native Grassland	CE ⁷	CE ⁷	1,280.1
439: Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland			9.2
492: Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest			652.4
492: Derived Native Grassland			53.5
508: Blakely's Red Gum - Stringybark - Rough-barked Apple open forest	CE ⁸	CE ⁸	15.5
510: Blakely's Red Gum - Yellow Box grassy woodland	CE ⁸	CE ⁸	991
510: Derived Native Grassland	CE ⁹	CE ⁹	338.6
563: White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest			381.1
563: Derived Native Grassland			8.2
569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland	CE ¹⁰	CE ¹⁰	133.9
571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland	CE ⁸	CE ⁸	35.8
571: Derived Native Grassland	CE ⁸	CE ⁸	45.7
572: Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest			515.9
572: Derived Native Grassland			1.8
574: Tea-tree riparian shrubland / heathland wetland			1.9
581: Tumbledown Red Gum - Dwyer's Red Gum - Wallaby Bush shrubby woodland			134.6
588: White Box - White Cypress Pine shrubby hills open forest			379.7
588: Derived Native Grassland			127.5

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest			2,584.4
592: Derived Native Grassland			248.3
599: Blakely's Red Gum - Yellow Box grassy tall woodland	CE ⁸	CE ⁸	24.8
599: Derived Native Grassland	CE ¹¹	CE ¹¹	21.5
619: Derived Wire Grass grassland			221.5
736: Broad-leaved Stringybark - Mountain Gum - Apple Box open forest			24.1
736: Derived Native Grassland			4.3
1165: Silvertop Stringybark - Orange Gum shrubby open forest			491.5
1165: Derived Native Grassland			44
1306: White Box - Red Stringybark shrubby woodlands			564.2
1306: Derived Native Grassland			46.7
Total Native Vegetation			11,438.9
Cleared Land/Infrastructure			530.9
Total			11,969.8

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered; E = Endangered.

- 1 Equivalent to the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-east Australia listed under the EPBC Act and Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions Endangered Ecological Community listed under the BC Act (Grey Box Woodland EEC listed under the BC Act and EPBC Act).
- 2 Approximately 50.3 ha equivalent to the Poplar Box Grassy Woodland on Alluvial Plains Endangered Ecological Community listed under the EPBC Act (Poplar Box Grassy Woodland EEC listed under the EPBC Act).
- 3 Equivalent to the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions Endangered Ecological Community listed under the EPBC Act and Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions Endangered Ecological Community listed under the BC Act (Semi-evergreen Vine Thicket EEC listed under the BC Act and EPBC Act).
- 4 Approximately 13.3 ha equivalent to the Poplar Box Grassy Woodland EEC listed under the EPBC Act.
- 5 Approximately 791.5 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act.
- 6 Approximately 780.5 ha equivalent to the Box-Gum Woodland CEEC listed under the EPBC Act.
- 7 Approximately 1,009.6 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.
- 8 Equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act
- 9 Approximately 336.9 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.
- 10 Approximately 103.1 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.
- 11 Approximately 17.3 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

3.2 Roseglass and Bimbooria

3.2.1 Plant Community Types and Descriptions

Approximately 2,085.9 ha of native vegetation was mapped on Roseglass and Bimbooria, across seven separate PCTs. Table 3.2 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset group is included as Figure 3.1.

Table 3.2 Mapped Plant Community Types for Roseglass and Bimbooria

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket	E ¹	E ¹	0.3
413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland			25
427: Cypress pine - Tumbledown Red Gum low open woodland to grassland			49.6
435: White Box - White Cypress Pine shrub grass hills woodland	CE ²	CE ²	277.3
435: Derived Native Grassland	CE ³	CE ³	399.3
439: Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland			9.2
581: Tumbledown Red Gum – Dwyer's Red Gum - Wallaby Bush shrubby woodland			117.6
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest			1,085.1
592: Derived Native Grassland			122.5
Total			2,085.9

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered; E = Endangered.

1 Equivalent to the Semi-evergreen Vine Thicket EEC listed under the EPBC Act and BC Act.

2 Approximately 232.4 ha equivalent to the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act.

3 Approximately 254.6 ha equivalent to the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act.

PCT 147

PCT Name: *Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion*

Vegetation Class: Western Vine Thickets

EPBC Status: Semi-evergreen Vine Thicket EEC

BC Status: Semi-evergreen Vine Thicket EEC

PCT 147 is a mid-high to low closed or open forest known as semi-evergreen vine thicket dominated by rich diversity of low trees and shrubs to about 6 m high. Low trees include *Notelaea microcarpa* var. *microcarpa* (Mock Olive), *Geijera parviflora* (Wilga), *Ehretia membranifolia* (Peach Bush) along with *Elaeodendron australe* var. *integrifolia*, *Ventilago viminalis*, *Psydrax oleiofolia*, *Alectryon subdentatus* and *Alstonia constricta*. Emergent trees to 15 m high are often present including *Eucalyptus albens* (White Box), *Eucalyptus melanophloia* (Silver-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and *Casuarina cristata* (Belah). The shrub layer may be mid-dense or dense and includes *Carissa ovata*, *Beyeria viscosa*, *Spartothamnella juncea*, *Solanum parvifolium*, *Rhagodia parabolica*, *Olearia elliptica*, *Senna coronilloides*, *Indigofera adesmiifolia*, *Indigofera brevidens*, *Breynia cernua*, *Solanum semiarmatum*, *Cassinia laevis*, *Myoporum montanum*, *Capparis lasiantha*, *Pimelea neo-anglica* and *Phyllanthus subcrenulatus*. Vines are common and include *Pandorea pandorana* (Wonga Vine), *Parsonsia eucalyptophylla* (Gargaloo), *Clematis microphylla* var. *microphylla*, *Cayratia clematidea* (Native Grape) and *Jasminum lineare* (Desert Jasmine). Mistletoes include *Lysiana exocarpi*, *Lysiana subfalcata* and *Amyema miraculosum*. The ground cover is mid-dense in open areas or sparse under dense tree or shrub canopies. Common grass species include *Austrostipa verticillata*, *Leptochloa asthenes*, *Poa sieberiana* var. *hirtilli*, *Elymus scaber*, *Panicum queenslandicum* var. *queenslandicum*, *Chloris ventricosa*, *Rytidisperma bipartitum*, *Paspalidium gracile* and *Cymbopogon refractus*. The climber *Desmodium brachypodum* is often abundant. Other groundcover species include *Boerhavia dominii*, *Dichondra* sp. A, *Carex inversa* and *Cheilanthes sieberi* subsp. *sieberi*.

Within the offset group, this community was mapped in a single patch on a rocky outcrop and scree slope. Other areas were too small to map and/or occurred as an understorey within another community.

PCT 413

PCT Name: *Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 413 is a tall to mid-high woodland or open forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) sometimes with *Eucalyptus albens*. The small tree *Alectryon oleifolius* subsp. *elongatus* may be present. The shrub layer is usually sparse but mid-dense in places and includes *Acacia deanei* subsp. *paucijuga*, *Solanum ferocissimum*, *Beyeria viscosa*, several subspecies of *Dodonaea viscosa*, *Acacia decora*, *Geijera parviflora* and *Abutilon oxycarpum*. The ground cover is sparse and includes grasses such as *Aristida vagans*, *Cymbopogon refractus*, *Poa sieberiana*, *Enteropogon acicularis*, *Austrostipa verticillata*, *Austrostipa scabra* subsp. *scabra* and *Microlaena stipoides*. The mat-rushes *Lomandra multiflora* subsp. *multiflora* or *Lomandra filiformis* subsp. *filiformis* are often present. Forbs include *Einadia hastata*, *Calotis cuneifolia*, *Einadia nutans* subsp. *nutans*, *Eremophila debilis*, *Chrysocephalum apiculatum*, *Opercularia diphylla*, *Bulbine semibarbata* and *Ranunculus sessiliflorus*. Climbers include *Glycine tabacina* and *Desmodium varians*.

Within the offset group, this community occurs on exposed slopes on Bimbooria.

PCT 427

PCT Name: *Cypress pine - Tumbledown Red Gum low open woodland to grassland on rocky benches, mainly in the Nandewar Bioregion*

Vegetation Class: Inland Rocky Hill Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 427 is an open woodland composed of *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus dealbata* (Tumbledown Red Gum). The shrub-layer is very sparse and includes *Notelaea microcarpa* var. *microcarpa*, *Beyeria viscosa*, *Psydrax oleifolia*, *Pimelea neo-anglica*, *Acacia decora*, *Melichrus urceolatus*, *Solanum parvifolium* and *Solanum ferocissimum*. The main vegetation structure may be low to mid-high open grassland dominated by herbaceous ground cover species including the grasses *Cymbopogon refractus*, *Tripogon loliiformis*, *Enneapogon gracilis*, *Poa sieberiana* and *Aristida ramosa*; forbs such as *Vittadinia muelleri*, *Wahlenbergia communis*, *Sigesbeckia australiensis*, *Swainsona galegifolia*, *Evolvulus alsinoides* var. *decumbens*, *Scleria mackaviensis*, *Hypericum gramineum*, *Haloragis serra*; sedges such as *Cyperus gracilis* and *Fimbristylis dichotoma*; the rock ferns *Cheilanthes sieberi* and *C. distans* also may be common.

Within the offset group, this community occurs on skeletal soils on rock outcrops in ridgetop positions.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC (Part)

BC Status: Box-Gum Woodland CEEC (Part)

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakelyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodium* or *Desmodium varians* may be common.

Within the offset group, this community occurs on more fertile soils on flats as well as lower, mid and upper slopes. On slopes this community may become more shrubby. This community occurs as both as woodland and DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not conform where shrub cover is too high or where condition is too low.

PCT 439

PCT Name: *Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland in the Gunnedah - Tambar Springs region, Brigalow Belt South Bioregion*

Vegetation Class: Inland Rocky Hill Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 439 is a tall open shrubland or shrubland dominated by *Notelaea microcarpa* (Mock Olive) and *Alphitonia excelsa* (Red Ash), with emergent trees such as *Eucalyptus dealbata* (Tumbledown Red Gum). The shrub layer is mid-dense to sparse and includes *Beyeria viscosa* (Sticky Wallaby Bush), *Geijera parviflora* (Wiliga), *Dodonea viscosa* subsp. *angustifolia* (Sticky Hop-bush) and *Abutilon oxycarpum* (Lantern Bush). The ground cover is sparse, commonly containing species such as *Aristida personata*, *Cymbopogon refractus*, *Paspalidium gracile*, *Eragrostis megalosperma*, *Solanum parvifolium*, *Desmodium brachypodium*, *Wahlenbergia gracilis*, *Calotis lappulacea*, *Boerhavia dominii*, *Daucus glochidiatus*, *Erodium crinitum*, *Sigesbeckia orientalis* subsp. *orientalis*, *Sida spinosa*, *Cheilanthes sieberi* subsp. *sieberi* and *Cheilanthes distans*.

Within the offset group, this community occurs on protected slopes on rocky ridgelines.

PCT 581

PCT Name: *Tumbledown Red Gum - Dwyer's Red Gum - Wallaby Bush shrubby woodland of the Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 581 is a mid-high woodland that has a variable overstory composition. The overstory is usually dominated by *Eucalyptus dealbata* (Tumbledown Red Gum), however other overstory species that may be present include *Callitris glaucophylla*, *Eucalyptus dwyeri*, *Eucalyptus albens*, *Eucalyptus crebra* and *Eucalyptus melanophloia*. Sometimes a tall shrub or small tree layer is present, containing *Acacia cheelii*, *Alphitonia excelsa*, *Geijera parviflora* or *Acacia deanei* subsp. *deanei*. There is usually a dense to mid-dense shrub layer dominated by *Beyeria viscosa* and *Notelaea microcarpa* var. *microcarpa*, along with other shrub species *Olearia* sp. aff. *elliptica*, *Dodonea viscosa* subsp. *angustifolia*, *Cassinia quinquefaria* and *Bursaria spinosa* subsp. *spinosa*. The ground layer is very sparse with common species including *Teucrium junceum*, *Pomax umbellata*, *Lomandra confertifolia* subsp. *pallida*, *Cheilanthes sieberi* subsp. *sieberi* and grass species such as *Aristida caput-medusae*, *Austrostipa scabra* subsp. *scabra*, *Rytidosperma longifolium*, *Cymbopogon refractus*, *Aristida ramosa*, *Microlaena stipoides* var. *stipoides* and *Paspalidium gracile*.

Within the offset group, this community occurs on slopes and ridgetops on rocky hills.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psyrax oleifolia*. The ground layer includes *Desmodium brachypodium* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the study area, this community occurs on rocky hills and slopes. On rocky upper slopes and ridgetops, this community may be shrubbier with *E. dealbata* a more common component of the canopy. This community occurs as both as woodland and DNG.

3.2.2 Threatened Ecological Communities

On Roseglass and Bimbooria two TECs were mapped. Approximately 487 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across relevant parts of PCT 435, *White Box - White Cypress Pine shrub grass hills woodland*. Approximately 0.3 ha of the Semi-evergreen Vine Thicket EEC listed under the EPBC Act and BC Act was mapped across the entirety of PCT 147 *Mock Olive – Wilga – Peach Bush – Cassinia semi-evergreen vine thicket* (Figure 3.1).

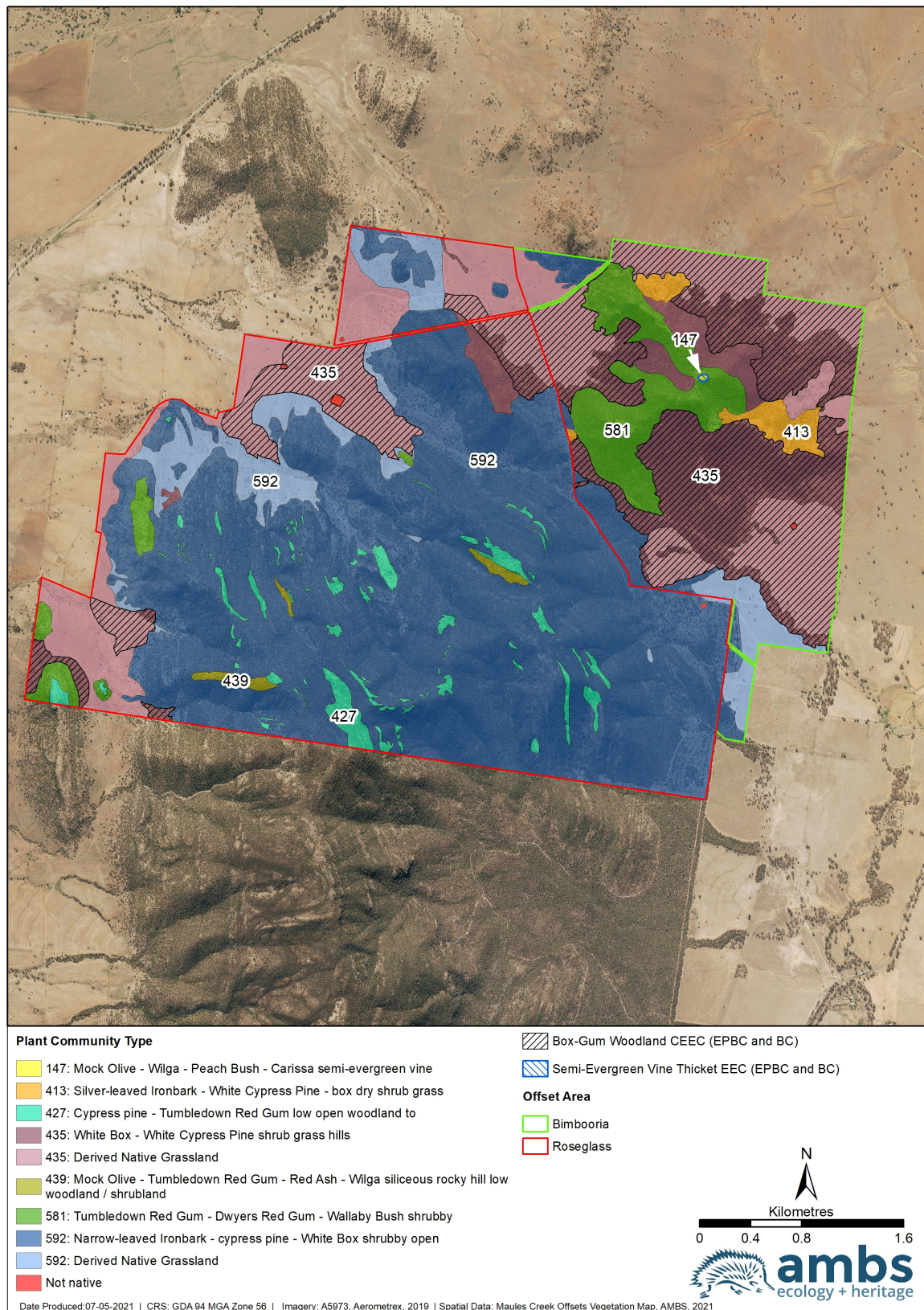


Figure 3.1 Plant Community Type Map for Roseglass and Bimbooria

3.3 Teston South

3.3.1 Plant Community Types and Descriptions

Approximately 335.6 ha of native vegetation was mapped on Teston South, across six separate PCTs. In addition, a small area (0.2 ha) of non-native vegetation was mapped. Table 3.3 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset group is included as Figure 3.2.

Table 3.3 Mapped Plant Community Types for Teston South

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
55: Belah woodland on alluvial plains and low rises			10.4
81: Western Grey Box – cypress pine shrub grass shrub tall woodland	E ¹	E ¹	2.2
435: White Box – White Cypress Pine shrub grass hills woodland	CE ²	CE ²	112.3
435: Derived Native Grassland	CE ³	CE ³	44.8
581: Tumbledown Red Gum – Dwyer's Red Gum – Wallaby Bush shrubby woodland			11.3
592: Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest			103
592: Derived Native Grassland			7
619: Derived Wire Grass grassland			44.6
Total			335.6

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered; E = Endangered.

1 Equivalent to the Grey Box Woodland EEC listed under the BC Act and EPBC Act.

2 Approximately 63.1 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

3 Approximately 17.6 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 55

PCT Name: *Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions*

Vegetation Class: North-west Floodplain Woodlands

EPBC Status: N/A

BC Status: N/A

Belah Woodland (PCT 55) is a tall woodland dominated by *Casaurina cristata* (Belah). Tall shrubs often present include *Geijera parviflora* (Wilga), *Alectryon oleifolius* (Western Rosewood), *Eremophila mitchellii* (Budda), *Capparis mitchellii* (Wild Orange) and *Ventilago viminalis* (Supplejack). The mid-storey includes *Myoporum montanum* (Western Boobialla) and *Rhagodia spinescens* (Thorny Rhagodia). The ground layer includes low shrubs such as *Enchylaena tomentosa* (Ruby Saltbush), *Sclerolaena birchii* (Galvanised Burr) and *Maireana enchylaenoides*, grasses such as *Enteropogon acicularis* (Curly Windmill Grass), *Monachather paradoxus*, *Rytidosperma setaceum* (syn. *Austrodanthonia setaceae*), *Austrostipa scabra*, *Rytidosperma fluvum* (syn. *Austrodanthonia fluva*), *Austrostipa aristiglumis*, *Austrostipa verticillata*, *Aristida leptopoda*, *Paspalidium gracile*, *Sporobolus caroli* and *Panicum queenslandicum*. Forbs include *Einadia nutans*, *Oxalis chnoodes*, *Vittadinia cuneifolia*, *Boerhavia dominii*, *Goodenia fascicularis* and *Solanum esuriale*. Sedges such as *Eleocharis pallens*, rushes such as *Juncus radula* and *Marsilea drummondii* (Nardoo) occur in depressions. Common weed species include *Rapistrum rugosum*, *Carthamus lanatus* and *Medicago polymorpha*.

Within the offset group, this community occurs on alluvial floodplains and drainage lines.

PCT 81

PCT Name: *Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion*

Vegetation Class: Floodplain Transition Woodlands

EPBC Status: Grey Box Woodland EEC

BC Status: Grey Box Woodland EEC

PCT 81 is a tall woodland dominated by *Eucalyptus microcarpa* (Western Grey Box), often in association with *Callitris glaucophylla*. Shrubs are typically sparse or absent and may include *Maireana microphylla* (Small-leaved Bluebush), *Senna artemisioides* (Silver Cassia) and *Acacia deanei* subsp. *deanei* (Dean's Wattle). The ground layer usually is mid-dense to dense and is dominated by grass and forb species. Common grass species include *Austrostipa scabra* (Speargrass), *Aristida ramosa* (Purple Wire Grass) and *Bothriochloa decipiens* (Pitted Bluegrass). Common forb species include *Desmodium varians* (Slender Tick-trefoil), *Glycine tabacina*, *Dichondra repens* (Kidney Weed) and *Oxalis perennans*. The ground fern *Cheilanthes sieberi* (Poison Rock Fern) is also often present.

Within the offset group, this community occurs on alluvial flats.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC (Part)

BC Status: Box-Gum Woodland CEEC (Part)

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakelyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodium* or *Desmodium varians* may be common.

Within the offset group, this community occurs primarily on hill slopes and adjacent flats as both an intact woodland and DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not be equivalent where shrub cover is too high or where condition is too low.

PCT 581

PCT Name: *Tumbledown Red Gum – Dwyer’s Red Gum - Wallaby Bush shrubby woodland of the Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 581 is a mid-high woodland that has a variable overstory composition. The overstory is usually dominated by *Eucalyptus dealbata* (Tumbledown Red Gum), however other overstory species that may be present include *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus dwyeri* (Dwyer’s Red Gum), *Eucalyptus albens* (White Box), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus melanophloia* (Silver-leaved Ironbark). Sometimes a tall shrub or small tree layer is present, containing *Acacia cheelii* (Motherumbah), *Alphitonia excelsa* (Red Ash), *Geijera parviflora* (Wilga) or *Acacia deanei* subsp. *deanei* (Green Wattle). There is usually a dense to mid-dense shrub layer dominated by *Beyeria viscosa* (Sticky Wallaby Bush) and *Notelaea microcarpa* var. *microcarpa* (Mock Olive), along with other shrub species *Olearia* sp. aff. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop-bush), *Cassinia quinquefaria* and *Bursaria spinosa* subsp. *spinosa* (Blackthorn). The ground layer is very sparse with common species including *Teucrium junceum*, *Pomax umbellata*, *Lomandra confertifolia* subsp. *pallida*, *Cheilanthes sieberi* subsp. *sieberi* and grass species such as *Aristida caput-medusae*, *Austrostipa scabra* subsp. *scabra*, *Rytidosperma longifolium*, *Cymbopogon refractus*, *Aristida ramosa*, *Microlaena stipoides* var. *stipoides* and *Paspalidium gracile*.

Within the study area, this community occurs on rocky slopes and hilltops.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop-bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psydrax oleifolia*. The ground layer includes *Desmodium brachypodum* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the study area, this community occurs on rocky slopes and hilltops, as both an intact woodland and DNG and grades into PCT 581 in some locations.

PCT 619

PCT Name: *Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Grasslands

EPBC Status: N/A

BC Status: N/A

Mid-high derived tussock grassland dominated by species of *Aristida* (wire grass) including *Aristida personata*, *Aristida vagans* and *Aristida ramosa*. Other grass species include *Rytidosperma bipartitum*, *Austrostipa aristiglumis*, *Austrostipa verticellata*, *Cymbopogon refractus*, *Rytidosperma racemosum* var. *obtusatum*, *Enteropogon acicularis*, *Leptochloa digitata*, *Cynodon dactylon*, *Bothriochloa macra*, *Themeda australis* and *Eulalia aurea*. The rush *Juncus subglaucus* may be present. Typical forbs include *Boerhavia dominii*, *Rumex brownii*, *Tribulus micrococcus*, *Erodium crinitum*, *Alternanthera denticulata*, *Geranium solanderi* var. *solanderi*, *Dichondra repens*, *Sida spinosa*, *Oxalis perennans*, *Solanum esuriale*, *Wahlenbergia communis*, *Portulaca oleracea* and *Einadia polygonoides*.

Within the offset group, this community occurs mainly on alluvial flats and is derived from a range of communities, including box gum woodlands, belah woodlands and ironbark woodlands.

3.3.2 Threatened Ecological Communities

On Teston South, two TECs were mapped. Approximately 80.7 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across relevant parts of PCT 435, *White Box - White Cypress Pine shrub grass hills woodland*. In addition, a small (2.2 ha) patch of the Grey Box Woodland EEC listed under the BC Act and EPBC Act was mapped (Figure 3.2).

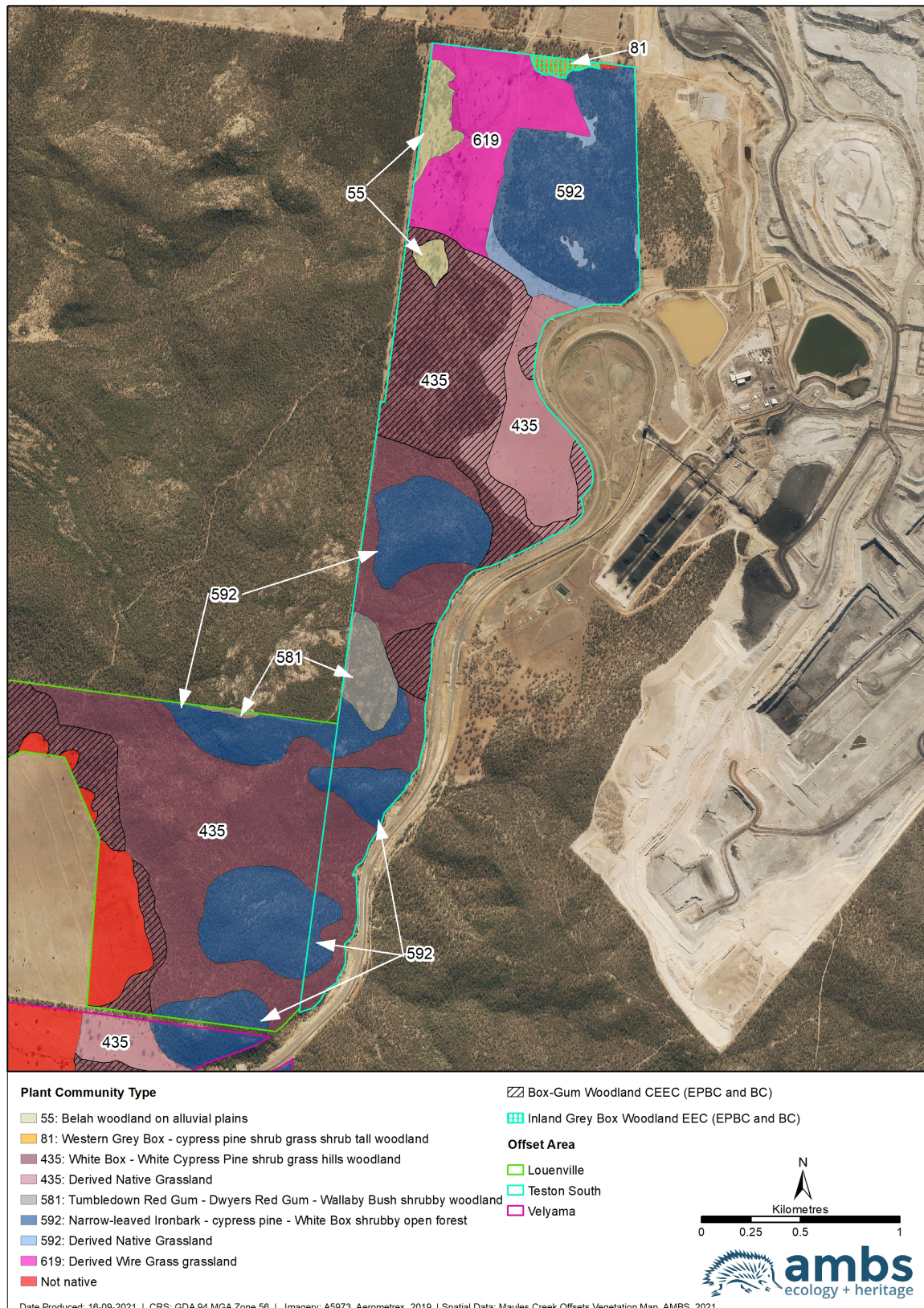


Figure 3.2 Plant Community Type Map for Teston South

3.4 Kelso, Velyama and Louenville

3.4.1 Plant Community Types and Descriptions

Approximately 1,195.8 ha of native vegetation was mapped on Kelso, Velyama and Louenville, across nine separate PCTs. In addition, a large area (208.3 ha) of non-native vegetation was mapped, largely made up of previously cultivated areas, with a high cover of exotic flora species. Table 3.4 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset group is included as Figure 3.3.

Table 3.1 Mapped Plant Community Types for Kelso, Velyama and Louenville

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
55: Belah woodland on alluvial plains and low rises			6
78: River Red Gum riparian tall woodland / open forest wetland			40.9
244: Poplar Box grassy woodland		E ¹	14.6
244: Derived Native Grassland			255.8
413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland			5.3
413: Derived Native Grassland			2.3
429: White Cypress Pine – Poplar Box – Silver-leaved Ironbark viney shrub woodland			7.1
435: White Box - White Cypress Pine shrub grass hills woodland	CE ²	CE ³	211.6
435: Derived Native Grassland	CE ⁴	CE ⁴	65.9
581: Tumbledown Red Gum – Dwyer’s Red Gum - Wallaby Bush shrubby woodland			0.7
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest			382.3
592: Derived Native Grassland			83.5
619: Derived Wire Grass grassland			119.8
Total			1195.8

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered; E = Endangered.

1 Approximately 13.3 ha equivalent to the Poplar Box Grassy Woodland EEC listed under the EPBC Act.

2 Approximately 109.8 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act.

3 Approximately 98.8 ha equivalent to the Box-Gum Woodland CEEC listed under the EPBC Act.

4 Approximately 3 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 55

PCT Name: *Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions*

Vegetation Class: North-west Floodplain Woodlands

EPBC Status: N/A

BC Status: N/A

Belah Woodland (PCT 55) is a tall woodland dominated by *Casuarina cristata* (Belah). Tall shrubs often present include *Geijera parviflora* (Wilga), *Alectryon oleifolius* (Western Rosewood), *Eremophila mitchellii* (Budda), *Apophyllum anomalum* (Warrior Bush), *Capparis mitchellii* (Wild Orange) and *Ventilago viminalis* (Supplejack). The mid-storey includes *Myoporum montanum* (Western Boobialla), *Rhagodia spinescens* (Thorny Rhagodia), *Maireana enchylaenoides*. The ground layer includes low shrubs such as *Enchylaena tomentosa* (Ruby Saltbush), *Sclerolaena birchii* (Galvanised Burr), *Sclerolaena divaricata*, grasses such as *Enteropogon acicularis* (Curly Windmill Grass), *Monachather paradoxus*, *Rytidosperma setaceum* (syn. *Austrodanthonia setaceae*), *Austrostipa scabra*, *Rytidosperma fluvum* (syn. *Austrodanthonia fluva*), *Austrostipa aristiglumis*, *Austrostipa verticillata*, *Aristida leptopoda*, *Paspalidium gracile*, *Sporobolus caroli* and *Panicum queenslandicum*. Forbs include *Einadia nutans*, *Oxalis chnoodes*, *Vittadinia cuneifolia*, *Boerhavia dominii*, *Goodenia fascicularis* and *Solanum esuriale*. Sedges such as *Eleocharis pallens*, rushes such as *Juncus radula* and *Marsilea drummondii* (Nardoo) occur in depressions. Common weed species include *Rapistrum rugosum*, *Carthamus lanatus* and *Medicago polymorpha*.

Within the offset group, this community occurs on alluvial floodplains and drainage lines.

PCT 78

PCT Name: *River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion*

Vegetation Class: Inland Riverine Forests

EPBC Status: N/A

BC Status: N/A

PCT 78 is a tall open forest or woodland dominated by *Eucalyptus camaldulensis* (River Red Gum), often in association with *Angophora floribunda* (Rough-barked Apple), *Eucalyptus melliodora* (Yellow Box) or *Casuarina cunninghamiana* (River Oak). Small trees include *Melaleuca bracteata* (Black Tea-tree). The shrub layer is sparse but may contain species such as *Callistemon sieberi* (River Bottlebrush), *Acacia deanei* (Dean's Wattle), *Leptospermum polygalifolium* (Tantoon), *Leptospermum brachyandrum* and *Notelaea microcarpa* var. *microcarpa* (Mock Olive). Small shrubs include *Swainsona galegifolia* (Smooth Darling Pea), *Nyssanthus erecta* and *Maireana microphylla* (Bluebush). The ground cover is often dense and is composed of *Alternanthera denticulata*, *Commelina cyanea*, *Einadia hastata*, *Ajuga australis*, *Urtica incisa*, *Lomandra longifolia*, *Arundinella nepalensis*, *Austrostipa verticillata*, *Cynodon dactylon*, *Aristida vagans*, *Cymbopogon refractus*, *Paspalidium aversum*, *Lachnagrostis filiformis*, *Paspalum distichum*, *Paspalidium jubiflorum*, *Cyperus gracilis*, *Cyperus gymnocaulos*, *Carex inomitata* and *Carex appressa*.

Within the offset group, this community occurs on alluvial river flats.

PCT 244

PCT Name: *Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)*

Vegetation Class: Floodplain Transition Woodlands

EPBC Status: Poplar Box Grassy Woodland EEC (Part)

BC Status: N/A

PCT 244 is a mid-high to tall woodland or open woodland dominated by *Eucalyptus populnea* (Poplar Box), often in association with *Callitris glaucophylla* (White Cypress Pine) or *Casuarina cristata* (Belah). Shrubs are typically sparse and may include a range of tall shrubs or small trees, including *Geijera parviflora* (Wilga), *Eremophila mitchellii* (Budda) and *Alectryon oleifolius* (Western Rosewood). Common low shrubs include *Maireana microphylla* (Small-leaf Bluebush), *Sclerolaena birchii* (Galvanised Burr) and *Rhagodia spinescens* (Spiny Saltbush). The ground layer is usually dominated by grasses, with common species including *Enteropogon acicularis* (Curly Windmill Grass), *Austrostipa scabra* (Spear Grass) and *Bothriochloa decipiens* (Redleg Grass). A range of forbs may also be present in the ground layer, including *Sida corrugata* (Corrugated Sida), *Wahlenbergia communis* (Tufted Bluebell) and *Glycine tabacina*.

Within the offset group, occurs on alluvial floodplains as both an intact woodland and DNG.

PCT 413

PCT Name: *Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 413 is a tall to mid-high woodland or open forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) sometimes with *Eucalyptus pilligaensis*, *Callitris endlicheri*, *Eucalyptus albens*, *Allocasuarina luehmannii* or *Eucalyptus populnea* subsp. *bimbil*. The small tree *Alectryon oleifolius* subsp. *elongatus* may be present. The shrub layer is usually sparse but mid-dense in places and includes *Acacia deanei* subsp. *paucijuga*, *Solanum ferocissimum*, *Beyeria viscosa*, several subspecies of *Dodonaea viscosa*, *Acacia decora*, *Geijera parviflora*, *Abutilon oxycarpum*, *Pimelea microcephala* subsp. *microcephala* and *Cassinia laevis*. The ground cover is sparse and includes grasses such as *Aristida vagans*, *Cymbopogon refractus*, *Poa sieberiana*, *Enteropogon acicularis*, *Austrostipa verticillata*, *Austrostipa scabra* subsp. *scabra* and *Microlaena stipoides*. The mat-rushes *Lomandra multiflora* subsp. *multiflora* or *Lomandra filiformis* subsp. *filiformis* are often present. Forbs include *Einadia hastata*, *Calotis cuneifolia*, *Einadia nutans* subsp. *nutans*, *Eremophila debilis*, *Chrysocephalum apiculatum*, *Opercularia diphylla*, *Bulbine semibarbata* and *Ranunculus sessiliflorus*. Climbers include *Glycine tabacina* and *Desmodium varians*.

Within the offset group, this community occurs on hillslopes as both an intact woodland and DNG.

PCT 429

PCT Name: *White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 429 is a tall woodland dominated by *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus populnea* subsp. *bimbil* (Poplar Box) or *Eucalyptus melanophloia* (Silver-leaved Ironbark) often with smaller trees of *Acacia leiocalyx* subsp. *leiocalyx*, *Alphitonia excelsa* or *Allocasuarina luehmannii*. The shrub layer contains tall and short shrubs and overall is dense to sparse with a species composition containing elements of semi-evergreen vine thicket (PCT 147). Shrub species include *Carissa spinarum*, *Notelaea microcarpa* var. *microcarpa* (Mock Olive), *Beyeria viscosa* (Sticky Wallaby Bush), *Psydrax odorata* (Lamboto), *Acacia deanei* subsp. *paucijuga* (Green Wattle), *Teucrium junceum*, *Myoporum montanum* (Western Boobialla), *Alstonia constricta* (Quinine Bush), *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush), *Elaeodendron australe* var. *angustifolium* (Narrow-leaved Red Olive Plum), *Solanum ferocissimum* (Spiney Potato Bush), *Capparis mitchellii* (Native Orange) and *Abutilon oxycarpum* (Lantern Bush). Vines include *Parsonsia eucalyptophylla* (Gargaloo), *Clematis microphylla* and *Pandorea pandorana* (Wonga Vine). The ground cover is sparse to very sparse and includes species such as *Aristida vagans*, *Aristida ramosa*, *Austrostipa scabra* subsp. *scabra*, *Ancistrachne uncinulata*, *Eragrostis leptostachya*, *Eragrostis lacunaria*, *Einadia hastata*, *Ranunculus sessiliflorus* var. *sessiliflorus*, *Calotis lappulacea*, *Vittadinia sulcata*, *Vittadinia dissecta* var. *hirta*, *Daucus glochidiatus sens lat.*, *Plantago debilis* and *Dichondra* sp. A.

Within the offset group, this community occurs on lower slopes and flats as a disturbed woodland.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC (Part)

BC Status: Box-Gum Woodland CEEC (Part)

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakleyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodium* or *Desmodium varians* may be common.

Within the offset group, this community occurs on hill slopes and adjacent flats as both an intact woodland and as DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not conform where shrub cover is too high or where condition is too low.

PCT 581

PCT Name: *Tumbledown Red Gum – Dwyer's Red Gum - Wallaby Bush shrubby woodland of the Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 581 is a mid-high woodland that has a variable overstory composition. The overstory is usually dominated by *Eucalyptus dealbata* (Tumbledown Red Gum), however other overstory species that may be present include *Callitris glaucophylla*, *Eucalyptus dwyeri*, *Eucalyptus albens*, *Eucalyptus crebra* and *Eucalyptus melanophloia*. Sometimes a tall shrub or small tree layer is present, containing *Acacia cheelii*, *Alphitonia excelsa*, *Geijera parviflora* or *Acacia deanei* subsp. *deanei*. There is usually a dense to mid-dense shrub layer dominated by *Beyeria viscosa* and *Notelaea microcarpa* var. *microcarpa*, along with other shrub species *Olearia* sp. aff. *elliptica*, *Dodonaea viscosa* subsp. *angustifolia*, *Cassinia quinquefaria* and *Bursaria spinosa* subsp. *spinosa*. The ground layer is very sparse with common species including *Teucrium junceum*, *Pomax umbellata*, *Lomandra confertifolia* subsp. *pallida*, *Cheilanthes sieberi* subsp. *sieberi* and grass species such as *Aristida caput-medusae*, *Austrostipa scabra* subsp. *scabra*, *Rytidosperma longifolium*, *Cymbopogon refractus*, *Aristida ramosa*, *Microlaena stipoides* var. *stipoides* and *Paspalidium gracile*.

Within the study area, this community occurs on rocky slopes and hilltops.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psydrax oleifolia*. The ground layer includes *Desmodium brachypodum* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the study area, this community occurs on rocky slopes and hilltops, as both an intact woodland and DNG and grades into PCT 581 in some locations.

PCT 619

PCT Name: *Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Grasslands

EPBC Status: N/A

BC Status: N/A

PCT 619 is a mid-high derived tussock grassland dominated by species of *Aristida* (wire grass) including *Aristida personata*, *Aristida vagans* and *Aristida ramosa*. Other grass species include *Rytidosperma bipartitum*, *Austrostipa aristiglumis*, *Austrostipa verticellata*, *Cymbopogon refractus*, *Rytidosperma racemosum* var. *obtusatum*, *Rytidosperma laeve*, *Rytidosperma erianthum*, *Enteropogon acicularis*, *Leptochloa digitata*, *Cynodon dactylon*, *Bothriochloa macra*, *Themeda australis* and *Eulalia aurea*. The rush *Juncus subglaucus* may be present. Typical forbs include *Boerhavia dominii*, *Rumex brownii*, *Tribulus micrococcus*, *Erodium crinitum*, *Alternanthera denticulata*, *Geranium solanderi* var. *solanderi*, *Dichondra repens*, *Sida spinosa*, *Oxalis perennans*, *Solanum esuriale*, *Wahlenbergia communis*, *Portulaca oleracea* and *Einadia polygonoides*.

Within the offset group, this community occurs mainly on alluvial flats and is derived from a range of communities, including box gum woodlands, belah woodlands and ironbark woodlands.

3.4.2 Threatened Ecological Communities

On Kelso, Velyama and Louenville, two TECs were mapped. Approximately 101.8 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and 112.8 ha under the BC Act was mapped across relevant parts of PCT 435, *White Box – White Cypress Pine shrub grass hills woodland* (both woodland and DNG forms). A 13.3 ha patch of the Poplar Box Grassy Woodland EEC listed under the EPBC Act was also mapped (Figure 3.3).

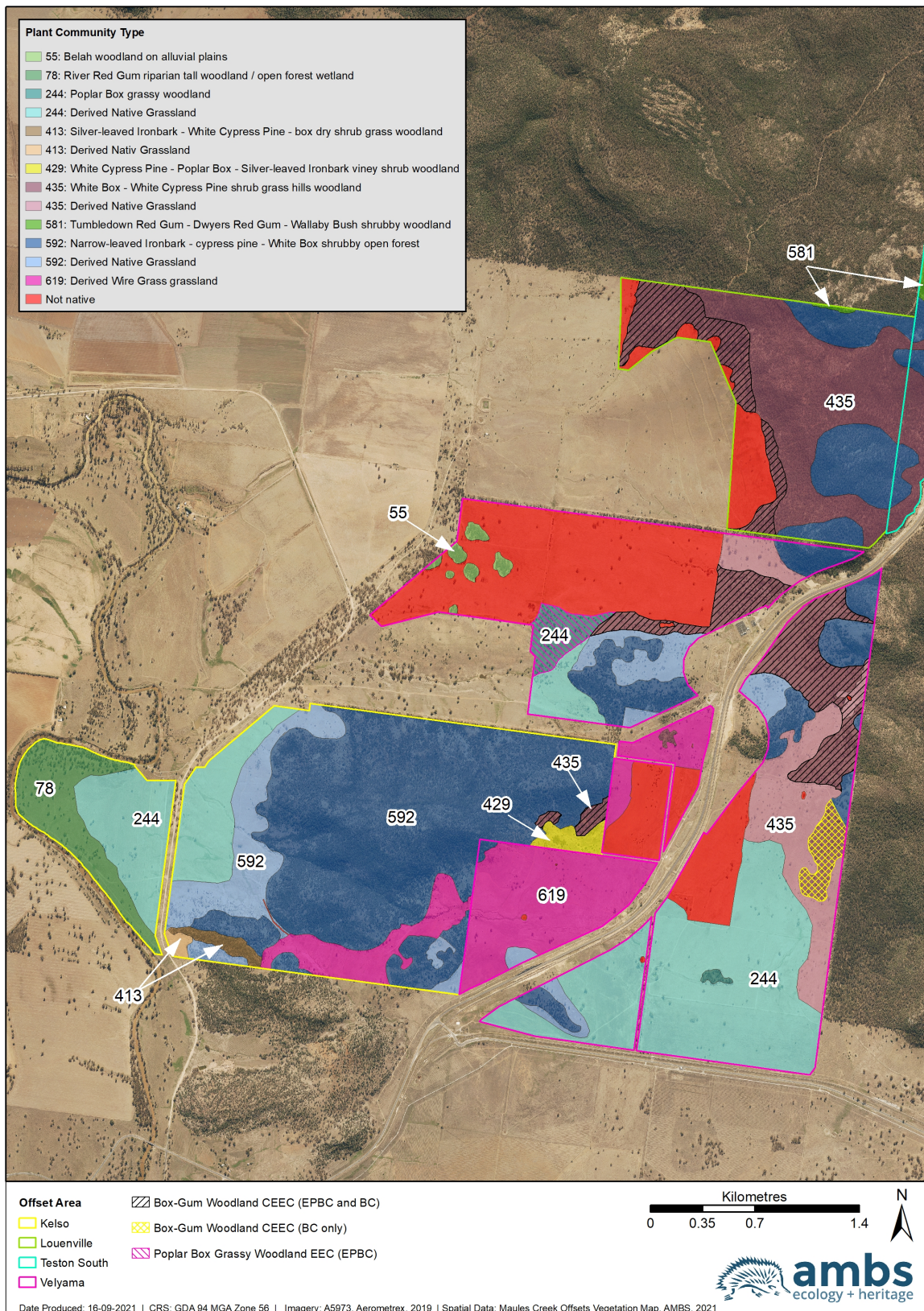


Figure 3.1 Plant Community Type Map for Kelso, Velyama and Louenville

3.5 Onavale

3.5.1 Plant Community Types and Descriptions

Approximately 249.6 ha of native vegetation was mapped on Onavale, across six separate PCTs. In addition, a large area (307.5 ha) of non-native vegetation was mapped, largely made up of previously cultivated areas, with a high cover of exotic flora species. Table 3.5 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset is included as Figure 3.4.

Table 3.2 Mapped Plant Community Types for Onavale

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
55: Belah woodland on alluvial plains			1.2
101: Poplar Box - Yellow Box - Western Grey Box grassy woodland			18.6
101: Derived Native Grassland			19.7
413: Silver-leaved Ironbark – White Cypress Pine – box dry shrub grass woodland			27.8
413: Derived Native Grassland			56.8
435: White Box - White Cypress Pine shrub grass hills woodland	CE ¹	CE ¹	10.3
435: Derived Native Grassland	CE ¹	CE ¹	30
581: Tumbledown Red Gum – Dwyer’s Red Gum - Wallaby Bush shrubby woodland			5
592: Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest			76.5
592: Derived Native Grassland			3.7
Total			249.6

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered.

1 Equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 55

PCT Name: *Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions*

Vegetation Class: North-west Floodplain Woodlands

EPBC Status: N/A

BC Status: N/A

Belah Woodland (PCT 55) is a tall woodland dominated by *Casaurina cristata* (Belah). Tall shrubs often present include *Geijera parviflora* (Wilga), *Alectryon oleifolius* (Western Rosewood), *Eremophila mitchellii* (Budda), *Apophyllum anomalum* (Warrior Bush), *Capparis mitchellii* (Wild Orange) and *Ventilago viminalis* (Supplejack). The mid-storey includes *Myoporum montanum* (Western Boobialla), *Rhagodia spinescens* (Thorny Rhagodia), *Maireana enchylaenoides*. The ground layer includes low shrubs such as *Enchylaena tomentosa* (Ruby Saltbush), *Sclerolaena birchii* (Galvanised Burr), *Sclerolaena divericata*, grasses such as *Enteropogon acicularis* (Curly Windmill Grass), *Monachather paradoxus*, *Rytidosperma setaceum* (syn. *Austrodanthonia setaceae*), *Austrostipa scabra*, *Rytidosperma fluvum* (syn. *Austrodanthonia fluva*), *Austrostipa aristiglumis*, *Austrostipa verticillata*, *Aristida leptopoda*, *Paspalidium gracile*, *Sporobolus caroli* and *Panicum queenslandicum*. Forbs include *Einadia nutans*, *Oxalis chnoodes*, *Vittadinia cuneifolia*, *Boerhavia dominii*, *Goodenia fascicularis* and *Solanum esuriale*. Sedges such as *Eleocharis pallens*, rushes such as *Juncus radula* and *Marsilea drummondii* (Nardoo) occur in depressions. Common weed species include *Rapistrum rugosum*, *Carthamus lanatus* and *Medicago polymorpha*.

Within the offset group, this community occurs on alluvial floodplains.

PCT 101

PCT Name: *Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion*

Vegetation Class: Brigalow Clay Plain Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 101 is tall woodland or open woodland dominated by *Eucalyptus populnea* subsp. *bimbil* (Poplar Box) sometimes with *Eucalyptus melliodora* (Yellow Box), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus melanophloia* (Silver-leaved Ironbark). A very sparse shrub layer may be present. Shrub species include *Geijera parviflora* (Wilga), *Notalea microcarpa* (Mock Olive), *Maireana microphylla*, *Capparis mitchellii* (Wild Orange) and *Alectryon oleifolius* (Western Rosewood). The ground cover is usually dense and is dominated by a rich array of grass and forb species. Grass species include *Austrostipa verticillata*, *Dichanthium sericeum* subsp. *sericeum*, *Bothriochloa decipiens*, *Rytidosperma bipartitum*, *Enteropogon acicularis*, *Aristida personata*, *Aristida ramosa*, *Austrostipa aristiglumis*, *Austrostipa scabra* subsp. *scabra*, *Themeda australis*, *Eulalia aurea*, *Paspalidium jubiflorum*, *Chloris truncata* and *Chloris ventricosa*. Forb species include *Rumex brownii*, *Einadia nutans*, *Cotula australis*, *Maireana enchylaenoides*, *Erodium crinitum*, *Calotis lappulacea*, *Rostellularia adscendens* subsp. *adscendens*, *Sida corrugata*, *Oxalis exilis*, *Einadia hastata*, *Vittadinia dissecta* var. *hirta*, *Vittadinia muelleri*, *Vittadinia sulcata*, *Chrysocephalum apiculatum*, *Solanum cinereum*, *Abutilon oxycarpum*, *Dichondra* sp. A, *Wahlenbergia stricta* subsp. *stricta*, *Pycnosorus globosus*, *Goodenia fascicularis* and *Brunoniella australis*.

Within the offset group, this community occurs on alluvial flats along drainage lines, both as an intact woodland and as DNG.

PCT 413

PCT Name: *Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 413 is a tall to mid-high woodland or open forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) sometimes with *Eucalyptus pilligaensis*, *Callitris endlicheri*, *Eucalyptus albens*, *Allocasuarina luehmannii* or *Eucalyptus populnea* subsp. *bimbil*. The small tree *Alectryon oleifolius* subsp. *elongatus* may be present. The shrub layer is usually sparse but mid-dense in places and includes *Acacia deanei* subsp. *paucijuga*, *Solanum ferocissimum*, *Beyeria viscosa*, several subspecies of *Dodonaea viscosa*, *Acacia decora*, *Geijera parviflora*, *Abutilon oxycarpum*, *Pimelea microcephala* subsp. *microcephala* and *Cassinia laevis*. The ground cover is sparse and includes grasses such as *Aristida vagans*, *Cymbopogon refractus*, *Poa sieberiana*, *Enteropogon acicularis*, *Austrostipa verticillata*, *Austrostipa scabra* subsp. *scabra* and *Microlaena stipoides*. The mat-rushes *Lomandra multiflora* subsp. *multiflora* or *Lomandra filiformis* subsp. *filiformis* are often present. Forbs include *Einadia hastata*, *Calotis cuneifolia*, *Einadia nutans* subsp. *nutans*, *Eremophila debilis*, *Chrysocephalum apiculatum*, *Opercularia diphylla*, *Bulbine semibarbata* and *Ranunculus sessiliflorus*. Climbers include *Glycine tabacina* and *Desmodium varians*.

Within the offset group, this community occurs on flats and low hills as both as intact woodland and DNG.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC

BC Status: Box-Gum Woodland CEEC

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakleyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodium* or *Desmodium varians* may be common.

Within the offset group, this community occurs on flats and low hills as both as intact woodland and DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not be equivalent where shrub cover is too high or where condition is too low.

PCT 581

PCT Name: *Tumbledown Red Gum – Dwyer's Red Gum - Wallaby Bush shrubby woodland of the Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 581 is a mid-high woodland that has a variable overstory composition. The overstory is usually dominated by *Eucalyptus dealbata* (Tumbledown Red Gum), however other overstory species that may be present include *Callitris glaucophylla*, *Eucalyptus dwyeri*, *Eucalyptus albens*, *Eucalyptus crebra* and *Eucalyptus melanophloia*. Sometimes a tall shrub or small tree layer is present, containing *Acacia cheelii*, *Alphitonia excelsa*, *Geijera parviflora* or *Acacia deanei* subsp. *deanei*. There is usually a dense to mid-dense shrub layer dominated by *Beyeria viscosa* and *Notelaea microcarpa* var. *microcarpa*, along with other shrub species *Olearia* sp. aff. *elliptica*, *Dodonaea viscosa* subsp. *angustifolia*, *Cassinia quinquefaria* and *Bursaria spinosa* subsp. *spinosa*. The ground layer is very sparse with common species including *Teucrium junceum*, *Pomax umbellata*, *Lomandra confertifolia* subsp. *pallida*, *Cheilanthes sieberi* subsp. *sieberi* and grass species such as *Aristida caput-medusae*, *Austrostipa scabra* subsp. *scabra*, *Rytidosperma longifolium*, *Cymbopogon refractus*, *Aristida ramosa*, *Microlaena stipoides* var. *stipoides* and *Paspalidium gracile*.

Within the offset group, this community occurs on rocky rises.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psydrax oleifolia*. The ground layer includes *Desmodium brachypodium* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the offset group, this community occurs on hilltops and slopes as both an intact woodland and DNG.

3.5.2 Threatened Ecological Communities

On Onavale, one TEC was mapped. Approximately 40.3 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across all of PCT 435, *White Box - White Cypress Pine shrub grass hills woodland* (Figure 3.4).

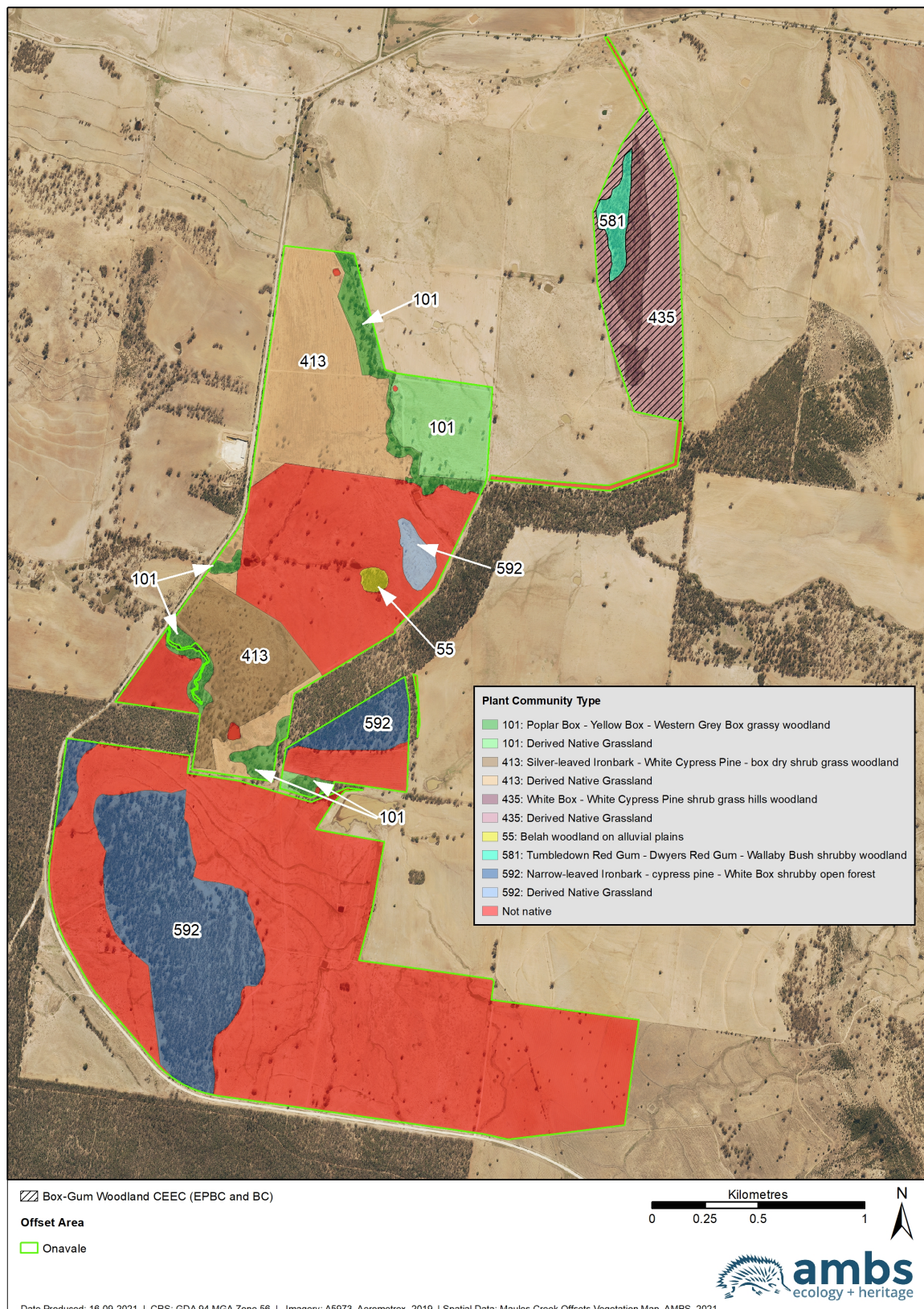


Figure 3.2 Plant Community Type Map for Onavale

3.6 Wollandilly

3.6.1 Plant Community Types and Descriptions

Approximately 799.4 ha of native vegetation was mapped on Wollandilly, across six separate PCTs. Table 3.6 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset is included as Figure 3.5.

Table 3.3 Mapped Plant Community Types for Wollandilly

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
101: Poplar Box - Yellow Box - Western Grey Box grassy woodland		E ¹	52.3
101: Derived Native Grassland			115.9
413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland			85.3
413: Derived Native Grassland			265.2
435: White Box - White Cypress Pine shrub grass hills woodland	CE ²	CE ²	27.5
435: Derived Native Grassland			35.2
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest			86.2
592: Derived Native Grassland			28.4
599: Blakely's Red Gum - Yellow Box grassy tall woodland	CE ²	CE ²	24.8
599: Derived Native Grassland	CE ³	CE ³	21.5
619: Derived Wire Grass grassland			57.1
Total			799.4

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered; E = Endangered.

1 Approximately 50.3 ha equivalent to the Poplar Box Grassy Woodland EEC listed under the EPBC Act.

2 Equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

3 Approximately 17.3 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 101

PCT Name: *Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion*

Vegetation Class: Brigalow Clay Plain Woodlands

EPBC Status: Poplar Box Grassy Woodland EEC (Part)

BC Status: N/A

PCT 101 is tall woodland or open woodland dominated by *Eucalyptus populnea* subsp. *bimbil* (Poplar Box) sometimes with *Eucalyptus melliodora* (Yellow Box), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus melanophloia* (Silver-leaved Ironbark). A very sparse shrub layer may be present, or it is absent. Shrub species include *Geijera parviflora* (Wilga), *Notalea microcarpa* (Mock Olive), *Maireana microphylla*, *Capparis mitchellii* (Wild Orange) and *Alectryon oleifolius* (Western Rosewood). The ground cover is usually dense and is dominated by a rich array of grass and forb species. Grass species include *Austrostipa verticillata*, *Dichanthium sericeum* subsp. *sericeum*, *Bothriochloa decipiens*, *Rytidosperma bipartitum*, *Enteropogon acicularis*, *Aristida personata*, *Aristida ramosa*, *Austrostipa aristiglumis*, *Austrostipa scabra* subsp. *scabra*, *Themeda australis*, *Eulalia aurea*, *Paspalidium jubiflorum*, *Chloris truncata* and *Chloris ventricosa*. Forb species include *Rumex brownii*, *Einadia nutans*, *Cotula australis*, *Maireana enchylaenoides*, *Erodium crinitum*, *Calotis lappulacea*, *Rostellularia adscendens* subsp. *adscendens*, *Sida corrugata*, *Oxalis exilis*, *Einadia hastata*, *Vittadinia dissecta* var. *hirta*, *Vittadinia muelleri*, *Vittadinia sulcata*, *Chrysocephalum apiculatum*, *Solanum cinereum*, *Abutilon oxycarpum*, *Dichondra* sp. A, *Wahlenbergia stricta* subsp. *stricta*, *Pycnosorus globosus*, *Goodenia fascicularis* and *Brunoniella australis*.

Within the offset group, this community occurs on alluvial flats along watercourses as both an intact woodland and DNG.

PCT 413

PCT Name: *Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Wialda region, Bragalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 413 is a tall to mid-high woodland or open forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) sometimes with *Eucalyptus pilligaensis*, *Callitris endlicheri*, *Eucalyptus albens*, *Allocasuarina luehmannii* or *Eucalyptus populnea* subsp. *bimbil*. The small tree *Alectryon oleifolius* subsp. *elongatus* may be present. The shrub layer is usually sparse but mid-dense in places and includes *Acacia deanei* subsp. *paucijuga*, *Solanum ferocissimum*, *Beyeria viscosa*, several subspecies of *Dodonaea viscosa*, *Acacia decora*, *Geijera parviflora*, *Abutilon oxycarpum*, *Pimelea microcephala* subsp. *microcephala* and *Cassinia laevis*. The ground cover is sparse and includes grasses such as *Aristida vagans*, *Cymbopogon refractus*, *Poa sieberiana*, *Enteropogon acicularis*, *Austrostipa verticillata*, *Austrostipa scabra* subsp. *scabra* and *Microlaena stipoides*. The mat-rushes *Lomandra multiflora* subsp. *multiflora* or *Lomandra filiformis* subsp. *filiformis* are often present. Forbs include *Einadia hastata*, *Calotis cuneifolia*, *Einadia nutans* subsp. *nutans*, *Eremophila debilis*, *Chrysocephalum apiculatum*, *Opercularia diphylla*, *Bulbine semibarbata* and *Ranunculus sessiliflorus*. Climbers include *Glycine tabacina* and *Desmodium varians*.

Within the offset group, this community occurs on low hills and flats as both an intact woodland and DNG.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC (woodland)

BC Status: Box-Gum Woodland CEEC (woodland)

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakleyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodum* or *Desmodium varians* may be common.

Within the offset group, this community occurs on low hills and flats as both an intact woodland and DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not be equivalent where shrub cover is too high or where condition is too low.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psydrax oleifolia*. The ground layer includes *Desmodium brachypodum* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the offset group, this community occurs on slopes and ridgetops as both an intact woodland and DNG.

PCT 599

PCT Name: *Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Grassy Woodlands

EPBC Status: Box-Gum Woodland CEEC (woodland, part DNG)

BC Status: Box-Gum Woodland CEEC (woodland, part DNG)

PCT 599 is a tall woodland dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus melliodora* (Yellow Box). The shrub layer is absent to sparse and includes species such as *Acacia implexa*, *Olearia elliptica* subsp. *elliptica*, *Geijera parviflora*, *Myoporum montanum*, or *Pimelea neo-anglica*. The ground cover is usually mid-dense to dense dominated by grasses and forbs. Grass species include *Aristida personata*, *Austrostipa verticillata*, *Themeda australis*, *Bothriochloa macra* or *Dichanthium sericeum*. Forb species include *Dichondra repens*, *Geranium solanderi*, *Hydrocotyle laxiflora*, *Rumex brownii*, *Scutellaria humilis*, *Hypericum gramineum*, *Senecio quadridentatus*, *Haloragis heterophylla*, *Dianella longifolia* var. *longifolia* and *Chrysocephalum apiculatum*.

Within the offset group, this community occurs mainly on alluvial flats as both an intact woodland and DNG.

PCT 619

PCT Name: *Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Grasslands

EPBC Status: N/A

BC Status: N/A

PCT 619 is a mid-high derived tussock grassland dominated by species of *Aristida* (wire grass) including *Aristida personata*, *Aristida vagans* and *Aristida ramosa*. Other grass species include *Rytidosperma bipartitum*, *Austrostipa aristiglumis*, *Austrostipa verticellata*, *Cymbopogon refractus*, *Rytidosperma racemosum* var. *obtusatum*, *Rytidosperma laeve*, *Rytidosperma erianthum*, *Enteropogon acicularis*, *Leptochloa digitata*, *Cynodon dactylon*, *Bothriochloa macra*, *Themeda australis* and *Eulalia aurea*. The rush *Juncus subglaucus* may be present. Typical forbs include *Boerhavia dominii*, *Rumex brownii*, *Tribulus micrococcus*, *Erodium crinitum*, *Alternanthera denticulata*, *Geranium solanderi* var. *solanderi*, *Dichondra repens*, *Sida spinosa*, *Oxalis perennans*, *Solanum esuriale*, *Wahlenbergia communis*, *Portulaca oleracea* and *Einadia polygonoides*.

Within the offset group, this community occurs mainly on alluvial flats and slopes and is derived from a range of communities, including box gum woodlands.

3.6.2 Threatened Ecological Communities

On Wollandilly two Commonwealth and one State listed TECs were mapped. Approximately 69.6 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across relevant parts of PCT 435, *White Box - White Cypress Pine shrub grass hills woodland* and PCT 599, *Blakely's Red Gum - Yellow Box grassy tall woodland*. In addition, approximately 50.3 ha of the Poplar Box Grassy Woodland EEC listed under the EPBC Act was mapped across relevant parts of PCT 101, *Poplar Box - Yellow Box - Western Grey Box grassy woodland* (Figure 3.5).

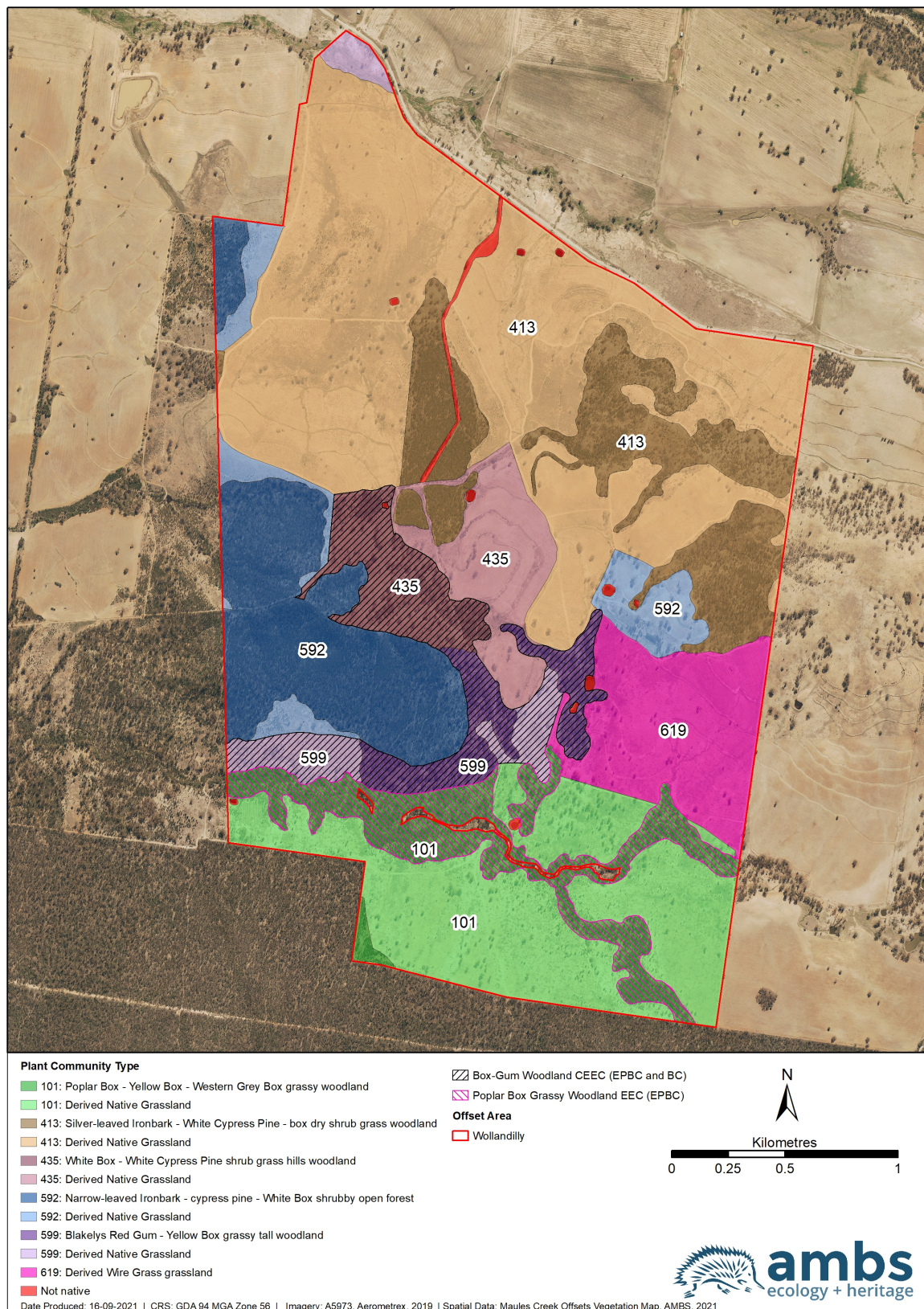


Figure 3.3 Plant Community Type Map for Wollandilly

3.7 Mt Lindesay

3.7.1 Plant Community Types and Descriptions

Approximately 2,334.3 ha of native vegetation was mapped on Mt Lindesay, across nine separate PCTs. Table 3.7 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset is included as Figure 3.6.

Table 3.4 Mapped Plant Community Types for Mt Lindesay

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
492: Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest			505.6
492: Derived Native Grassland			42.9
508: Blakely's Red Gum – Stringybark – Rough-barked Apple open forest	CE ¹	CE ¹	15.5
510: Blakely's Red Gum - Yellow Box grassy woodland	CE ¹	CE ¹	609.6
510: Derived Native Grassland	CE ²	CE ²	82.7
569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland	CE ³	CE ³	123.3
571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland	CE ¹	CE ¹	35.8
571: Derived Native Grassland	CE ¹	CE ¹	45.7
572: Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest			435.4
572: Derived Native Grassland			0.6
574: Tea-tree riparian shrubland / heathland wetland			1.9
1165: Silvertop Stringybark - Orange Gum shrubby open forest			385.3
1165: Derived Native Grassland			0.5
1306: White Box - Red Stringybark shrubby woodlands			49.5
Total			2,334.3

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered.

1 Equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

2 Approximately 81 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

3 Approximately 92.5 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 492

PCT Name: *Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion*

Vegetation Class: New England Grassy Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 492 is a tall or mid-high open forest dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), *Eucalyptus melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple). The shrub layer varies from mid-dense with species including *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Bursaria spinosa* subsp. *spinosa* (Blackthorn), *Melicytus dentatus* (Tree Violet), *quinquefaria*, *Pittosporum undulatum* (Sweet Pittosporum). Vines include *Eustrephus latifolius* (Wombat Berry), *Pandorea pandorana* (Wonga Vine) and *Clematis glycinoides* (Headache Vine). The scramblers *Desmodium varians* and *Glycine clandestina* may also be common. The ground layer is sparse and usually grassy, with common grass species including *Rytidosperma racemosum* var. *racemosum*, *Elymus scaber* var. *scaber*, *Bothriochloa macra*, *Rytidosperma laeve*, *Microlaena stipoides* var. *stipoides*, *Echinopogon ovatus* and *Poa labillardierei* var. *labillardierei*. Sedges include *Carex breviculmis* and *Carex incomitata*. Forb species include *Dichondra repens*, *Hydrocotyle laxiflora*, *Sigesbeckia orientalis* subsp. *orientalis*, *Geranium solanderi* var. *solanderi*, *Acaena novae-zelandiae*, *Swainsona galegifolia*, *Arthropodium milleflorum*, *Asperula conferta*, *Hypericum gramineum*, *Galium gaudichaudii*, and *Plantago debilis*.

Within the offset group, this community occurs on slopes in hilly terrain as both an intact woodland and DNG.

PCT 508

PCT Name: *Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandewar Bioregion and western New England Tableland Bioregion*

Vegetation Class: Northern Tableland Dry Sclerophyll Forests

EPBC Status: Box-Gum Woodland CEEC

BC Status: Box-Gum Woodland CEEC

PCT 508 is a tall woodland to open forest with an overstorey dominated by *Eucalyptus blakelyi* (Blakely's Red Gum), *Angophora floribunda* (Rough-barked Apple) and a stringybark species, most commonly *Eucalyptus macrorhyncha*. The shrub layer is usually absent, but when present it is sparse and may contain *Acacia neriiifolia*, *Leptospermum brevipes*, *Cassinia quinquefaria*, *Leucopogon muticus*, *Hibbertia obtusifolia*, *Melichrus urceolatus*, *Pultenaea* sp. G, *Brachyloma daphnoides* subsp. *glabrum*, *Lissanthe strigosa*, *Olearia elliptica*, *Olearia viscidula*, *Hibbertia riparia*, *Dodonaea viscosa* var. *angustifolia*, *Acacia brownii* or *Grevillea triternata*. The ground layer comprises a mix of grasses and forbs such as *Cheilanthes sieberi* subsp. *sieberi*, *Aristida ramosa*, *Cymbopogon refractus*, *Aristida vagans*, *Geranium solanderi* var. *solanderi*, *Dichelachne micrantha*, *Lomandra multiflora*, *Eragrostis leptostachya*, *Echinopogon caespitosus* var. *caespitosus* and *Panicum effusum* as the most frequent species along with occasional *Wahlenbergia planifolia* subsp. *pilosa*, *Oxalis chnoodes*, *Joycea pallida*, *Acaena novae-zelandiae*, *Viola betonicifolia*, *Veronica calycina*, *Goodenia rotundifolia*, *Stylidium laricifolium*, *Laxmannia gracilis*, *Poranthera microphylla*, and *Adiantum hispidulum*.

Within the offset group, this community occurs on slopes in hilly terrain.

PCT 510

PCT Name: *Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion*

Vegetation Class: New England Grassy Woodlands

EPBC Status: Box-Gum Woodland CEEC (woodland, part DNG)

BC Status: Box-Gum Woodland CEEC (woodland, part DNG)

PCT 510 is a tall open forest or woodland that is dominated by *Angophora floribunda* (Rough-barked Apple), *Eucalyptus melliodora* (Yellow Box) and/or *Eucalyptus blakelyi* (Red Gum). The shrub layer is either sparse or absent, with typical species including *Acacia implexa* (Hickory Wattle), *Acacia fimbriata* (Fringed Wattle), *Cassinia quinquefaria* or *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush). The ground layer is well developed with dominant species including *Themeda australis* (Kangaroo Grass), *Poa sieberiana* (Snow Grass), *Cymbopogon refractus* (Barbed Wire Grass) and *Lepedeza juncea* subsp. *sericea*. Less frequent groundcover species include *Aristida ramosa*, *Sorghum leiocladum*, *Dianella revoluta* var. *revoluta*, *Microlaena stipoides* var. *stipoides*, *Desmodium brachypodum*, *Viola betonicifolia*, *Chrysocephalum apiculatum*, *Glycine tabacina*, *Lomandra longifolia*, *Bothriochloa macra* and *Carex breviculmis*.

Within the offset group, this community occurs on flats and lower slopes as both an intact woodland and DNG.

PCT 569

PCT Name: *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland of the NSW Northern Tablelands*

Vegetation Class: Temperate Montane Grasslands

EPBC Status: Box-Gum Woodland CEEC (Part)

BC Status: Box-Gum Woodland CEEC (Part)

PCT 569 is a mid-high to tall tussock grassland dominated by *Poa sieberiana* or *labillardierei* var. *labillardierei* (Snow Grass), often with *Themeda australis* (Kangaroo Grass), *Sorghum leiocladum* (Wild Sorghum), *Echinopogon caespitosus* var. *caespitosus*, *Echinopogon ovatus*, *Imperata cylindrica* var. *major* (Blady Grass), *Panicum effusum* or *Bothriochloa macra* (Redleg Grass) and *Microlaena stipoides*. The sub-shrubs *Lepedeza juncea* subsp. *sericea* and *Pimelea curviflora* var. *divergens* may be present. Scattered tall shrubs include *Bursaria spinosa* subsp. *spinosa*, *Acacia filicifolia*, *Melicytus dentatus*, *Leucopogon lanceolatus* var. *lanceolatus*. Forb species include *Dichondra repens*, *Geranium solanderi* var. *solanderi*, *Asperula conferta*, *Dianella revoluta* var. *revoluta*, *Acaena ovina*, *Scleranthus biflorus*, *Swainsona galegifolia*, *Senecio lautus* var. *dissectifolius*, *Viola betonicifolia* and *Chrysocephalum apiculatum*.

Within the offset group, this community occurs mainly on flats and lower slopes at higher elevations and is derived from a range of box and stringybark dominated communities.

PCT 571

PCT Name: *Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion*

Vegetation Class: New England Dry Sclerophyll Forests

EPBC Status: Box-Gum Woodland CEEC

BC Status: Box-Gum Woodland CEEC

PCT 571 is a tall open forest with a canopy dominated by *Eucalyptus viminalis* (Ribbon Gum), *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus melliodora* (Yellow Box), often in association with *Eucalyptus blakelyi* (Blakely's Red Gum). A sparse shrub layer may be present, with common shrubs including *Lissanthe strigosa* (Peach Heath), *Cassinia quinquefaria*, *Bursaria spinosa* subsp. *spinosa* (Blackthorn), *Olearia elliptica* (Sticky Daisy Bush). The ground layer is usually well developed and dominated by grasses, with common species including *Poa sieberiana* subsp. *sieberiana* (Snow Grass), *Themeda australis* (Kangaroo Grass), *Bothriochloa macra* (Red Grass) and *Sporobolus creber*. Common forb species include *Geranium solanderi* var. *solanderi* (Native Geranium), *Lespedeza juncea* subsp. *sericea*, *Lotus australis* (Australian Trefoil), *Mentha satureioides* (Creeping Mint).

Within the offset group, this community occurs on lower slopes and alluvial flats along watercourses as both an intact woodland and a derived native grassland.

PCT 572

PCT Name: *Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest in the Kaputar area of the Nandewar Bioregion*

Vegetation Class: New England Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 572 is a tall to very tall open forest community dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), *Eucalyptus elliptica* (Bendemeer White Gum) and *Eucalyptus viminalis* (Ribbon Gum). Low shrubs are very sparse, with *Olearia viscidula* (Wallaby Weed), *Melichrus urceolatus* (Urn Heath) and *Lissanthe strigosa* subsp. *subulata* (Peach Heath) occasionally forming a low shrub layer in drier sites. Other shrub species recorded in moister sites include *Polyscias sambucifolia*, *Bursaria spinosa*, *Acacia maidenii*, *Hibbertia obtusifolia*, *Coprosma quadrifida*, *Syzygium smithii* and *Acacia pruinosa*. There is a well developed ground layer of forbs, grasses and ferns with *Poa sieberiana* (Snow Grass), *Rytidosperma racemosum* var. *racemosum*, *Lomandra longifolia* (Spiny-headed Mat-rush), *Geranium solanderi* var. *solanderi*, *Themeda australis*, *Swainsona galegifolia*, *Desmodium varians*, *Ranunculus lappaceus*, *Eustrephus latifolius*, *Rubus parvifolius*, *Doodia aspera*, *Adiantum aethiopicum* and *Echinopogon caespitosus* var. *caespitosus* most frequent.

Within the offset group, this community occurs on slopes in hilly terrain, often along watercourses, as both an intact woodland and DNG.

PCT 574

PCT Name: *Tea-tree riparian shrubland / heathland wetland on drainage areas of Nandewar Bioregion and New England Tableland Bioregion*

Vegetation Class: Northern Montane Heaths

EPBC Status: N/A

BC Status: N/A

PCT 574 is a mid-high to very tall shrubland dominated by a variety of shrubs including *Leptospermum polygalifolium* subsp. *transmontanum*, *Leptospermum novae-angliae*, *Callistemon sieberi* and *Callistemon viminalis*. The most prominent ground layer species include *Haloragis heterophylla*, *Schoenus apogon*, *Microlaena stipoides* var. *stipoides*, *Dichondra repens*, *Poa sieberiana* (Snow Grass) and *Lomandra longifolia* (Spiny-headed Mat-rush).

Within the offset group, this community occurs along drainage lines and creeks.

PCT 1165

PCT Name: *Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 1165 is a shrubby open forest dominated by *Eucalyptus macrorhyncha* (Silvertop Stringybark) and *Eucalyptus prava* (Orange Gum). The mid-story consists of *Olearia elliptica* (Sticky Daisy Bush) and *Olearia viscidula* (Viscid Daisy Bush). The ground layer predominately consists of *Dichelachne micrantha* (Shorthair Plumegrass), *Poa sieberiana* var. *sieberiana* (Snow Grass), *Glycine clandestina* and *Desmodium brachypodium*.

Within the offset group, this community occurs on slopes and low hills as both an intact woodland and DNG.

PCT 1306

PCT Name: *White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 1306 is a shrubby woodland by *Eucalyptus albens* (White Box) and *Eucalyptus macrorhyncha* (Red Stringybark), with *Brachychiton populneus* subsp. *Populneus* (Kurrajong) and *Callitris glaucophylla* (White Cypress Pine). The shrub layer consists of *Alphitonia excelsa*, *Cassinia quinquefaria*, *Dodonaea viscosa* subsp. *angustifolia*. The ground layer consists of *Adiantum aethiopicum*, *Aristida ramosa*, *Cheilanthes sieberi* subsp. *sieberi*, *Cyperus eragrostis*. The climber *Clematis glycinoides* var. *glycinoides* may also be present.

Within the offset group, this community occurs on slopes in hilly terrain.

3.7.2 Threatened Ecological Communities

On Mt Lindesay one TEC was mapped. Approximately 880.1 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across relevant parts of PCT 508, *Blakely's Red Gum - Stringybark - Rough-barked Apple open forest*, PCT 510, *Blakely's Red Gum - Yellow Box grassy woodland*, PCT 571, *Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland*, PCT 569, *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland* and PCT 571, *Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland* (Figure 3.6).

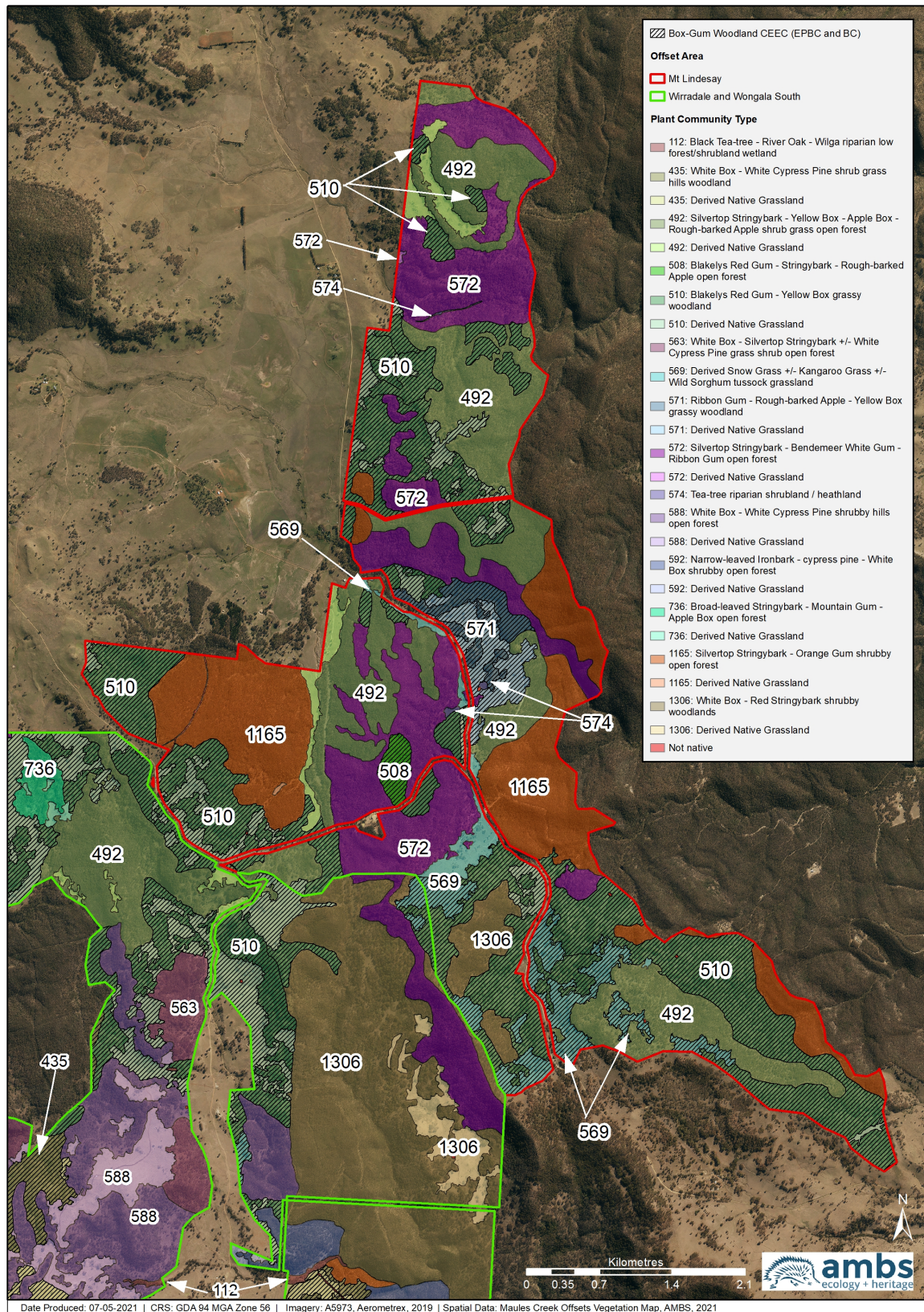


Figure 3.4 Plant Community Type Map for Mt Lindesay

3.8 Wirradale and Wongala South

3.8.1 Plant Community Types and Descriptions

Approximately 4,438.3 ha of native vegetation was mapped on Wirradale and Wongala South, across twelve separate PCTs. Table 3.8 below provides a list of the mapped PCTs and total areas mapped of each. Detailed descriptions of mapped PCTs are provided below. A map showing the distribution of PCTs across this offset is included as Figure 3.7.

Table 3.5 Mapped Plant Community Types for Wirradale and Wongala South

PCT Label	BC Act Status*	EPBC Act Status*	Area (ha)
112: Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland			7.5
435: White Box - White Cypress Pine shrub grass hills woodland	CE ¹	CE ¹	348.4
435: Derived Native Grassland	CE ²	CE ²	704.9
492: Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest			146.8
492: Derived Native Grassland			10.6
510: Blakely's Red Gum - Yellow Box grassy woodland	CE ¹	CE ¹	381.4
510: Derived Native Grassland	CE ¹	CE ¹	255.9
563: White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest			381.1
563: Derived Native Grassland			8.2
569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland	CE ¹	CE ¹	10.6
572: Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest			80.5
572: Derived Native Grassland			1.2
588: White Box - White Cypress Pine shrubby hills open forest			379.7
588: Derived Native Grassland			127.5
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest			851.3
592: Derived Native Grassland			3.2
736: Broad-leaved Stringybark - Mountain Gum - Apple Box open forest			24.1
736: Derived Native Grassland			4.3
1165: Silvertop Stringybark - Orange Gum shrubby open forest			106.2
1165: Derived Native Grassland			43.5
1306: White Box - Red Stringybark shrubby woodlands			514.7
1306: Derived Native Grassland			46.7
Total			4,438.3

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021). CE = Critically Endangered.

1 Equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

2 Approximately 704.4 ha equivalent to the Box-Gum Woodland CEEC listed under the BC Act and EPBC Act.

PCT 112

PCT Name: *Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland of rich soil depressions in the Brigalow Belt South Bioregion*

Vegetation Class: Inland Riverine Forests

EPBC Status: N/A

BC Status: N/A

PCT 112 is a low open forest or very tall shrubland dominated by *Melaleuca bracteata* (Black Tea-tree). Other tree species include *Casuarina cunninghamiana* (River Oak) and *Angophora floribunda* (Rough-barked Apple). Shrubs are sparse and include *Geijera parviflora* (Wilga), *Pimelea neo-anglica*, *Phyllanthus subcrenulatus*, *Breynia cernua*, *Dodonaea viscosa* subsp. *angustifolia*, *Pimelea curviflora* var. *curviflora*, *Psydrax oleifolia* and *Abutilon oxycarpum*. Vines include *Pandorea pandorana* subsp. *pandorana* or *Clematis microphylla* var. *leptophylla*. The ground cover contains the forbs *Urtica incisa*, *Persicaria decipiens*, *Plantago debilis*, *Wahlenbergia communis*, *Rorippa eustylis*, *Geranium solanderi* var. *solanderi*, *Hydrocotyle laxiflora*, *Wahlenbergia communis* and *Daucus glochidiatus*. Grasses include *Austrostipa verticillata*, *Lachnagrostis filiformis*, *Sporobolus creber*, *Ancistrachne uncinulata*, *Bothriochloa macra*, *Oplismenus aemulus*, *Cynodon dactylon* and *Leptochloa digitata*. Sedges include *Cyperus gracilis*, *Carex incomitata*, *Carex appressa*, *Cyperus gunnii*, *Cyperus vaginatus* and *Cyperus victoriensis*. Ground cover weeds include *Lycium ferocissimum*, *Medicago minima*, *Sida rhombifolia*, *Modiola caroliniana*, *Verbascum virgatum*, *Galium aparine*, *Stellaria media*, *Fumaria muralis*, *Vicia sativa* subsp. *sativa* and *Cirsium vulgare*.

Within the offset group, this community occurs along drainage lines and water courses.

PCT 435

PCT Name: *White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: Box-Gum Woodland CEEC (woodland, part DNG)

BC Status: Box-Gum Woodland CEEC (woodland, part DNG)

PCT 435 is a mid-high woodland dominated by *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus albens* (White Box), with *Eucalyptus blakleyi* (Blakely's Red Gum) and *Brachychiton populneus* subsp. *populneus* (Kurrajong) also sometimes present in the overstory. Depending on grazing intensity, the shrub layer can be sparse to dense and includes *Cassinia quinquefaria*, *Acacia implexa* (Hickory Wattle), *Acacia penninervis* var. *penninervis* (Mountain Hickory), *Geijera parviflora* (Wilga), *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Hop-bush), *Teucrium betchei* and *Cassinia sifton* (Sifton Bush). The ground cover is mid-dense and includes grass species such as *Aristida personata* (Purple Wire Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda australis* (Kangaroo Grass), *Rytidosperma racemosum* var. *racemosum*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Austrostipa scabra* subsp. *scabra* (Spear Grass). Common forb species include *Calotis lappulacea* (Yellow Burr Daisy), *Vittadinia sulcata*, *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Wahlenbergia communis* (Tufted Bluebell), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Swainsona galegifolia* (Smooth Darling Pea), *Dichondra* sp. A and *Daucus glochidiatus* (Native Carrot). The scramblers *Desmodium brachypodium* or *Desmodium varians* may be common.

Within the offset group, this community occurs mainly on lower slopes and flats on better soils as both an intact woodland and DNG. This community is equivalent to the Box-Gum Woodland CEEC (EPBC Act and BC Act) in some cases, however it may not be equivalent where shrub cover is too high or where condition is too low.

PCT 492

PCT Name: *Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion*

Vegetation Class: New England Grassy Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 492 is a tall or mid-high open forest dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), *Eucalyptus melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple). The shrub layer varies from mid-dense with species including *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush), *Bursaria spinosa* subsp. *spinosa* (Blackthorn), *Melicytus dentatus* (Tree Violet), *quinquefaria*, *Pittosporum undulatum* (Sweet Pittosporum). Vines include *Eustrephus latifolius* (Wombat Berry), *Pandorea pandorana* (Wonga Vine) and *Clematis glycinoides* (Headache Vine). The scramblers *Desmodium varians* and *Glycine clandestina* may also be common. The ground layer is sparse and usually grassy, with common grass species including *Rytidosperma racemosum* var. *racemosum*, *Elymus scaber* var. *scaber*, *Bothriochloa macra*, *Rytidosperma laeve*, *Microlaena stipoides* var. *stipoides*, *Echinopogon ovatus* and *Poa labillardierei* var. *labillardierei*. Sedges include *Carex breviculmis* and *Carex incomitata*. Forb species include *Dichondra repens*, *Hydrocotyle laxiflora*, *Sigesbeckia orientalis* subsp. *orientalis*, *Geranium solanderi* var. *solanderi*, *Acaena novae-zelandiae*, *Swainsona galegifolia*, *Arthropodium milleflorum*, *Asperula conferta*, *Hypericum gramineum*, *Galium gaudichaudii*, and *Plantago debilis*. Ferns such as *Adiantum atroviride* occur in protected sites.

Within the offset group, this community occurs on slopes in hilly terrain as both an intact woodland and DNG.

PCT 510

PCT Name: *Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion*

Vegetation Class: New England Grassy Woodlands

EPBC Status: Box-Gum Woodland CEEC

BC Status: Box-Gum Woodland CEEC

PCT 510 is a tall open forest or woodland that is dominated by *Angophora floribunda* (Rough-barked Apple), *Eucalyptus melliodora* (Yellow Box) and/or *Eucalyptus blakelyi* (Red Gum). The shrub layer is either sparse or absent, with typical species including *Acacia implexa* (Hickory Wattle), *Acacia fimbriata* (Fringed Wattle), *Cassinia quinquefaria* or *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush). The ground layer is well developed with dominant species including *Themeda australis* (Kangaroo Grass), *Poa sieberiana* (Snow Grass), *Cymbopogon refractus* (Barbed Wire Grass) and *Lepedeza juncea* subsp. *sericea*. Less frequent groundcover species include *Aristida ramosa*, *Sorghum leiocladum*, *Dianella revoluta* var. *revoluta*, *Microlaena stipoides* var. *stipoides*, *Desmodium brachypodum*, *Viola betonicifolia*, *Chrysocephalum apiculatum*, *Glycine tabacina*, *Lomandra longifolia*, *Bothriochloa macra* and *Carex breviculmis*.

Within the offset group, this community occurs on flats and lower slopes as both an intact woodland and DNG.

PCT 563

PCT Name: *White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 563 is a tall open forest with a variable overstorey dominated by *Eucalyptus albens* (White Box), *Eucalyptus laevopinea* (Silver-top Stringybark), *Angophora floribunda* (Rough-barked Apple), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus blakelyi* (Blakely's Red Gum) and/or *Eucalyptus melliodora* (Yellow Box). There is a well-developed shrub layer with *Olearia elliptica*, *Notelaea microcarpa* var. *microcarpa* and *Cassinia quinquefaria* the most frequent species. The ground layer is usually sparse to mid-dense with common species including *Poa sieberiana* (Snow Grass), *Desmodium brachypodum*, *Aristida ramosa* and *Dichondra repens*. Other frequent groundcover species include *Swainsona galegifolia*, *Rytidosperma racemosa* var. *racemosa*, *Vittadinia cuneata*, *Themeda australis*, *Cheilanthes sieberi* subsp. *sieberi* and *Cymbopogon refractus*.

Within the offset group, this community occurs on slopes in hilly terrain as both an intact woodland and DNG.

PCT 569

PCT Name: *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland of the NSW Northern Tablelands*

Vegetation Class: Temperate Montane Grasslands

EPBC Status: Box-Gum Woodland CEEC

BC Status: Box-Gum Woodland CEEC

PCT 569 to mid-high to tall tussock grassland dominated by *Poa sieberiana*, *Poa labillardierei* var. *labillardierei* (Snow Grass) often with *Themeda australis* (Kangaroo Grass), *Sorghum leiocladum* (Wild Sorghum), *Echinopogon caespitosus* var. *caespitosus*, *Echinopogon ovatus*, *Imperata cylindrica* var. *major* (Blady Grass), *Panicum effusum* or *Bothriochloa macra* (Redleg Grass) and *Microlaena stipoides*. The sub-shrubs *Lespedeza juncea* subsp. *sericea* and *Pimelea curviflora* var. *divergens* may be present. Scattered tall shrubs include *Bursaria spinosa* subsp. *spinosa*, *Acacia filicifolia*, *Melicytus dentatus*, *Leucopogon lanceolatus* var. *lanceolatus* and the sub-shrub *Desmodium brachypodum*. Forb species include *Dichondra repens*, *Geranium solanderi* var. *solanderi*, *Asperula conferta*, *Dianella revoluta* var. *revoluta*, *Acaena ovina*, *Scleranthus biflorus*, *Swainsona galegifolia*, *Senecio lautus* var. *dissectifolius*, *Viola betonicifolia* and *Chrysocephalum apiculatum*. The scrambler *Glycine tabacina* may be present.

Within the offset group, this community occurs mainly on flats and lower slopes at higher elevations and is derived from a range of box and stringybark dominated communities.

PCT 572

PCT Name: *Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest in the Kaputar area of the Nandewar Bioregion*

Vegetation Class: New England Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 572 is a tall to very tall open forest community dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), *Eucalyptus elliptica* (Bendemeer White Gum) and *Eucalyptus viminalis* (Ribbon Gum). Low shrubs are very sparse, with *Olearia viscidula* (Wallaby Weed), *Melichrus urceolatus* (Urn Heath) and *Lissanthe strigosa* subsp. *subulata* (Peach Heath) occasionally forming a low shrub layer in drier sites. Other shrub species recorded in moister sites include *Polyscias sambucifolia*, *Bursaria spinosa*, *Acacia maidenii*, *Hibbertia obtusifolia*, *Coprosma quadrifida*, *Syzygium smithii* and *Acacia pruinosa*. There is a well developed ground layer of forbs, grasses and ferns with *Poa sieberiana* (Snow Grass), *Rytidosperma racemosum* var. *racemosum*, *Lomandra longifolia* (Spiny-headed Mat-rush), *Geranium solanderi* var. *solanderi*, *Themeda australis*, *Swainsona galegifolia*, *Desmodium varians*, *Ranunculus lappaceus*, *Eustrephus latifolius*, *Rubus parvifolius*, *Doodia aspera*, *Adiantum aethiopicum* and *Echinopogon caespitosus* var. *caespitosus* most frequent.

Within the offset group, this community occurs on slopes in hilly terrain, often along watercourses, as both an intact woodland and DNG.

PCT 588

PCT Name: *White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 588 is an open forest to woodland dominated by *Eucalyptus albens* (White Box) and *Callitris glaucophylla* (White Cypress Pine) with a shrubby understorey. Other tree species include *Eucalyptus melliodora* (Yellow Box), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark) may also occur. Contains a mid-dense to sparse shrub layer including *Notelaea microcarpa* var. *microcarpa* (Native Olive), *Geijera parviflora* (Wilga), *Beyeria viscosa* (Sticky Wallaby Bush), *Olearia elliptica* (Sticky Daisy Bush), *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush), *Acacia decora* (Western Silver Wattle), *Bursaria spinosa* var. *spinosa* (Blackthorn), *Psydrax odorata* (Lamboto), *Cassinia laevis* and *Olearia ramosissima*. There is usually a mid-dense ground cover of grass species such as *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Cymbopogon refractus* (Barbedwire Grass), *Austrostipa scabra* (Speargrass), *Elymus scaber* and *Dichelachne micrantha* (Shorthair Plumegrass). The sub-shrub *Desmodium brachypodum* and climber *Glycine tabacina* are often present. Other ground layer species include *Rostellularia adscendens*, *Boerhavia repleta*, *Swainsona galegifolia*, *Swainsona queenslandica*, *Vittadinia muelleri*, *Galium propinquum*, *Dichondra* sp. A, *Desmodium brachypodum* and *Glycine tabacina*.

Within the offset group, this community occurs on slopes and low hills as both an intact woodland and DNG.

PCT 592

PCT Name: *Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion*

Vegetation Class: Western Slopes Dry Sclerophyll Forests

EPBC Status: N/A

BC Status: N/A

PCT 592 is a tall or mid-high open forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees may include *Eucalyptus dealbata* (Tumbledown Red Gum) or *Eucalyptus melanophloia* (Silver-leaved Ironbark). There is usually a sparse shrubby understorey with the most common species including *Beyeria viscosa* (Wallaby Bush), *Notelaea microcarpa* var. *microcarpa* (Native Olive) and *Dodonaea viscosa* subsp. *angustifolia* (Sticky Hop Bush). Other shrubs present include *Breynia cernua*, *Solanum parvifolium*, *Melichrus urceolatus*, *Spartothamnella juncea* and *Psydrax oleifolia*. The ground layer includes *Desmodium brachypodum* and grass species such as *Austrostipa scabra* subsp. *scabra*, *Rytidosperma racemosum* var. *obtusatum*, *Microlaena stipoides* var. *stipoides*, *Aristida ramosa* and *Cymbopogon refractus*. Forb species include *Dichondra* sp. A, *Calotis anthemoides*, *Vernonia cinerea* var. *cinerea*, *Brunoniella australis*, *Arthropodium* sp. B, *Desmodium varians* and *Glycine clandestina*.

Within the offset group, this community occurs on slopes and ridgetops as both an intact woodland and DNG.

PCT 736

PCT Name: *Broad-leaved Stringybark - Mountain Gum - Apple Box open forest*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 736 is an open forest dominated by *Eucalyptus dalrympleana* (Mountain Gum) and *Eucalyptus bridgesiana*, often in association with *Eucalyptus caliginosa* (Broad-leaved stringybark). Shrubs are sparse or absent and may include *Brachyloma daphnoides* (Daphne Heath), *Hibbertia obtusifolia* and *Melichrus urceolatus* (Urn Heath). The ground layer is dominated by grasses, including *Rytidosperma racemosum*, *Bothriochloa macra* and *Elymus scaber*. A range of forbs, such as *Desmodium varians* and *Dichondra repens* are also often present.

Within the offset group, this community mainly occurs on flats and lower slopes as both an intact woodland and DNG.

PCT 1165

PCT Name: *Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 1165 is a shrubby open forest dominated by *Eucalyptus macrorhyncha* (Silvertop Stringybark) and *Eucalyptus prava* (Orange Gum). The mid-story consists of *Olearia elliptica* (Sticky Daisy Bush) and *Olearia viscidula* (Viscid Daisy Bush). The ground layer predominately consists of *Dichelachne micrantha* (Shorthair Plumegrass), *Poa sieberiana* var. *sieberiana* (Snow Grass), *Glycine clandestina* and *Desmodium brachypodum*.

Within the offset group, this community occurs on slopes in hilly terrain as both an intact woodland and DNG.

PCT 1306

PCT Name: *White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion*

Vegetation Class: North-west Slopes Dry Sclerophyll Woodlands

EPBC Status: N/A

BC Status: N/A

PCT 1306 is a shrubby woodland by *Eucalyptus albens* (White Box) and *Eucalyptus macrorhyncha* (Red Stringybark), with *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Callitris glaucophylla* (White Cypress Pine). The shrub layer consists of *Alphitonia excelsa*, *Cassinia quinquefaria* and *Dodonaea viscosa* subsp. *angustifolia*. The ground layer consists of *Adiantum aethiopicum*, *Aristida ramosa*, *Cheilanthes sieberi* subsp. *sieberi* and *Cyperus eragrostis*. The climber *Clematis glycinoides* var. *glycinoides* may also be present.

Within the offset group, this community occurs on slopes in hilly terrain as both an intact woodland and DNG.

3.8.2 Threatened Ecological Communities

On Wirradale and Wongala South, one TEC was mapped. Approximately 1,700.7 ha of the Box-Gum Woodland CEEC listed under the EPBC Act and BC Act was mapped across relevant parts of PCT 435, *White Box - White Cypress Pine shrub grass hills woodland*, PCT 510, *Blakely's Red Gum - Yellow Box grassy woodland* and PCT 569, *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland* (Figure 3.7).

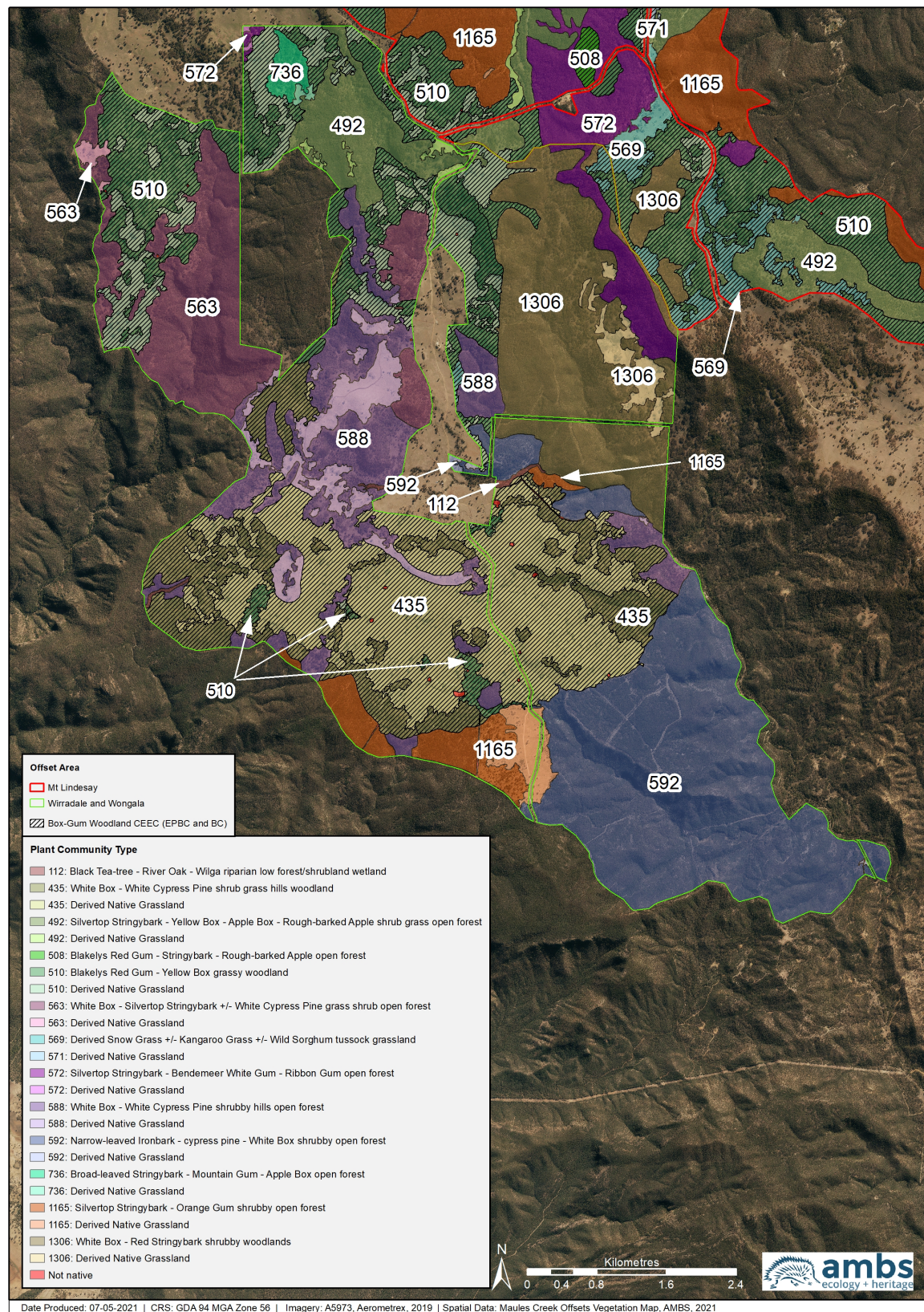


Figure 3.5 Plant Community Type Map for Wirradale and Wongala South

4 Summary of the Threatened Ecological Communities

4.4 Box-Gum Woodland CEEC (EPBC Act)

A total of approximately 3,360.2 ha of the Box-Gum Woodland CEEC listed under the EPBC Act was mapped across all offset areas. This includes 1,512.6 ha of grassland form and 1,847.6 ha of woodland form. The Box-Gum Woodland CEEC is a grassy woodland with an overstorey dominated by *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) often in association with *Angophora floribunda* (Rough-barked Apple). The shrub layer is typically sparse or absent, with common species including *Geijera parviflora* (Wilga), *Acacia deanei* (Dean's Wattle) and *Maireana microphylla* (Small-leaved Bluebush). The ground layer is typically dominated by grasses and forbs, with common grass species including *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Aristida ramosa* (Purple Wire Grass), *Themeda australis* (Kangaroo Grass) and *Bothriochloa* spp. (Red Grass).

Box-Gum Woodland CEEC occurs on higher fertility soils in a range of landscape positions, from slopes to alluvial flats. The Box-Gum Woodland CEEC occurs in the study area as an intact woodland, as a DNG and as a disturbed woodland with a regenerating canopy woodland, which may be dominated by dense stands of *C. glaucophylla* in some cases. Table 4.1 below provides a summary of the area of Box-Gum Woodland CEEC listed under the EPBC Act mapped on each of the offset areas.

Table 4.1 Area of Box-Gum Woodland CEEC Listed Under the EPBC Act Mapped by Offset Group

Offset Group	Box-Gum Woodland CEEC (Grassland Form) (ha)	Box-Gum Woodland CEEC (Woodland Form) (ha)	Total (ha)
Kelso, Velyama and Louenville	3	98.8	101.8
Mt Lindesay	219.2	660.9	880.1
Onavale	30	10.3	40.3
Roseglass and Bimbooria	254.6	232.4	487
Teston South	17.6	63.1	80.7
Wirradale and Wongala South	970.9	729.8	1,700.7
Wollandilly	17.3	52.3	69.6
Total	1,512.6	1,847.6	3,360.2

4.5 Box-Gum Woodland CEEC (BC Act)

A total of approximately 3,371.2 ha of the Box-Gum Woodland CEEC listed under the BC Act was mapped across all offset areas. This includes 1,512.6 ha of grassland form and 1,858.6 ha of woodland form. The description of the Box-Gum Woodland CEEC listed under the BC Act is the same as for the CEEC listed under the EPBC Act, with the main difference being that areas with an intact canopy, but disturbed ground layer, may be included under the BC Act, but not under the EPBC Act. This means that additional areas were mapped as fitting the Box-Gum Woodland CEEC listed under the BC Act.

Table 4.2 Area of Box-Gum Woodland CEEC Listed Under the BC Act Mapped by Offset Group

Offset Group	Box-Gum Woodland CEEC (Grassland Form) (ha)	Box-Gum Woodland CEEC (Woodland Form) (ha)	Total (ha)
Kelso, Velyama and Louenville	3	109.8	112.8
Mt Lindesay	219.2	660.9	880.1
Onavale	30	10.3	40.3
Roseglass and Bimbooria	254.6	232.4	487
Teston South	17.6	63.1	80.7
Wirradale and Wongala South	970.9	729.8	1,700.7
Wollandilly	17.3	52.3	69.6
Total	1,512.6	1,858.6	3,371.2

4.6 Grey Box Woodland EEC (EPBC Act and BC Act)

The EPBC Act-listed endangered ecological community *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia* (TSSC, 2010) and BC Act-listed endangered ecological community *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions* (TSSC, 2011a) are woodlands dominated by *Eucalyptus microcarpa* (Western Grey Box), often in association with *Callitris glaucophylla* (White Cypress Pine) and *Brachychiton populneus* (Kurrajong). A small amount of this TEC (2.2 ha) was mapped on Teston South (see Table 4.3).

4.7 Poplar Box Grassy Woodland EEC (EPBC Act)

The EPBC Act-listed endangered ecological community *Poplar Box Woodland on Alluvial Plains* (TSSC, 2019) is a grassy woodland dominated by *Eucalyptus populnea* (Poplar Box), often in association with *Callitris glaucophylla* (White Cypress Pine) and *Casuarina cristata* (Belah). Shrubs are sparse or absent and may include *Geijera parviflora* (Wilga) and *Capparis mitchellii* (Native Orange). The ground layer is typically grassy, with common grass species including *Bothriochloa macra* (Red Grass), *Dichanthium sericeum* (Blue Grass) and *Aristida ramosa* (Purple Wire Grass). Approximately 63.6 ha of this TEC was mapped across two offset groups (see Table 4.3).

4.8 Semi-evergreen Vine Thicket EEC (EPBC Act and BC Act)

The EPBC Act-listed endangered ecological community *Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions* (TSSC, 2011b) and BC Act-listed endangered ecological community *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* are low, dense dry rainforests dominated by rainforest small trees and vines. Common canopy species include *Notelaea microcarpa* (Native Mock Olive), *Geijera parviflora* (Wilga), *Alstonia constricta* (Quinine Bush) and *Ehretia membranifolia* (Peach Bush). Common vines include *Pandorea pandorana* (Wonga Vine) and *Parsonsia eucalyptaphylla* (Gargaloo). A small amount of this TEC (0.3 ha) was mapped across one offset group (see Table 4.3).

Table 4.3 Area of Other TECs Mapped by Offset Group

Offset Group	Grey Box Woodland EEC Listed Under the BC Act and EPBC Act (ha)	Poplar Box Grassy Woodland EEC Listed Under the EPBC Act (ha)	Semi-evergreen Vine Thicket EEC Listed Under the BC Act and EPBC Act (ha)	Total (ha)
Kelso, Velyama and Louenville	0	13.3	0	13.3
Roseglass and Bimbooria	0	0	0.3	0.3
Teston South	2.2	0	0	2.2
Wollandilly	0	50.3	0	50.3
Total	2.2	63.6	0.3	66.1

5 Summary of the Threatened Plant Species

Two threatened plant species were recorded in the offset areas, one of which is listed as threatened under the BC Act and both under the EPBC Act. Table 5.1 lists the threatened species recorded and their status under the EPBC Act and BC Act. Approximately 1,040 individuals of *Dichanthium setosum* were recorded from five locations on the Northern Offsets.

Table 5.1 Threatened Species Recorded

Scientific Name	Common Name	EPBC Act Status*	BC Act Status*
<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Vulnerable
<i>Callistemon pungens</i>	-	Vulnerable	-

* Conservation status under the BC Act and/or EPBC Act (current as of June 2021).

An additional four species have been previously recorded in the offset areas. Recorded locations of *Tylophora linearis*, *Thesium* and *Digitaria porrecta* (ALA, 2020; AMBS, 2015-2019; AMBS, 2017) are shown on Figure 5.1 and Niche Environment and Heritage (2012) also recorded *Homoranthus prolixus* on Roseglass, but the co-ordinates were not reported.

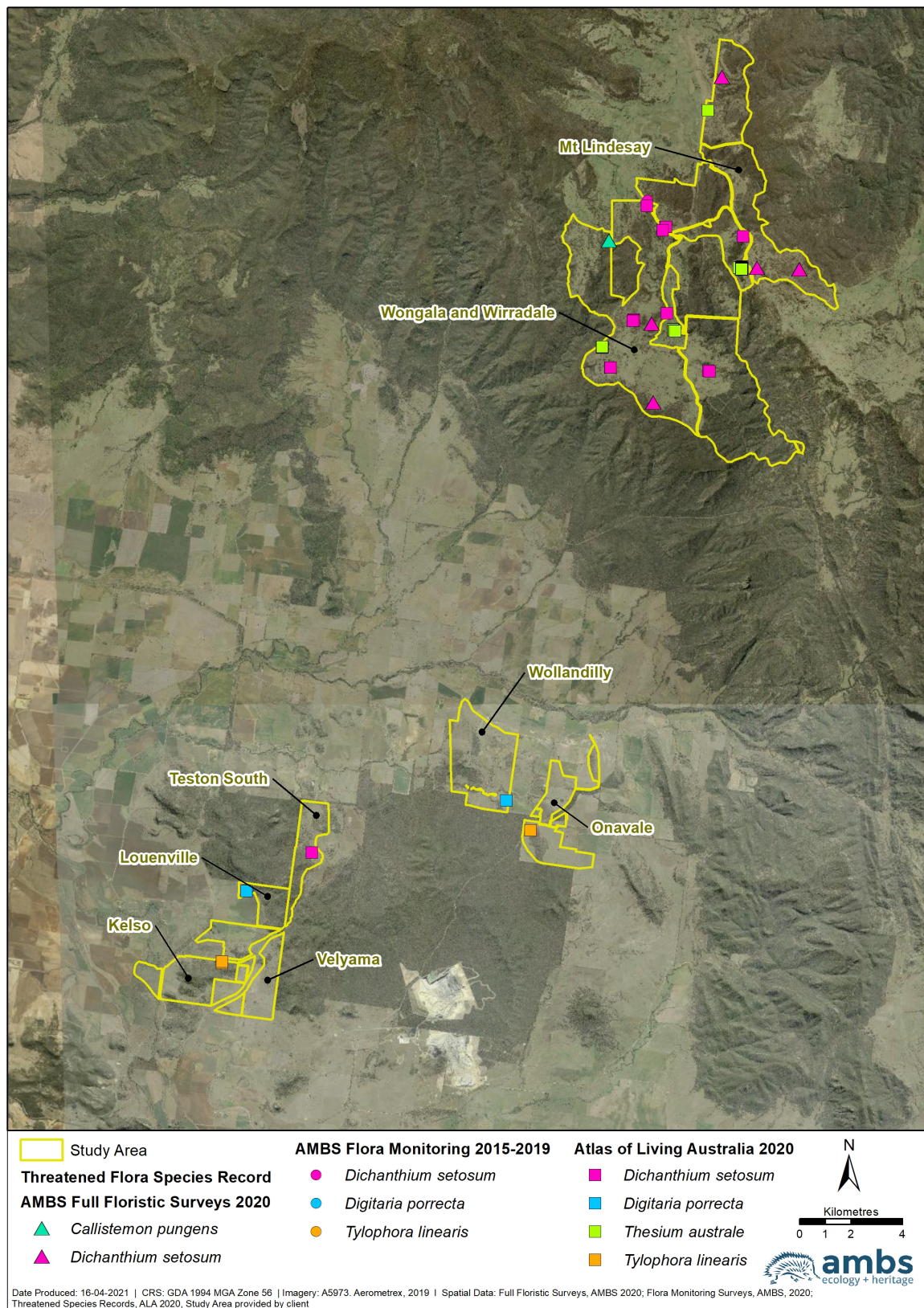


Figure 5.1 Records of Threatened Plant Species within the Offset Areas

6 Conclusions

A total of 733 plant species in 87 families were recorded during surveys to determine the PCTs in the offset areas. Of these, 519 were native plant species.

This study has confirmed the following range of PCTs within the offset areas:

- 55: *Belah woodland on alluvial plains and low rises*
- 78: *River Red Gum riparian tall woodland / open forest wetland*
- 81: *Western Grey Box – cypress pine shrub grass shrub tall woodland*
- 101: *Poplar Box - Yellow Box - Western Grey Box grassy woodland*
- 112: *Black Tea-tree – River Oak – Wilga riparian low forest/shrubland wetland*
- 147: *Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket*
- 244: *Poplar Box grassy woodland*
- 413: *Silver-leaved Ironbark – White Cypress Pine – box dry shrub grass woodland*
- 427: *Cypress pine - Tumbledown Red Gum low open woodland to grassland*
- 429: *White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland*
- 435: *White Box – White Cypress Pine shrub grass hills woodland*
- 439: *Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland*
- 492: *Silvertop Stringybark – Yellow Box – Apple Box – Rough-barked Apple shrub grass open forest*
- 508: *Blakely's Red Gum - Stringybark - Rough-barked Apple open forest*
- 510: *Blakely's Red Gum - Yellow Box grassy woodland*
- 563: *White Box – Silvertop Stringybark +/- White Cypress Pine grass shrub open forest*
- 569: *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland*
- 571: *Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland*
- 572: *Silvertop Stringybark – Bendemeer White Gum – Ribbon Gum open forest*
- 574: *Tea-tree riparian shrubland / heathland wetland*
- 581: *Tumbledown Red Gum – Dwyer's Red Gum – Wallaby Bush shrubby woodland*
- 569: *Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland*
- 592: *Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest*
- 599: *Blakely's Red Gum - Yellow Box grassy tall woodland*
- 619: *Derived Wire Grass grassland*
- 736: *Broad-leaved Stringybark – Mountain Gum – Apple Box open forest*
- 1165: *Silvertop Stringybark - Orange Gum shrubby open forest*
- 1306: *White Box - Red Stringybark shrubby woodlands*

Four TECs listed under the EPBC Act were identified in the offset areas:

- Box-Gum Woodland CEEC listed under the EPBC Act (comprising 1,847.6 ha of woodland and 1,512.6 ha of DNG);
- Poplar Box Grassy Woodland EEC listed under the EPBC Act;
- Grey Box Woodland EEC listed under the EPBC Act; and
- Semi-evergreen Vine Thicket EEC listed under the EPBC Act.

Three TECs listed under the BC Act were identified in the offset areas:

- Box-Gum Woodland CEEC listed under the BC Act (comprising 1,858.6 ha of woodland and 1,512.6 ha of DNG);
- Grey Box Woodland EEC listed under the BC Act; and
- Semi-evergreen Vine Thicket EEC listed under the BC Act.

Two threatened plant species were recorded in the offset areas, one of which is listed as threatened under the BC Act and both under the EPBC Act:

- *Dichanthium setosum* (Bluegrass); and
- *Callistemon pungens*.

An additional four threatened plant species have been previously recorded in the offset areas, namely, *Tylophora linearis*, *Thesium australe*, *Digitaria porrecta* and *Homoranthus prolixus*.

References

AMBS Ecology and Heritage (2015 - 2019) *MCCM Offset Area Vegetation Monitoring Data*. Prepared for Whitehaven Coal Limited.

AMBS Ecology & Heritage (2017) Threatened flora records in *Wirradale Biodiversity Constraints Due Diligence Report*. Prepared for Whitehaven Coal Limited.

AMBS Ecology and Heritage (2020) *Maules Creek Coal Mine: Flora Monitoring of the Offset Areas – Spring 2019*. Prepared for Whitehaven Coal Limited.

AMBS Ecology and Heritage (2021) *Maules Creek Coal Mine Vegetation Mapping on Areas External to the Maules Creek Offset Areas*. Prepared for Whitehaven Coal Limited.

Atlas of Living Australia (2020) Atlas of Living Australia website at <http://www.ala.org.au>. Accessed 1 August 2020.

Australian Bureau of Agriculture and Resource Economics and Sciences (2018) *Fires in Australia's Forests 2011-16*. <https://www.agriculture.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/forest-fire>

Belbin (2003) *PATN: A User's Guide*. Blatant Fabrications, Bonnet Hill

Bureau of Meteorology (2020) *Climate statistics for Australian locations: Summary statistics for NARRABRI AIRPORT AWS*. Website Accessed: August 2020. <http://www.bom.gov.au/climate/averages/tables>

Cumberland Ecology (2011a) *Maules Creek Coal Project Ecological Assessment*. Prepared for Hansen Bailey.

Cumberland Ecology (2011b) *Maules Creek Coal Project Biodiversity Offset Management Plan*. Prepared for Hansen Bailey.

Cumberland Ecology (2013a) *Maules Creek Coal Project: Analysis of Offset Potential of the Brennan Property*. Prepared for Whitehaven Coal.

Cumberland Ecology (2013b) *Maules Creek Coal Project: Analysis of Offset Potential of the Phillips Property*. Prepared for Whitehaven Coal.

Department of Agriculture, Water and Environment (2020) *Australia's Bioregions (IBRA)*. Department of Agriculture, Water and the Environment. <https://www.environment.gov.au/land/nrs/science/ibra>

Department of Industry – Water (2020) *Hydro Line Spatial Data* New South Wales Department of Industry – Water. <https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data>

Department of Planning, Industry and Environment (2020a) *BioNet Atlas Systematic Flora Survey Database*. New South Wales Department of Planning, Industry and Environment. https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/YETI_/FloraSearch.aspx

Department of Planning, Industry and Environment (2020b) *Australian Soil Classification Mapping, NSW*. New South Wales Department of Planning, Industry and Environment. <https://data.nsw.gov.au/data/dataset/australian-soil-classification-asc-soil-type-map-of-nsw-2010>

Department of Planning, Industry and Environment (2020c) *Great Soils Group Mapping, NSW*. New South Wales Department of Planning, Industry and Environment.

Department of Planning, Industry and Environment (2020d) *BioNet Vegetation Classification Database*. <https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx>

Geoscience Australia (2020a) *Continental Geology Section: 1:250 000 geological map series*. <https://www.ga.gov.au/about/projects/resources/continental-geology>

Geoscience Australia (2020b) *National Surface Water Information: Surface Hydrology Lines- Regional*. <http://www.ga.gov.au/scientific-topics/water/national-surface-water-information>

Greenloaning Biostudies (2013) *Independent Peer Review of Offsets for the Maules Creek Coal Project – EPBC 2010/5566*. Prepared for Whitehaven Coal Pty Ltd.

Greenloaning Biostudies (2014) *Independent Peer Review of Offsets for the Maules Creek Coal Project – EPBC 2010/5566 Verification Report for Additional Offsets*. Prepared for Whitehaven Coal Pty Ltd.

Greenloaning Biostudies (2015) *Maules Creek Coal Mine Biodiversity Offset Areas - Vegetation Descriptions*. In Whitehaven (2017) Appendix E.

Greenloaning Biostudies (2019-2020) *Data Supplied as part of the Conservation Agreements for the MCCC Offset Areas*.

Hansen Bailey (2011) *Maules Creek Project Environmental Assessment*. Prepared for Aston Coal 2 Pty Ltd.

Keith, D. A. and Simpson, C.C. (2020) *Vegetation Formations and Classes of NSW* (version 3.03 - 200m Raster). VIS_ID 3848.
Website Accessed: August 2020. <https://data.nsw.gov.au/data/dataset/vegetation-classes-of-nsw-version-3-03-200m-raster-david-a-keith-and-christopher-c-simpc0917>.

Mitchell, P. (2002) *NSW Landscape Mapping: Background and Methodology* Vers. 2 NSW Department of Environment and Climate Change. <https://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf>

Murray Darling Basin Authority (2019) *Murray-Darling Basin Water Resource Plan Areas – Surface Water*, CC-BY 4.0. Accessed 18 August 2020. <https://data.gov.au/data/dataset/7b0c274f-7f12-4062-9e54-5b8227ca20c4>

National Parks and Wildlife Service (2020) *Fire History - Wildfires and Prescribed Burns*. <https://data.nsw.gov.au/data/dataset/fire-history-wildfires-and-prescribed-burns-1e8b6>

Niche Environment and Heritage (2012) *Roseglass Offset Area Flora and Fauna Assessment*. Prepared for Whitehaven Coal Ltd.

Office of Environment and Heritage (2015) *Regional vegetation mapping for the Border River/ Gwydir and Namoi regions*.

Threatened Species Scientific Committee (2006) *Commonwealth Listing Advice on White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*.

Threatened Species Scientific Committee (2010) *Commonwealth Listing Advice on Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia*.

Threatened Species Scientific Committee (2011a) *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions – Endangered Ecological Community listing NSW Threatened Species Scientific Committee – Final Determination*.

Threatened Species Scientific Committee (2011b) *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions – Endangered Ecological Community listing NSW Threatened Species Scientific Committee – Final Determination*.

Threatened Species Scientific Committee (2019) *Commonwealth Listing Advice on Poplar Box Grassy Woodland on Alluvial Plains*.

Threatened Species Scientific Committee (2020) *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered Ecological Community listing NSW Threatened Species Scientific Committee – Final Determination*.

Whitehaven (2017) *Maules Creek Coal Mine Biodiversity Management Plan*. Whitehaven Coal Pty Ltd.

Appendix A: Plant Species List

Family	Current Scientific Name	Common Name	Exotic
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet	No
Acanthaceae	<i>Rostellularia adscendens</i>	Pink Tongues	No
Acanthaceae	<i>Rostellularia adscendens</i> var. <i>adscendens</i>		No
Adiantaceae	<i>Pellaea calidirupium</i>		No
Adiantaceae	<i>Pellaea paradoxa</i>		No
Aizoaceae	<i>Tetragonia tetragonioides</i>	New Zealand Spinach	No
Alliaceae	<i>Nothoscordum borbonicum</i>	Onion Weed	Yes
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed	No
Amaranthaceae	<i>Alternanthera nana</i>	Hairy Joyweed	No
Amaranthaceae	<i>Alternanthera</i> sp. A		No
Amaranthaceae	<i>Alternanthera</i> spp.	Joyweed	No
Amaranthaceae	<i>Amaranthus hybridus</i>	Slim Amaranth	Yes
Amaranthaceae	<i>Amaranthus powellii</i>	Powell's Amaranth	Yes
Amaranthaceae	<i>Amaranthus</i> spp.	Amaranth	-
Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed	Yes
Amaryllidaceae	<i>Crinum flaccidum</i>	Darling Lily	No
Anthericaceae	<i>Anthericaceae</i> indeterminate		-
Anthericaceae	<i>Arthropodium</i> spp.		No
Anthericaceae	<i>Dichopogon fimbriatus</i>	Nodding Chocolate Lily	No
Anthericaceae	<i>Dichopogon</i> spp.	Chocolate Lily	No
Anthericaceae	<i>Dichopogon strictus</i>	Chocolate Lily	No
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily	No
Apiaceae	<i>Ammi majus</i>	Bishop's Weed	Yes
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	Yes
Apiaceae	<i>Daucus glochidiatus</i>	Native Carrot	No
Apiaceae	<i>Daucus</i> spp.		-
Apiaceae	<i>Eryngium vesiculosum</i>	Prostrate Blue Devil	No
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	No
Apiaceae	<i>Hydrocotyle sibthorpioides</i>		No
Apiaceae	<i>Hydrocotyle</i> spp.		-
Apiaceae	<i>Hydrocotyle tripartita</i>	Pennywort	No
Apocynaceae	<i>Alstonia constricta</i>	Quinine Bush	No
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	Yes
Apocynaceae	<i>Marsdenia australis</i>	Doubah	No
Apocynaceae	<i>Marsdenia pleiadenia</i>		No
Apocynaceae	<i>Marsdenia</i> spp.		No
Apocynaceae	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear	No
Apocynaceae	<i>Parsonsia eucalyptophylla</i>	Gargaloo	No
Apocynaceae	<i>Rhyncharrhena linearis</i>	Purple Pentatropé	No
Asphodelaceae	<i>Bulbine bulbosa</i>	Bulbine Lily	No
Asphodelaceae	<i>Bulbine semibarbata</i>	Wild Onion	No

Family	Current Scientific Name	Common Name	Exotic
Asphodelaceae	<i>Bulbine spp.</i>		No
Asteraceae	<i>Arctotheca calendula</i>	Capeweed	Yes
Asteraceae	<i>Asteraceae indeterminate</i>	Daisies	-
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	Yes
Asteraceae	<i>Bidens subalternans</i>	Greater Beggar's Ticks	Yes
Asteraceae	<i>Brachycome spp.</i>		No
Asteraceae	<i>Brachyscome chrysoglossa</i>		No
Asteraceae	<i>Brachyscome formosa</i>	Pillaga Daisy	No
Asteraceae	<i>Brachyscome kaputarensis</i>		No
Asteraceae	<i>Brachyscome microcarpa</i>		No
Asteraceae	<i>Brachyscome spp.</i>		No
Asteraceae	<i>Calotis hispidula</i>	Bogan Flea	No
Asteraceae	<i>Calotis lappulacea</i>	Yellow Burr-daisy	No
Asteraceae	<i>Carthamus lanatus</i>	Saffron Thistle	Yes
Asteraceae	<i>Cassinia quinquefaria</i>		No
Asteraceae	<i>Cassinia spp.</i>		No
Asteraceae	<i>Centaurea melitensis</i>	Maltese Cockspur	Yes
Asteraceae	<i>Centaurea solstitialis</i>	St Barnabys Thistle	Yes
Asteraceae	<i>Centaurea spp.</i>	Thistle	Yes
Asteraceae	<i>Chondrilla juncea</i>	Skeleton Weed	Yes
Asteraceae	<i>Chrysocephalum apiculatum</i>	Common Everlasting	No
Asteraceae	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	No
Asteraceae	<i>Chrysocephalum spp.</i>		No
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	Yes
Asteraceae	<i>Conyza spp.</i>		Yes
Asteraceae	<i>Cotula australis</i>	Common Cotula	No
Asteraceae	<i>Crepis capillaris</i>	Smooth Hawksbeard	Yes
Asteraceae	<i>Cymbonotus lawsonianus</i>	Bear's Ear	No
Asteraceae	<i>Cymbonotus preissianus</i>	Austral Bear's Ear	No
Asteraceae	<i>Cymbonotus spp.</i>		No
Asteraceae	<i>Eclipta platyglossa</i>	Yellow Twin-heads	No
Asteraceae	<i>Euchiton japonicus</i>		No
Asteraceae	<i>Euchiton sphaericus</i>	Star Cudweed	No
Asteraceae	<i>Euchiton spp.</i>		No
Asteraceae	<i>Facelis retusa</i>		Yes
Asteraceae	<i>Gamochaeta coarctata</i>		Yes
Asteraceae	<i>Gamochaeta spp.</i>		Yes
Asteraceae	<i>Glossocardia bidens</i>	Cobbler's Tack	No
Asteraceae	<i>Hypochaeris albiflora</i>	White Flatweed	Yes
Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	Yes
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	Yes
Asteraceae	<i>Hypochaeris spp.</i>		Yes
Asteraceae	<i>Isoetopsis graminifolia</i>	Grass Cushion	No
Asteraceae	<i>Lactuca saligna</i>	Willow-leaved Lettuce	Yes
Asteraceae	<i>Lactuca serriola</i>	Prickly Lettuce	Yes

Family	Current Scientific Name	Common Name	Exotic
Asteraceae	<i>Lactuca serriola f. integrifolia</i>		Yes
Asteraceae	<i>Lagenifera stipitata</i>	Blue Bottle-daisy	No
Asteraceae	<i>Lagenophora gracilis</i>	Slender Lagenophora	No
Asteraceae	<i>Lagenophora stipitata</i>	Common Lagenophora	No
Asteraceae	<i>Leiocarpa panaetioides</i>	Wooly Buttons	No
Asteraceae	<i>Leiocarpa spp.</i>		No
Asteraceae	<i>Leontodon rhagadioloides</i>	Cretan Weed	Yes
Asteraceae	<i>Leontodon spp.</i>		Yes
Asteraceae	<i>Leptorhynchos squamatus</i>	Scaly Buttons	No
Asteraceae	<i>Olearia elliptica</i>	Sticky Daisy-bush	No
Asteraceae	<i>Olearia spp.</i>		No
Asteraceae	<i>Olearia viscidula</i>	Wallaby Weed	No
Asteraceae	<i>Olearia viscosa</i>		No
Asteraceae	<i>Pycnosorus globosus</i>	Drumsticks	No
Asteraceae	<i>Schkuhria pinnata var. abrotanoides</i>	Dwarf Marigold	Yes
Asteraceae	<i>Scolymus hispanicus</i>	Golden Thistle	Yes
Asteraceae	<i>Senecio diaschides</i>		No
Asteraceae	<i>Senecio microbasis</i>		No
Asteraceae	<i>Senecio prenanthoides</i>		No
Asteraceae	<i>Senecio quadridentatus</i>	Cotton Fireweed	No
Asteraceae	<i>Senecio spp.</i>	Groundsel, Fireweed	-
Asteraceae	<i>Sigesbeckia australiensis</i>		No
Asteraceae	<i>Sigesbeckia orientalis subsp. orientalis</i>	Indian Weed	No
Asteraceae	<i>Sigesbeckia spp.</i>		No
Asteraceae	<i>Silybum marianum</i>	Variegated Thistle	Yes
Asteraceae	<i>Solenogyne bellioides</i>	Solengyne	No
Asteraceae	<i>Solenogyne dominii</i>		No
Asteraceae	<i>Solenogyne spp.</i>		No
Asteraceae	<i>Soliva sessilis</i>	Bindyi	Yes
Asteraceae	<i>Sonchus asper</i>	Prickly Sowthistle	Yes
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	Yes
Asteraceae	<i>Stuartina spp.</i>		No
Asteraceae	<i>Tagetes minuta</i>	Stinking Roger	Yes
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	Yes
Asteraceae	<i>Triptilodiscus pygmaeus</i>	Common Sunray	No
Asteraceae	<i>Vittadinia cervicalis</i>		No
Asteraceae	<i>Vittadinia cuneata</i>		No
Asteraceae	<i>Vittadinia cuneata var. cuneata</i>		No
Asteraceae	<i>Vittadinia dissecta</i>		No
Asteraceae	<i>Vittadinia muelleri</i>		No
Asteraceae	<i>Vittadinia pterochaeta</i>	Rough Fuzzweed	No
Asteraceae	<i>Vittadinia pustulata</i>	Fuzzweed	No
Asteraceae	<i>Vittadinia spp.</i>	Fuzzweed	No
Asteraceae	<i>Vittadinia sulcata</i>		No

Family	Current Scientific Name	Common Name	Exotic
Asteraceae	<i>Xanthium occidentale</i>	Noogoora Burr	Yes
Asteraceae	<i>Xanthium spinosum</i>	Bathurst Burr	Yes
Asteraceae	<i>Xanthium spp.</i>		Yes
Asteraceae	<i>Xerochrysum bracteatum</i>	Golden Everlasting	No
Asteraceae	<i>Xerochrysum viscosum</i>	Sticky Everlasting	No
Bignoniaceae	<i>Pandorea jasminoides</i>	Bower Vine	No
Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Wonga Vine	No
Boraginaceae	<i>Buglossoides arvensis</i>	Sheepweed	Yes
Boraginaceae	<i>Cynoglossum australe</i>		No
Boraginaceae	<i>Cynoglossum spp.</i>		Yes
Boraginaceae	<i>Echium plantagineum</i>	Patterson's Curse	Yes
Boraginaceae	<i>Ehretia membranifolia</i>	Peach Bush	No
Boraginaceae	<i>Ehretia spp.</i>		No
Boraginaceae	<i>Hackelia latifolia</i>		No
Boraginaceae	<i>Plagiobothrys plurisepaleus</i>		No
Brassicaceae	<i>Brassica spp.</i>	Brassica	Yes
Brassicaceae	<i>Capsella bursa-pastoris</i>	Shepherd's Purse	Yes
Brassicaceae	<i>Cardamine spp.</i>		-
Brassicaceae	<i>Lepidium africanum</i>	Common Peppergrass	Yes
Brassicaceae	<i>Lepidium bonariense</i>	Argentine Peppergrass	Yes
Brassicaceae	<i>Lepidium didymum</i>	Lesser Swinegrass	Yes
Brassicaceae	<i>Lepidium spp.</i>		-
Brassicaceae	<i>Rapistrum rugosum</i>	Turnip Weed	Yes
Brassicaceae	<i>Sisymbrium erysimoides</i>	Smooth Mustard	Yes
Brassicaceae	<i>Sisymbrium irio</i>	London Rocket	Yes
Brassicaceae	<i>Sisymbrium orientale</i>	Indian Hedge Mustard	Yes
Cactaceae	<i>Opuntia aurantiaca</i>	Tiger Pear	Yes
Cactaceae	<i>Opuntia spp.</i>		Yes
Cactaceae	<i>Opuntia stricta</i>	Common Prickly Pear	Yes
Cactaceae	<i>Opuntia tomentosa</i>	Velvet Tree Pear	Yes
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell	No
Campanulaceae	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	No
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	No
Campanulaceae	<i>Wahlenbergia luteola</i>	Bluebell	No
Campanulaceae	<i>Wahlenbergia spp.</i>	Bluebell	No
Campanulaceae	<i>Wahlenbergia stricta</i>	Tall Bluebell	No
Campanulaceae	<i>Wahlenbergia stricta subsp. stricta</i>	Tall Bluebell	No
Capparaceae	<i>Capparis lasiantha</i>	Nepine	No
Capparaceae	<i>Capparis mitchellii</i>	Native Orange	No
Capparaceae	<i>Capparis spp.</i>		No
Caryophyllaceae	<i>Arenaria leptoclados</i>	Lesser Thyme-leaved Sandwort	Yes
Caryophyllaceae	<i>Caryophyllaceae indeterminate</i>	Pinks	-
Caryophyllaceae	<i>Cerastium glomeratum</i>	Mouse-ear Chickweed	Yes
Caryophyllaceae	<i>Cerastium spp.</i>		Yes

Family	Current Scientific Name	Common Name	Exotic
Caryophyllaceae	<i>Cerastium vulgare</i>	Mouse-ear Chickweed	Yes
Caryophyllaceae	<i>Gypsophila tubulosa</i>	Annual Chalkwort	No
Caryophyllaceae	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort, Brazilian Whitlow	Yes
Caryophyllaceae	<i>Petrorhagia nanteuillii</i>	Proliferous Pink	Yes
Caryophyllaceae	<i>Petrorhagia</i> spp.		Yes
Caryophyllaceae	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed	Yes
Caryophyllaceae	<i>Scleranthus diander</i>		No
Caryophyllaceae	<i>Scleranthus</i> spp.		No
Caryophyllaceae	<i>Silene gallica</i>	French Catchfly	Yes
Caryophyllaceae	<i>Silene</i> spp.		Yes
Caryophyllaceae	<i>Stellaria angustifolia</i>	Swamp Starwort	No
Caryophyllaceae	<i>Stellaria angustifolia</i> subsp. <i>angustifolia</i>		No
Caryophyllaceae	<i>Stellaria flaccida</i>		No
Caryophyllaceae	<i>Stellaria leptoclada</i>		No
Caryophyllaceae	<i>Stellaria media</i>	Common Chickweed	Yes
Caryophyllaceae	<i>Stellaria multiflora</i>		No
Caryophyllaceae	<i>Stellaria pallida</i>		Yes
Caryophyllaceae	<i>Stellaria pungens</i>	Prickly Starwort	No
Caryophyllaceae	<i>Stellaria</i> spp.	Prickly Starwort	-
Casuarinaceae	<i>Casuarina cristata</i>	Belah	No
Celastraceae	<i>Denhamia cunninghamii</i>		No
Chenopodiaceae	<i>Atriplex spinibractea</i>	Spiny-fruit Saltbush	No
Chenopodiaceae	<i>Chenopodiaceae</i> indeterminate	Salt-bushes	-
Chenopodiaceae	<i>Chenopodium auricomum</i>	Queensland Bluebush	No
Chenopodiaceae	<i>Chenopodium murale</i>	Nettle-leaf Goosefoot	Yes
Chenopodiaceae	<i>Dysphania carinata</i>	Keeled Goosefoot	No
Chenopodiaceae	<i>Dysphania cristata</i>	Crested Crumbweed	No
Chenopodiaceae	<i>Dysphania pumilio</i>	Small Crumbweed	No
Chenopodiaceae	<i>Dysphania</i> spp.		No
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	No
Chenopodiaceae	<i>Einadia nutans</i>	Climbing Saltbush	No
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>linifolia</i>	Climbing Saltbush	No
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>nutans</i>	Climbing Saltbush	No
Chenopodiaceae	<i>Einadia polygonoides</i>	Knotweed Goosefoot	No
Chenopodiaceae	<i>Einadia</i> spp.		No
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	No
Chenopodiaceae	<i>Einadia trigonos</i> subsp. <i>leiocarpa</i>		No
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush	No
Chenopodiaceae	<i>Maireana enchylaenoides</i>	Wingless Fissure-weed	No
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaf Bluebush	No
Chenopodiaceae	<i>Salsola australis</i>		No
Chenopodiaceae	<i>Salsola kali</i> var. <i>kali</i>	Buckbush	No
Chenopodiaceae	<i>Sclerolaena bicornis</i>	Goathead Burr	No
Chenopodiaceae	<i>Sclerolaena birchii</i>	Galvanized Burr	No

Family	Current Scientific Name	Common Name	Exotic
Chenopodiaceae	<i>Sclerolaena muricata</i>	Black Rolypoly	No
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort	No
Colchicaceae	<i>Wurmbea biglandulosa</i>		No
Colchicaceae	<i>Wurmbea dioica subsp. dioica</i>	Early Nancy	No
Colchicaceae	<i>Wurmbea spp.</i>		No
Convolvulaceae	<i>Convolvulaceae indeterminate</i>	Morning glories	-
Convolvulaceae	<i>Convolvulus erubescens</i>	Pink Bindweed	No
Convolvulaceae	<i>Convolvulus spp.</i>		-
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	No
Convolvulaceae	<i>Dichondra sp. Inglewood</i>		No
Convolvulaceae	<i>Dichondra spp.</i>		No
Convolvulaceae	<i>Evolvulus alsinoides</i>	Bindweed	No
Convolvulaceae	<i>Evolvulus alsinoides var. decumbens</i>		No
Crassulaceae	<i>Crassula decumbens var. decumbens</i>	Spreading Stonecrop	No
Crassulaceae	<i>Crassula helmsii</i>	Swamp Stonecrop	No
Crassulaceae	<i>Crassula sieberiana</i>	Australian Stonecrop	No
Crassulaceae	<i>Crassula spp.</i>	Stonecrop	No
Cucurbitaceae	<i>Citrullus amarus</i>	Camel Melon	Yes
Cucurbitaceae	<i>Citrullus spp.</i>		Yes
Cucurbitaceae	<i>Cucumis myriocarpus subsp. leptodermis</i>	Paddy Melon	Yes
Cucurbitaceae	<i>Cucumis spp.</i>		Yes
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine	No
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine	No
Cyperaceae	<i>Carex appressa</i>	Tall Sedge	No
Cyperaceae	<i>Carex breviculmis</i>		No
Cyperaceae	<i>Carex inversa</i>	Knob Sedge	No
Cyperaceae	<i>Carex spp.</i>		-
Cyperaceae	<i>Cyperaceae indeterminate</i>	Sedges	-
Cyperaceae	<i>Cyperus difformis</i>	Dirty Dora	No
Cyperaceae	<i>Cyperus fulvus</i>	Sticky Sedge	No
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat-sedge	No
Cyperaceae	<i>Cyperus rigidellus</i>		No
Cyperaceae	<i>Cyperus sanguinolentus</i>		No
Cyperaceae	<i>Cyperus spp.</i>		-
Cyperaceae	<i>Cyperus victoriensis</i>		No
Cyperaceae	<i>Eleocharis pusilla</i>		No
Cyperaceae	<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	No
Cyperaceae	<i>Fimbristylis spp.</i>		No
Cyperaceae	<i>Gahnia spp.</i>		No
Cyperaceae	<i>Lepidosperma laterale</i>	Variable Sword-sedge	No
Cyperaceae	<i>Lepidosperma spp.</i>		No
Cyperaceae	<i>Schoenus spp.</i>		No
Cyperaceae	<i>Scleria mackaviensis</i>		No

Family	Current Scientific Name	Common Name	Exotic
Cyperaceae	<i>Scleria spp.</i>		No
Dilleniaceae	<i>Hibbertia acicularis</i>		No
Dilleniaceae	<i>Hibbertia obtusifolia</i>	Hoary Guinea Flower	No
Dilleniaceae	<i>Hibbertia spp.</i>		No
Ericaceae	<i>Astroloma humifusum</i>	Native Cranberry	No
Ericaceae	<i>Brachyloma daphnoides</i>	Daphne Heath	No
Ericaceae	<i>Epacridaceae indeterminate</i>	Austral heaths	-
Ericaceae	<i>Lissanthe strigosa</i>	Peach Heath	No
Ericaceae	<i>Lissanthe strigosa subsp. subulata</i>	Peach Heath	No
Ericaceae	<i>Melichrus urceolatus</i>	Urn Heath	No
Euphorbiaceae	<i>Beyeria viscosa</i>	Sticky Wallaby Bush	No
Euphorbiaceae	<i>Chamaesyce dallachyana</i>		No
Euphorbiaceae	<i>Chamaesyce drummondii</i>	Caustic Weed	No
Euphorbiaceae	<i>Euphorbia planiticola</i>	Plains Spurge	No
Euphorbiaceae	<i>Euphorbia spp.</i>		-
Fabaceae (Caesalpinioideae)	<i>Senna barclayana</i>	Smooth Senna	No
Fabaceae (Caesalpinioideae)	<i>Senna clavigera</i>		No
Fabaceae (Caesalpinioideae)	<i>Senna coronilloides</i>		No
Fabaceae (Caesalpinioideae)	<i>Senna spp.</i>		-
Fabaceae (Faboideae)	<i>Cullen tenax</i>	Emu-foot	No
Fabaceae (Faboideae)	<i>Daviesia genistifolia</i>	Broom Bitter Pea	No
Fabaceae (Faboideae)	<i>Daviesia mimosoides</i>		No
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	No
Fabaceae (Faboideae)	<i>Desmodium gunnii</i>	Slender Tick-trefoil	No
Fabaceae (Faboideae)	<i>Desmodium varians</i>	Slender Tick-trefoil	No
Fabaceae (Faboideae)	<i>Dillwynia phyllicoides</i>	Parrot-pea	No
Fabaceae (Faboideae)	<i>Fabaceae indeterminate</i>	Legumes	-
Fabaceae (Faboideae)	<i>Glycine canescens</i>	Silky Glycine	No
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining glycine	No
Fabaceae (Faboideae)	<i>Glycine microphylla</i>	Small-leaf Glycine	No
Fabaceae (Faboideae)	<i>Glycine spp.</i>		No
Fabaceae (Faboideae)	<i>Glycine stenophita</i>		No
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine	No
Fabaceae (Faboideae)	<i>Glycine tabacina 'l' form f. 'l'</i>		No
Fabaceae (Faboideae)	<i>Gompholobium huegelii</i>	Pale Wedge Pea	No
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla	No
Fabaceae (Faboideae)	<i>Hovea heterophylla</i>		No
Fabaceae (Faboideae)	<i>Hovea lanceolata</i>		No
Fabaceae (Faboideae)	<i>Hovea spp.</i>		No
Fabaceae (Faboideae)	<i>Indigofera adesmiifolia</i>	Tick Indigo	No
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian Indigo	No
Fabaceae (Faboideae)	<i>Lespedeza juncea subsp. sericea</i>		No
Fabaceae (Faboideae)	<i>Lotus australis</i>	Australian Trefoil	No
Fabaceae (Faboideae)	<i>Medicago arabica</i>	Spotted Burr Medic	Yes
Fabaceae (Faboideae)	<i>Medicago laciniata</i>	Cut-leaved Medic	Yes

Family	Current Scientific Name	Common Name	Exotic
Fabaceae (Faboideae)	<i>Medicago minima</i>	Woolly Burr Medic	Yes
Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic	Yes
Fabaceae (Faboideae)	<i>Medicago spp.</i>		Yes
Fabaceae (Faboideae)	<i>Medicago truncatula</i>	Barrel Medic	Yes
Fabaceae (Faboideae)	<i>Oxytes brachypoda</i>	Large Tick-trefoil	No
Fabaceae (Faboideae)	<i>Pultenaea cuneata</i>		No
Fabaceae (Faboideae)	<i>Pultenaea retusa</i>		No
Fabaceae (Faboideae)	<i>Pultenaea setulosa</i>		No
Fabaceae (Faboideae)	<i>Pultenaea spp.</i>		No
Fabaceae (Faboideae)	<i>Rhynchosia minima</i>		No
Fabaceae (Faboideae)	<i>Swainsona galegifolia</i>	Smooth Darling Pea	No
Fabaceae (Faboideae)	<i>Swainsona spp.</i>		No
Fabaceae (Faboideae)	<i>Trifolium angustifolium</i>	Narrow-leaved Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium arvense</i>	Haresfoot Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium campestre</i>	Hop Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium cernuum</i>	Drooping-flowered Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium dubium</i>	Yellow Suckling Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium glomeratum</i>	Clustered Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium hirtum</i>	Rose Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium scabrum</i>	Rough Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium spp.</i>		Yes
Fabaceae (Faboideae)	<i>Trifolium striatum</i>	Knotted Clover	Yes
Fabaceae (Faboideae)	<i>Trifolium subterraneum</i>	Subterranean Clover	Yes
Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common vetch	Yes
Fabaceae (Faboideae)	<i>Vicia spp.</i>	Vetch	Yes
Fabaceae (Faboideae)	<i>Zornia dyctiocarpa var. dyctiocarpa</i>	Zornia	No
Fabaceae (Mimosoideae)	<i>Acacia cheelii</i>	Motherumbah	No
Fabaceae (Mimosoideae)	<i>Acacia deanei</i>	Green Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia deanei subsp. deanei</i>	Deane's Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia decora</i>	Western Silver Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia rubida</i>	Red-stemmed Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia spp.</i>	Wattle	No
Fabaceae (Mimosoideae)	<i>Acacia stenophylla</i>	River Cooba	No
Fabaceae (Mimosoideae)	<i>Archidendron grandiflorum</i>	Pink Lace Flower	No
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury	Yes
Gentianaceae	<i>Centaurium tenuiflorum</i>	Branched Centaury, Slender centaury	Yes
Geraniaceae	<i>Erodium cicutarium</i>	Common Crowfoot	Yes
Geraniaceae	<i>Erodium crinitum</i>	Blue Crowfoot	No
Geraniaceae	<i>Erodium spp.</i>	Crowfoot	-
Geraniaceae	<i>Geranium retrorsum</i>	Cranesbill Geranium	No
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium	No
Geraniaceae	<i>Geranium solanderi var. solanderi</i>		No

Family	Current Scientific Name	Common Name	Exotic
Geraniaceae	<i>Geranium spp.</i>		-
Geraniaceae	<i>Pelargonium australe</i>	Native Storksbill	No
Geraniaceae	<i>Pelargonium spp.</i>		-
Goodeniaceae	<i>Brunonia australis</i>	Blue Pincushion	No
Goodeniaceae	<i>Goodenia cycloptera</i>	Cut-leaf Goodenia	No
Goodeniaceae	<i>Goodenia fascicularis</i>	Mallee Goodenia	No
Goodeniaceae	<i>Goodenia glabra</i>	Smooth Goodenia	No
Goodeniaceae	<i>Goodenia hederacea</i>	Ivy Goodenia	No
Goodeniaceae	<i>Goodenia hederacea subsp. hederacea</i>		No
Goodeniaceae	<i>Goodenia pinnatifida</i>	Scrambles Eggs	No
Goodeniaceae	<i>Goodenia rotundifolia</i>		No
Goodeniaceae	<i>Goodenia spp.</i>		No
Haloragaceae	<i>Gonocarpus spp.</i>	Raspwort	No
Haloragaceae	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	No
Haloragaceae	<i>Haloragaceae indeterminate</i>	Raspworts and milfoils	-
Haloragaceae	<i>Haloragis aspera</i>	Rough Raspwort	No
Haloragaceae	<i>Haloragis heterophylla</i>	Variable Raspwort	No
Iridaceae	<i>Patersonia sericea</i>	Silky Purple-Flag	No
Juncaceae	<i>Juncus bufonius</i>	Toad Rush	Yes
Juncaceae	<i>Juncus filicaulis</i>		No
Juncaceae	<i>Juncus homalocaulis</i>		No
Juncaceae	<i>Juncus spp.</i>		No
Juncaceae	<i>Juncus subglauca</i>	Rush	No
Juncaceae	<i>Juncus subsecundus</i>	Finger Rush	No
Juncaceae	<i>Luzula spp.</i>		No
Lamiaceae	<i>Ajuga australis</i>	Austral Bugle	No
Lamiaceae	<i>Lamiaceae indeterminate</i>	Mints and balms	-
Lamiaceae	<i>Lamium amplexicaule</i>	Dead Nettle	Yes
Lamiaceae	<i>Marrubium vulgare</i>	White Horehound	Yes
Lamiaceae	<i>Mentha diemenica</i>	Slender Mint	No
Lamiaceae	<i>Mentha sativoides</i>	Native Pennyroyal	No
Lamiaceae	<i>Plectranthus parviflorus</i>		No
Lamiaceae	<i>Salvia plebeia</i>	Austral Sage	No
Lamiaceae	<i>Salvia reflexa</i>	Mintweed	Yes
Lamiaceae	<i>Salvia verbenaca</i>	Vervain	Yes
Lamiaceae	<i>Scutellaria humilis</i>	Dwarf Skullcap	No
Lamiaceae	<i>Scutellaria spp.</i>		No
Lamiaceae	<i>Stachys arvensis</i>	Stagger Weed	Yes
Lamiaceae	<i>Teucrium betchei</i>		No
Lamiaceae	<i>Teucrium junceum</i>		No
Lamiaceae	<i>Teucrium spp.</i>		No
Lemnaceae	<i>Lemna spp.</i>		No
Linaceae	<i>Linum marginale</i>	Native Flax	No
Loganiaceae	<i>Mitrasacme spp.</i>		No

Family	Current Scientific Name	Common Name	Exotic
Lomandraceae	<i>Lomandra confertifolia</i> subsp. <i>pallida</i>	Matrush	No
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Matt-rush	No
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Matt-rush	No
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>		No
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>flavior</i>	Wattle Matt-rush	No
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	No
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush	No
Lomandraceae	<i>Lomandra</i> spp.	Mat-rush	No
Loranthaceae	<i>Amyema pendula</i>		No
Loranthaceae	<i>Amyema quandang</i>	Grey Mistletoe	No
Loranthaceae	<i>Amyema</i> spp.	Mistletoe	No
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry	No
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily	No
Malaceae	<i>Cotoneaster</i> spp.		Yes
Malaceae	<i>Pyracantha crenulata</i>		Yes
Malaceae	<i>Pyracantha</i> spp.		Yes
Malvaceae	<i>Abutilon oxycarpum</i>	Straggly Lantern-bush	No
Malvaceae	<i>Abutilon</i> spp.	Lantern-bush	No
Malvaceae	<i>Abutilon tubulosum</i>		No
Malvaceae	<i>Brachychiton populneus</i>	Kurrajong	No
Malvaceae	<i>Brachychiton populneus</i> subsp. <i>populneus</i>		No
Malvaceae	<i>Brachychiton</i> spp.		No
Malvaceae	<i>Hibiscus sturtii</i>	Hill Hibiscus	No
Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow	Yes
Malvaceae	<i>Malva</i> spp.	Mallow	Yes
Malvaceae	<i>Malvaceae</i> indeterminate	Mallows, jutes and lantern bushes	-
Malvaceae	<i>Malvastrum americanum</i>	Spiked Malvastrum	Yes
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	Yes
Malvaceae	<i>Sida corrugata</i>	Corrugated Sida	No
Malvaceae	<i>Sida cunninghamii</i>	Ridge Sida	No
Malvaceae	<i>Sida fibulifera</i>	Pin Sida	No
Malvaceae	<i>Sida hackettiana</i>	Golden Rod, Spiked Sida, Queensland Hemp	No
Malvaceae	<i>Sida spinosa</i>		Yes
Malvaceae	<i>Sida</i> spp.		-
Malvaceae	<i>Sida trichopoda</i>	High Sida	No
Marsileaceae	<i>Marsilea</i> spp.		No
Myoporaceae	<i>Eremophila debilis</i>	Amulla	No
Myoporaceae	<i>Eremophila mitchellii</i>	Budda	No
Myoporaceae	<i>Myoporum montanum</i>	Western Boobialla	No
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	No
Myrtaceae	<i>Callistemon pungens</i> *		No
Myrtaceae	<i>Eucalyptus albens</i>	White Box	No

Family	Current Scientific Name	Common Name	Exotic
Myrtaceae	<i>Eucalyptus andrewsii</i>	Gum-topped Peppermint	No
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	No
Myrtaceae	<i>Eucalyptus bridgesiana</i>	Apple Box	No
Myrtaceae	<i>Eucalyptus camaldulensis</i>	River Red Gum	No
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	No
Myrtaceae	<i>Eucalyptus dalrympleana</i>	Mountain Gum	No
Myrtaceae	<i>Eucalyptus dealbata</i>	Tumbledown Red Gum	No
Myrtaceae	<i>Eucalyptus elliptica</i>	Bendemeer White Gum	No
Myrtaceae	<i>Eucalyptus laevopinea</i>	Silver-top Stringybark	No
Myrtaceae	<i>Eucalyptus macrorhyncha</i>	Red Stringybark	No
Myrtaceae	<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	No
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box	No
Myrtaceae	<i>Eucalyptus microcarpa</i>	Western Grey Box	No
Myrtaceae	<i>Eucalyptus populnea subsp. bimbil</i>	Bimble Box	No
Myrtaceae	<i>Eucalyptus prava</i>	Orange Gum	No
Myrtaceae	<i>Eucalyptus spp.</i>		No
Myrtaceae	<i>Eucalyptus viminalis</i>	Ribbon Gum	No
Myrtaceae	<i>Leptospermum polygalifolium subsp. transmontanum</i>		No
Myrtaceae	<i>Leptospermum spp.</i>	Tea-tree	No
Myrtaceae	<i>Melaleuca bracteata</i>	Black Tea-tree	No
Nyctaginaceae	<i>Boerhavia dominii</i>	Tarvine	No
Oleaceae	<i>Jasminum lineare</i>	Desert Jasmine	No
Oleaceae	<i>Jasminum suavisissimum</i>		No
Oleaceae	<i>Ligustrum vulgare</i>	European Privet	Yes
Oleaceae	<i>Notelaea microcarpa</i>	Native Olive	No
Oleaceae	<i>Notelaea microcarpa var. microcarpa</i>		No
Oleaceae	<i>Olea europaea</i>	Common Olive	Yes
Onagraceae	<i>Epilobium billardierianum subsp. billardierianum</i>		No
Ophioglossaceae	<i>Ophioglossum lusitanicum</i>	Adder's Tongue	No
Ophioglossaceae	<i>Ophioglossum spp.</i>		No
Orchidaceae	<i>Cymbidium canaliculatum</i>	Tiger Orchid	No
Orchidaceae	<i>Microtis unifolia</i>	Common Onion Orchid	No
Orchidaceae	<i>Pterostylis spp.</i>	Greenhood	No
Oxalidaceae	<i>Oxalis chnoodes</i>		No
Oxalidaceae	<i>Oxalis exilis</i>		No
Oxalidaceae	<i>Oxalis perennans</i>		No
Oxalidaceae	<i>Oxalis spp.</i>		No
Papaveraceae	<i>Argemone ochroleuca subsp. ochroleuca</i>	Mexican Poppy	Yes
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily	No
Phormiaceae	<i>Dianella longifolia</i>	Blueberry Lily	No
Phormiaceae	<i>Dianella longifolia var. stenophylla</i>		No
Phormiaceae	<i>Dianella revoluta</i>	Blueberry Lily	No
Phormiaceae	<i>Dianella revoluta var. revoluta</i>		No

Family	Current Scientific Name	Common Name	Exotic
Phormiaceae	<i>Dianella spp.</i>		No
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush	No
Phyllanthaceae	<i>Phyllanthus gunnii</i>		No
Phyllanthaceae	<i>Phyllanthus spp.</i>		-
Phyllanthaceae	<i>Phyllanthus virgatus</i>	Wiry Spurge	No
Phyllanthaceae	<i>Poranthera microphylla</i>	Small Poranthera	No
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	No
Pittosporaceae	<i>Pittosporum angustifolium</i>	Butterbush	No
Pittosporaceae	<i>Rhytidisporum procumbens</i>		No
Plantaginaceae	<i>Plantago debilis</i>	Shade Plantain	No
Plantaginaceae	<i>Plantago hispida</i>		No
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	Yes
Plantaginaceae	<i>Plantago spp.</i>	Plantain	-
Plantaginaceae	<i>Plantago turrifera</i>	Small Sago-weed	No
Plantaginaceae	<i>Plantago varia</i>		No
Plantaginaceae	<i>Veronica arvensis</i>	Wall Speedwell	Yes
Plantaginaceae	<i>Veronica calycina</i>	Hairy Speedwell	No
Plantaginaceae	<i>Veronica plebeia</i>	Trailing Speedwell	No
Plantaginaceae	<i>Veronica spp.</i>		-
Poaceae	<i>Anthosachne scabra</i>	Wheatgrass, Common Wheatgrass	No
Poaceae	<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	Yes
Poaceae	<i>Aristida acuta</i>		No
Poaceae	<i>Aristida calycina</i>		No
Poaceae	<i>Aristida caput-medusae</i>	Many-headed Wiregrass	No
Poaceae	<i>Aristida jerichoensis</i>	Jericho Wiregrass	No
Poaceae	<i>Aristida leptopoda</i>	White Speargrass	No
Poaceae	<i>Aristida personata</i>		No
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass	No
Poaceae	<i>Aristida spp.</i>		No
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass	No
Poaceae	<i>Arundinella nepalensis</i>	Reedgrass	No
Poaceae	<i>Austrostipa aristiglumis</i>	Plains Grass	No
Poaceae	<i>Austrostipa bigeniculata</i>	Yanganbil	No
Poaceae	<i>Austrostipa nitida</i>		No
Poaceae	<i>Austrostipa scabra</i>	Speargrass	No
Poaceae	<i>Austrostipa setacea</i>	Corkscrew Grass	No
Poaceae	<i>Austrostipa spp.</i>		No
Poaceae	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	No
Poaceae	<i>Avena barbata</i>	Bearded Oats	Yes
Poaceae	<i>Avena ludoviciana</i>	Ludo Wild Oats	Yes
Poaceae	<i>Avena sativa</i>	Oats	Yes
Poaceae	<i>Bothriochloa decipiens</i> var. <i>decipiens</i>	Pitted Bluegrass	No
Poaceae	<i>Bothriochloa macra</i>	Red Grass	No
Poaceae	<i>Bothriochloa spp.</i>	Redgrass, Bluegrass	No

Family	Current Scientific Name	Common Name	Exotic
Poaceae	<i>Briza minor</i>	Shivery Grass	Yes
Poaceae	<i>Bromus catharticus</i>	Praire Grass	Yes
Poaceae	<i>Cenchrus ciliaris</i>	Buffel Grass	Yes
Poaceae	<i>Cenchrus longisetus</i>	Feathertop, White Foxtail	Yes
Poaceae	<i>Cenchrus spp.</i>		Yes
Poaceae	<i>Chloris spp.</i>		-
Poaceae	<i>Chloris truncata</i>	Windmill Grass	No
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris	No
Poaceae	<i>Chloris virgata</i>	Feathertop Rhodes Grass	Yes
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass	No
Poaceae	<i>Cynodon dactylon</i>	Common Couch	No
Poaceae	<i>Dactyloctenium radulans</i>	Button Grass	No
Poaceae	<i>Deyeuxia spp.</i>		No
Poaceae	<i>Dichanthium sericeum</i> [^]	Queensland Bluegrass	No
Poaceae	<i>Dichanthium sericeum subsp. sericeum</i>	Queensland Bluegrass	No
Poaceae	<i>Dichanthium setosum</i>	Bluegrass	No
Poaceae	<i>Dichanthium spp.</i>		No
Poaceae	<i>Dichelachne crinita</i>	Longhair Plumegrass	No
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass	No
Poaceae	<i>Dichelachne sieberiana</i>		No
Poaceae	<i>Dichelachne spp.</i>		No
Poaceae	<i>Digitaria brownii</i>	Cotton Panic Grass	No
Poaceae	<i>Digitaria diffusa</i>	Open Summer-grass	No
Poaceae	<i>Digitaria divaricatissima</i>	Umbrella Grass	No
Poaceae	<i>Digitaria ramularis</i>	Finger Panic Grass	No
Poaceae	<i>Digitaria spp.</i>		No
Poaceae	<i>Echinochloa crus-galli</i>	Barnyard Grass	Yes
Poaceae	<i>Echinochloa esculenta</i>	Japanese Millet	Yes
Poaceae	<i>Echinopogon intermedius</i>	Erect Hedgehog Grass	No
Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass	No
Poaceae	<i>Echinopogon spp.</i>		No
Poaceae	<i>Eleusine spp.</i>		Yes
Poaceae	<i>Eleusine tristachya</i>	Goose Grass	Yes
Poaceae	<i>Elymus plurinervis</i>		No
Poaceae	<i>Elymus spp.</i>		No
Poaceae	<i>Enneapogon gracilis</i>	Slender Nineawn	No
Poaceae	<i>Enneapogon nigricans</i>	Niggerheads	No
Poaceae	<i>Enneapogon spp.</i>	Nineawn Grass, Bottlewashers	No
Poaceae	<i>Enneapogon truncatus</i>	Bottlewashers	No
Poaceae	<i>Enteropogon acicularis</i>	Curly Windmill Grass	No
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	No
Poaceae	<i>Eragrostis cilianensis</i>	Stinkgrass	Yes
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	Yes
Poaceae	<i>Eragrostis elongata</i>	Clustered Lovegrass	No

Family	Current Scientific Name	Common Name	Exotic
Poaceae	<i>Eragrostis lacunaria</i>	Purple Lovegrass	No
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	No
Poaceae	<i>Eragrostis megalosperma</i>		No
Poaceae	<i>Eragrostis parviflora</i>	Weeping Lovegrass	No
Poaceae	<i>Eragrostis spp.</i>		-
Poaceae	<i>Eriochloa crebra</i>	Cup Grass, Tall Cupgrass	No
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	No
Poaceae	<i>Eriochloa spp.</i>		No
Poaceae	<i>Eulalia aurea</i>	Silky Browntop	No
Poaceae	<i>Glyceria spp.</i>		Yes
Poaceae	<i>Hordeum leporinum</i>	Barley Grass	Yes
Poaceae	<i>Hordeum spp.</i>		Yes
Poaceae	<i>Hyparrhenia hirta</i>	Coolatai Grass	Yes
Poaceae	<i>Imperata cylindrica</i>	Blady Grass	No
Poaceae	<i>Lachnagrostis filiformis</i>		No
Poaceae	<i>Lolium perenne</i>	Perennial Ryegrass	Yes
Poaceae	<i>Lolium spp.</i>		Yes
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	No
Poaceae	<i>Microlaena stipoides var. stipoides</i>	Weeping Grass	No
Poaceae	<i>Panicum buncei</i>	Native Panic	No
Poaceae	<i>Panicum effusum</i>	Hairy Panic	No
Poaceae	<i>Panicum spp.</i>	Panicum	No
Poaceae	<i>Paspalidium distans</i>		No
Poaceae	<i>Paspalidium gracile</i>	Slender Panic	No
Poaceae	<i>Paspalidium spp.</i>		No
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	Yes
Poaceae	<i>Paspalum spp.</i>		Yes
Poaceae	<i>Poa annua</i>	Winter Grass	Yes
Poaceae	<i>Poa labillardierei var. labillardierei</i>	Tussock	No
Poaceae	<i>Poa sieberiana</i>	Snowgrass	No
Poaceae	<i>Poa spp.</i>		-
Poaceae	<i>Poaceae indeterminate</i>	Grasses, reeds and bamboos	-
Poaceae	<i>Rytidosperma bipartitum</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	No
Poaceae	<i>Rytidosperma fulvum</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma laeve</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma longifolium</i>	Long-leaved Wallaby Grass	No
Poaceae	<i>Rytidosperma pallidum</i>	Redanther Wallaby Grass; Silvertop Wallaby Grass	No
Poaceae	<i>Rytidosperma racemosum</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma racemosum var. obtusatum</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma racemosum var. racemosum</i>	Wallaby Grass	No
Poaceae	<i>Rytidosperma setaceum</i>	Small-flowered Wallaby-grass	No

Family	Current Scientific Name	Common Name	Exotic
Poaceae	<i>Rytidosperma spp.</i>		No
Poaceae	<i>Setaria parviflora</i>		Yes
Poaceae	<i>Setaria spp.</i>		Yes
Poaceae	<i>Setaria viridis</i>	Green Pigeon Grass	Yes
Poaceae	<i>Sorghum leiocladum</i>	Wild Sorghum	No
Poaceae	<i>Sporobolus caroli</i>	Fairy Grass	No
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	No
Poaceae	<i>Sporobolus spp.</i>	Rat's Tail Couch	-
Poaceae	<i>Themeda triandra</i>		No
Poaceae	<i>Thyridolepis mitchelliana</i>	Mulga Mitchell Grass	No
Poaceae	<i>Tragus australianus</i>	Small Burrgrass	No
Poaceae	<i>Tripogon loliiformis</i>	Fiveminute Grass	No
Poaceae	<i>Urochloa panicoides</i>	Urochloa Grass	Yes
Poaceae	<i>Urochloa spp.</i>		Yes
Polygalaceae	<i>Polygala japonica</i>	Dwarf Milkwort	No
Polygonaceae	<i>Emex australis</i>	Spiny Emex	Yes
Polygonaceae	<i>Fallopia convolvulus</i>	Black Bindweed	Yes
Polygonaceae	<i>Persicaria maculosa</i>	Redshank	Yes
Polygonaceae	<i>Polygonum aviculare</i>	Wireweed	Yes
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock	No
Portulacaceae	<i>Calandrinia eremaea</i>	Small Purslane	No
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed	No
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Yes
Proteaceae	<i>Hakea microcarpa</i>	Small-fruited Hakea	No
Proteaceae	<i>Hakea spp.</i>		No
Proteaceae	<i>Persoonia sericea</i>		No
Pteridaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern	No
Pteridaceae	<i>Cheilanthes distans</i>	Bristly Cloak Fern	No
Pteridaceae	<i>Cheilanthes sieberi</i>	Rock Fern	No
Pteridaceae	<i>Cheilanthes sieberi subsp. sieberi</i>	Rock Fern	No
Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard	No
Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine	No
Ranunculaceae	<i>Clematis microphylla</i>	Small-leaved Clematis	No
Ranunculaceae	<i>Clematis spp.</i>		No
Ranunculaceae	<i>Ranunculus inundatus</i>	River Buttercup	No
Ranunculaceae	<i>Ranunculus lappaceus</i>	Common Buttercup	No
Ranunculaceae	<i>Ranunculus pumilio</i>	Ferny Buttercup	No
Ranunculaceae	<i>Ranunculus pumilio var. politus</i>		No
Ranunculaceae	<i>Ranunculus sessiliflorus</i>	Small-flowered Buttercup	No
Ranunculaceae	<i>Ranunculus sessiliflorus var. sessiliflorus</i>		No
Ranunculaceae	<i>Ranunculus spp.</i>		No
Resedaceae	<i>Reseda luteola</i>	Weld	Yes
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash	No
Rhamnaceae	<i>Cryptandra amara</i>	Bitter Cryptandra	No

Family	Current Scientific Name	Common Name	Exotic
Rhamnaceae	<i>Cryptandra spp.</i>		No
Rhamnaceae	<i>Discaria pubescens</i>	Australian Anchor Plant	No
Rosaceae	<i>Acaena novae-zelandiae</i>	Bidgee-widgee	No
Rosaceae	<i>Acaena ovina</i>	Acaena	No
Rosaceae	<i>Acaena spp.</i>	Sheep's Burr	No
Rosaceae	<i>Rosa rubiginosa</i>	Sweet Briar	Yes
Rosaceae	<i>Rubus fruticosus sp. agg.</i>	Blackberry complex	Yes
Rosaceae	<i>Rubus parvifolius</i>	Native Raspberry	No
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff	No
Rubiaceae	<i>Galium aparine</i>	Goosegrass	Yes
Rubiaceae	<i>Galium gaudichaudii</i>	Rough Bedstraw	No
Rubiaceae	<i>Galium leptogonium</i>		No
Rubiaceae	<i>Galium microlobum</i>		No
Rubiaceae	<i>Galium propinquum</i>	Maori Bedstraw	No
Rubiaceae	<i>Galium spp.</i>		-
Rubiaceae	<i>Opercularia aspera</i>	Coarse Stinkweed	No
Rubiaceae	<i>Opercularia diphylla</i>	Stinkweed	No
Rubiaceae	<i>Opercularia spp.</i>		No
Rubiaceae	<i>Opercularia varia</i>	Variable Stinkweed	No
Rubiaceae	<i>Psydrax odorata</i>	Shiny-leaved Canthium	No
Rubiaceae	<i>Psydrax oleifolia</i>		No
Rutaceae	<i>Correa reflexa</i>	Native Fuschia	No
Rutaceae	<i>Geijera parviflora</i>	Wilga	No
Santalaceae	<i>Exocarpos cupressiformis</i>	Cherry Ballart	No
Santalaceae	<i>Santalum lanceolatum</i>	Northern Sandalwood	No
Sapindaceae	<i>Alectryon oleifolius</i>	Western Rosewood	No
Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood	No
Sapindaceae	<i>Dodonaea sinuolata</i>		No
Sapindaceae	<i>Dodonaea spp.</i>		No
Sapindaceae	<i>Dodonaea viscosa</i>	Sticky Hop-bush	No
Sapindaceae	<i>Dodonaea viscosa subsp. angustifolia</i>		No
Sapindaceae	<i>Dodonaea viscosa subsp. angustissima</i>	Narrow-leaf Hop-bush	No
Scrophulariaceae	<i>Linaria arvensis</i>		Yes
Scrophulariaceae	<i>Linaria vulgaris</i>		Yes
Scrophulariaceae	<i>Misopates orontium</i>	Lesser Snapdragon	Yes
Scrophulariaceae	<i>Scrophulariaceae indeterminate</i>	Toadflaxes and mulleins	-
Scrophulariaceae	<i>Verbascum spp.</i>		Yes
Scrophulariaceae	<i>Verbascum thapsus subsp. thapsus</i>	Great Mullein	Yes
Scrophulariaceae	<i>Verbascum virgatum</i>	Twiggy Mullein	Yes
Solanaceae	<i>Datura ferox</i>	Fierce Thornapple	Yes
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	Yes
Solanaceae	<i>Nicotiana suaveolens</i>	Native Tobacco	No
Solanaceae	<i>Physalis ixocarpa</i>	Ground Cherry	Yes
Solanaceae	<i>Physalis spp.</i>		Yes

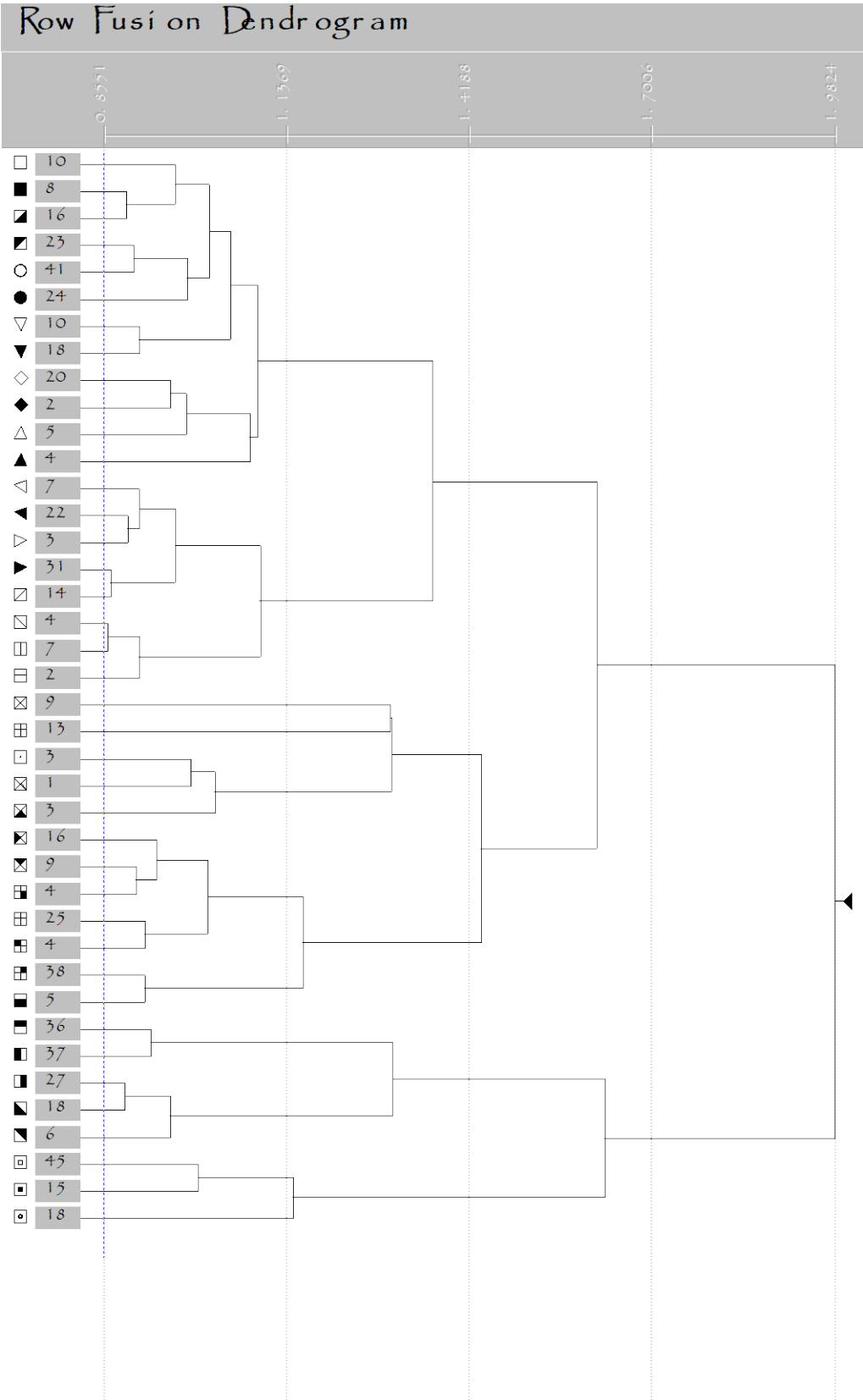
Family	Current Scientific Name	Common Name	Exotic
Solanaceae	<i>Solanum amblymerum</i>		No
Solanaceae	<i>Solanum cinereum</i>	Narrawa Burr	No
Solanaceae	<i>Solanum esuriale</i>	Quena	No
Solanaceae	<i>Solanum jucundum</i>		No
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	Yes
Solanaceae	<i>Solanum parvifolium subsp. parvifolium</i>	Nightshade	No
Solanaceae	<i>Solanum spp.</i>		-
Stackhousiaceae	<i>Stackhousia monogyna</i>	Creamy Candles	No
Stackhousiaceae	<i>Stackhousia muricata</i>	Stackhousia	No
Stackhousiaceae	<i>Stackhousia spp.</i>		No
Thymelaeaceae	<i>Pimelea curviflora</i>	Rice Flower	No
Thymelaeaceae	<i>Pimelea curviflora var. sericea</i>		No
Thymelaeaceae	<i>Pimelea glauca</i>	Smooth Rice-flower	No
Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower	No
Thymelaeaceae	<i>Pimelea neo-anglica</i>	Poison Pimelea	No
Thymelaeaceae	<i>Pimelea spp.</i>		No
Thymelaeaceae	<i>Pimelea strigosa</i>		No
Urticaceae	<i>Parietaria debilis</i>	Native Pellitory	No
Urticaceae	<i>Parietaria judaica</i>	Pellitory	Yes
Urticaceae	<i>Urtica dioica</i>	Giant Nettle	Yes
Urticaceae	<i>Urtica incisa</i>	Stinging Nettle	No
Urticaceae	<i>Urtica spp.</i>		-
Verbenaceae	<i>Phyla canescens</i>	Lippia	Yes
Verbenaceae	<i>Verbena africana</i>		Yes
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	Yes
Verbenaceae	<i>Verbena gaudichaudii</i>	Verbena	No
Verbenaceae	<i>Verbena spp.</i>		-
Verbenaceae	<i>Verbena supina</i>	Trailing Verbena	Yes
Violaceae	<i>Melicytus dentatus</i>	Tree Violet	No
Violaceae	<i>Viola betonicifolia</i>	Native Violet	No
Violaceae	<i>Viola spp.</i>		-
Xanthorrhoeaceae	<i>Xanthorrhoea spp.</i>		No
Zygophyllaceae	<i>Tribulus micrococcus</i>	Spineless Caltrop	No
Zygophyllaceae	<i>Tribulus spp.</i>	Cat-head, Caltrop	-
Zygophyllaceae	<i>Zygophyllum glaucum</i>	Pale Twinleaf	No
Zygophyllaceae	<i>Zygophyllum iodocarpum</i>	Violet Twinleaf	No

* Listed as Vulnerable under the EPBC Act

^ Listed as Vulnerable under the BC Act and EPBC Act

Appendix B: Output of Floristic Analysis

Dendrogram



Plot Group Membership

Survey ID	Site ID	Group
NARROM_99	NRM99-14	1
NARROM_99	NRM99-10	1
NVMP-NPWS	NBFF0363	1
JTH_PY	PY08	1
JTH_PY	PY21	1
JTH_PY	PY16	1
JTH_PY	PY19	1
JTH_RU	RU06	1
JTH_RU	RU02	1
JTH_RU	RU09	1
STH_KAP_98	MTKAPP03	2
STH_KAP_98	MTKAPP39	2
STH_KAP_98	MTKAPP37	2
STH_KAP_98	MTKAPP47	2
STH_KAP_98	MTKAPP48	2
NVMP-NPWS	NBFF0005	2
NVMP-NPWS	NBFF0006	2
NVMP-NPWS	NBFF0007	2
STH_KAP_98	MTKAPP35	3
NANDE_WRA	NBFF1295	3
NANDE_WRA	NBFF1300	3
NVMP-NPWS	NBFF0364	3
NVMP-NPWS	NBFF0365	3
NVMP-NPWS	NBFF0483	3
PLAINSF_99	WKDLB017	3
JTH_KV	KV07	3
JTH_KV	KV08	3
JTH_KV	KV10	3
JTH_KV	KV02	3
JTH_KV	KV09	3
JTH_PY	PY20	3
JTH_RU	RU08	3
NO	NOFF0082	3
SO	SOFF0070	3
NARROM_99	NRM99-15	4
NARROM_99	NRM99-11	4
NARROM_99	NRM99-12	4
NARROM_99	NRM99-13	4
NARROM_99	NRM99-16	4
NARROM_99	NRM99-09	4
BOGGABRI	BGB104	4
BOGGABRI	BGB013	4
BOGGABRI	BGB057	4
BOGGABRI	BGB060	4
BOGGABRI	BGB061	4
BOGGABRI	BGB071	4

Survey ID	Site ID	Group
BOGGABRI	BGB068	4
BOGGABRI	BGB098	4
BOGGABRI	BGB099	4
JVMPDB	JV_JW003	4
JVMPDB	JV_JW004	4
JVMPDB	JV_JW006	4
JVMPDB	JV_JW007	4
JVMPDB	JV_JW002	4
JVMPDB	JV_JW005	4
JVMPDB	JV_JW008	4
PLAINSF_99	WLDLB099	4
BOGGABRI	BGB009	5
BOGGABRI	BGB070	5
JTH_KV	KV12	5
JTH_KV	KV06	5
JTH_KV	KV11	5
JTH_KV	KV01	5
JTH_KV	KV03	5
JTH_KV	KV17	5
JTH_KV	KV18	5
JTH_KV	KV21	5
JTH_KV	KV19	5
JTH_KV	KV20	5
JTH_LE	LE11	5
JTH_LE	LE09	5
JTH_LE	LE10	5
JTH_LE	LE03	5
JTH_LE	LE13	5
JTH_LE	LE14	5
JTH_PY	PY01	5
JTH_PY	PY02	5
JTH_PY	PY03	5
JTH_PY	PY09	5
JTH_PY	PY04	5
JTH_PY	PY14	5
JTH_PY	PY10	5
JTH_PY	PY11	5
JTH_PY	PY12	5
JTH_PY	PY13	5
JTH_PY	PY22	5
JTH_PY	PY29	5
JTH_PY	PY30	5
JTH_PY	PY17	5
JTH_PY	PY24	5
JTH_PY	PY18	5
JTH_PY	PY23	5
JTH_PY	PY25	5

Survey ID	Site ID	Group
JTH_PY	PY26	5
JTH_PY	PY27	5
JTH_RU	RU07	5
JTH_RU	RU01	5
JTH_RU	RU03	5
JVMPDB	JV_DB153	6
JVMPDB	JV_SF008	6
JVMPDB	JV_SF007	6
PLAINSF_99	WVDLB046	6
PLAINSF_99	WVDLB047	6
PLAINSF_99	WLDLB100	6
PLAINSF_99	WLDLB097	6
PLAINSF_99	WLDLB098	6
PLAINSF_99	WLDLB101	6
PLAINSF_99	WLDLB095	6
PLAINSF_99	WLDLB094	6
PLAINSF_99	WLDLB096	6
PLAINSF_99	WLDLB093	6
PLAINSF_99	WKDLB043	6
PLAINSF_99	WKDLB018	6
FS_TARRAWONGA10	TRWNGA05	6
FS_TARRAWONGA10	TRWNGA04	6
FS_TARRAWONGA10	TRWNGA06	6
FS_TARRAWONGA10	TRWNGA01	6
FS_TARRAWONGA10	TRWNGA07	6
FS_TARRAWONGA10	TRWNGA10	6
FS_TARRAWONGA10	TRWNGA02	6
FS_TARRAWONGA10	TRWNGA03	6
FS_TARRAWONGA10	TRWNGA11	6
NANDE_WRA	NBFF1292	7
NANDE_WRA	NBFF1299	7
JTH_LE	LE05	7
JTH_LE	LE04	7
JTH_LE	LE12	7
JTH_PY	PY06	7
JTH_PY	PY28	7
JTH_RU	RU05	7
JTH_RU	RU15	7
JTH_RU	RU10	7
BOGGABRI	BGB135	8
BOGGABRI	BGB016	8
BOGGABRI	BGB136	8
BOGGABRI	BGB050	8
BOGGABRI	BGB049	8
BOGGABRI	BGB066	8
BOGGABRI	BGB080	8
BOGGABRI	BGB095	8

Survey ID	Site ID	Group
BOGGABRI	BGB093	8
JTH_PY	PY05	8
JTH_PY	PY15	8
JTH_PY	PY31	8
JTH_RU	RU04	8
FS_TARRAWONGA10	TRWNGA12	8
FS_TARRAWONGA10	TRWNGA13	8
FS_TARRAWONGA10	TRWNGA14	8
FS_TARRAWONGA11	TRWNGA25	8
FS_TARRAWONGA11	TRWNGA24	8
BOGGABRI	BGB001	9
BOGGABRI	BGB002	9
BOGGABRI	BGB003	9
BOGGABRI	BGB005	9
BOGGABRI	BGB010	9
BOGGABRI	BGB109	9
BOGGABRI	BGB134	9
BOGGABRI	BGB019	9
BOGGABRI	BGB036	9
BOGGABRI	BGB054	9
BOGGABRI	BGB056	9
BOGGABRI	BGB079	9
BOGGABRI	BGB082	9
BOGGABRI	BGB075	9
BOGGABRI	BGB077	9
JVMPDB	JV_JW001	9
JVMPDB	JV_JW009	9
JTH_LE	LE06	9
JTH_RU	RU16	9
FS_TARRAWONGA11	TRWNGA31	9
BOGGABRI	BGB117	10
BOGGABRI	BGB074	10
BOGGABRI	BGB033	11
BOGGABRI	BGB040	11
BOGGABRI	BGB055	11
BOGGABRI	BGB081	11
BOGGABRI	BGB076	11
JVMPAO	AOSF093	12
JVMPAO	AOSF094	12
JVMPAO	AOSF095	12
JVMPAO	AOSF096	12
BOGGABRI	BGB113	13
BOGGABRI	BGB108	13
JVMPDB	JV_DB144	13
JTH_LE	LE01	13
JTH_LE	LE02	13
JTH_LE	LE07	13

Survey ID	Site ID	Group
MC	MCFF0014	13
BOGGABRI	BGB078	14
JTH_KV	KV04	14
JTH_LE	LE08	14
EW	EWFF0073	14
EW	EWFF0093	14
EW	EWFF0081	14
SO	SOFF0059	14
SO	SOFF0058	14
SO	SOFF0066	14
SO	SOFF0040	14
SO	SOFF0067	14
SO	SOFF0043	14
SO	SOFF0034	14
SO	SOFF0052	14
SO	SOFF0011	14
SO	SOFF0069	14
MC	MCFF0013	14
MC	MCFF0012	14
MC	MCFF0024	14
MC	MCFF0023	14
SO	SOFF1009	14
EW	EWFF0074	14
SO	SOFF0048	15
SO	SOFF0031	15
EW	EWFF1013	15
EW	EWFF0079	16
EW	EWFF0104	16
EW	EWFF0053	16
EW	EWFF0022	16
EW	EWFF0102	16
EW	EWFF0082	16
EW	EWFF0100	16
EW	EWFF0048	16
EW	EWFF0090	16
SO	SOFF0036	16
EW	EWFF0010	16
SO	SOFF0014	16
SO	SOFF0002	16
SO	SOFF0018	16
EW	EWFF0007	16
EW	EWFF1015	16
EW	EWFF1012	16
EW	EWFF0101	16
CL	CLEA5001	16
CL	CLEA5002	16
CL	CLEA5003	16

Survey ID	Site ID	Group
CL	CLEA5004	16
BI	BIMB3001	16
BI	BIMB3002	16
BI	BIMB3008	16
BI	BIMB3009	16
BI	BIMB3003	16
BI	BIMB3006	16
BI	BIMB3011	16
BI	BIMB3012	16
BI	BIMB3013	16
EW	EWFF0025	17
EW	EWFF0003	17
EW	EWFF0006	17
EW	EWFF0005	17
EW	EWFF0077	17
SO	SOFF0054	17
EW	EWFF0033	17
EW	EWFF0027	17
EW	EWFF0024	17
CL	CLEA5000	17
BI	BIMB3010	17
BI	BIMB3007	17
BI	BIMB3005	17
BI	BIMB3004	17
EW	EWFF0000	18
EW	EWFF0063	18
EW	EWFF0071	18
EW	EWFF1014	18
EW	EWFF0012	19
SO	SOFF0029	19
SO	SOFF0063	19
SO	SOFF0068	19
SO	SOFF0055	19
SO	SOFF1011	19
SO	SOFF1010	19
MC	MCFF0000	20
MC	MCFF0022	20
OOLINE	OOL11	21
OOLINE	OOL17	21
OOLINE	OOL20	21
OOLINE	OOL19	21
OOLINE	OOL21	21
OOLINE	OOL12	21
OOLINE	OOL13	21
OOLINE	OOL16	21
OOLINE	OOL18	21
STH_KAP_98	MTKAPP23	22

Survey ID	Site ID	Group
STH_KAP_98	MTKAPP38	22
NANDE_WRA	NBFF1293	22
NVMP-NPWS	NBFF0473	22
NVMP-NPWS	NBFF0485	22
NVMP-NPWS	NBFF0486	22
TCRF	TCRF076	22
TCRF	TCRF075	22
TCRF	TCRF069	22
TCRF	TCRF077	22
JTH_PY	PY07	22
JTH_RU	RU14	22
JTH_HF	HTFL19	22
BOGGABRI	BGB100	23
BOGGABRI	BGB027	23
BOGGABRI	BGB028	23
EW	EWFF0023	24
BOGGABRI	BGB039	25
BOGGABRI	BGB026	25
BOGGABRI	BGB097	25
STH_KAP_98	MTKAPP19	26
STH_KAP_98	MTKAPP20	26
STH_KAP_98	MTKAPP36	26
NVMP-NPWS	NBFF0021	26
NVMP-NPWS	NBFF0023	26
NVMP-NPWS	NBFF0478	26
NVMP-NPWS	NBFF0472	26
NVMP-NPWS	NBFF0956	26
NVMP-NPWS	NBFF0958	26
NVMP-NPWS	NBFF0954	26
NVMP-NPWS	NBFF0957	26
NVMP-NPWS	NBFF0960	26
MTKAP2000	KAPJH053	26
JTH_HF	HTFL20	26
JTH_HF	HTFL12	26
JTH_HF	HTFL18	26
NVMP-NPWS	NBFF0022	27
BRG-CMA	060405-1	27
BRG-CMA	060405-2	27
BRG-FF	070509-1	27
BRG-FF	070510-1	27
BRG-FF	070510-2	27
MTKAP2000	KAPJH005	27
MTKAP2000	KAPJH003	27
MTKAP2000	KAPJH002	27
NVMP-NPWS	NBFF0976	28
MTKAP2000	KAPJH006	28
MTKAP2000	KAPJH004	28

Survey ID	Site ID	Group
MTKAP2000	KAPJH052	28
STH_KAP_98	MTKAPP15	29
NVMP-NPWS	NBFF0477	29
NVMP-NPWS	NBFF0471	29
NVMP-NPWS	NBFF0476	29
NVMP-NPWS	NBFF0479	29
NVMP-NPWS	NBFF0474	29
NVMP-NPWS	NBFF0475	29
NVMP-NPWS	NBFF0481	29
NVMP-NPWS	NBFF0484	29
NVMP-NPWS	NBFF0480	29
NVMP-NPWS	NBFF0487	29
NVMP-NPWS	NBFF0482	29
NVMP-NPWS	NBFF0492	29
NVMP-NPWS	NBFF0971	29
NVMP-NPWS	NBFF0962	29
NVMP-NPWS	NBFF0972	29
NVMP-NPWS	NBFF0973	29
JTH_HF	HTFL17	29
JTH_HF	HTFL21	29
JTH_HF	HTFL13	29
JTH_HF	HTFL16	29
JTH_HF	HTFL14	29
JTH_HF	HTFL15	29
NO	NOFF0052	29
NO	NOFF0002	29
NVMP-NPWS	NBFF0953	30
NVMP-NPWS	NBFF0951	30
NVMP-NPWS	NBFF0959	30
NVMP-NPWS	NBFF0952	30
NO	NOFF0006	31
NO	NOFF0018	31
NO	NOFF0027	31
NO	NOFF0040	31
NO	NOFF0073	31
NO	NOFF0007	31
NO	NOFF0021	31
NO	NOFF0058	31
NO	NOFF0009	31
NO	NOFF0012	31
NO	NOFF0013	31
NO	NOFF0004	31
NO	NOFF0020	31
NO	NOFF0019	31
NO	NOFF0039	31
NO	NOFF1000	31
NO	NOFF1001	31

Survey ID	Site ID	Group
NO	NOFF0011	31
NO	NOFF0057	31
NO	NOFF0085	31
NO	NOFF0075	31
NO	NOFF0035	31
NO	NOFF0099	31
NO	NOFF0024	31
NO	NOFF0016	31
NO	NOFF0095	31
NO	NOFF0025	31
NO	NOFF0074	31
NO	NOFF0046	31
NO	NOFF0000	31
NO	NOFF0083	31
NO	NOFF0097	31
NO	NOFF0098	31
NO	NOFF0096	31
NO	NOFF0032	31
NO	NOFF0022	31
NO	NOFF0001	31
NO	NOFF0045	31
NO	NOFF0003	32
NO	NOFF0084	32
NO	NOFF1002	32
NO	NOFF1007	32
NO	NOFF0053	32
BOG_2015	VS14	33
BOG_2015	VS11	33
BOG_2015	VS12	33
BOG_2015	VS17	33
BOG_2015	VS19	33
BOG_2015	VS20	33
BOG_2015	VS21	33
BOG_2015	VS22	33
BOG_2015	VS23	33
BOG_2015	VS24	33
BOG_2015	VS25	33
BOG_2015	VS18	33
BOG_2015	VS14	33
BOG_2015	VS11	33
BOG_2015	VS12	33
BOG_2015	VS17	33
BOG_2015	VS18	33
BOG_2015	VS19	33
BOG_2015	VS20	33
BOG_2015	VS22	33
BOG_2015	VS23	33

Survey ID	Site ID	Group
BOG_2015	VS24	33
BOG_2015	VS25	33
BOG_2015	VS21	33
BOG_2015	VS14	33
BOG_2015	VS12	33
BOG_2015	VS17	33
BOG_2015	VS18	33
BOG_2015	VS19	33
BOG_2015	VS20	33
BOG_2015	VS21	33
BOG_2015	VS22	33
BOG_2015	VS23	33
BOG_2015	VS24	33
BOG_2015	VS25	33
BOG_2015	VS11	33
BOG_2015	RF01	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34
BOG_2015	RF08	34
BOG_2015	VS13	34
BOG_2015	RF01	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34
BOG_2015	RF08	34
BOG_2015	VS13	34
BOG_2015	RF01	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34
BOG_2015	RF08	34
BOG_2015	VS13	34
BOG_2015	RF01	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34
BOG_2015	RF08	34
BOG_2015	RF01	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34

Survey ID	Site ID	Group
BOG_2015	RF08	34
BOG_2015	RF02	34
BOG_2015	RF03	34
BOG_2015	RF04	34
BOG_2015	RF07	34
BOG_2015	CC06	35
BOG_2015	VS15	35
BOG_2016	VS27	35
BOG_2015	VS10	35
BOG_2015	CC05	35
BOG_2016	VS26	35
BOG_2016	VS31	35
BOG_2016	VS33	35
BOG_2015	CC07	35
BOG_2015	CC06	35
BOG_2015	VS15	35
BOG_2016	VS27	35
BOG_2015	CC05	35
BOG_2015	CC07	35
BOG_2015	VS10	35
BOG_2016	VS31	35
BOG_2016	VS33	35
BOG_2016	VS26	35
BOG_2015	CC06	35
BOG_2015	VS15	35
BOG_2016	VS27	35
BOG_2016	VS26	35
BOG_2016	VS31	35
BOG_2015	CC05	35
BOG_2015	CC07	35
BOG_2015	VS10	35
BOG_2016	VS33	35
BOG_2015	VS16	36
BOG_2016	VS34	36
BOG_2015	CC08	36
BOG_2016	VS30	36
BOG_2016	VS32	36
BOG_2016	VS35	36
BOG_2015	CC08	36
BOG_2015	VS16	36
BOG_2016	VS30	36
BOG_2016	VS32	36
BOG_2016	VS34	36
BOG_2016	VS35	36
BOG_2015	VS16	36
BOG_2016	VS30	36
BOG_2015	CC08	36

Survey ID	Site ID	Group
BOG_2016	VS32	36
BOG_2016	VS34	36
BOG_2016	VS35	36
BOG_2016	VS28	37
BOG_2016	VS29	37
BOG_2016	VS28	37
BOG_2016	VS29	37
BOG_2016	VS28	37
BOG_2016	VS29	37
BOG_2015	VS01	38
BOG_2015	CC02	38
BOG_2015	CC03	38
BOG_2015	CC04	38
BOG_2015	VS02	38
BOG_2015	VS03	38
BOG_2015	VS08	38
BOG_2015	VS09	38
BOG_2016	VS36	38
BOG_2016	VS38	38
BOG_2016	VS39	38
BOG_2015	CC01	38
BOG_2015	VS04	38
BOG_2015	VS05	38
BOG_2015	VS07	38
BOG_2016	VS39	38
BOG_2015	VS01	38
BOG_2015	CC01	38
BOG_2015	CC03	38
BOG_2015	CC04	38
BOG_2015	VS03	38
BOG_2015	VS05	38
BOG_2015	VS09	38
BOG_2016	VS36	38
BOG_2015	CC02	38
BOG_2015	VS02	38
BOG_2015	VS04	38
BOG_2015	VS07	38
BOG_2015	VS08	38
BOG_2016	VS38	38
BOG_2015	VS09	38
BOG_2015	CC01	38
BOG_2015	CC03	38
BOG_2015	CC04	38
BOG_2015	VS03	38
BOG_2016	VS36	38
BOG_2016	VS39	38
BOG_2015	VS08	38

Survey ID	Site ID	Group
BOG_2015	CC02	38
BOG_2015	VS01	38
BOG_2015	VS02	38
BOG_2015	VS07	38
BOG_2015	VS05	38
BOG_2016	VS38	38
BOG_2015	VS04	38
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2015	VS06	39
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2015	VS06	39
BOG_2015	RF05	39
BOG_2015	RF06	39
BOG_2015	VS06	39
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2015	RF06	39
BOG_2015	RF05	39
BOG_2016	VS50	40
BOG_2016	VS51	40
BOG_2016	VS52	40
BOG_2016	VS37	40
BOG_2016	VS48	40
BOG_2016	VS49	40
BOG_2016	VS50	40
BOG_2016	VS51	40
BOG_2016	VS52	40
BOG_2016	VS49	40
BOG_2016	VS48	40
BOG_2016	VS37	40
BOG_2016	VS50	40
BOG_2016	VS37	40
BOG_2016	VS52	40
BOG_2016	VS49	40
BOG_2016	VS51	40
BOG_2016	VS48	40

Appendix C: PCT Photographs



PCT 55: Belah Woodland on Alluvial Plains



78: River Red Gum riparian tall woodland / open forest wetland



81: Western Grey Box - cypress pine shrub grass shrub tall woodland



101: Poplar Box - Yellow Box - Western Grey Box grassy woodland



112: Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland



147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket



244: Poplar Box grassy woodland



413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland



427: Cypress pine - Tumbledown Red Gum low open woodland to grassland



429: White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland



435: White Box - White Cypress Pine shrub grass hills woodland



439: Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland



492: Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest



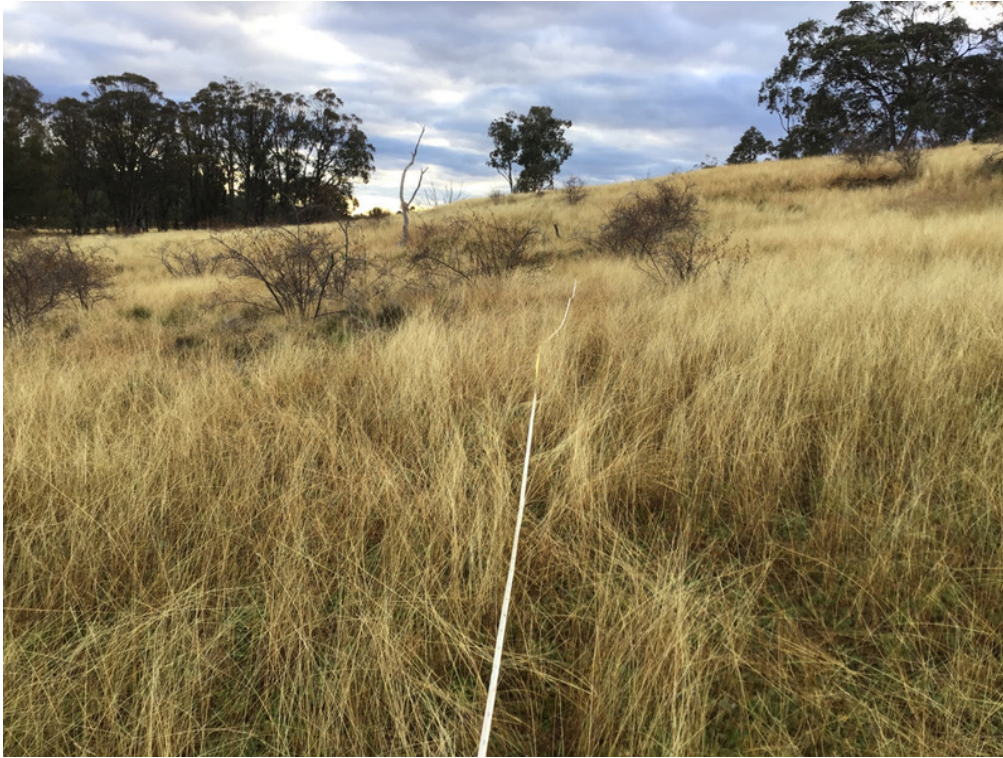
508: Blakely's Red Gum - Stringybark - Rough-barked Apple open forest



510: Blakely's Red Gum - Yellow Box grassy woodland



563: White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest



569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland



571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland



572: Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest



574: Tea-tree riparian shrubland / heathland wetland (right hand side of photo)



581: Tumbledown Red Gum - Dwyer's Red Gum - Wallaby Bush shrubby woodland



588: White Box - White Cypress Pine shrubby hills open forest



592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest



599: Blakely's Red Gum - Yellow Box grassy tall woodland



619: Derived Wire Grass grassland



736: Broad-leaved Stringybark - Mountain Gum - Apple Box open forest



1165: Silvertop Stringybark - Orange Gum shrubby open forest



1306: White Box - Red Stringybark shrubby woodlands

Appendix D: PCT and TEC Areas by Conservation Agreement Group

Table A. Area of PCTs within MCCM Offset Areas

Conservation Agreement Group	Kelso, Velyama and Louenville			Mt Lindsay	Oakleigh/Onavale	Teston South	Roseglass and Bimbooria		Wirradale and Wongala South	Wollandilly	Total
Plant Community Type	Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Teston South	Bimbooria	Roseglass	Wirradale and Wongala South	Wollandilly	
101: Derived Native Grassland					19.7					115.9	135.6
101: Poplar Box - Yellow Box - Western Grey Box grassy woodland					18.6					52.3	70.9
112: Black Tea-tree - River Oak - Wilga riparian low forest/shrubland wetland									7.5		7.5
1165: Derived Native Grassland				0.5					43.5		44
1165: Silvertop Stringybark - Orange Gum shrubby open forest				385.3					106.2		491.5
1306: Derived Native Grassland									46.7		46.7
1306: White Box - Red Stringybark shrubby woodlands				49.5					514.7		564.2
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket							0.3				0.3
244: Derived Native Grassland	78.5		177.3								255.8
244: Poplar Box grassy woodland			14.6								14.6
413: Derived Native Grassland	2.3				56.8					265.2	324.3
413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland	5.3				27.8		25			85.3	143.4
427: Cypress pine - Tumbledown Red Gum low open woodland to grassland								49.6			49.6
429: White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland	7.1										7.1
435: Derived Native Grassland			65.9		30	44.8	185.2	214.1	704.9	35.2	1280.1

Conservation Agreement Group	Kelso, Velyama and Louenville			Mt Lindsay	Oakleigh/Onavale	Teston South	Roseglass and Bimbooria		Wirradale and Wongala South	Wollandilly	Total
Plant Community Type	Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Teston South	Bimbooria	Roseglass	Wirradale and Wongala South	Wollandilly	
435: White Box - White Cypress Pine shrub grass hills woodland	4	136.9	70.7		10.3	112.3	242.2	35.1	348.4	27.5	987.4
439: Mock Olive - Tumbledown Red Gum - Red Ash - Wilga siliceous rocky hill low woodland / shrubland								9.2			9.2
492: Derived Native Grassland				42.9					10.6		53.5
492: Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest				505.6					146.8		652.4
508: Blakelys Red Gum - Stringybark - Rough-barked Apple open forest				15.5							15.5
510: Blakelys Red Gum - Yellow Box grassy woodland				609.6					381.4		991
510: Derived Native Grassland				82.7					255.9		338.6
55: Belah woodland on alluvial plains			6		1.2	10.4					17.6
563: Derived Native Grassland									8.2		8.2
563: White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest									381.1		381.1
569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland				123.3					10.6		133.9
571: Derived Native Grassland				45.7							45.7
571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland				35.8							35.8
572: Derived Native Grassland				0.6					1.2		1.8
572: Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest				435.4					80.5		515.9
574: Tea-tree riparian shrubland / heathland wetland				1.9							1.9
581: Tumbledown Red Gum - Dwyers Red Gum - Wallaby Bush shrubby woodland		0.7			5	11.3	96.8	20.8			134.6

Conservation Agreement Group	Kelso, Velyama and Louenville			Mt Lindsay	Oakleigh/Onavale	Teston South	Roseglass and Bimbooria		Wirradale and Wongala South	Wollandilly	Total
Plant Community Type	Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Teston South	Bimbooria	Roseglass	Wirradale and Wongala South	Wollandilly	
588: Derived Native Grassland									127.5		127.5
588: White Box - White Cypress Pine shrubby hills open forest									379.7		379.7
592: Derived Native Grassland	52		31.5		3.7	7	32.1	90.4	3.2	28.4	248.3
592: Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest	270.4	49.3	62.6		76.5	103	40.8	1044.3	851.3	86.2	2584.4
599: Blakelys Red Gum - Yellow Box grassy tall woodland										24.8	24.8
599: Derived Native Grassland										21.5	21.5
619: Derived Wire Grass grassland	28.5		91.3			44.6				57.1	221.5
736: Broad-leaved Stringybark - Mountain Gum - Apple Box open forest									24.1		24.1
736: Derived Native Grassland									4.3		4.3
78: River Red Gum riparian tall woodland / open forest wetland	40.9										40.9
81: Western Grey Box - cypress pine shrub grass shrub tall woodland						2.2					2.2
Not native	0.1	26	182.2	2.1	307.5	0.2	0.1	1	7.2	4.5	530.9
Total by Offset Area	489.1	212.9	702.1	2336.4	557.1	335.8	622.5	1464.5	4445.5	803.9	11969.8
Total by Conservation Agreement Group	1404.1			2336.4	557.1	335.8	2087		4445.5	803.9	11969.8

Table B. Area of Box-Gum Woodland CEEC Listed Under the EPBC Act within MCCM Offset Areas

Conservation Agreement Group		Kelso, Velyama and Louenville			Mt Lindsay	Oakleigh / Onavale	Roseglass and Bimbooria		Teston South	Wirradale and Wongala South	Wollandilly	Total
Offset Area		Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Bimbooria	Roseglass	Teston South	Wirradale and Wongala South	Wollandilly	
Box Gum Woodland CEEC (Grassland Form)	435: Derived Native Grassland			3		30	160.3	94.3	17.6	704.4		1009.6
	510: Derived Native Grassland				81					255.9		336.9
	569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland				92.5					10.6		103.1
	571: Derived Native Grassland				45.7							45.7
	599: Derived Native Grassland										17.3	17.3
Total Box Gum Woodland CEEC (Grassland Form) by Offset Area				3	219.2	30	160.3	94.3	17.6	970.9	17.3	1512.6
Total Box Gum Woodland CEEC (Grassland Form) by Conservation Agreement Group		3			219.2	30	254.6			970.9	17.3	1495
Box Gum Woodland CEEC (Woodland Form)	435: White Box - White Cypress Pine shrub grass hills woodland	4	36	58.8		10.3	212.9	19.5	63.1	348.4	27.5	780.5
	508: Blakelys Red Gum - Stringybark - Rough-barked Apple open forest				15.5							15.5
	510: Blakelys Red Gum - Yellow Box grassy woodland				609.6					381.4		991
	571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland				35.8							35.8
	599: Blakelys Red Gum - Yellow Box grassy tall woodland										24.8	24.8
Total Box Gum Woodland CEEC (Woodland Form) by Offset Area		4	36	58.8	660.9	10.3	212.9	19.5	63.1	729.8	52.3	1847.6
Total Box Gum Woodland CEEC (Woodland Form) by Conservation Agreement Group		98.8			660.9	10.3	232.4		63.1	729.8	52.3	1784.5
Total Box Gum Woodland CEEC by Offset Area		4	36	61.8	880.1	40.3	373.2	113.8	80.7	1700.7	69.6	3360.2
Total Box Gum Woodland CEEC by Conservation Agreement Group		101.8			880.1	40.3	487		80.7	1700.7	69.6	3360.2

Table C. Area of Endangered Ecological Communities Listed Under the EPBC Act within MCCM Offset Areas


Conservation Agreement Group		Kelso, Velyama and Louenville			Mt Lindsay	Onavale	Roseglass and Bimbooria		Teston South	Wirradale and Wongala South	Wollandilly	Total
EEC Listed Under the EPBC Act	Plant Community Type	Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Bimbooria	Roseglass	Teston South	Wirradale and Wongala South	Wollandilly	
Grey Box (Eucalyptus macrocarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia	81: Western Grey Box - cypress pine shrub grass shrub tall woodland								2.2			2.2
Poplar Box Grassy Woodland on Alluvial Plains	101: Poplar Box - Yellow Box - Western Grey Box grassy woodland										50.3	50.3
	244: Poplar Box grassy woodland			13.3								13.3
Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket						0.3					0.3
Total EECs Listed Under the EPBC Act		0	0	13.3	0	0	0.3	0	2.2	0	50.3	66.1

Table D. Area of Box-Gum Woodland CEEC Listed Under the BC Act within MCCM Offset Areas

Conservation Agreement Group		Kelso, Velyama and Louenville			Mt Lindsay	Oakleigh / Onavale	Roseglass and Bimbooria		Teston South	Wirradale and Wongala South	Wollandilly	NEW TOTAL
Offset Area		Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Bimbooria	Roseglass	Teston South	Wirradale and Wongala South	Wollandilly	
Box Gum Woodland CEEC (Grassland Form)	435: Derived Native Grassland			3		30	160.3	94.3	17.6	704.4		1009.6
	510: Derived Native Grassland				81					255.9		336.9
	569: Derived Snow Grass +/- Kangaroo Grass +/- Wild Sorghum tussock grassland				92.5					10.6		103.1
	571: Derived Native Grassland				45.7							45.7
	599: Derived Native Grassland										17.3	17.3
Total Box Gum Woodland CEEC (Grassland Form) by Offset Area				3	219.2	30	160.3	94.3	17.6	970.9	17.3	1512.6
Total Box Gum Woodland CEEC (Grassland Form) by Conservation Agreement Group		3			219.2	30	254.6		17.6	970.9	17.3	1512.6
Box Gum Woodland CEEC (Woodland Form)	435: White Box - White Cypress Pine shrub grass hills woodland	4	36	69.8		10.3	212.9	19.5	63.1	348.4	27.5	791.5
	508: Blakelys Red Gum - Stringybark - Rough-barked Apple open forest				15.5							15.5
	510: Blakelys Red Gum - Yellow Box grassy woodland				609.6					381.4		991
	571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland				35.8							35.8
	599: Blakelys Red Gum - Yellow Box grassy tall woodland										24.8	24.8
Total Box Gum Woodland CEEC (Woodland Form) by Offset Area		4	36	69.8	660.9	10.3	212.9	19.5	63.1	729.8	52.3	1858.6
Total Box Gum Woodland CEEC (Woodland Form) by Conservation Agreement Group		109.8			660.9	10.3	232.4		63.1	729.8	52.3	1858.6
Total Box Gum Woodland CEEC by Offset Area		4	36	72.8	880.1	40.3	373.2	113.8	80.7	1700.7	69.6	3371.4
Total Box Gum Woodland CEEC by Conservation Agreement Group		112.8			880.1	40.3	487		80.7	1700.7	69.6	3371.4

Table E. Area of Endangered Ecological Communities Listed Under the BC Act within MCCM Offset Areas

Conservation Agreement Group		Kelso, Velyama and Louenville			Mt Lindsay	Onavale	Roseglass and Bimbooria		Teston South	Wirradale and Wongala South	Wollandilly	Total
EEC Listed Under the BC Act	Plant Community Type	Kelso	Louenville	Velyama	Mt Lindsay	Onavale	Bimbooria	Roseglass	Teston South	Wirradale and Wongala South	Wollandilly	
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions	81: Western Grey Box - cypress pine shrub grass shrub tall woodland								2.2			2.2
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions	147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket						0.3					0.3
Total EECs Listed Under the BC Act							0.3		2.2			2.5

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX C

SURVEY SITES AND PHOTO REFERENCE POINTS




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table C-1
Indicative Location of Fauna Monitoring Sites (AMBS, 2017)


Equipment	Site	Easting	Northing
Anabat	FS01	231370	6616143
Anabat	FS01	231326	6615866
Anabat	FS02	229417	6617678
Anabat	FS02	229425	6617749
Anabat	FS03	223277	6618402
Anabat	FS03	223248	6618409
Anabat	FS04	220952	6612341
Anabat	FS04	220912	6612392
Anabat	FS05	219359	6610936
Anabat	FS05	219379	6610991
Anabat	FS06	213555	6607512
Anabat	FS06	213540	6607485
Anabat	FS07	244978	6599684
Anabat	FS07	244932	6599793
Anabat	FS08	245794	6598066
Anabat	FS08	245865	6598051
Anabat	FS09	240042	6638864
Anabat	FS09	240040	6638964
Anabat	FS10	238371	6642604
Anabat	FS10	238234	6642576
Anabat	FS11	236410	6640650
Anabat	FS11	236461	6640676
Anabat	FS12	237693	6638812
Anabat	FS12	237585	6638800
Anabat	FS13	236712	6636153
Anabat	FS13	236614	6636291
Anabat	FS14	237819	6635456
Anabat	FS14	237796	6635436
Anabat	FS15	237392	6632890
Anabat	FS15	237455	6632943
Anabat	FS16	238053	6631806
Anabat	FS16	238069	6631749
Anabat	NRV01	236808	6633583
Anabat	NRV01	236862	6633672
Anabat	RV01	229510	6619179
Anabat	RV01	229518	6619060
Anabat	RV02	222865	6615253
Anabat	RV02	222858	6615180
Anabat	RV03	216836	6610026
Anabat	RV03	216728	6610027
Camera	FS01	231395	6616065
Camera	FS01	231377	6615966
Camera	FS02	229441	6617677

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Equipment	Site	Easting	Northing
Camera	FS02	229362	6617805
Camera	FS03	223288	6618357
Camera	FS03	223257	6618430
Camera	FS04	220977	6612361
Camera	FS04	221084	6612346
Camera	FS05	219366	6610988
Camera	FS05	219323	6610944
Camera	FS06	213509	6607472
Camera	FS06	213415	6607440
Camera	FS07	244913	6599801
Camera	FS07	244990	6599669
Camera	FS08	245832	6598049
Camera	FS08	245790	6598073
Camera	FS09	240047	6638925
Camera	FS09	240055	6638864
Camera	FS10	238322	6642586
Camera	FS10	238393	6642593
Camera	FS11	236478	6640665
Camera	FS11	236452	6640707
Camera	FS12	237623	6638807
Camera	FS12	237657	6638801
Camera	FS13	236629	6636186
Camera	FS13	236617	6636254
Camera	FS14	237763	6635449
Camera	FS14	237723	6635409
Camera	FS15	237458	6632959
Camera	FS15	237417	6632915
Camera	FS16	238097	6631760
Camera	FS16	238089	6631733
Camera	NRV01	236789	6633607
Camera	NRV01	236853	6633665
Camera	RV01	229506	6619215
Camera	RV01	229492	6619144
Camera	RV02	222879	6615261
Camera	RV02	222812	6615146
Camera	RV03	216834	6610022
Camera	RV03	216733	6610022
Frog survey	FS17	216580	6610821
Frog survey	FS18	239981	6638812
Frog survey	FS19	237897	6642362
Frog survey	FS20	236719	6636158
Frog survey	FS21	237951	6635520
Full survey methods	FS01	231347	6615831
Full survey methods	FS02	229164	6617770
Full survey methods	FS03	223143	6618451
Full survey methods	FS04	223138	6618468

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Equipment	Site	Easting	Northing
Full survey methods	FS05	219238	6610794
Full survey methods	FS06	213283	6607420
Full survey methods	FS07	244995	6599667
Full survey methods	FS08	245787	6598171
Full survey methods	FS09	240034	6638738
Full survey methods	FS10	238461	6642647
Full survey methods	FS11	236531	6640785
Full survey methods	FS12	237571	6638717
Full survey methods	FS13	236602	6636342
Full survey methods	FS14	237681	6635382
Full survey methods	FS15	237388	6632763
Full survey methods	FS16	238188	6631840
Full survey methods	NRV01	236714	6633548
Full survey methods	RV01	229511	6619007
Full survey methods	RV02	222805	6615101
Full survey methods	RV03	216844	6610009
Harp	FS01	231359	6615900
Harp	FS01	231415	6616048
Harp	FS02	229443	6617695
Harp	FS02	229322	6617768
Harp	FS03	223279	6618408
Harp	FS03	223256	6618400
Harp	FS04	220946	6612337
Harp	FS04	220945	6612445
Harp	FS05	219334	6610993
Harp	FS05	219385	6610899
Harp	FS06	213515	6607437
Harp	FS06	213561	6607512
Harp	FS07	244892	6599827
Harp	FS07	244975	6599698
Harp	FS08	245814	6598034
Harp	FS08	245763	6598058
Harp	FS09	239979	6638868
Harp	FS09	240059	6638921
Harp	FS10	238374	6642602
Harp	FS10	238239	6642601
Harp	FS11	236428	6640700
Harp	FS11	236465	6640652
Harp	FS12	237657	6638204
Harp	FS12	237682	6638829
Harp	FS13	236622	6636306
Harp	FS13	236696	6636185
Harp	FS14	237819	6635466
Harp	FS14	237787	6635435
Harp	FS15	237395	6632899
Harp	FS15	237472	6632941

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Equipment	Site	Easting	Northing
Harp	FS16	238172	6631734
Harp	FS16	238068	6631716
Tadpole survey	FS22	239979	6638868
Tadpole survey	FS23	237971	6642299
Tadpole survey	FS24	236718	6636146
Tadpole survey	FS25	237824	6635469
Tadpole survey	FS26	237951	6635520

Source: AMBS (2017) Maules Creek Coal Mine: Fauna Monitoring of the Offset Areas, Summer 2017.




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table C-2
Floristic Plot Locations

Site ID	Latitude	Longitude
EWFF0010	-30.53745238	150.2120335
EWFF0022	-30.55272832	150.2064529
EWFF0033	-30.54701726	150.2144281
EWFF0077	-30.53331771	150.2253421
EWFF0102	-30.555766	150.2059847
EWFF0003	-30.54406088	150.1765712
EWFF0005	-30.54449142	150.1899405
EWFF0006	-30.54683785	150.1833988
EWFF0025	-30.52317544	150.1750189
EWFF0053	-30.53631211	150.1699656
EWFF0079	-30.53797596	150.1756644
EWFF0104	-30.54143077	150.1770456
EWFF3004	-30.53688301	150.1838754
NOFF0000	-30.3626221	150.2965261
NOFF0001	-30.35331152	150.2997371
NOFF0007	-30.33315246	150.2894491
NOFF0011	-30.30409684	150.2927644
NOFF0021	-30.32732046	150.2862172
NOFF0025	-30.29075189	150.287559
NOFF0040	-30.33481644	150.2576984
NOFF0045	-30.34173574	150.2797398
NOFF0046	-30.35968458	150.2993738
NOFF0053	-30.35267127	150.2935996
NOFF0057	-30.30917549	150.2900052
NOFF0058	-30.32772794	150.2937759
NOFF0073	-30.33526885	150.2633317
NOFF0074	-30.28622026	150.2902679
NOFF0075	-30.3234976	150.2915843
NOFF0083	-30.36352508	150.3135023
NOFF0095	-30.29539299	150.2841264
NOFF0097	-30.37145105	150.3200425
NOFF1000	-30.30890709	150.2822648
NOFF1001	-30.35887694	150.2837858
NOFF0010	-30.3877267	150.2468908
NOFF0034	-30.41337465	150.2601182
NOFF0002	-30.37212994	150.2684641
NOFF0003	-30.34145038	150.246769
NOFF0004	-30.34043084	150.2394418
NOFF0006	-30.35527427	150.2559984
NOFF0009	-30.35138863	150.2757517
NOFF0012	-30.35226781	150.2295152
NOFF0013	-30.35177315	150.2370136
NOFF0016	-30.38602869	150.275186


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Site ID	Latitude	Longitude
NOFF0018	-30.35450318	150.2579647
NOFF0019	-30.35808296	150.2773081
NOFF0020	-30.36087141	150.2803758
NOFF0022	-30.40167397	150.2945284
NOFF0024	-30.38277278	150.2696207
NOFF0027	-30.35860717	150.2664741
NOFF0032	-30.39836165	150.2815023
NOFF0035	-30.4167334	150.2677563
NOFF0039	-30.34151726	150.2435845
NOFF0052	-30.38135176	150.2868259
NOFF0082	-30.42473347	150.2868881
NOFF0084	-30.3540086	150.267488
NOFF0085	-30.40897784	150.253275
NOFF0096	-30.3534953	150.2245536
NOFF0098	-30.36668498	150.2294951
NOFF0099	-30.38125591	150.2534312
NOFF1002	-30.36329726	150.2251803
NOFF1007	-30.39276963	150.2741812
BIMB3001	-30.71723088	150.3460557
BIMB3002	-30.71869662	150.3504365
BIMB3003	-30.72636535	150.3607708
BIMB3004	-30.70403462	150.3409051
BIMB3005	-30.70085054	150.3529642
BIMB3006	-30.70531449	150.3597318
BIMB3007	-30.70429928	150.3610943
BIMB3008	-30.71586785	150.3555445
BIMB3009	-30.71460726	150.3623134
BIMB3010	-30.72567535	150.3618724
BIMB3011	-30.70787118	150.3440964
BIMB3012	-30.70877199	150.3515066
BIMB3013	-30.70650665	150.357619
SOFF0002	-30.70693224	150.3544367
SOFF0018	-30.70621609	150.3483132
SOFF0029	-30.70933211	150.3606028
SOFF0058	-30.71196549	150.3611785
SOFF0059	-30.71694116	150.3509767
SOFF0011	-30.70661327	150.3257251
SOFF0014	-30.71920993	150.3218463
SOFF0031	-30.72182663	150.3261975
SOFF0034	-30.72497814	150.3490436
SOFF0036	-30.72463063	150.3079956
SOFF0040	-30.70720914	150.3368409
SOFF0043	-30.70916246	150.3174096
SOFF0048	-30.73195784	150.3495903
SOFF0052	-30.70686774	150.3270373
SOFF0054	-30.70281346	150.3268569

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			


Site ID	Latitude	Longitude
SOFF0055	-30.72846489	150.3035896
SOFF0063	-30.71108552	150.3263237
SOFF0066	-30.707616	150.3349703
SOFF0067	-30.7152455	150.3316014
SOFF0068	-30.71753711	150.3083393
SOFF0069	-30.70617988	150.3291872
SOFF0070	-30.73526312	150.3462303
SOFF1009	-30.72787149	150.3002448
SOFF1010	-30.73031293	150.3025887
SOFF1011	-30.72403954	150.3014612
EWFF0024	-30.61150318	150.0664562
EWFF0048	-30.60298591	150.0752266
EWFF0071	-30.60176538	150.0406435
EWFF0082	-30.60972014	150.0657478
EWFF0073	-30.58965622	150.0976578
EWFF0081	-30.5779941	150.0894665
EWFF0093	-30.58234409	150.1010151
EWFF0100	-30.55960923	150.1072135
EWFF3002	-30.57353263	150.1052761
EWFF3003	-30.56799017	150.110338
EWFF0000	-30.58954306	150.0719191
EWFF0027	-30.60958637	150.0931161
EWFF3000	-30.59582272	150.0938141

Source: AMBS Ecology and Heritage (2021a) *Maules Creek Coal Mine Offset Area Vegetation Mapping*. Prepared for Whitehaven Coal Limited.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX D

TYLOPHORA LINEARIS PROPAGATION AND TRANSLOCATION PROGRAM

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

1. PURPOSE

This addendum to the *Maules Creek Biodiversity Management Plan* (BMP) was prepared to document propagation and translocation program for *Tylophora linearis* (a threatened flora species listed under the New South Wales (NSW) *Threatened Species Conservation Act, 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). This addendum was prepared in consultation with Dr Colin Driscoll (Hunter Eco), Office of the Environment (OEH), Department of Planning and Environment (DP&E) and Department of the Environment (DotE).

The BMP was approved by DP&E in April 2017.

Requirements

Section 4.1 of the BMP requires pre-clearing surveys for *Tylophora linearis* and states:

If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DoE (for MNES). The program will be documented in the BMP [Biodiversity Management Plan] via an addendum or new revision.

Tylophora linearis was identified during the flora pre-clearing surveys undertaken by Niche Environment and Heritage (Niche). In accordance with the BMP the numbers of plants were counted by Niche and a population estimate was calculated by Dr Colin Driscoll (Hunter Eco). On 14 May 2014, the DP&E requested this addendum to the Maules Creek BMP to document a propagation and translocation program for *Tylophora linearis*.


On 26 August 2014, DotE confirmed that they were satisfied with the adequacy of this propagation and translocation program for *Tylophora linearis*. OEH (8 September 2014) had no comments on the program.

2. PROPAGATION AND TRANSLOCATION PROGRAM

There are multiple stages to the propagation and translocation program:

- Stage 1 - Root Architecture and Growth Study;
- Stage 2 - Seed Production Monitoring;
- Stage 3 - Seed Collection and Storage;
- Stage 4 – Seed Propagation; and
- Stage 5 –Translocation Trials.

These stages are documented below. A staged approach is required as the success of each stage has bearing on the next stage (e.g. fruiting needs to be observed before seed collection and seed collection is required before seed propagation).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

3. STAGE 1 - TYLOPHORA LINEARIS ROOT ARCHITECTURE AND GROWTH STUDY

Objective

Tylophora linearis is a small terrestrial twining plant observable as groups of stems, often spread over several square metres, that twine around grasses and small shrubs. Forster *et al.* (2004) describes that the species has an underground rhizome from which more than one aerial stem can emerge, but the extent of the underground rhizome is not currently known. There is a distinct possibility that the species is clonal and that groups of stems could be composed of a number of clones. The objective of the *Tylophora linearis* root architecture and growth study is to document the underground and aboveground growth of the species. This study will provide information relevant to translocating whole plants (in the event whole plants are to be translocated) (Section 7).

Timing

During mine clearing activities in 2014, a selection of *Tylophora linearis* within the area to be cleared will be excavated to document their root architecture and growth.

Procedure

A minimum of 20 *Tylophora linearis* plants from within the Maules Creek Project Surface Development Extent will be selected. The following data will be collected for the *Tylophora linearis* plants:

- photograph of the *Tylophora linearis* plants and root architecture;
- note the general vegetative condition of the entire plant;
- number and length of stems;
- length and depth of roots; and
- maturity of the plant (i.e. whether reproductive material is present).


Reporting procedures are described in Section 8.

4. STAGE 2 - TYLOPHORA LINEARIS SEED PRODUCTION MONITORING

Objective

The objective of the *Tylophora linearis* seed production study is to monitor flowering *Tylophora linearis* plants for the development of fruit for the ultimate purpose of collecting seed.

If seed is observed in 2014, the seed collection activities will be initiated (Section 5). If no seed is observed, the seed collection activities will not occur in 2014 and the seed production study will be modified and implemented in 2014/2015.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Timing

Flowering is reported as during November, and several weeks after at least 20 mm of rain following a lengthy dry period (Forster *et al.*, 2004). However, *Tylophora linearis* was observed flowering in March, April and May 2014 by Niche. The *Tylophora linearis* seed production study will commence in May 2014 and be undertaken fortnightly until flowering/fruitletting has ended.

Procedure

A minimum of 20 flowering *Tylophora linearis* plants (ten flowering plants from within the Maules Creek Project Surface Development Extent and ten flowering plants outside of the Maules Creek Project Surface Development Extent) will be selected. The plants selected will be spread widely across these areas so as to maximise genetic variation as part of the seed collection and storage activities (Section 5).

These 20 plants will be assigned an individual number/code and visually monitored *in situ* for signs of fruit.

The following data will be collected for plants bearing fruit:

- photographs of the flowering portion of each monitored plant each monitoring occasion;
- notes of the general vegetative condition of the entire plant on each monitoring occasion;
- a count of the total number of open plus dead flowers on each plant on each monitoring occasion;
- the date when a new fruit is observed for each plant;
- the length and widest diameter of each fruit at each monitoring occasion; and
- where multiple fruit develop on the one plant, each fruit will be tagged and coded.

The following data will be collected for plants not bearing fruit:


- a count of the total number of open plus dead flowers on each plant on each monitoring occasion; and
- the length and widest diameter of each fruit at each monitoring occasion.

Reporting procedures are described in Section 8.

5. STAGE 3 - TYLOPHORA LINEARIS SEED COLLECTION AND STORAGE

Objective

The objective of the *Tylophora linearis* seed collection and storage activities is to obtain seed for propagation (Section 6) and storage in the Australian PlantBank.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Timing

Seed collection will occur concurrently with and immediately following the seed production monitoring (Section 4).

Procedure

Seed collection will be undertaken by personnel with the appropriate NSW Scientific Licence.

Seed collection steps will include:

1. bagging fruit (Suitable bagging material can be made from old nylon stockings that are fine enough to keep out pest insects while allowing light and air in) when they are around 2 centimetres (cm) in length with a bag of sufficient size to allow for fruit to develop inside the bag;
2. when fruit has fully opened to shed seed, the fruit will be snipped off at the main stem, complete with bag, and placed in a paper bag with fresh silica gel;
3. the fruit will be stored in a dark cool dry place; and
4. as soon as practicable after collection, the fruit will be sent by priority mail to the Australian PlantBank.

The Australian PlantBank is a science and research facility of the Royal Botanic Gardens and Domain Trust and is located at the Australian Botanic Garden, Mount Annan. Seed will be stored in the Australian PlantBank and/or used as part of a propagation program (Section 6).

Reporting procedures are described in Section 8.

6. STAGE 4 - TYLOPHORA LINEARIS SEED PROPAGATION


Objective

If sufficient seed is collected from *Tylophora linearis* as part of the procedure described in Section 3.3, all or some of the seed will be propagated to create an *ex situ* supply of seedlings suitable for translocation.

If sufficient seed is not collected from *Tylophora linearis* as part of the procedure described in Section 3.3, consideration will be given to production of seedlings from tissue culture using either germinated seedlings or mature plant material. Tissue culture is a well-established technique for producing plants *en masse* for horticultural or native plant translocation and habitat regeneration purposes. There are reports of the technique having been successfully applied to Indian *Tylophora indica* (Faisal *et al.*, 2007).

Timing

Seed propagation will occur following the collection of sufficient seed (Section 5) or mature plant material (if insufficient seed is collected).

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Procedure

Plant propagation will be undertaken in an appropriate tissue culture laboratory that will germinate the seed or use plant tissue in sterile conditions to provide a source of fresh plant material.

Reporting procedures are described in Section 8.

7. STAGE 5 – TYLOPHORA LINEARIS TRANSLOCATION TRIALS

Objective

If a sufficient supply of seedlings is propagated (Section 6), a translocation proposal will be prepared in accordance with national translocation protocols (Vallee *et al.*, 2004). The translocation proposal will outline research trials to inform potential techniques for establishing *Tylophora linearis*.

Translocation can involve using propagules to create an *ex situ* supply of seedlings suitable for translocation (Section 6) or moving whole plants from a disturbance area to an appropriate recipient area.

Timing

The translocation proposal will be prepared once an *ex situ* supply of seedlings suitable for translocation is established as described in Section 8.


Procedure

The translocation procedure will be described within the translocation proposal. If a sufficient supply of seedlings is propagated (Section 6), consideration will be given to translocating cultured plants into suitable recipient sites within the Maules Creek offset areas. If a sufficient supply of seedlings is not propagated, consideration will be given to translocating whole plants where this can be planned in advance of the clearing program.

In accordance with national translocation protocols (Vallee *et al.*, 2004), the translocation proposal will include details such as:

- who is undertaking the translocation;
- recipient sites (with a justification as to why the site is appropriate and not likely to significantly impact the natural environment);
- information on the number of individuals to be translocated;
- on-going management; and
- funding.

Reporting procedures are described in Section 8.


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

8. REPORTING

A report will be compiled annually which documents the implementation of the Propagation and Translocation Program for *Tylophora linearis*. This report will report on each of the five stages of the program until the completion criteria have been met (i.e. the study was completed). The report will be sent to OEH, DP&E and DotE. A summary will also be provided within the Annual Review.

9. REFERENCES

- Faisal, M., Ahmad, N and Anis, M. (2007) An efficient micropropagation system for *Tylophora indica*: an endangered, medicinally important plant. *Plant Biotechnology Reports* 1:155-161.
- Forster P.I., Binns, D. and Robertson, G. (2004) Rediscovery of *Tylophora linearis* P.I. Forst. (Apocynaceae: Asclepiadoideae) from New South Wales, with revision of its conservation status to vulnerable. *Austrobaileya* 6 (4): 941-947.
- Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M., and Rosetto, M. (2004) *Guidelines for the Translocation of Threatened Plants in Australia*. Australian Network for Plant Conservation, Canberra.

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX E

COMPLETION CRITERIA FOR KEY BIOMETRICS OF VEGETATION CLASSES AND CORRESPONDING BVTs/PCTs MAPPED WITHIN THE OFFSET AREA


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table E-1
Completion Criteria for Key Biometrics of Vegetation Classes and Corresponding BVTs/PCTs Mapped Within the Offset Area

Vegetation Class (Keith 2004)	BVT/PCT Number	Community Common Name	TEC	Completion criteria			
				NPS	NOS	NMS	NGCG
Brigalow Clay Plain Woodlands	NA102 (PCT 55)	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	Yes	12-16	6-25	0-5	20-30
	NA185 (PCT 101)	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Yes				
New England Dry Sclerophyll Forests	NA351 (PCT 572)	Silvertop Stringybark - Bendemeer White Gum - Ribbon Gum open forest in the Kaputar area of the Nandewar Bioregion	No	26-33	25-40	6-25	18-20
	BR122 (PCT 736)	Broad-leaved Stringybark - Mountain Gum - Apple Box open forest of the New England Tableland Bioregion	No				
New England Grassy Woodlands	NA258 (PCT 510)	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Yes*	20-25	6-25	0-5	30-40
	NA358 (PCT 492)	Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion	Yes*				
	NA332 (PCT 571)	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	Yes*				
North-west Slopes Dry Sclerophyll Woodlands	NA348 (PCT 413)	Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	No	20-26	6-25	6-25	20-30
	NA407 (PCT 429)	White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion	No				
	NA397 (PCT 435)	White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion	Yes*				



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table E-1 (Continued)
Completion Criteria for Key Biometrics of Vegetation Classes and Corresponding BVTs/PCTs Mapped Within the Offset Area

Vegetation Class (Keith 2004)	BVT/PCT Number	Community Common Name	TEC	Completion criteria			
				NPS	NOS	NMS	NGCG
North-west Slopes Dry Sclerophyll Woodlands (cont.)	NA393 (PCT 563)	White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion	No	24-30	25-40	6-25	20-30
	NA398 (PCT 588)	White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	No				
	NA206 (PCT1165)	Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion	No				
	NA222 (PCT 1306)	White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion	No				
Western Slopes Dry Sclerophyll Forests	NA373 (PCT 581)	Tumbledown Red Gum - Dwyers Red Gum - Wallaby Bush shrubby woodland of the Nandewar Bioregion	No				
	NA316 (PCT 592)	Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	No				

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX F

ANNUAL PERFORMANCE CRITERIA FOR KEY BIOMETRICS OF VEGETATION CLASSES MAPPED WITHIN THE OFFSET AREA


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table F-1
Annual performance criteria values for management zones of Brigalow Clay Plain Woodlands (PCTs 55 and 101)

Biometric	Threshold - BVT benchmark	Annual performance criteria (Year since offset established/revegetated)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NPS	Lower-80% BVT	0.6	1.3	1.9	2.6	3.2	3.8	4.5	5.1	5.8	6.4	7.0	7.7	8.3	9.0	9.6	10.2	10.9	11.5	12.2	12.8
	Upper-100% BVT	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0	12.8	13.6	14.4	15.2	16
NOS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NMS	Lower – Min. BVT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upper – Max. BVT	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.3	3.5	3.8	4.0	4.3	4.5	4.8	5
NGCG	Lower – Min. BVT	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20
	Upper – Max. BVT	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table F-2
Annual performance criteria values for management zones of New England Dry Sclerophyll Forests (PCTs 572 and 736)

Biometric	Threshold - BVT benchmark	Annual performance criteria (Year since offset established/revegetated)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NPS	Lower-80% BVT	1.3	2.6	4.0	5.3	6.6	7.9	9.2	10.6	11.9	13.2	14.5	15.8	17.2	18.5	19.8	21.1	22.4	23.8	25.1	26.4
	Upper-100% BVT	1.7	3.3	5.0	6.6	8.3	9.9	11.6	13.2	14.9	16.5	18.2	19.8	21.5	23.1	24.8	26.4	28.1	29.7	31.4	33
NOS	Lower – Min. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
	Upper – Max. BVT	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40
NMS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NGCG	Lower – Min. BVT	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.8	11.7	12.6	13.5	14.4	15.3	16.2	17.1	18
	Upper – Max. BVT	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table F-3
Annual performance criteria values for management zones of New England Grassy Woodlands (PCTs 492, 510, 571)

Biometric	Threshold - BVT benchmark	Annual performance criteria (Year since offset established/revegetated)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NPS	Lower-80% BVT	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20
	Upper-100% BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NOS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NMS	Lower – Min. BVT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upper – Max. BVT	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.3	3.5	3.8	4.0	4.3	4.5	4.8	5
NGCG	Lower – Min. BVT	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30
	Upper – Max. BVT	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table F-4
Annual performance criteria values for management zones of North-west Slopes Dry Sclerophyll Woodlands
(PCT 413, 429, 435, 563, 588, 1165, 1306)

Biometric	Threshold - BVT benchmark	Annual performance criteria (Year since offset established/revegetated)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NPS	Lower-80% BVT	1.0	2.1	3.1	4.2	5.2	6.2	7.3	8.3	9.4	10.4	11.4	12.5	13.5	14.6	15.6	16.6	17.7	18.7	19.8	20.8
	Upper-100% BVT	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0	14.3	15.6	16.9	18.2	19.5	20.8	22.1	23.4	24.7	26
NOS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NMS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NGCG	Lower – Min. BVT	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20
	Upper – Max. BVT	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30



	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Revision Period:	Group Manager – ABP
		Issue:	2
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table F-5
Annual performance criteria values for management zones of Western Slopes Dry Sclerophyll Forests (PCTs 581, 592)

Biometric	Threshold - BVT benchmark	Annual performance criteria (Year since offset established/revegetated)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NPS	Lower- 80% BVT	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4	15.6	16.8	18.0	19.2	20.4	21.6	22.8	24
	Upper- 100% BVT	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30
NOS	Lower – Min. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
	Upper – Max. BVT	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40
NMS	Lower – Min. BVT	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6
	Upper – Max. BVT	1.3	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25
NGCG	Lower – Min. BVT	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20
	Upper – Max. BVT	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

APPENDIX G

OFFSET AREA RISK ASSESSMENT




	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table G-1
Risk Assessment


Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Substrate	Ground disturbance	C	4	L	<ul style="list-style-type: none"> Ground preparation and soil disturbance for revegetation will only be undertaken where required in revegetation (Section 4.4); Vehicle access will be restricted to designated tracks, except in the case of biodiversity management actions and inspections (Section 4.11); and Establishment and maintenance of fire breaks around the perimeter of and within the offset areas only where practicable (Section 4.12); 	D	4	L
Clearing	Incidental clearing and fragmentation	C	4	L	<ul style="list-style-type: none"> Low level management interventions in existing woodland and forest to minimise clearing (Section 4.2); Active revegetation will be undertaken to increase the area and connectivity of native vegetation (Section 4.4); and Ecological thinning will be limited to areas of dense regrowth of <i>Callitris</i> spp. (Section 4.5). 	D	4	L
Livestock	Grazing by cattle – ground disturbance, remove or destroy seeds, seedlings or plantings	C	2	H	<ul style="list-style-type: none"> Agriculture/grazing has been excluded from the offset area (Section 4.10); Inadvertent grazing from neighbouring stock will be removed as soon as practicable (Section 4.10). 	D	3	L

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Introduced flora species (weeds)	Weed invasion – perennial and annual grasses, perennial herbs, annual and biennial herbs and woody weeds	C	2	H	<ul style="list-style-type: none"> Whitehaven will instruct contractor vehicles and equipment entering the offset area to be clean and free from weeds and/or seeds reduce introduction and spread of weeds (Section 4.7); Seasonal weed assessment programs will be used to identify weeds and implement timely and prioritised weed control; Weed control will target priority weed species; The cover and extent of exotic species will be monitored (Section 4.15); and An increase in perennial exotic plant cover will trigger management actions and a review of factors leading to increasing/high weed cover (Section 4.16). 	D	3	L
Impacts from Animals (exotics and grazing native animals)	Grazing by feral pigs and goats	B	3	H	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L
	Rabbits and hares	B	3	H	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L
	Grazing native fauna species (e.g. kangaroos)	B	4	M	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L
	Feral foxes	B	3	H	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L
	Deer	C	4	L	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L
	Feral Cat	B	4	M	<ul style="list-style-type: none"> Pest animal abundance is monitored across the offset area (Section 4.8); Control measures are informed by monitoring results/presence of pest animals (Section 4.8). 	B	5	L

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Fire	Uncontrolled bushfire	B	2	H	<ul style="list-style-type: none"> Establishing and maintaining fire breaks around the perimeter of and within the offset areas (Section 4.12); Fuel loads, bushfire risk and appropriate hazard reduction methods will be assessed annually; Whitehaven will undertake an annual ecological burn program according to the annual assessment; Controlled burns may be utilised as a contingency measure within the Trigger Action Response Plan according to annual flora performance criteria (Sections 4.14, 4.15 and 4.16). 	D	3	L
Floristics	Poor understorey diversity	C	3	M	<ul style="list-style-type: none"> Annual revegetation assessments will determine key species to be planted in order to create a structurally diverse habitat (Section 4.4); Ecological monitoring (Section 4.15) will assess the diversity of understorey species in defined control/treatment plots to determine required contingency measures (Section 4.16); Supplementary planting of appropriate tubestock or seeding will be undertaken if the contingency measure is triggered (Section 4.16). 	D	3	L
Native plant growth	Poor native plant growth/germination	C	3	M	<ul style="list-style-type: none"> Annual revegetation assessments will determine key species to be planted in areas requiring active revegetation (Section 4.4); Vegetation and habitat monitoring will be undertaken to track changes in vegetation and habitat in the offset areas in response to management measures (Section 4.15); Supplementary planting of appropriate tubestock or seeding will be undertaken if the contingency measure is triggered (Section 4.16). 	C	4	L
	Dense overstorey and midstorey revegetation	C	3	M	<ul style="list-style-type: none"> Ecological monitoring (Section 4.15) will assess the density of overstorey and midstorey vegetation in defined control/treatment plots to determine required contingency measures (Section 4.16); Ecological thinning will be conducted in areas of dense regrowth of <i>Callitris</i> spp. where it has adverse impacts on habitat condition or restoration (Section 4.5). 	C	4	L

	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
	Dense grass cover	C	3	M	<ul style="list-style-type: none"> Ecological monitoring (Section 4.15) will assess the density of grasses in defined control/treatment plots to determine required contingency measures (Section 4.16). 	C	4	L
Fauna habitat	Lack of bush rocks	C	4	L	<ul style="list-style-type: none"> Habitat needs assessment will be undertaken to determine the requirements for habitat augmentation (Section 4.6); Habitat augmentation will use available salvaged resources such as rocky debris. 	C	4	L
	Lack of fallen timber/hollow logs	C	4	L	<ul style="list-style-type: none"> Habitat needs assessment will be undertaken to determine the requirements for habitat augmentation (Section 4.6) Habitat augmentation will use available salvaged resources such as coarse woody debris and artificial hollows 	C	4	L
	Lack of structural diversity (including lack of tree hollows)	C	4	L	<ul style="list-style-type: none"> Habitat needs assessment will be undertaken to determine the requirements for habitat augmentation (Section 4.6); Nest box installation (where required) will use high quality, durable materials suited to hollow-dependent threatened species; 	C	4	L
	Lack of suitable vegetation for foraging and/or roosting	C	4	L	<ul style="list-style-type: none"> Habitat needs assessment will be undertaken to determine the requirements for habitat augmentation (Section 4.6); Nest box installation (where required) will use high quality, durable materials suited to hollow-dependent threatened species. 	C	4	L


	MAULES CREEK	Document Owner:	Group Superintendent - Biodiversity
		Document Approver:	Group Manager – ABP
		Issue:	4
		Last Revision Date:	5 November 2021
		Revision Period:	Go to Section 5.5
WHC_PLN_MC_OFFSET MANAGEMENT PLAN			

Table G-2 Likelihood and Consequence

Qualitative measure of likelihood (how likely is it that this event/issue will occur after control strategies have been put in place)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Qualitative measure of consequences (what will be the consequence/result if this issue does occur rating)	
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Source: Department of the Environment (2014)

Table G-3 Risk Rating

	Consequence				
	Minor	Moderate	High	Major	Critical
Highly Likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Source: Department of the Environment (2014)