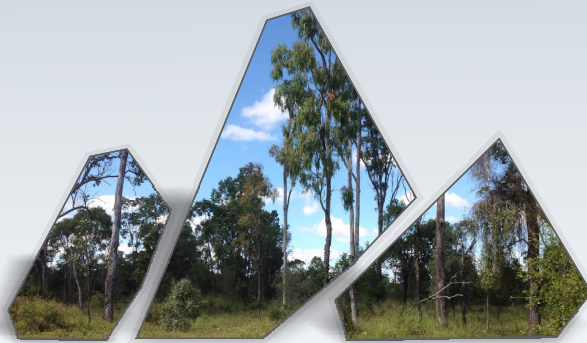


MIDDLEMOUNT COAL MINE WESTERN EXTENSION PROJECT (EPBC 2017/8130) EPBC Act Preliminary Assessment Documentation

Attachment G

Middlemount Coal Mine
Offset Management Plan/Vegetation Management Plan



MIDDLEMOUNT COAL MINE

OFFSET MANAGEMENT PLAN/
VEGETATION MANAGEMENT PLAN



MARCH 2019
Project No. MCPL-02
Document No. 00960203

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	Approval Date
All	1	Original (Middlemount Coal [Stage 2] Project offset area)	SEWPaC	30 November 2012
All	2	Inclusion of: - Middlemount Coal Mine Rail Loop and Spur offset areas; - Parrot Quarry offset areas; - Thirteen Mile Gully Diversion offset areas; - Amendments to the Middlemount Coal (Stage 2) Project offset area; - VDec Requirements; and - DNRM comments.	DNRM (August 2013)	25 November 2013 (Refer to the VDec Notice)
			DotE (February 2014) (Plan dated November 2013 to reflect VDec Notice)	18 March 2014
All	3	Inclusion of: - Modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 20105394) - Modified Rail Loop and Spur Offset Area - North-eastern Extension Commonwealth Offset Area (EPBC 2016/7717) - North-eastern Extension State Offset Area - Western Extension Commonwealth Offset Area (EPBC 2017/8130) - Western Extension State Offset Area	DEE (July 2018)	-
All	4	Inclusion of comments from DEE	DEE (November 2018)	-
All	5	Inclusion of comments from DEE	DEE (March 2019)	-

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
EXECUTIVE SUMMARY	ES-1
1 INTRODUCTION	1
1.1 BACKGROUND	1
1.2 OFFSET MANAGEMENT PLAN REQUIREMENTS	6
1.2.1 Middlemount Coal (Stage 2) Project Commonwealth Offset Area	6
1.2.2 Rail Loop and Spur Offset Area	8
1.2.3 Parrot Quarry Offset Area	10
1.2.4 Thirteen Mile Gully Diversion Offset Area	11
1.2.5 North-eastern Extension Commonwealth Offset Area	12
1.2.6 North-eastern Extension State Offset Area	14
1.2.7 Western Extension Commonwealth Offset Area	14
1.2.8 Western Extension State Offset Area	15
1.3 ENDURING PROTECTION OF THE OFFSET AREAS – VOLUNTARY DECLARATION MANAGEMENT PLAN REQUIREMENTS	15
1.4 REPORT STRUCTURE	19
2 OFFSET AREA DETAILS	20
2.1 PROPERTY AND OWNERSHIP DETAILS AND REGISTERED INTERESTS	20
2.2 MIDDLEMOUNT COAL (STAGE 2) PROJECT COMMONWEALTH OFFSET AREA	20
2.2.1 Ecological Surveys and Monitoring	20
2.2.2 Native Vegetation	20
2.2.3 Weeds and Animal Pests	21
2.2.4 Matters of National Environmental Significance	22
2.3 RAIL LOOP AND SPUR OFFSET AREA	22
2.4 PARROT QUARRY OFFSET AREA	23
2.5 THIRTEEN MILE GULLY DIVERSION OFFSET AREA	23
2.6 NORTH-EASTERN EXTENSION COMMONWEALTH OFFSET AREA	24
2.6.1 Ecological Surveys	24
2.6.2 Native Vegetation	24
2.6.3 Shrub Cover	25
2.6.4 Weeds and Animal Pests	26
2.6.5 Matters of National Environmental Significance	27
2.7 NORTH-EASTERN EXTENSION STATE OFFSET AREA	27
2.7.1 Ecological Surveys	27
2.7.2 Native Vegetation	28
2.7.3 Weeds and Animal Pests	28
2.8 WESTERN EXTENSION COMMONWEALTH OFFSET AREA	28
2.8.1 Ecological Surveys	28
2.8.2 Native Vegetation	28
2.8.3 Weeds and Animal Pests	30
2.8.4 Matters of National Environmental Significance	30
2.9 WESTERN EXTENSION STATE OFFSET AREA	30
2.9.1 Ecological Surveys	31
2.9.2 Native Vegetation	31
2.9.3 Weeds and Animal Pests	31

TABLE OF CONTENTS (Continued)

3	MANAGEMENT ACTIONS	32
3.1	MANAGEMENT OF EPBC ACT LISTED THREATENED SPECIES	32
3.2	SETTING UP THE OFFSET AREAS	34
3.3	REGENERATION	34
3.4	WEED MANAGEMENT STRATEGY	35
3.5	PEST ANIMAL MANAGEMENT STRATEGY	37
3.6	FIRE MANAGEMENT	38
3.7	EROSION AND SEDIMENT CONTROL	39
3.8	MANAGEMENT OF LIVESTOCK	40
3.9	RESTRICTIONS TO ACCESS	41
3.10	ADDITIONAL HABITAT FEATURES	41
3.11	REMOVAL OF BARBED WIRE	43
3.12	EDUCATION	43
3.13	MANAGEMENT SCHEDULE	43
4	PERFORMANCE AND COMPLETION CRITERIA	48
4.1	PERFORMANCE CRITERIA	48
4.1.1	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	48
4.1.2	Rail Loop and Spur Offset Area	49
4.1.3	Parrot Quarry Offset Area	49
4.1.4	Thirteen Mile Gully Diversion Offset Area	49
4.1.5	North-eastern Extension Commonwealth Offset Area	49
4.1.6	North-eastern Extension State Offset Area	51
4.1.7	Western Extension Commonwealth Offset Area	51
4.1.8	Western Extension State Offset Area	51
4.2	COMPLETION CRITERIA	55
4.2.1	All Offset Areas	55
4.2.2	North-eastern Extension Commonwealth Offset Area	55
4.2.3	North-eastern Extension State Offset Area	56
4.2.4	Western Extension State Offset Area	61
5	MONITORING PLAN	62
5.1.1	Monitoring the Effectiveness of Regeneration in the Offset Areas	63
5.1.2	Habitat Quality Assessments	69
5.1.3	Usage of the Offset Areas by Fauna	69
5.1.4	Effectiveness of the Weed Control	70
5.1.5	Effectiveness of the Pest Animal Control	70
5.1.6	Visual Inspections	70
5.1.7	Assessment of the Requirement for Restoration Thinning	71
5.1.8	Impacts of Grazing on Management Objectives	71
6	CONTINGENCY MEASURES	72
6.1	POTENTIAL RISKS AND CONTINGENCY MEASURES	72
6.1.1	Active Seeding/Planting	72
6.1.2	Brigalow Regrowth Restoration Thinning	73
6.2	IMPACTS FROM A THIRD PARTY	75

TABLE OF CONTENTS (Continued)

7	TIMING AND RESPONSIBILITIES	76
8	COST OF ACTIVITIES	77
9	TRUST FUND	78
10	REPORTING, AUDIT AND REVIEWING	79
10.1	DOCUMENTATION	79
10.1.1	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	79
10.1.2	North-eastern Extension Commonwealth Offset Area	79
10.1.3	Western Extension Commonwealth Offset Area	79
10.1.4	Weed Monitoring Report	80
10.1.5	Pest Animal Monitoring Report	80
10.2	COMPLIANCE REPORTING	80
10.2.1	Qld State Requirements	80
10.2.2	EPBC Act Compliance Report - Middlemount Coal (Stage 2) Project Commonwealth Offset Area	81
10.2.3	EPBC Act Compliance Report - North-eastern Extension Commonwealth Offset Area	81
10.2.4	EPBC Act Compliance Report - Western Extension Commonwealth Offset Area	81
10.2.5	Publishing of this Plan	82
10.3	INDEPENDENT AUDIT	82
10.3.1	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	82
10.3.2	North-eastern Extension Commonwealth Offset Area	82
10.3.3	Western Extension Commonwealth Offset Area	82
10.4	REVIEW AND REVISION OF THIS PLAN	83
10.4.1	Qld State Requirements	83
10.4.2	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	83
10.4.3	North-eastern Extension Commonwealth Offset Area	83
10.4.4	Western Extension Commonwealth Offset Area	83
11	REFERENCES	84

LIST OF TABLES

Table 1	Middlemount Coal Mine Offset Areas
Table 2	Relevant Conditions for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC Act 2010/5394)
Table 3	Middlemount Coal Mine Rail Loop and Spur Clearing Area
Table 4	Offset Management Plan Requirements from the <i>Queensland Policy for Vegetation Management Offsets (Version 3)</i>
Table 5	Parrot Quarry Clearing Area
Table 6	Relevant Conditions for the North-Eastern Extension Project Commonwealth Offset Area (EPBC 2016/7717)
Table 7	Vegetation Management Plan Requirements from the <i>Guide to Voluntary Declarations</i>
Table 8	Regional Ecosystems - Middlemount Coal (Stage 2) Project Commonwealth Offset Area

TABLE OF CONTENTS (Continued)

Table 9	Matters of National Environmental Significance for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area
Table 10	Middlemount Coal Mine Rail Loop and Spur Offset Areas
Table 11	Parrot Quarry Offset Areas
Table 12	Thirteen Mile Gully Diversion Clearing Area and Offset Area
Table 13	Regional Ecosystems - North-eastern Extension Commonwealth Offset Area
Table 14	Baseline Shrub Cover for RE11.5.2a, 11.7.2 and 11.7.4 within the North-eastern Extension Commonwealth Offset Area
Table 15	Baseline Weed Cover for Regional Ecosystems within the North-eastern Extension Commonwealth Offset Area and Western Extension Commonwealth Offset Area
Table 16	Matters of National Environmental Significance - North-eastern Extension Commonwealth Offset Area
Table 17	Regional Ecosystems - Western Extension Commonwealth Offset Area
Table 18	Matters of National Environmental Significance Western Extension Commonwealth Offset Area
Table 19	Regional Ecosystems - Western Extension State Offset Area
Table 20	Specific Management Measures Relevant to Matters of National Environmental Significance
Table 21	Management Areas
Table 22	Weed Control Methods
Table 23	Broad Management Schedule
Table 24	Detailed Management Schedule
Table 25	Performance Criteria - Middlemount Coal (Stage 2) Project Commonwealth Offset Area
Table 26	Performance Criteria - North-eastern Extension Commonwealth Offset Area
Table 27	Performance Criteria - North-eastern Extension State Offset Area
Table 28	Performance Criteria - Western Extension Commonwealth Offset Area
Table 29	Performance Criteria - Western Extension State Offset Area
Table 30	Completion Criteria
Table 31	Monitoring Plan
Table 32	Additional Photo Points
Table 33	Transect Monitoring Sites
Table 34	Potential Risks and Contingency Measures
Table 35	Revegetation Methods

LIST OF FIGURES

Figure 1	Regional Location
Figure 2	Middlemount Coal Mine
Figure 3	Offset Locations
Figure 4	Aerial Photograph with Reference Points
Figure 5	Regional Ecosystem Mapping

TABLE OF CONTENTS (Continued)

Figure 6	Threatened Species Records
Figure 7	Paddocks
Figure 8	Brigalow Woodland Threatened Ecological Community – Western Extension Commonwealth Offset Area
Figure 9	Ornamental Snake Habitat Mapping - Western Extension Commonwealth Offset Area
Figure 10	Squatter Pigeon (southern) Habitat Mapping - Western Extension Commonwealth Offset Area
Figure 11	Koala Habitat Mapping - Western Extension Commonwealth Offset Area
Figure 12	Greater Glider Habitat Mapping - Western Extension Commonwealth Offset Area
Figure 13	Monitoring Locations and Access Tracks
Figure 14	Restoration Thinning Guide

LIST OF APPENDICES

Appendix A	Ecological Investigations within the Offset Area for Stage 2 Of The Middlemount Coal Mine, Queensland
Appendix B	Ecological Equivalence – Rail Loop and Spur Offset Area, Parrot Quarry Offset Area and Thirteen Mile Gully Diversion Offset Area
Appendix C	North-Eastern Extension Offset Area Offset Baseline Repot
Appendix D	Western Extension Project Offset Area Baseline Report
Appendix E	Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines
Appendix F	Risk Analysis
Appendix G	Peer Review Letter – Biodiversity Australia

EXECUTIVE SUMMARY

The Middlemount Coal Mine is an existing mine located approximately 90 kilometres (km) north-east of Emerald and approximately 3 km to the south-west of the Middlemount Township, Queensland (Qld).

This Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan provides for the management of numerous offset areas held by Middlemount Coal Pty Ltd (MCPL) (ABN 49 122 348 412) for the Middlemount Coal Mine. The offset areas are located immediately west of the mine on freehold land owned by MCPL.

The offset areas cover an area of approximately 5,861.4 hectares and area required to address eight different offset requirements. There are three Commonwealth Offset Areas under the Commonwealth *Environment Protection and Biodiversity Act, 1999* covered in this plan:

- Middlemount Coal (Stage 2) Project Commonwealth Offset Area;
- North-eastern Extension Commonwealth Offset Area; and
- Western Extension Commonwealth Offset Area.

There are five State (Qld) Offset Areas covered in this plan:

- Rail Loop and Spur Offset Area;
- Parrot Quarry Offset Area;
- Thirteen Mile Gully Diversion Offset Area;
- North-eastern Extension State Offset Area; and
- Western Extension State Offset Area.

Each approval has specific requirements, however, the desired outcome is generally that the extent and condition of the habitat values of threatened species and communities within the offset areas are protected and enhanced, including currently degraded areas reaching remnant status.

This Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan has been prepared to guide the management of the offset areas to fulfil the relevant offset obligations. If the performance criteria are not met then the relevant management measures will be reviewed consistent with an adaptive management framework (plan, do, check and review).

The offset areas will be secured through a voluntary declaration (Vdec) of an area of high nature conservation value under the Qld *Vegetation Management Act, 1999*. Once a Vdec is established over the offset areas, any amendments to this Offset Management Plan/ Vegetation Management Plan are to be made by agreement between MCPL and the chief executive of Department of Natural Resources and Mines and approved by the Commonwealth Minister.

1 INTRODUCTION

1.1 BACKGROUND

The Middlemount Coal Mine is an existing mine located approximately 90 kilometres (km) north-east of Emerald and approximately 3 km to the south-west of the Middlemount Township, Queensland (Qld) (Figures 1 and 2). The offset areas provided for the Middlemount Coal Mine are located immediately west of the mine on freehold land owned by Middlemount Coal Pty Ltd (MCPL) (ABN 49 122 348 412) (Figures 3 and 4). The Middlemount Coal Mine offset areas associated with eight different approvals are listed in Table 1.

Table 1
Middlemount Coal Mine Offset Areas

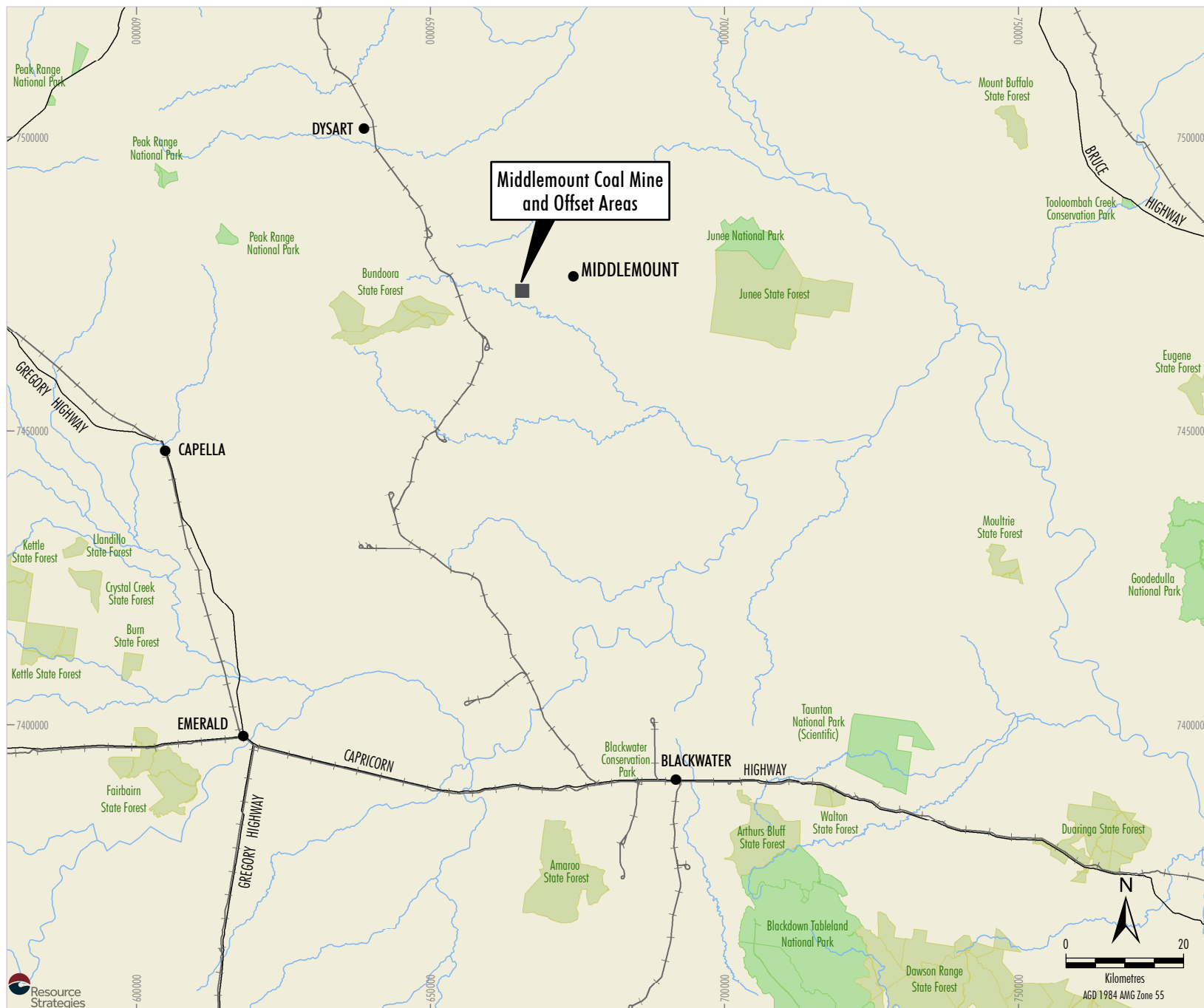
Offset Area	Source of Offset Requirement	Size (ha)
Middlemount Coal (Stage 2) Project Commonwealth Offset Area	EPBC 2010/5394	3,318
Rail Loop and Spur Offset Area	Decision Notice IC0410MKY003 Deed of Agreement	110
Parrot Quarry Offset Area	DERM Permit number: 2010/003611 Deed of Agreement	15.4
Thirteen Mile Gully Diversion Offset Area	SPA and EPBC 2010/5394*	31
North-eastern Extension Commonwealth Offset Area	EPBC 2016/7717	532
North-eastern Extension State Offset Area	EPML00716913	181
Western Extension Commonwealth Offset Area	EPBC 2017/8130	1,220
Western Extension State Offset Area	EPML00716913	454
Total		5,861.4

The Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan was originally approved by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (now the Department of Environment and Energy [DEE]) on 30 November 2012 for the management of the Middlemount Coal (Stage 2) Project Commonwealth Offset Area under the Commonwealth *Environment Protection and Biodiversity Act, 1999* (EPBC Act) (EPBC 2010/5394).

In early 2013, the Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan was revised to describe how MCPL will manage offset areas established for other various components of the Middlemount Coal Mine, namely the Rail Loop and Spur Offset Area, Parrot Quarry Offset Area and Thirteen Mile Gully Diversion Offset Area.

In 2018, the plan was revised again to include the following:

- a modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area;
- a modified Rail Loop and Spur Offset Area;
- the North-eastern Extension Commonwealth Offset Area;
- the North-eastern Extension State Offset Area;
- the Western Extension Commonwealth Offset Area; and
- the Western Extension State Offset Area.



LEGEND

- National Park/Conservation Area
- State Forest
- Railway
- Major Road

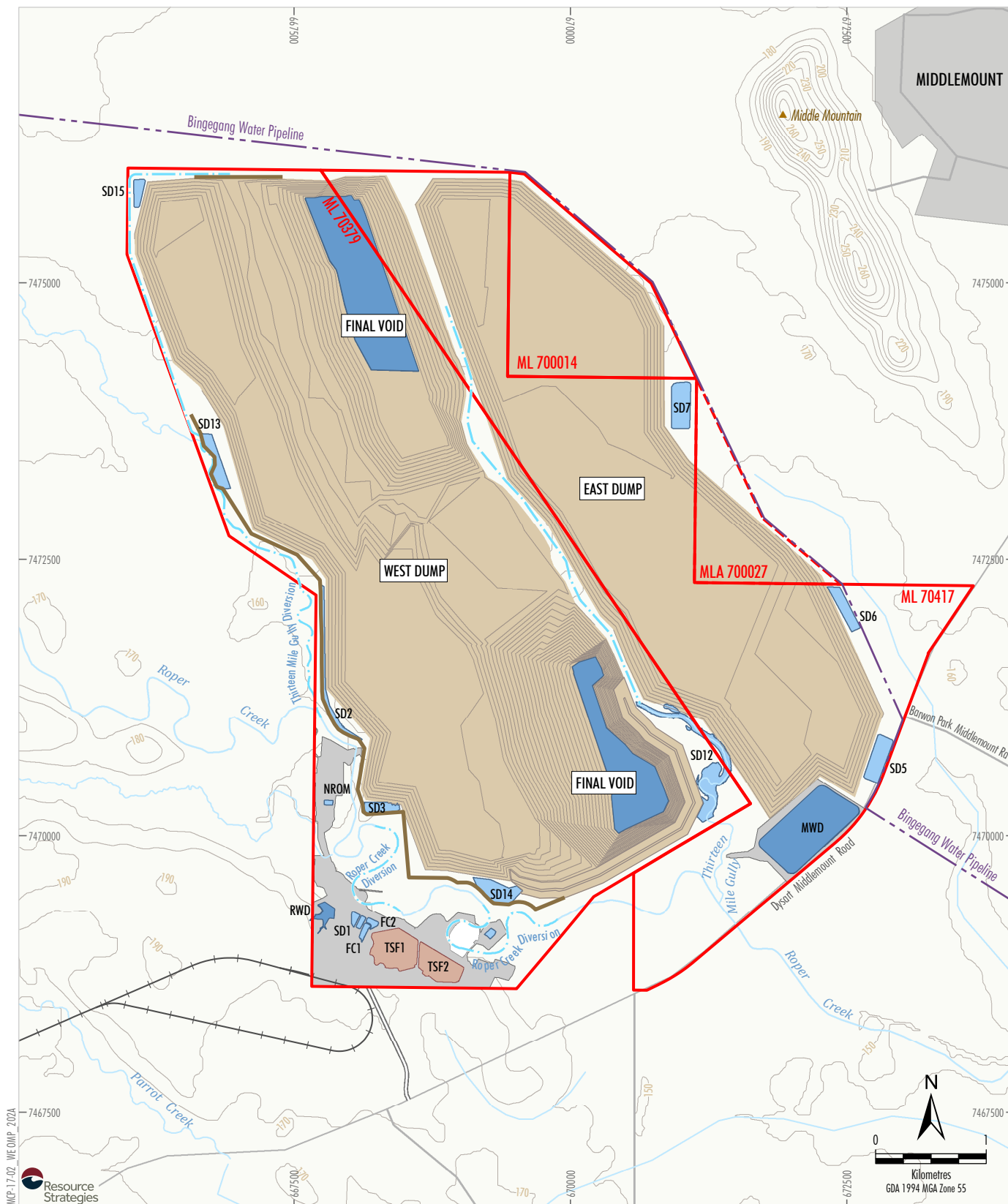
Source: Geoscience Australia - Topographical Data 250K (2006)



OFFSET MANAGEMENT PLAN

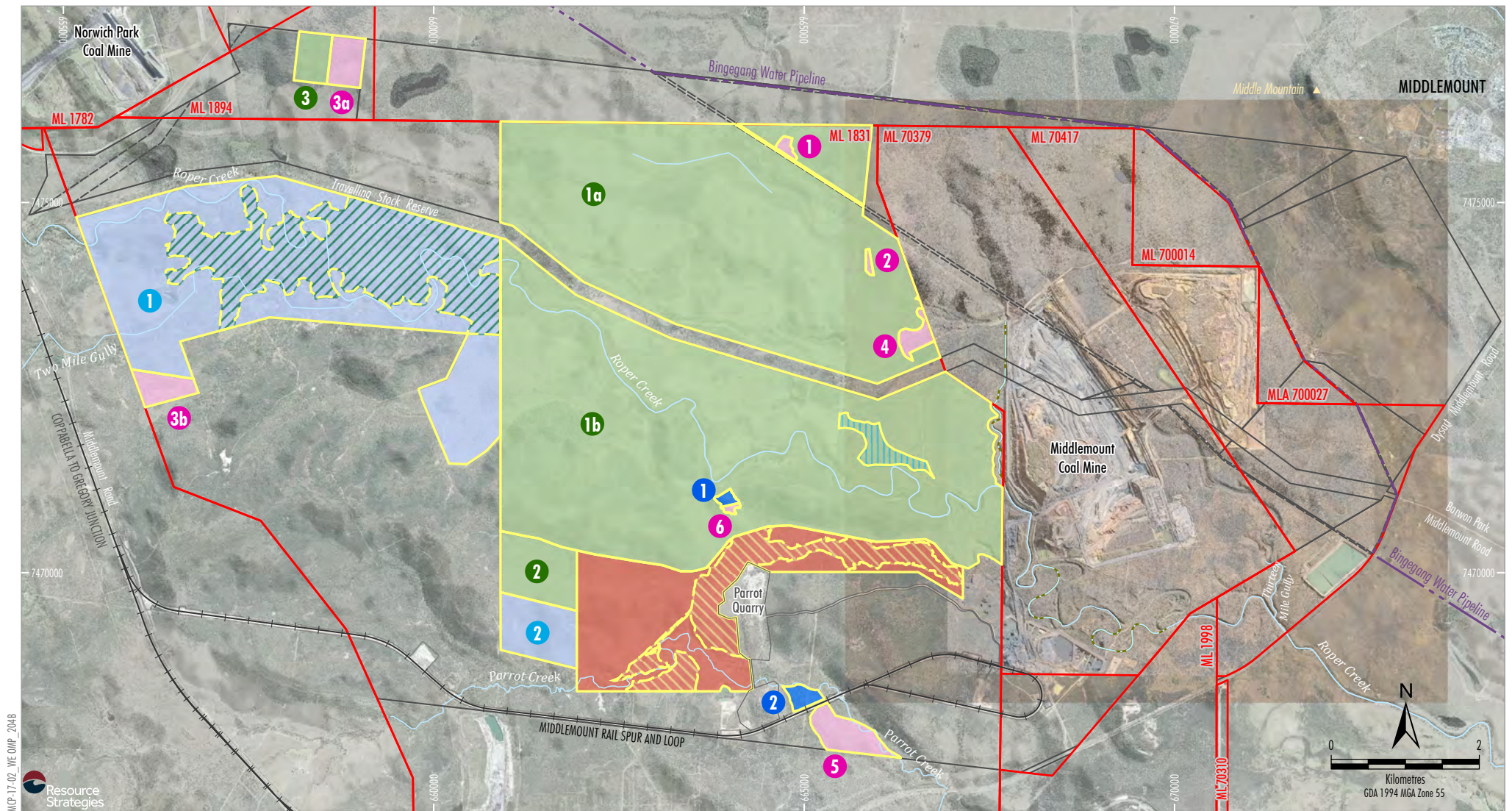
Regional Location

Figure 1



OFFSET MANAGEMENT PLAN
Middlemount Coal Mine

Figure 2



1/03/17-02 WE OMF 2048



LEGEND

- Mining Lease Boundary (ML)
- Mining Lease Application Boundary (MLA)
- Middlemount Coal Owned Land
- Railway

Offset Areas

- North-eastern Extension Commonwealth Offset Area (EPBC 2016/7717)
- North-eastern Extension State Offset Area
- Parrot Quarry Offset Area (Declared Area Map 2013/3919)
- Thirteen Mile Gully Diversion Offset Area (Declared Area Map 2013/3919)
- Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394)
- Rail Loop and Spur Offset Area
- Western Extension Commonwealth Offset Area (EPBC 2017/8130)
- Western Extension State Offset Area

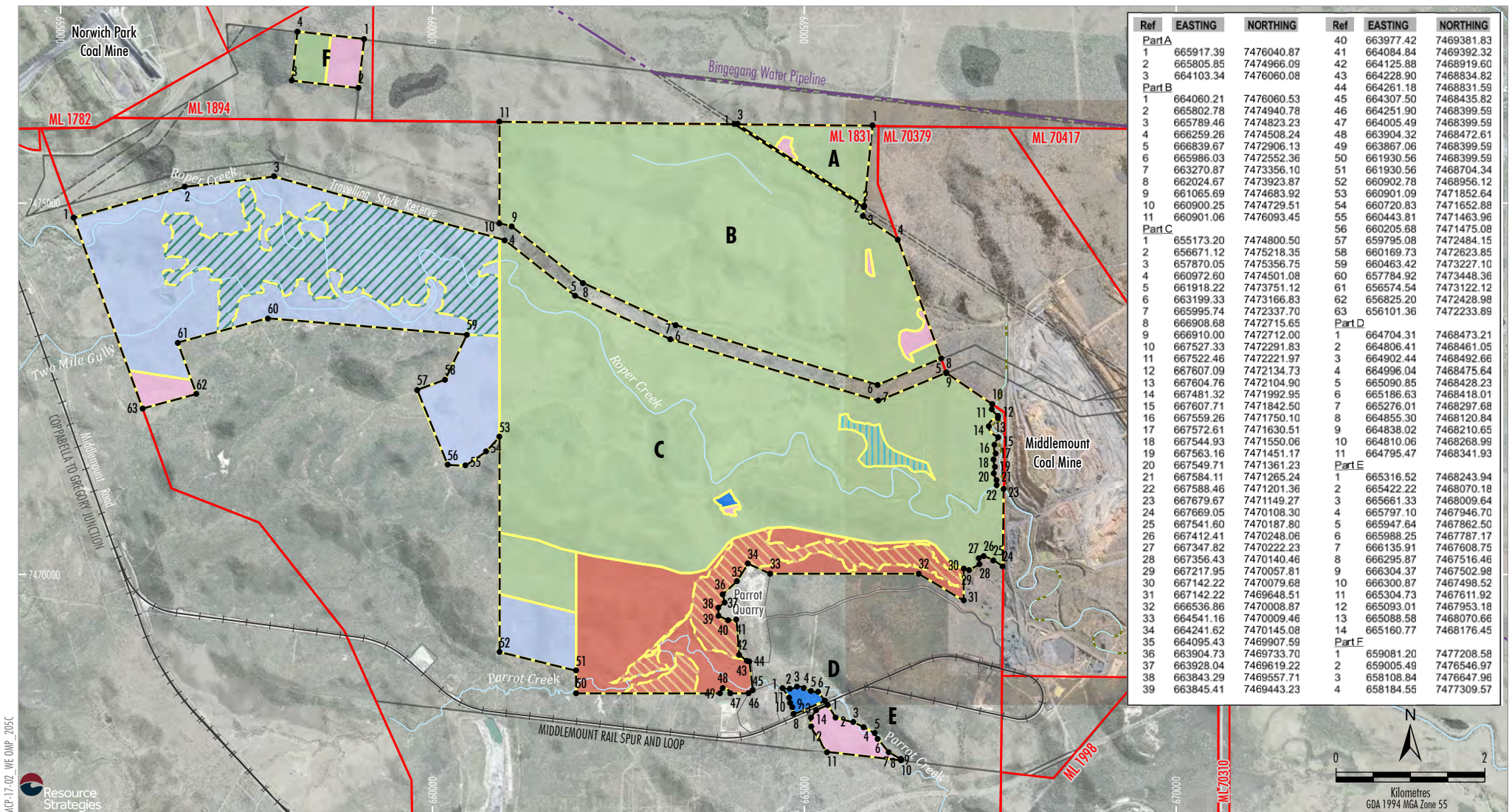
Source: MCPL (2018); Department of Natural Resources and Mines (2017); © State of Queensland (Department of Science, Information Technology and Innovation, 2017)
Orthophoto: MCPL (June 2017, 2012)



OFFSET MANAGEMENT PLAN

Offset Locations

Figure 3



Ref	EASTING	NORTHING	Ref	EASTING	NORTHING
Part A			40	663977.42	7469381.83
1	665917.39	7476040.87	41	664084.84	7469392.32
2	665805.85	7474966.09	42	664125.88	7468919.60
3	664103.34	7476060.08	43	664228.90	7468834.82
Part B			44	664261.18	7468831.59
1	664060.21	7476060.53	45	664307.50	7468435.82
2	665802.78	7474940.78	46	664251.90	7468399.59
3	665789.46	7474823.23	47	664005.49	7468399.59
4	666259.26	7474508.24	48	663904.32	7468472.61
5	666839.67	7472906.13	49	663867.06	7468399.59
6	665986.03	7472552.36	50	661930.56	7468399.59
7	663270.87	7473356.10	51	661930.56	7468704.34
8	662024.67	7473923.87	52	660902.78	7468956.12
9	661065.69	7474683.92	53	660901.09	7471852.64
10	660900.25	7474729.51	54	660720.83	7471652.88
11	660901.06	7476093.45	55	660443.81	7471463.96
Part C			56	660205.68	7471475.08
1	655173.20	7474800.50	57	659795.08	7472484.15
2	656671.12	7475218.35	58	660169.73	7472623.85
3	657870.05	7475356.75	59	660463.42	7473227.10
4	660972.60	7474501.08	60	657784.92	7473448.36
5	661918.22	7473751.12	61	656574.54	7473122.12
6	663199.33	7473166.83	62	656825.20	7472428.98
7	665995.74	7472337.70	63	656101.36	7472233.89
8	666908.68	7472715.65	Part D		
9	666910.00	7472712.00	1	664704.31	7468473.21
10	667527.33	7472291.83	2	664806.41	7468461.05
11	667522.46	7472221.97	3	664902.44	7468492.66
12	667607.09	7472134.73	4	664996.04	7468475.64
13	667604.76	7472104.90	5	665090.85	7468428.23
14	667481.32	7471992.95	6	665186.63	7468418.01
15	667607.71	7471842.50	7	665276.01	7468297.68
16	667559.26	7471750.10	8	664855.30	7468120.84
17	667572.61	7471630.51	9	664838.02	7468210.65
18	667544.93	7471550.06	10	664810.06	7468268.98
19	667563.16	7471451.17	11	664795.47	7468341.93
20	667549.71	7471361.23	Part E		
21	667584.11	7471265.24	1	665316.52	7468243.94
22	667588.46	7471201.36	2	665422.22	7468070.18
23	667679.67	7471149.27	3	665661.33	7468009.64
24	667669.05	7470108.30	4	665797.10	7467946.70
25	667541.60	7470187.80	5	665947.64	7467862.50
26	667412.41	7470248.06	6	665988.25	7467787.17
27	667347.82	7470222.23	7	666135.91	7467608.75
28	667356.43	7470140.46	8	666295.87	7467516.46
29	667217.95	7470057.81	9	666304.37	7467502.98
30	667142.22	7470079.68	10	666300.87	7467498.52
31	667142.22	7469648.51	11	665304.73	7467611.92
32	666536.86	7470008.87	12	665093.01	7467953.18
33	664541.16	7470009.46	13	665088.58	7468070.66
34	664241.62	7470145.08	14	665160.77	7468176.45
35	664095.43	7469907.59	Part F		
36	663904.73	7469733.70	1	659081.20	7477208.58
37	663928.04	7469619.22	2	659005.49	7476546.97
38	663843.29	7469557.71	3	658108.84	7476647.96
39	663845.41	7469443.23	4	658184.55	7477309.57

- LEGEND**

 - Mining Lease Boundary (ML)
 - Mining Lease Application Boundary (MLA)
 - Middlemount Coal Owned Land
 - Railway

Source: MCPL (2018); Department of Natural Resources and Mines (2017); © State of Queensland (Department of Science, Information Technology and Innovation, 2017)
Orthophoto: MCPL (June 2017, 2012)
- Offset Areas**

 - North-eastern Extension Commonwealth Offset Area (EPBC 2016/7717)
 - North-eastern Extension State Offset Area
 - Parrot Quarry Offset Area (Declared Area Map 2013/3919)
 - Thirteen Mile Gully Diversion Offset Area (Declared Area Map 2013/3919)
 - Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394)
 - Rail Loop and Spur Offset Area
 - Western Extension Commonwealth Offset Area (EPBC 2017/8130)
 - Western Extension State Offset Area

Figure 4

The Department of the Environment (DotE, 2014a) *Environmental Management Plan Guidelines* were considered in this revision of the plan.

1.2 OFFSET MANAGEMENT PLAN REQUIREMENTS

This Offset Management Plan/Vegetation Management Plan has been prepared to address relevant State and Commonwealth approval conditions for each offset as listed in Table 1. The relevant source of requirements for each offset area are outlined in the sections below.

1.2.1 Middlemount Coal (Stage 2) Project Commonwealth Offset Area

An offset strategy was developed for the Middlemount Coal (Stage 2) Project in accordance with the Department of the Environment and Water Resources (2007) *Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* and SEWPaC (2011a) *Consultation Draft: EPBC Act Environmental Offsets Policy, 2011*. The offset strategy was provided to SEWPaC (now DEE) on 1 August 2012. MCPL was subsequently granted approval for the Middlemount Coal (Stage 2) Project under the EPBC Act on 7 September 2012 (Commonwealth Approval [EPBC Act 2010/5394]). MCPL notified SEWPaC (now DEE) that the Middlemount Coal (Stage 2) Project was to commence on the 17 September 2012.

The Middlemount Coal (Stage 2) Project was approved under the Qld *Environmental Protection Act, 1994* on 29 June 2012 (Qld Project Approval [Permit Number MIN100646307]). The Qld Project Approval does not include any approval conditions relevant to the Middlemount Coal (Stage 2) Project Commonwealth Offset Area.

The Western Extension Project will result in the removal of a small portion (approximately 32 hectares [1%]) of the Middlemount Coal Project Stage 2 Commonwealth Offset Area (EPBC 2010/5394). Two additional areas are proposed to be added to the Modified Middlemount Coal Project Stage 2 Commonwealth Offset Area (Parts 2 and 3) (Figure 3).

Table 2 provides the relevant EPBC 2010/5394 Commonwealth Approval Conditions and the corresponding Offset Management Plan/Vegetation Management Plan sections that meet such conditions. There are three Matters of National Environmental Significance which are directly relevant to the conditions outlined in the Commonwealth Approval:

- Ornamental Snake (*Denisonia maculata*);
- Squatter Pigeon (southern) (*Geophaps scripta scripta*); and
- Brigalow (*Acacia harpophylla* dominant and co-dominant) endangered ecological community (Brigalow EEC).

The desired outcome of the Middlemount Coal (Stage 2) Project Commonwealth Offset Area is that the extent and condition of the habitat values of threatened species and communities within the offset areas are protected and enhanced. The land in the offset areas will be enhanced so as the currently degraded areas reach remnant status through increasing the structural integrity and extent of vegetation in the area.

Table 2
Relevant Conditions for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area
(EPBC Act 2010/5394)

Offset Management Plan Condition	Relevant Section that Addresses the Condition
Offsets Offset management plan 1. To offset the impacts to EPBC listed threatened species and ecological communities, the person taking the action must submit to the Minister for approval an Offset Management Plan within 12 months of the date of this approval. Operations within Area B cannot commence unless the Offset Management Plan has been approved by the Minister.	Section 1.1
The Offset Management Plan must include, but not be limited to the following: a. details of management actions to protect and enhance the extent and condition of the threatened species habitat values including rehabilitation, weed control, fire management, erosion and sediment control, management of livestock and restrictions to access of no less than: i. 1670 ha of Ornamental Snake (<i>Denisonia maculata</i>) habitat; ii. 3280 ha of Squatter Pigeon (<i>Geophaps scripta scripta</i>); and iii. 150 ha of Brigalow ecological community;	Section 3
b. the desired outcomes/objectives of implementing the plan;	Section 1.2.1
c. the timing, responsibilities and performance criteria for such actions;	Sections 4.1 and 7
d. a monitoring plan including ecological surveys that must be undertaken to assess the success of the management measures against identified milestones and objectives;	Section 5
e. a clear definition of the location and boundaries of the offset area, through maps and/or textual descriptions as well as accompanying shapefiles;	Section 1.2 and Figures 3 and 4
f. a process to report to the Department the management actions undertaken in the offset areas and the outcome of those actions, including identifying any need for improved management;	Section 10.2.2
g. a description of the potential risks to successful management and rehabilitation in the offset areas, and a description of the contingency measures that would be implemented to mitigate these risks;	Section 6
h. details of parties responsible for monitoring, reviewing and implementing the plan; and	Section 7
1. what would be the contingency strategy in the event that a third party impacts upon the offset site. The approved Offset Management Plan must be implemented.	Section 6.2
Mechanism to secure offsets 2. To offset the impacts to EPBC listed threatened species and ecological communities, the person taking the action must register a legally binding conservation mechanism over a minimum of 1670 ha of Ornamental Snake (<i>Denisonia maculata</i>) habitat, 3280 ha of Squatter Pigeon (<i>Geophaps scripta scripta</i>) and 150 ha of Brigalow ecological community (the offset area) as identified in the offset management plan referred to in condition 1. The mechanism/s must provide enduring protection for protection for the offset areas and be registered within 12 months of the date of this approval. The conditions of the conservation mechanism must ensure that management actions are undertaken for the protection and enhancement of the EPBC listed threatened species and ecological communities. The person taking the action must obtain agreement from any third parties responsible for management actions and provide details of the responsible parties, including their position or status as a separate contractor, to the Department.	Section 1.3
Reporting and auditing 7. Within three months of every 12 month anniversary of the Commencement of the action, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department at the same time as the compliance report is published.	Section 10.2.2
8. Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the Commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.	Section 10.3.1

Table 2 (Continued)
Relevant Conditions for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area
(EPBC Act 2010/5394)

Offset Management Plan Condition	Relevant Section that Addresses the Condition
9. <i>If the person taking the action wishes to carry out any activity otherwise than in accordance with the plan referred to in condition 1, the person taking the action must submit for the Minister's written approval a revised version of any such plan. The varied activity shall not commence until the Minister has approved the varied plan in writing. If the Minister approves such a revised plan, that plan must be implemented in place of the plan originally approved. Unless the Minister has approved the revised plan, then the person taking the action must continue to implement the plan originally approved, referred to in condition 1.</i>	Section 10.4.2
10. <i>If the Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities to do so, the Minister may request that the person taking the action make specified revisions to the plan pursuant to condition 1 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 plan originally approved, referred to in condition 1.</i>	Section 10.4.2
<i>Publication of plans</i> 12. <i>The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the above conditions of approval, including measures taken to implement the management plans required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.</i>	Section 10.1.1
13. <i>Unless otherwise agreed to in writing by the Minister, the person taking the action must publish the management plan, referred to in condition 1, of approval on their website. Each plan must be published on the website within one month of being approved.</i>	Section 10.2.5

1.2.2 Rail Loop and Spur Offset Area

In 2010, Local Council approval was sought for the construction and operation of a rail spur and balloon loop to the coal handling and preparation plant at the mine (here in referred to as the Rail Project).

The Rail Project was approved on 31 August 2010 by the decision notice for material change of use issued by Isaac Regional Council (IC0410MKY003). Following further rail design and prior to commencement of construction activities, the vegetation clearing extents were refined and reduced. This change to the development approval was processed by the Qld Department of Environment and Resource Management (DERM) (now the Qld Department of Natural Resources and Mines [DNRM]) on 19 November 2010. Construction of the Rail Project commenced in 2011.

On the 12 November 2010, MCPL entered into a written Deed of Agreement whereby MCPL, in seeking consent to clear native vegetation for the Rail Project, agreed to obtain and secure a vegetation offset. A variation of the Deed of Agreement (i.e. a Deed of Variation) was entered into for an extension of time in which MCPL has to secure the vegetation offset. The offset area is to contain vegetation and values that offset the clearing shown in Table 3.

Table 3
Middlemount Coal Mine Rail Loop and Spur Clearing Area

Regional Ecosystem	Vegetation Management Status	Brief Regional Ecosystem Description	Broad Vegetation Group*	Area (ha)
Performance Requirement – Watercourse PR P3 – 1st Stream Order				
11.5.2	Least Concern	<i>Eucalyptus crebra</i> Woodland	18b	1.142
11.5.2a	Least Concern	<i>Allocasuarina leuhmannii</i> Woodland	24a	0.055
11.5.3	Least Concern	<i>Eucalyptus populnea</i> Woodland	17a	1.585
Performance Requirement – Watercourse PR P3 – 2nd Stream Order				
11.10.12	Least Concern	<i>Eucalyptus populnea</i> Woodland	17a	0.405
11.3.4	Of Concern	<i>Eucalyptus tereticornis</i> Open Forest	16c	0.703
11.4.8	Endangered	<i>Eucalyptus cambageana</i> / <i>Acacia harpophylla</i> Woodland	25a	0.009
Performance Requirement – Watercourse PR P3 – 3rd Stream Order				
11.7.2	Least Concern	<i>Acacia shirleyi</i> Woodland	24a	0.369
11.3.25	Least Concern	<i>Eucalyptus camuldelensis</i> Open Forest	16a	0.376
11.3.2	Of Concern	<i>Eucalyptus populnea</i> Woodland	17a	1.562
Performance Requirement – Connectivity PR P4				
11.7.2	Least Concern	<i>Acacia shirleyi</i> Woodland	-	1.519
11.5.3	Least Concern	<i>Eucalyptus populnea</i> Woodland	-	0.987
Performance Requirement – Conserving remnant Endangered and Of Concern Regional Ecosystems PR P7				
11.5.18	Of Concern	<i>Micromyrtus capricornii</i> Shrubland	29b	3.190
11.3.4	Of Concern	<i>Eucalyptus tereticornis</i> Open Forest	16c	0.703
11.3.2	Of Concern	<i>Eucalyptus populnea</i> Woodland	17a	2.225
11.4.8	Endangered	<i>Eucalyptus cambageana</i> / <i>Acacia harpophylla</i> Woodland	25a	0.795
Total				15.625

Source: MCPL (2013a).

* Broad vegetation groups are a higher-level grouping of vegetation units or Regional Ecosystems (REs).

The *Middlemount Coal Mine Rail Loop and Spur Vegetation Offset Proposal* (MCPL, 2013a) was provided to the DNRM on 1 March 2013.

The *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011a) is relevant to the offsets for development applications approved by the State (Middlemount Coal Mine Rail Loop and Spur Offset Area, Parrot Quarry Offset Area and Thirteen Mile Gully Diversion Offset Area) but not to the Middlemount Coal (Stage 2) Project Commonwealth Offset Area. The vegetation offset proposals for the relevant developments (MCPL, 2013a, b and c) explain how the offsets meet the requirements of the *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011).

The Western Extension Project will result in the removal of approximately 22 ha of the existing Rail Loop and Spur Offset Area. Two additional areas are proposed to be added to the Modified Rail Loop and Spur Offset Area (Parts 3a and 3b) (Figure 3).

This Offset Management Plan/Vegetation Management Plan addressed the relevant requirements for management as outlined in the *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011) (Table 4).

Table 4
Offset Management Plan Requirements from the Queensland Policy for Vegetation Management Offsets (Version 3)

Requirement	Relevant Section that Addresses the Requirement		
	Middlemount Coal Mine Rail Loop and Spur	Parrot Quarry	Thirteen Mile Gully Diversion
<i>A map that clearly defines the offset areas with Global Positioning System points, including any areas subject to specific management actions</i>	Figure 4	Figure 4	Figure 4
<i>The proposed clearing regional ecosystem/s and essential habitat, and those on the offset areas</i>	Sections 1.2.2 and 2.3	Sections 1.2.3 and 2.4	Sections 1.2.4 and 2.5
<i>The ecological equivalence assessment of the offset area and the date it was undertaken</i>	Section 2.3 and Appendix B, Table B1	Section 2.4 and Appendix B, Table B2	Section 2.5 and Appendix B, Table B3
<i>The offset area management objectives and outcomes</i>	Section 1.2.2	Section 1.2.3	Section 1.2.4
<i>Activities to be undertaken on the offset area to achieve the management objectives and outcomes.</i>	Section 3		
<i>Restrictions imposed to the use of the offset area to achieve the management objectives and outcomes</i>	Section 3		
<i>An analysis of the risk to achieving the management objectives and outcomes, actions to minimise the risks and remedial action that will be undertaken if any of the risks occur</i>	Section 6.1		
<i>A yearly schedule of management actions, to ensure achievement of the management objectives and outcomes, for the period until the offset area is mapped as remnant regional ecosystem or essential habitat</i>	Section 4		
<i>A monitoring and reporting program</i>	Sections 5 and 10		
<i>The estimated time until the offset management objectives and outcomes will be achieved</i>	Section 4.2		
<i>Identification of all registered interests including mortgages, leases, subleases, covenants, profit a prendes, easements and building management statements, that have been registered on title under the Land Act 1994 or the Land Title Act 1994.</i>	Section 2.1		

1.2.3 Parrot Quarry Offset Area

In 2010, approval was sought for a quarry (referred to as Parrot Quarry) to supply material to the Middlemount Coal Mine (Figure 3). Development Approval for the quarry was granted by DERM (now DNRM) on 20 August 2010 (DERM Permit number: 2010/003611). On 17 August 2010, MCPL entered into a written Deed of Agreement whereby MCPL, in seeking consent to clear native vegetation for the Parrot Quarry, agreed to obtain and secure a vegetation offset (Figure 3).

Following further design work, the access road to the quarry was realigned and the vegetation clearing extents were refined and reduced. A request to change the approval (relating to the alignment of the access road) was submitted on the 5 May 2011 (DERM Permit number: 2011/002831). A variation of the Deed of Agreement (i.e. a Deed of Variation) was entered into for the modification (14 July 2011). The offset area is to contain vegetation and values that offset the clearing shown in Table 5. The *Parrot Quarry Vegetation Offset Proposal* (MCPL, 2013b) was provided to DNRM on 1 March 2013. The Parrot Quarry Offset Area is shown on Figure 3.

Table 5
Parrot Quarry Clearing Area

Regional Ecosystem ID	Vegetation Management Status	Brief Regional Ecosystem Description	Broad Vegetation Group	Area Cleared Requiring Offsetting (ha)
11.3.4	Of Concern	<i>Eucalyptus tereticornis</i> forest	16c	1.266
11.5.18	Of Concern	<i>Micromyrtus capricornia</i> Shrubland on Cainozoic sand plains/remnant surfaces	29b	1.9 [^]
Total				3.166

Source: MCPL (2013b).

[^] Note the area of RE 11.5.18 was overestimated in the Deed of Variation as it is a mixed polygon containing both Of Concern (40 percent [%]) (RE 11.5.18) and Least Concern REs (60%) (RE 11.5.9). The actual clearing area of RE 11.5.18 is therefore 1.9 ha, instead of 4.57 ha.

1.2.4 Thirteen Mile Gully Diversion Offset Area

MCPL proposed to divert a portion of the Thirteen Mile Gully as part of the Middlemount Coal (Stage 2) Project. The Thirteen Mile Gully Diversion was assessed in the *Middlemount Coal Project (Stage 2) Environmental Impact Statement* (Parsons Brinkerhoff, 2010). However, the design was revised following comments received from the Qld Department of Environment and Heritage Protection (DEHP). The revised design more closely mimics a natural watercourse as it meanders along its length (Figure 2). A portion of the Thirteen Mile Gully diversion occurs outside of the western boundary of Mining Lease (ML) 70379 and is subject to environmental approvals under the *Qld Sustainable Planning Act, 2009*.

A development application for the Thirteen Mile Gully Diversion was submitted under the *Sustainable Planning Act, 2009* on the 17 August 2012. Approximately 7.8 ha¹ of REs which are Of Concern (RE 11.3.2 dominant) will be impacted for the Thirteen Mile Gully Diversion (MCPL, 2012).

In accordance with Criteria 1b of the *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011), an offset proposal may be used to satisfy multiple offset requirements under the State and Commonwealth legislation. Since the final design of the Thirteen Mile Gully Creek Diversion was assessed by SEWPaC (now DEE) as part of the Middlemount Coal (Stage 2) Project, the same offset applies (i.e. the impacts from construction of the Thirteen Mile Gully Diversion were offset within the Middlemount Coal [Stage 2] Project Offset Area).

A specific location within the overall Middlemount Coal (Stage 2) Project Offset Area which offsets the impacts from the Thirteen Mile Gully Diversion was identified for the purpose of the environmental approval under the *Sustainable Planning Act, 2009*. This was requested by DNRM in its role as a concurrence agency reviewer of the development application.

The *Thirteen Mile Gully Diversion Vegetation Offset Proposal* (MCPL, 2013c) was provided to DNRM on 5 March 2013. The Thirteen Mile Gully Diversion Offset Area is shown on Figure 3.

¹ Please note that this number has been rounded up to be conservative.

1.2.5 North-eastern Extension Commonwealth Offset Area

MCPL lodged a referral for the North-eastern Extension on the 6 June 2016 (EPBC 2016/7717). On the 7 July 2017, a delegate of the Commonwealth Minister declared the Project to be a controlled action, with the controlling provisions of listed threatened species and communities (Sections 18 and 18A). On 29 March 2017, the North-eastern Extension was approved under the EPBC Act with conditions relating to Squatter Pigeon (southern) and Corben's Long-eared Bat (*Nyctophilus corbeni*). Relevant approval conditions for the North Eastern Extension are given in Table 6. MCPL notified DEE that the North-Eastern Extension Project commenced on the 16 August 2017.

The North-Eastern Extension Commonwealth Offset Area is shown on Figure 3 (and it includes the North-eastern Extension State Offset Area). The desired outcome of the North-Eastern Extension Commonwealth Offset Area (EPBC 2016/7717) is that the extent and condition of the habitat values of threatened species and communities within the offset areas are protected and enhanced. The land in the offset areas will be enhanced, via the currently degraded areas reaching remnant status through increasing the structural integrity and extent of vegetation in the area.

Table 6
Relevant Conditions for the North-Eastern Extension Project Commonwealth Offset Area
(EPBC 2016/7717)

Condition Number	Condition	Relevant Section that Addresses the Condition
2	<i>To compensate for the loss of 181 hectares (ha) of habitat for the squatter pigeon and south-eastern long-eared bat, the approval holder must:</i>	
	<i>a. Legally secure and implement the offset of at least 532 ha within the offset site, as shown in Figure 2. The offset mechanism used to legally secure the offset site must be in place within two years from the date of approval and must remain in place for the life of the approval. The condition targets listed in condition 2d. Must be listed in the outcomes of the offset mechanism.</i>	Section 1.3
	<i>b. Ensure the Offset Management Plan used to legally secure the offset site includes at Pest Animal Management Strategy that aims to reduce and minimise the presence of vertebrate pest species, including but not limited to rabbits (<i>Oryctolagus cuniculus</i>), cats (<i>Felis catus</i>) and red foxes (<i>Vulpes vulpes</i>) within the offset site. The Offset Management Plan must be published on the approval holder's website within 1 month of the offset mechanism being granted by the Queensland Government.</i>	Sections 3.5 and 10.2.5
	<i>c. Conduct a Baseline Survey of the offset site and provide an Offset Baseline Report detailing the results of the Baseline Survey to the Department within 12 months of commencement. The Offset Baseline Report must be prepared by a suitably trained ecologist/s, provide a geo-referenced map showing the location of the survey sites, provide written descriptions about the baseline health and quality of each Regional Ecosystem Mapping index area within the offset site, and provide the statistics recorded during the Baseline Survey. The Baseline Survey, including the selection of survey sites and Offset Baseline Report must be undertaken and prepared in accordance with the Queensland Government's Guide to determining terrestrial habitat quality.</i>	Section 2.6
	<i>d. Ensure that by the 15 year anniversary of commencement of the action, the offset site meets the following condition targets:</i> <i>i. Each area designated by Regional Ecosystem Mapping in Figure 2 must have a weed cover of 20% or less;</i> <i>ii. Areas identified as regional ecosystems 11.5.2a, 11.7.2 and 11.7.4 in Figure 2 must each have at least 30% shrub canopy cover; and</i> <i>iii. Areas designated by Regional Ecosystem Mapping in Figure 2 as non-remnant must be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (as defined under the Queensland Vegetation Management Act 1999) where Eucalyptus, Corymbia, Acacia or Callitris spp are the dominant canopy species.</i>	Section 4.2
	<i>e. Ensure weed cover in any Regional Ecosystem Mapping Index area of the offset site does not exceed the baseline condition for each Regional Ecosystem Mapping index area described in the Offset Baseline Report required under condition 2c of this approval for the life of the approval.</i>	Section 4.1

Table 6 (Continued)
Relevant Conditions for the North-Eastern Extension Project Commonwealth Offset Area
(EPBC 2016/7717)

Condition Number	Condition	Relevant Section that Addresses the Condition
	f. Ensure that the condition targets do not decline for the remainder of the approval once the condition targets have been met.	Section 4.1
	g. Make application to the Queensland Government to have areas shown in Figure 2 identified as non-remnant to be listed as remnant vegetation under the Vegetation Management Act 1999 prior to the 15 th anniversary of commencement of the action.	Section 4.2
3	By 17 December 2017, the approval holder must submit to the Department an Annual Compliance Report covering the period from the date of this approval to 17 September 2017. By 17 December 2017 of every following year, the approval holder must submit to the Department an Annual Compliance Report covering the period of 18 September of the previous year to 17 September of that year. The Annual Compliance Report must: a. Address compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. b. Provide evidence of the progress achieved by the approval holder in reaching the condition targets for the offset site. The report must include benchmarks, prepared by a suitably trained ecologist/s, that provide clear and measureable goals that will indicate whether the offsets are on-track to be delivered by the 15 year anniversary of commencement of the action. The report must state whether each benchmark has been met. If the benchmarks have not been met, the report must state what measures are being taken to ensure that the condition targets will be met by the 15 year anniversary of the commencement of the action.	Section 10.2.3
4	Unless otherwise agreed to in writing by the Minister, the approval holder must publish the Annual Compliance Report referred to in these conditions of approval on its website. The Annual Compliance Report must be published on the approval holder's website within 1 month of being provided to the Department. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department in the following Annual Compliance Report. The Minister may provide written consent to cease the Annual Compliance Report if satisfied that the action is complete and there are no further outstanding requirements.	Section 10.2.3
5	Within 30 days after the commencement of the action, the approval holder must advise the Department in writing of the actual date of commencement of the action.	Section 10.2.3
6	If, at any time after 5 years from the date of this approval, the approval holder has not substantially commenced the action, then the approval holder must not substantially commence the action without written agreement of the Minister.	
7	The approval holder must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the offsets, monitoring results and the Annual Compliance Report required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media	Section 10.2.3
8	Upon the direction of the Minister, the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor and the audit criteria must be approved by the Minister prior to the beginning of the audit. The audit report must address the criteria to the satisfaction of the Minister.	Section 10.3.2

Benchmark/s	Meaning milestones that measure the progress of the offset improvements during and upon completion of the approval, such as the condition targets, identified in Condition 2d.
Condition targets	Refers to the condition targets defined in condition 2d. of this approval.
Shrub canopy cover	Means the percentage canopy cover of multi-stemmed, perennial plants native to Australia, between the overstory and groundcover strata of the regional ecosystem which includes, as measured in accordance with the Guide to determining terrestrial habitat quality.
Weed Cover	Means any plants (including grasses, herbs and forbs) not native to Australian that comprise the groundcover of the project site, as measured in accordance with the Guide to determining terrestrial habitat quality.
Woody	Vegetation for which the predominant canopy is comprised mainly of trees: a. covering more than 50% of the predominant canopy; and b. averaging more than 70% of the dominant tree's normal height when growing in undisturbed conditions.

1.2.6 North-eastern Extension State Offset Area

MCPL lodged an amendment application to the Middlemount Coal Mine EA EPML00716913 in accordance with section 224 of the Qld *Environment Protection Act, 1994* to approve the extension of the East Dump at the Middlemount Coal Mine (the North-eastern Extension). The North-eastern Extension was approved by DEHP on 23 September 2016.

Approximately 181 ha of a 'Least Concern' regional ecosystem (i.e. RE 11.5.3) will be impacted for the North-eastern Extension. The North-eastern Extension State Offset Area is required for the prescribed environmental matter "connectivity area" for clearance of approximately 181 ha of Regional Ecosystem (RE) 11.5.3 as described in the *Middlemount Coal Mine North-eastern Extension Offset Delivery Plan* (MCPL, 2017).

The North-eastern Extension State Offset Area is located wholly within the North-eastern Extension Commonwealth Offset Area. The land in the North-eastern Extension State Offset Area will be enhanced so as the currently degraded areas reach remnant status through increasing the structural integrity and extent of vegetation in the area.

1.2.7 Western Extension Commonwealth Offset Area

On the 21 December 2017, MCPL lodged a referral for the Project with the DEE to determine whether the proposed Project needed formal assessment and approval under the EPBC Act. An action requires approval under the EPBC Act if the action is likely to have a significant impact on Matters of National Environmental Significance (MNES). On 8 February 2018, a delegate of the Commonwealth Minister declared the Project to be a controlled action for the purposes of the EPBC Act.

The proposed Western Extension Commonwealth Offset Area is located to the west and south of the existing Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394) (Figure 3). The Western Extension Commonwealth Offset Area is approximately 1,220 ha in size, comprising approximately 752.5 ha of remnant vegetation and approximately 444 ha of non-remnant vegetation, with the remainder of the area being mapped as cleared land.

The Western Extension Commonwealth Offset Area will offset the clearance of 22 ha of Brigalow EEC (represented by 15.5 ha of RE 11.4.9 and RE 11.3.1 as well as 6.5 ha of regrowth). The Western Extension Commonwealth Offset Area contains approximately 76 ha of Brigalow EEC (represented by RE 11.3.1, RE 11.4.8, RE 11.4.9 and RE 11.4.9a) (Figure 5).

Two threatened species, the Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*) were recorded by Biodiversity Australia (2018b) (Appendix D) within the Western Extension Commonwealth Offset Area (Figure 6). The other two threatened species, the Ornamental Snake and Squatter Pigeon (southern) have both been recorded in the general locality and both are considered likely to occur within the Western Extension Commonwealth Offset Area.

The desired outcome of the Western Extension Commonwealth Offset Area is that the extent and condition of the habitat values of threatened species and communities within the offset areas are protected and enhanced. The land in the offset areas will be enhanced so as the currently degraded areas reach remnant status through increasing the structural integrity and extent of vegetation in the area.

1.2.8 Western Extension State Offset Area

MCPL lodged an amendment application to the Middlemount Coal Mine EA EPML00716913 in accordance with section 224 of the Qld *Environment Protection Act, 1994* to approve the extension of the Western Extension Project. The Western Extension State Offset Area is required for the following prescribed environmental matters:

- Of Concern Regional Ecosystem (not within an urban area) - RE 11.3.2 (43.5 ha);
- Of Concern Regional Ecosystem (not within an urban area) - RE 11.3.2/RE 11.3.4 (1.5 ha);
- A wetland of high ecological significance shown on the Map of referable wetlands (0.75 ha);
- Connectivity area that is a regional ecosystem (not in urban area) (371.5 ha); and
- Legally secured offset area - Rail Loop and Spur Offset Area (22 ha).

The Western Extension State Offset Area is located wholly within the Western Extension Commonwealth Offset Area. The Western Extension State Offset Area is 454 ha in size, comprising approximately 240.5 ha of remnant vegetation and 213.5 ha of non-remnant vegetation.

The Western Extension State Offset Area contains:

- approximately 185 ha of RE 11.3.2 (for impact on an Of Concern RE);
- approximately 3 ha of wetlands (for impact on a wetland of high ecological significance);
- approximately 222 ha of non-remnant vegetation (for impact on Connectivity); and
- approximately 44 ha of other vegetation.

The land in the Western Extension State Offset Area will be enhanced so as the currently degraded areas reach remnant status through increasing the structural integrity and extent of vegetation in the area.

The offset for the Rail Loop and Spur Offset Area is described in Section 1.2.2.

1.3 ENDURING PROTECTION OF THE OFFSET AREAS – VOLUNTARY DECLARATION MANAGEMENT PLAN REQUIREMENTS

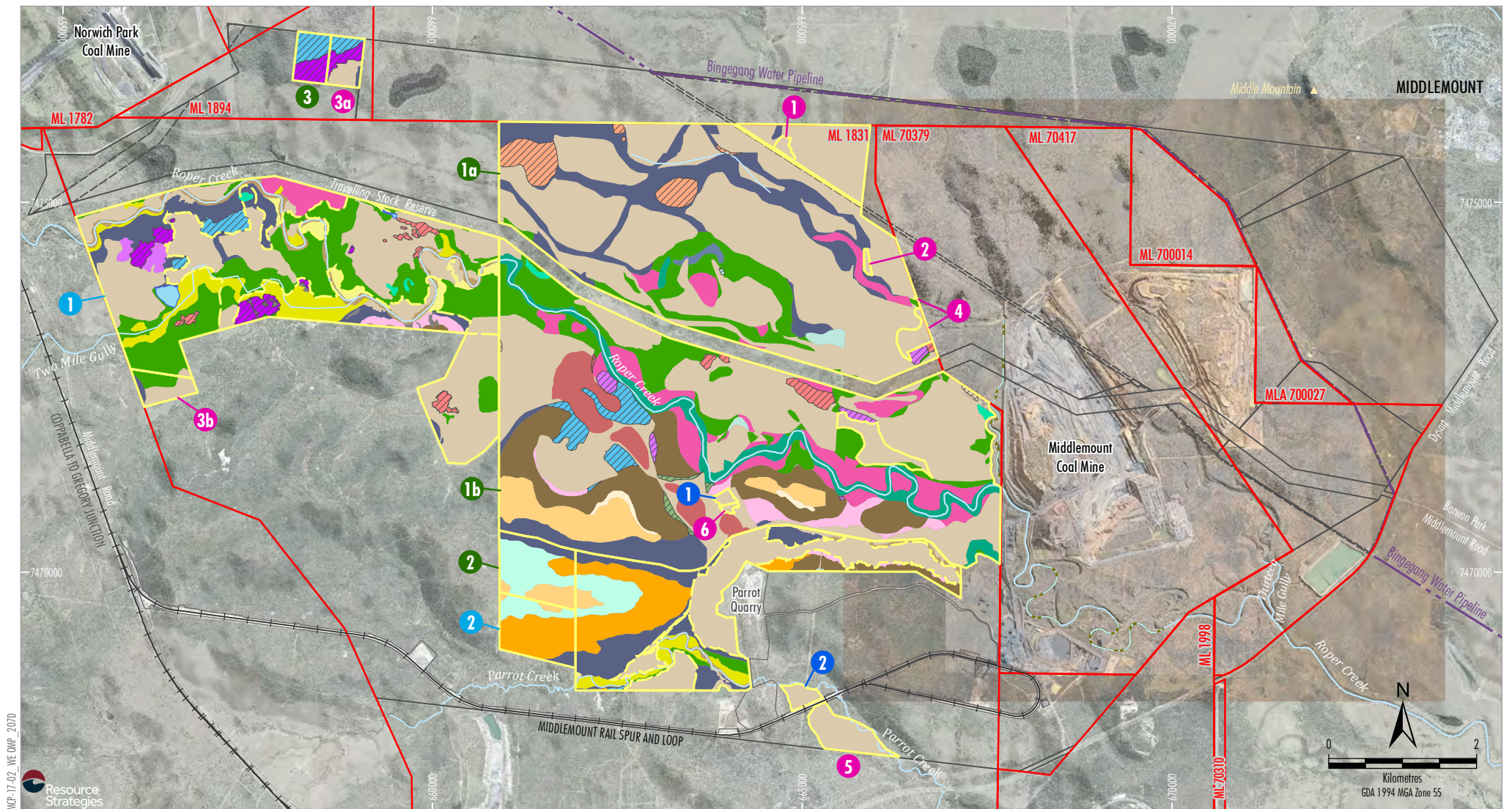
The offset areas are all located on freehold land owned by MCPL (Lot 2, SP248577). The offset areas will be secured through a voluntary declaration of an area of high nature conservation value (Vdec) under the *Qld Vegetation Management Act, 1999* (VM Act). The *Guide to Voluntary Declarations under the Queensland Vegetation Management Act, 1999* (DNRM, 2017) provides requirements for Vegetation Management Plans under a Vdec. Table 7 provides the relevant requirements and the corresponding sections of this plan that meet such requirements.

North-eastern Extension Commonwealth Offset Area

Condition 2a of EPBC 2016/7717, states that the offset mechanism used to legally secure the North-eastern Extension Commonwealth Offset Area must remain in place for the life of the approval (i.e. 1 November 2042). The condition targets listed in Condition 2d of EPBC 2016/7717 will be listed in the outcomes of the Vdec.

Table 7
Vegetation Management Plan Requirements from the *Guide to Voluntary Declarations*

Requirement	Relevant Section that Addresses the Requirement
<i>The management plan must be signed by the proponent.</i>	Following the table of contents.
<i>The management plan must include sufficient information to allow DNRM to map the boundary of the stated area.</i>	Figure 4
<i>The management plan must state the proponent's management intent and proposed outcome for the conservation of the high nature conservation value of the area or the prevention of land degradation in the area.</i>	Section 1.2
<i>The management plan must state the activities that the proponent intends to carry out or refrain from carrying out to achieve the management outcomes for the conservation of the high nature conservation value of the area or the prevention of land degradation in the area.</i>	Section 3
<i>The management plan must state the restrictions, if any, to be imposed on the use of, or access to, the area by other persons to achieve the management outcomes for the conservation of high nature conservation value of the area or the prevention of land degradation in the area.</i>	Section 3.9



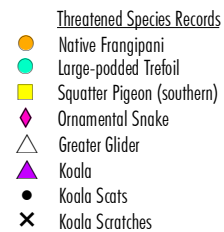
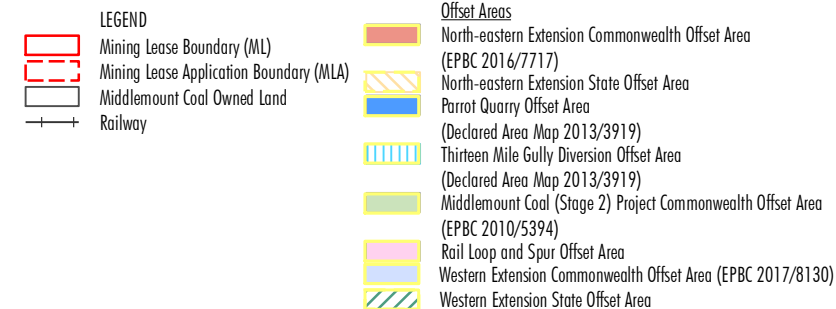
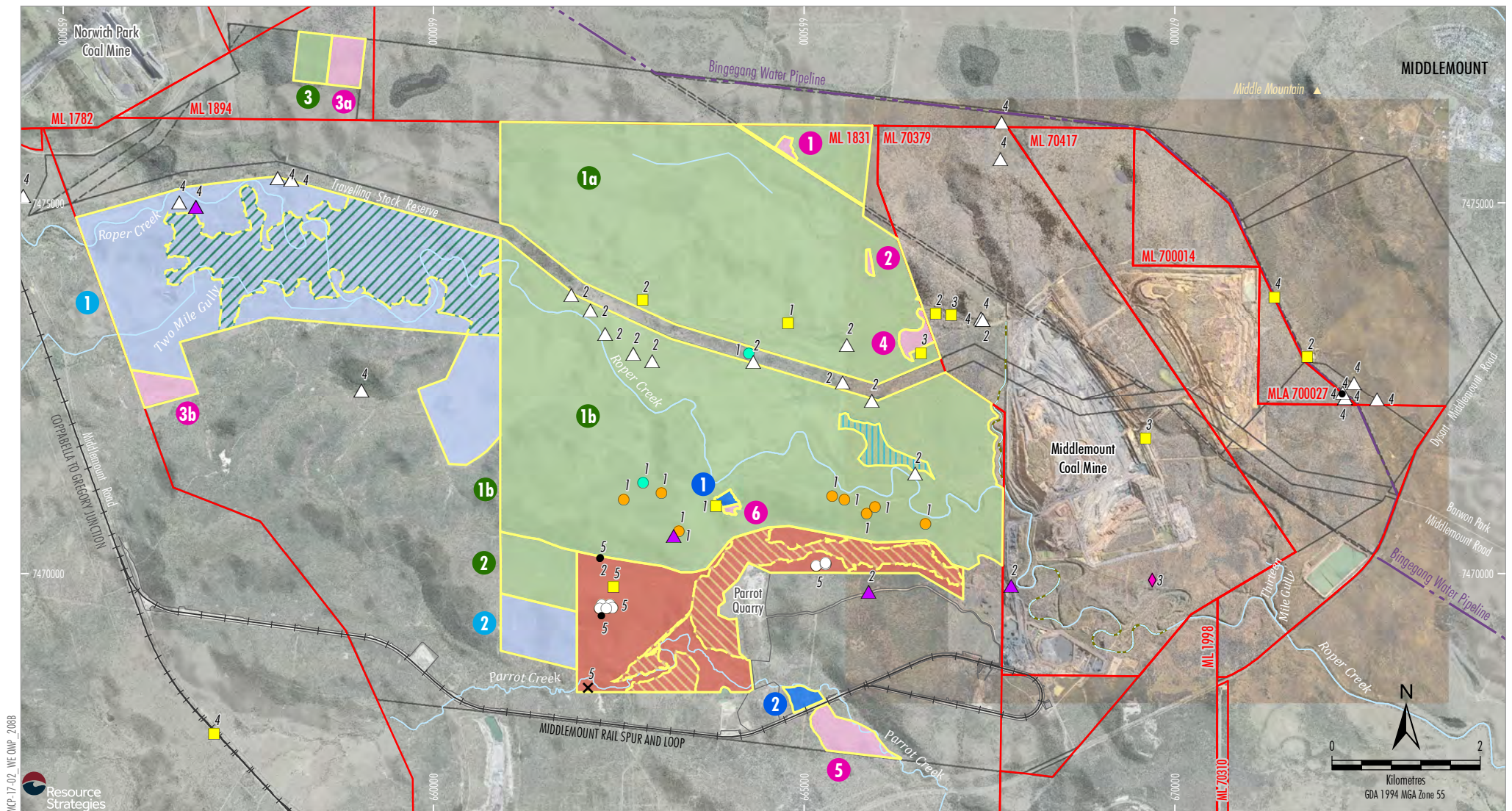
- LEGEND**
- Mining Lease Boundary (ML)
 - Mining Lease Application Boundary (MLA)
 - Middlemount Coal Owned Land
 - Railway
 - Offset Area

Regional Ecosystem Mapping					
	11.3.1		11.4.3		11.5.3b
	11.3.2		11.4.3 High value re		11.5.9
	11.3.25		11.4.8		11.7.2
	11.3.27		11.4.9		11.7.4
	11.3.27b		11.4.9a		11.9.1
	11.3.27d		11.5.18		Non-remnant
	11.3.4		11.5.18 with cerbera		Dam
	11.3.4a		11.5.2a		Cleared Land
	11.3.7		11.5.3		Disturbed/Erosion/Bare Ground

- Threatened Ecological Community**
- Brigalow

Source: MCPL (2018); Biodiversity Australia (2018); Naturecall Environmental (2014, 2017); Parsons Brinkerhoff (2010); (Department of Natural Resources and Mines (2017); © State of Queensland (Department of Science, Information Technology and Innovation, 2017)
 Orthophoto: MCPL (June 2017, 2012)

Figure 5



Reference: 1 Ecology and Heritage Partners (2012) 3 Parsons Brinkerhoff (2010)
 2 Naturecall Environmental (2014) 4 Biodiversity Australia (2018)
 5 Naturecall Environmental (2017)

Note: Additional Greater Glider records occur within the extent of this figure, however coordinates were not recorded (Naturecall, 2017).

Source: MCPL (2018); © State of Queensland (Department of Science, Information Technology and Innovation, 2017); Department of Natural Resources and Mines (2016)
 Orthophoto: MCPL (June 2017, 2012)

middlemount coal

OFFSET MANAGEMENT PLAN

Threatened Species Records

Figure 6

1.4 REPORT STRUCTURE

The structure of this plan is as follows:

Section 2	Offset area details.
Section 3	Management Actions.
Section 4	Performance and completion criteria.
Section 5	Monitoring plan.
Section 6	Contingency measures.
Section 7	Timing and responsibilities.
Section 8	Cost of activities.
Section 9	Trust fund.
Section 10	Reporting, audit and review.
Section 11	References cited in this Offset Management Plan/Vegetation Management Plan.

The following appendices are attached to this plan:

Appendix A	Ecological Investigations within the Offset Area for Stage 2 of the Middlemount Coal Mine, Queensland
Appendix B	Ecological Equivalence – Rail Loop and Spur Offset Area, Parrot Quarry Offset Area and Thirteen Mile Gully Diversion Offset Area
Appendix C	North-eastern Extension Offset Area Offset Baseline Repot
Appendix D	Western Extension Project Offset Area Baseline Report
Appendix E	Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines
Appendix F	Risk Analysis

2 OFFSET AREA DETAILS

The offset areas are located in the Isaac Regional Council area of the Brigalow Belt Bioregion. The closest reserves are Bundorra State Forest located approximately 10 km south-west and Junee National Park located approximately 20 km north-east (Figure 1).

The offset areas are in a relatively high rainfall area located approximately 120 km inland from the Qld coast. The closest Commonwealth Bureau of Meteorology (BoM) weather station to the offset areas are the Emerald Post Office (035027). Mean maximum temperature at the offset areas ranges from 22.4 degrees Celsius (°C) in July to 34.8°C in December (BoM, 2018). Mean minimum temperature ranges from 6.9°C in July to 21.4°C in January (BoM, 2018). Mean rainfall is approximately 640.3 millimetres (mm), with the most rain occurring in January (mean rainfall 103.4 mm) and the least amount of rainfall occurring in August (mean rainfall 20.7 mm) (BoM, 2018).

2.1 PROPERTY AND OWNERSHIP DETAILS AND REGISTERED INTERESTS

The offset areas are located on freehold land owned by MCPL (Lot 2, SP248577 – Booroondarra Station). There are no other registered interest holders under the *Land Act 1994* or *Land Title Act, 1994*.

The offset areas have a history of clearing and cattle grazing. The land outside of the offset areas is currently agisted and will be subject to grazing. A travelling stock reserve and pipeline easement occur outside of the offset areas (Figure 3). There is no Strategic Cropping Land mapped in the vicinity of the offset areas.

The offset areas are overlying ML 1831 and ML 1894 held by Anglo Coal (German Creek) Pty Ltd (Anglo Coal). Anglo Coal does not hold surface rights over the part of ML 1831, where the offset areas are located. Anglo Coal's ML 1831 is for sub-surface rights only in the vicinity of the offset areas. Any future mining proposals from Anglo Coal will need to account for the impacts to the offset areas (Section 6.2).

2.2 MIDDLEMOUNT COAL (STAGE 2) PROJECT COMMONWEALTH OFFSET AREA

2.2.1 Ecological Surveys and Monitoring

Ecology and Heritage Partners Pty Ltd (2012a) (Appendix A) and Biodiversity Australia (2018b) (Appendix D) undertook baseline surveys for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area. Monitoring has been undertaken by Naturecall Environmental (Naturecall) (2013, 2014, 2015a and b, 2016 and 2017a) and Biodiversity Australia (2018a).

2.2.2 Native Vegetation

In regard to the Middlemount Coal (Stage 2) Project Commonwealth Offset Area, the native vegetation in Part 1a and 1b was ground-truthed by Ecology and Heritage Partners (2012a) (Appendix A) and the native vegetation in Parts 2 and 3 was ground-truthed by Biodiversity Australia (2018b) (Appendix D) (Figure 5). Regional ecosystems within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area are listed in Table 8 and shown in Figure 5.

Table 8
Regional Ecosystems – Middlemount Coal (Stage 2) Project Commonwealth Offset Area

RE ID	Description	Status ¹		
		VM Act	Biodiversity Status	EPBC Act
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	E	E	E
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC	OC	-
11.3.27	Freshwater wetlands	LC	OC	-
11.3.7	<i>Corymbia</i> spp. Woodland on alluvial plains, sandy soils	LC	OC	-
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	E	E	E
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	E	E
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	E	E
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces	OC	OC	-
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces	LC	NC	-
11.5.3	<i>Eucalyptus populnea</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces	LC	NC	-
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains and/or remnant surfaces	LC	NC	-
11.7.2	<i>Acacia</i> spp. Woodland on lateritic duricrust, scarp retreat zone	LC	NC	-
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust	LC	NC	-
11.9.1	<i>Acacia harpophylla</i> - <i>Eucalyptus cambageana</i> open forest to woodland on fine-grained sedimentary rocks	E	E	E

¹ Conservation status of REs listed under the VM Act and/or EPBC Act (current at June 2018).

E = Endangered, OC = Of Concern, LC = Least Concern, NC = No Concern at Present.

2.2.3 Weeds and Animal Pests

Ecology and Heritage Partners (2012a) (Appendix A) reported *Harrisia* Cactus, *Parthenium* Weed and Velvety Tree Pear sparsely distributed in low densities across the Middlemount Coal (Stage 2) Project Commonwealth Offset Area. Weed control is undertaken on a regular basis targeting Cactus (*Harrisia* sp.), Prickly Acacia (*Acacia nilotica*), Tiger Pear (*Opuntia aurantiaca*), Giant Rats Tail Grass (*Sporobolus pyramidalis*), and *Parthenium* Weed (*Parthenium hysterophorus*) (Biodiversity Australia, 2018). Giant Rats Tail Grass (*Sporobolus pyramidalis*) and *Parthenium* Weed (*Parthenium hysterophorus*) were recorded as single occurrences (Biodiversity Australia, 2018a).

Pest animal species recorded within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area are Feral Pig (*Sus scrofa*), Wild Dog (*Canis lupus familiaris*), European Rabbit (*Oryctolagus cuniculus*), European Red Fox (*Vulpes vulpes*), Feral Cat (*Felis catus*) and Cane Toad (*Bufo marinus*) (Biodiversity Australia, 2018a). European Rabbit and Wild Dog are the most common pests in the offset area (Biodiversity Australia, 2018a).

2.2.4 Matters of National Environmental Significance

Ecology and Heritage Partners (2012b) ground-truthed areas of Threatened Ecological Communities listed under the EPBC Act and mapped potential habitat for the Ornamental Snake and Squatter Pigeon (southern) within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area. MNES relevant to this offset area are listed in Table 9.

Table 9
Matters of National Environmental Significance for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area

Scientific Name	Common Name	EPBC Act Status ¹	Current Extent and Condition
Threatened Ecological Community			
<i>Brigalow</i> (<i>Acacia harpophylla</i> dominant and co-dominant) community		E	Approximately 168.5 ha of the Brigalow EEC occurs within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Figure 5) as mapped by Ecology and Heritage Partners (2012b) and Biodiversity Australia (2018b) (Appendix D). The Brigalow EEC is in good ecological condition (for the most part). There are few weeds within the patches and the only existing disturbance is from cattle grazing. The following REs in the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Figure 5) represent Brigalow EEC: RE11.3.1, RE11.4.3, RE11.4.8 and RE11.4.9.
Fauna			
<i>Denisonia maculata</i>	Ornamental Snake	V	Approximately 1,692.5 ha of potential habitat for the Ornamental Snake occurs within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area as mapped by Ecology and Heritage Partners (2012b) and Biodiversity Australia [2018b] [Appendix D]). The following REs in the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Figure 5) represent potential habitat for the Ornamental Snake: RE11.3.1, RE11.4.3, RE11.4.8 and RE11.4.9.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	Approximately 3,318 ha of potential habitat for the Squatter Pigeon (southern) occurs within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Ecology and Heritage Partners (2012b) and Biodiversity Australia [2018b] [Appendix D]). Squatter Pigeons are able to use a range of vegetation associations including non-remnant vegetation.

¹ Conservation status under the EPBC Act (current at June 2018).

V = Vulnerable, E = Endangered, M= Migratory.

2.3 RAIL LOOP AND SPUR OFFSET AREA

There are seven individual offset areas for the Rail Project (Table 10). The boundaries of the Rail Project offset areas are shown on Figures 3 and 4.

GHD (2012) undertook ecological equivalence measurements within the clearing area and in Rail Project Offset Areas 1, 4 and 5 in March 2012 (MCPL, 2013a) (Appendix B). Ecology and Heritage Partners (2013a) undertook ecological equivalence measurements within Rail Offset Areas 2 and 6 in December 2012 (MCPL, 2013a; Appendix B). Parts 3a and 3b were surveyed by Biodiversity Australia (2018b) (Appendix D).

Table 10
Middlemount Coal Mine Rail Loop and Spur Offset Areas

Offset Area	Regional Ecosystem ID	Vegetation Management Status	Broad Vegetation Group	Reason for Inclusion – Performance Requirement	Area (ha)
1	11.4.9b	Endangered	25a	Endangered Regional Ecosystem (RE)	4.5
2	11.3.2/11.5.3	Least Concern	17a	Watercourse	2
3a	11.4.8	Endangered	25a	Of Concern RE	25
	11.4.9	Endangered	25a		
	11.5.3	Least Concern	17a		
3b	11.3.2	Of Concern	17a	Of Concern RE	23
	11.5.3	Least Concern	17a		
4	11.3.1	Endangered	25a	Watercourse	12
5	11.3.4	Of Concern	16c	Watercourse, and Of Concern RE	41.6
6	11.5.18	Of Concern	29b	Of Concern RE	2.1
Total					110

Source: MCPL (2013a).

2.4 PARROT QUARRY OFFSET AREA

Table 11 provides an overview of the Parrot Quarry Offset Areas and the boundaries are shown on Figure 4. There are two individual offset areas, totalling approximately 15.4 ha.

Table 11
Parrot Quarry Offset Areas

Offset Area	Regional Ecosystem ID	Vegetation Management Status	Broad Vegetation Group	Area (ha)
1	11.5.18	Of Concern	29b	4.37
2	11.3.4	Of Concern	16c	11
Total				15.37

Source: MCPL (2013b).

Ecology and Heritage Partners (2013b) undertook ecological equivalence measurements within the Parrot Quarry clearing area and offset areas (MCPL, 2013b; Appendix B).

2.5 THIRTEEN MILE GULLY DIVERSION OFFSET AREA

The boundary of the Thirteen Mile Gully Diversion Offset Area is shown on Figure 4. Table 12 provides an overview of its characteristics. Clearing Area totalled 7.8 ha and Offset Area totalled 31 ha.

Table 12
Thirteen Mile Gully Diversion Clearing Area and Offset Area

	Regional Ecosystem ID	Vegetation Management Status	Broad Vegetation Group	Area (ha)
Clearing Area	11.3.2	Of Concern	17a	7.8
Offset Area	11.3.2	Of Concern	17a	31

Source: MCPL (2013c).

Ecology and Heritage Partners (2013c) undertook ecological equivalence measurements within the Thirteen Mile Gully Diversion clearing area and offset areas in December 2012 (MCPL, 2013c; Appendix B).

2.6 NORTH-EASTERN EXTENSION COMMONWEALTH OFFSET AREA

2.6.1 Ecological Surveys

Naturecall (2017b) (Appendix C) conducted a baseline survey of the North-eastern Extension Commonwealth Offset Area in accordance with EPBC 2016/7717 Commonwealth Approval Condition 2c.

Naturecall (2017b) (Appendix C) undertook flora and fauna surveys in accordance with Qld and Commonwealth survey guidelines to assess the suitability of the offset areas. Field surveys were undertaken in June 2016 and May and June 2017.

The flora surveys were undertaken in accordance with the Qld Herbarium vegetation survey methods described in Neldner *et al.* (2017). Survey techniques included a combination of secondary and quaternary surveys, identification of Threatened Ecological Communities, targeted searches for conservation significant species and random meanders.

Habitat Quality Assessments were also conducted across the offset areas in accordance with the *Guide to Determining Terrestrial Habitat Quality* (DEHP, 2014), including an assessment of required number of sampling sites, site condition assessment, site context assessment and fauna species habitat assessment.

2.6.2 Native Vegetation

Regional ecosystems ground-truthed by Naturecall (2017b) (Appendix C) within the North-eastern Extension Commonwealth Offset Area are listed in Table 13 and shown in Figure 5.

Table 13
Regional Ecosystems – North-eastern Extension Commonwealth Offset Area

RE ID	Description	VM Act	Status ¹ Biodiversity Status	EPBC Act	Area (ha)
Land Zone 3: Recent Quaternary alluvial systems					
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	OC	OC	-	12.5
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> Woodland on alluvial plains.	OC	OC	-	28
11.3.4a	Floodplain (other than floodplain wetlands). <i>Corymbia tessellaris</i> woodland. On alluvial sand ridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.	OC	OC	-	0.5
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	LC	OC	-	18.5
Land Zone 4: Tertiary – early Quaternary clay plains					
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	E	E	E	1
Land Zone 5: Tertiary – early Quaternary loamy and sandy plains and plateaus					
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	LC	NC	-	98
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	LC	NC	-	108.0
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus spp.</i> And <i>Corymbia spp.</i> Woodland on Cainozoic sand plains and/or remnant surfaces.	LC	NC	-	34.5
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	OC	OC	-	6.5
Land Zone 7: Cainozoic duricrusts					
11.7.2	<i>Acacia spp.</i> Woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	LC	NC	-	26.5
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus spp.</i> , <i>Corymbia spp.</i> , <i>Acacia spp.</i> , <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust.	LC	NC	-	5
Total Remnant					339
Total Non-remnant					193
Total					532

Source Appendix C.

¹ Conservation status of REs listed under the VM Act and/or EPBC Act (current at June 2018).

E = Endangered, OC = Of Concern, LC = Least Concern, NC = No Concern at Present.

2.6.3 Shrub Cover

Baseline shrub cover recorded by Naturecall (2017b) (Appendix C) for RE11.5.2a, 11.7.2 and 11.7.4 within the North-eastern Extension Commonwealth Offset Area are listed in Table 14.

Table 14
Baseline Shrub Cover for RE11.5.2a, 11.7.2 and 11.7.4 within the North-eastern Extension Commonwealth Offset Area

RE ID	Description	Shrub Cover
Land Zone 5: Tertiary – early Quaternary loamy and sandy plains and plateaus		
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	0-7.2%
Land Zone 7: Cainozoic duricrusts		
11.7.2	<i>Acacia spp.</i> Woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	10.5%
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus spp.</i> , <i>Corymbia spp.</i> , <i>Acacia spp.</i> , <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust.	24.3%

Source Appendix C.

2.6.4 Weeds and Animal Pests

The main weeds present are Buffel Grass (*Cenchrus ciliaris*), Sabi Grass (*Urochloa mosambicensis*) and Red Natal Grass (*Melinis repens*) along with herbs including *Sida spp.* Cobblers Pegs (*Bidens pilosa*), Gomphrena Weed (*Gomphrena celosioides*) and Stylo (*Stylosanthes scabra*) (Naturecall, 2017b) (Appendix C). There is a low density of Prickly Pear, Velvet Tree Pear, Harrisia Cactus and Rats Tail Grass (Naturecall, 2017b) (Appendix C).

Baseline weed cover recorded by Naturecall (2017b) (Appendix C) for REs within the North-eastern Extension Commonwealth Offset Area and baseline weed cover recorded by Biodiversity Australia (Appendix D) for REs within the Western Extension Commonwealth Offset Area are listed in Table 15.

Table 15
Baseline Weed Cover for Regional Ecosystems within the North-eastern Extension Commonwealth Offset Area and Western Extension Commonwealth Offset Area

RE ID	Description	Weed Cover (%) North-eastern Extension Commonwealth Offset Area	Weed Cover (%) Western Extension Commonwealth Offset Area
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	-	10
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	45	10
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> Woodland on alluvial plains.	20	41
11.3.4a	Floodplain (other than floodplain wetlands). <i>Corymbia tessellaris</i> woodland. On alluvial sand ridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.	20	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	40-75	60
11.3.7	<i>Corymbia spp.</i> Woodland on alluvial plains, sandy soils	-	75
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	5	5
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	-	7.5
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	1-5	0
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	5-60	7.5

Table 15 (Continued)
Baseline Weed Cover for Regional Ecosystems within the North-eastern Extension
Commonwealth Offset Area and Western Extension Commonwealth Offset Area

RE ID	Description	Weed Cover (%) North-eastern Extension Commonwealth Offset Area	Weed Cover (%) Western Extension Commonwealth Offset Area
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains and/or remnant surfaces.	1-5	5
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	0-1	-
11.7.2	<i>Acacia</i> spp. Woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	5	-
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust.	25	10

Source Appendices C and D.

2.6.5 Matters of National Environmental Significance

MNES relevant to the North-eastern Extension Commonwealth Offset Area are listed in Table 16. Naturecall (2017b) (Appendix C) mapped potential habitat for the Squatter Pigeon (southern) and South-eastern Long-eared Bat within the North-eastern Extension Commonwealth Offset Area.

Table 16
Matters of National Environmental Significance – North-eastern Extension Commonwealth
Offset Area

Scientific Name	Common Name	EPBC Act Status ¹	Current Extent and Condition
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	Approximately 532 ha of potential habitat for the Squatter Pigeon (southern) occurs within the North-eastern Extension Commonwealth Offset Area (Appendix C). Squatter Pigeons are able to use a range of vegetation associations including non-remnant vegetation. The Squatter Pigeon (southern) was recorded in the north-west of the North-eastern Extension Commonwealth Offset Area (Figure 6).
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	V	All of the woodland communities (approximately 339 ha) will provide suitable foraging and breeding habitat for the South-eastern Long-eared Bat (were it to occur in the locality). There are no nearby records of the South-eastern Long-eared Bat.

Source Appendix C.

¹Conservation status under the EPBC Act (current at June 2018).

V = Vulnerable, E = Endangered, M= Migratory.

2.7 NORTH-EASTERN EXTENSION STATE OFFSET AREA

2.7.1 Ecological Surveys

The baseline surveys of the North-eastern Extension Commonwealth Offset Area by Naturecall (2017b) (Appendix C) (Section 2.6.1) also covered the North-eastern Extension State Offset Area.

2.7.2 Native Vegetation

The North-eastern Extension State Offset Area comprises non-remnant vegetation. During the baseline surveys by Naturecall (2017b) (Appendix C), it was noted that generally the areas of non-remnant vegetation (including non-remnant Brigalow and non-remnant Eucalypt woodlands) demonstrated positive signs of native tree recruitment and natural regeneration (Naturecall, 2017b) (Appendix C).

2.7.3 Weeds and Animal Pests

Refer to Section 2.6.1. Baseline surveys by Naturecall (2017b) (Appendix C) describe that the condition of the non-remnant vegetation varies but overall shows positive signs of natural regeneration. There are several areas in the centre and east of the offset area that have been previously cleared and are grazed by cattle. These areas all displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses.

2.8 WESTERN EXTENSION COMMONWEALTH OFFSET AREA

2.8.1 Ecological Surveys

Biodiversity Australia (2018b) (Appendix D) undertook flora and fauna surveys in accordance with Qld and Commonwealth survey guidelines to assess the suitability of the offset areas. Field surveys were undertaken in July and November 2017.

The flora surveys by Biodiversity Australia (2018b) (Appendix D) were undertaken in accordance with the Qld Herbarium vegetation survey methods described in Neldner *et al.* (2017). Survey techniques included a combination of secondary and quaternary surveys, identification of threatened ecological communities, targeted searches for conservation significant species and random meanders.

Habitat Quality Assessments were also conducted across the offset areas in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017b), including an assessment of required number of sampling sites, site condition assessment, site context assessment and fauna species habitat assessment (Appendix D).

2.8.2 Native Vegetation

REs ground-truthed by Biodiversity Australia (2018b) (Appendix D) within the Western Extension Commonwealth Offset Area are listed in Table 17 and shown in Figure 5.

Table 17
Regional Ecosystems – Western Extension Commonwealth Offset Area

RE ID	Description	Status ¹			Area (ha)
		VM Act	Biodiversity Status	EPBC Act	
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	E	E	E	16.5
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	OC	-	281
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC	OC	-	57

Table 17
Regional Ecosystems – Western Extension Commonwealth Offset Area

RE ID	Description	VM Act	Status ¹		Area (ha)
			Biodiversity Status	EPBC Act	
11.3.27d	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> woodland. A range of sedges and grasses occur in the ground layer including <i>Fimbristylis vagans</i> , <i>Myriophyllum striatum</i> , <i>Nitella pseudoflabellata</i> and <i>Pseudoraphis</i> sp. Occurs fringing large lakes. Palustrine wetland (e.g. vegetated swamp)	LC	OC	-	4
11.3.4/11.3.4a	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains; and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	OC	OC	-	117.5
11.3.7	<i>Corymbia</i> spp. Woodland on alluvial plains	LC	OC	-	29
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	E	E	17
11.4.9/11.4.9a	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains; <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles. Floodplain (other than floodplain wetlands)	E	E	E	42.5
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	LC	NC	-	52.5
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	NC	-	86.5
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces	LC	NC	-	23.5
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	OC	OC	-	9
11.7.2	<i>Acacia</i> spp. Woodland on Cainozoic lateritic duricrust. Scarp retreat zone	LC	NC	-	3
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	LC	NC	-	13.5
Total					752.5

Source: Appendix D.

¹ Conservation status of REs listed under the VM Act and/or EPBC Act (current at June 2018).

E = Endangered, OC = Of Concern, LC = Least Concern, NC = No Concern at Present.

2.8.3 Weeds and Animal Pests

The main weeds present are Buffel Grass, Sabi Grass and Red Natal Grass along with herbs including *Sida spp.* Cobblers Pegs, Gomphrena Weed and Stylo (Appendix D). There is a low density of declared weeds including Prickly Pear, Velvet Tree Pear, Harrisia Cactus and Rats Tail Grass (Appendix D).

2.8.4 Matters of National Environmental Significance

MNES relevant to the Western Extension Commonwealth Offset Area are listed in Table 18.

Table 18
Matters of National Environmental Significance – Western Extension Commonwealth Offset Area

Scientific Name	Common Name	EPBC Act Status ¹	Current Extent and Condition
Threatened Ecological Community			
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) community		E	The Western Extension Commonwealth Offset Area contains approximately 76 ha of Brigalow EEC (represented by RE 11.3.1, RE 11.4.8, RE 11.4.9 and RE 11.4.9a) (Figure 5). The condition of the Brigalow EEC in the offset areas is generally good (ranging from average to high condition).
Fauna			
<i>Denisonia maculata</i>	Ornamental Snake	V	The Western Extension Commonwealth Offset Area contains approximately 76 ha of potential habitat for the Ornamental Snake. The following REs in the Western Extension Commonwealth Offset Area (Figure 5) represent potential habitat for the Ornamental Snake: RE 11.3.1, RE 11.4.8, RE 11.4.9 and RE 11.4.9a.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	The Western Extension Commonwealth Offset Area contains approximately 1,155 ha of potential habitat for the Squatter Pigeon (southern), comprising approximately 749.5 ha of remnant and 405.5 ha of regrowth vegetation. Squatter Pigeons are able to use a range of vegetation associations including non-remnant vegetation.
<i>Petauroides volans</i>	Greater Glider	V	Approximately 575 ha of potential habitat for the Greater Glider will be enhanced and conserved as part of the Western Extension Commonwealth Offset Area. The following REs in the Western Extension Commonwealth Offset Area (Figure 5) represent potential habitat for the Greater Glider: RE 11.3.2, RE 11.3.25, RE 11.3.4, RE 11.3.4a, RE 11.3.7, RE 11.3.27d and RE 11.5.3. Three Greater Gliders were observed during a spotlighting survey within the north of the Western Extension Commonwealth Offset area. The Greater Gliders were recorded in open woodland habitats near Roper Creek equivalent to RE 11.5.3 and RE 11.3.7.
<i>Phascolarctos cinereus</i>	Koala (combined Qld, NSW and the Australian Capital Territory)	V	Approximately 664.5 ha of potential habitat for the Koala will be enhanced and conserved as part of the Western Extension Commonwealth Offset Area. The following REs in the Western Extension Commonwealth Offset Area (Figure 5) represent potential habitat for the Koala: RE 11.3.2, RE 11.3.25, RE 11.3.4, RE 11.3.4a, RE 11.3.7, RE 11.3.27d, RE 11.5.2a, RE 11.5.9 and RE 11.7.4. A Koala was recorded just to the south of Roper Creek within the Western Extension Commonwealth Offset Area during a spotlighting survey (Figure 6). The Koala was recorded within a Qld Blue Gum within vegetation equivalent to RE 11.3.4.

Source: Appendix D.

¹ Conservation status under the EPBC Act (current at June 2018).

V = Vulnerable, E = Endangered, M = Migratory.

2.9 WESTERN EXTENSION STATE OFFSET AREA

2.9.1 Ecological Surveys

The baseline surveys of the Western Extension Commonwealth Offset Area by Naturecall (2017b) (Appendix C Section 2.8.1) also covered the Western Extension State Offset Area.

2.9.2 Native Vegetation

Regional Ecosystems ground-truthed by Biodiversity Australia (2018b) (Appendix D) within the Western Extension State Offset Area are listed in Table 19 and shown in Figure 5.

Table 19
Regional Ecosystems – Western Extension State Offset Area

RE ID	Description	VM Act	Status ¹		Area (ha)
			Biodiversity Status	EPBC Act	
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on alluvial plains	E	E	-	8
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	OC	-	185
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC	OC	-	17.5
11.3.27d	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> woodland. A range of sedges and grasses occur in the ground layer including <i>Fimbristylis vagans</i> , <i>Myriophyllum striatum</i> , <i>Nitella pseudoflabellata</i> and <i>Pseudoraphis</i> sp. Occurs fringing large lakes. Palustrine wetland (e.g. vegetated swamp).	LC	OC	-	4
11.3.4/11.3.4a	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Woodland on alluvial plains; <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles. Floodplain (other than floodplain wetlands)	OC	OC	-	17
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	E	E	0.5
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	NC	-	8.5
Total					240.5

Source: Appendix D.

¹ Conservation status of REs listed under the VM Act and/or EPBC Act (current at June 2018).

E = Endangered, OC = Of Concern, LC = Least Concern, NC = No Concern at Present.

2.9.3 Weeds and Animal Pests

Refer to Section 2.8.3.

3 MANAGEMENT ACTIONS

The following management measures are described in this section:

- management of EPBC Act listed threatened species (Section 3.1);
- setting up the offset areas on the ground (Section 3.2);
- regeneration (Section 3.3);
- weed management strategy (Section 3.4);
- pest animal management strategy (Section 3.5);
- fire management (Section 3.6);
- erosion and sediment control (Section 3.7);
- management of livestock (Section 3.8);
- restrictions to access (Section 3.9);
- additional habitat features (Section 3.10);
- removal of barbed wire (Section 3.11);
- education (Section 3.12); and
- management schedule (Section 3.13).

3.1 MANAGEMENT OF EPBC ACT LISTED THREATENED SPECIES

Table 20 provides management measures relevant to MNES as described in this Offset Management Plan/Vegetation Management Plan. The section of this Offset Management Plan/Vegetation Management Plan that addresses the management measure is also provided.

The management measures provided in this Offset Management Plan/Vegetation Management Plan consider the threat abatement and recovery information on the DEE (2018) website, such as:

- *Approved Conservation Advice for Phascolarctos cinereus (combined populations in Queensland, New South Wales and the Australian Capital Territory)* (SEWPaC, 2012);
- *Approved Conservation Advice for the Brigalow (Acacia harpophylla Dominant and Co-dominant) Ecological Community* (DotE, 2013);
- *Approved Conservation Advice for Denisonia maculata (Ornamental Snake)* (DotE, 2014b);
- *Commonwealth Conservation Advice for Brigalow Ecological Community* (Threatened Species Scientific Committee, 2013);
- *Conservation Advice Geophaps scripta scripta Squatter Pigeon (southern)* (Threatened Species Scientific Committee, 2015); and
- *Conservation Advice Petauroides volans Greater Glider* (Threatened Species Scientific Committee, 2016).

Table 20
Specific Management Measures Relevant to Matters of National Environmental Significance

Matter of National Environmental Significance	Management Measures	Section
Middlemount Coal (Stage 2) Project Commonwealth Offset Area		
Ornamental Snake	- Livestock will be managed in the offset areas. - A pest animal management strategy to control pest animals (such as Feral Pig). - Relocation of transportable habitat features such as large logs and boulders in adjacent retained areas to allow their continuation as potential fauna refuge sites.	Section 3.8 Section 3.5 Section 3.10
Squatter Pigeon (southern)	- Livestock will be managed in the offset areas. - A pest animal management strategy to control pest animals (such as European Red Fox and Feral Cat). - A weed management strategy (Buffel Grass). - Regeneration of already cleared land will be allowed by preventing regrowth clearing, minimising fire and by managing grazing in the offset areas.	Section 3.8 Section 3.5 Section 3.4 Section 3.3
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) Community	- Livestock will be managed in the offset areas. - A weed management strategy. - A pest animal management strategy to control pest animals (such as Feral Pig, European Red Fox and Feral Cat). - Fire management.	Section 3.8 Section 3.4 Section 3.5 Section 3.6
North-eastern Extension Commonwealth Offset Area		
Squatter Pigeon (southern)	As above for Squatter Pigeon (southern).	
South-eastern Long-eared Bat	- Livestock will be managed in the offset areas. - Regeneration of already cleared land will be allowed by preventing regrowth clearing, minimising fire and by managing grazing in the offset areas.	Section 3.8 Section 3.3
Western Extension Commonwealth Offset Area		
Ornamental Snake	- Livestock will be managed in the offset areas. - A pest animal management strategy to control pest animals (such as Feral Pig).	Section 3.8 Section 3.5
Squatter Pigeon (southern)	As above for Squatter Pigeon (southern).	
Greater Glider	- Livestock will be managed in the offset areas. - Regeneration of already cleared land will be allowed by preventing regrowth clearing, minimising fire and by managing grazing in the offset areas.	Section 3.8 Section 3.3
Koala (combined Qld, NSW and the Australian Capital Territory)	- Livestock will be managed in the offset areas. - A pest animal management strategy to control pest animals (such as Feral Dog). - Regeneration of already cleared land will be allowed by preventing regrowth clearing, minimising fire and by managing grazing in the offset areas.	Section 3.8 Section 3.5 Section 3.3
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) Community	As above for Brigalow EEC.	

3.2 SETTING UP THE OFFSET AREAS

The Middlemount Coal (Stage 2) Project Commonwealth Offset Area, Rail Loop and Spur Offset Area, Parrot Quarry Offset Area and Thirteen Mile Gully Diversion Offset Area were originally set up in 2012.

Due to the Western Extension Project and required changes in the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Part 1a and 1b) and Rail Loop and Spur Offset Area (Part 4), these modified areas will need additional fencing between the Middlemount Coal Mine and the new offset area boundaries to manage grazing livestock in the offset areas.

After enduring protection of the offset areas has been established (Section 1.3), the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (Parts 2 and 3), Rail Loop and Spur Offset Area (Parts 3a and 3b), North-eastern Extension Commonwealth Offset Area, North-eastern Extension State Offset Area, Western Extension Commonwealth Offset Area and Western Extension State Offset Area will be set-up on the ground by:

- identifying/establishing fire trails/access tracks required for fire management or other management purposes;
- fencing the perimeter of the group of offset areas or a wider extent on the property around the offset areas to manage grazing livestock in the offset areas;
- installing locks on gates into the offset areas; and
- installing signage along main access roads which recognise that the area is protected for conservation purposes to deter third party access into the area.

An operational review of road and fire trail construction is to be completed in order to set up the offset areas. The tracks in the offset areas are shown on Figure 13. If any new tracks are required, the tracks will avoid conservation significant vegetation and flora (Figure 6).

Any existing access tracks not necessary for management purposes will be ripped and revegetated (Section 3.3). Excess fencing inside of the offset areas which is not required will be removed and recycled where practicable. Access tracks across drainage lines in the offset areas will be repaired and stabilised.

3.3 REGENERATION

Two main types of management areas are relevant to the offset area, namely, Enhancement Areas and Regeneration Areas (Table 21).

Table 21
Management Areas

Management Area	Description
Enhancement Areas	Existing woodland/forest habitats will be managed to improve its condition.
Regeneration Areas	Cleared land (non-remnant vegetation – Figure 5) will be allowed to regenerate.

The Enhancement Areas comprise existing woodland/forest habitats and will not need specific revegetation measures. On the other hand, the Regeneration Areas comprise land which has been cleared in the past and is now at various stages of regeneration (non-remnant). The non-remnant vegetation in these areas are likely to contain varying quantities of the surrounding vegetation communities, including Brigalow.

The land is considered to have moderate to high resilience despite the past disturbance, evidenced by regrowth of trees and native understorey. Therefore, the primary method for regenerating the offset areas will be through management of threatening processes that inhibit natural regeneration (e.g. weeds [Section 3.4], pest animals [Section 3.5], erosion [Section 3.7] and grazing livestock [Section 3.8]). Specific monitoring of these areas is described in Section 5.1.

Access tracks not necessary for management purposes will be ripped and revegetated according to the method in Section 6.1.1. Areas of excessive erosion will be treated according to the method outlined in Section 3.7.

In the unlikely event that natural regeneration is not readily occurring or species composition is poor, contingency measures are described in Section 6.1, including active seeding/planting or disturbance to reduce competition.

3.4 WEED MANAGEMENT STRATEGY

Purpose

The purpose of the weed management strategy is to reduce the presence of environmental weeds/restricted invasive plants which will impact on the desired conservation outcomes.

Frequency, Timing and Duration

The procedure for controlling and monitoring environmental weeds/restricted invasive plants will be implemented annually, during spring to early summer.

Procedure for Controlling and Monitoring Weeds

The spread and introduction of environmental weeds/restricted invasive plants to and within the offset areas will be minimised by restricting vehicles to designated access tracks.

The implementation of measures that favour the restoration of healthy native vegetation is also an effective method of weed management. The introduction, establishment and spread of environmental weeds/restricted invasive plants will be minimised through regular monitoring and treatment activities.

The procedure for controlling and monitoring environmental weeds/restricted invasive plants will be as follows:

1. Monitor the location and density of environmental weeds/restricted invasive plants through inspections, including annual monitoring events.
2. Identification of suitable control methods for target environmental weeds/restricted invasive plants.
3. Implementation of the selected control methods on the target environmental weeds/restricted invasive plants.
4. Follow-up site inspections to evaluate the effectiveness of the weed control (within 2 weeks of control).
5. Follow-up control where previous control has been sub-optimal (within 2 weeks of point 4).

In regard to weed management measures, physical removal and chemical application are the main weed control methods available. Appropriately qualified persons will be engaged to undertake weed control.

Control methods will target the following species listed as restricted invasive plants under the *Biosecurity Act, 2014*²:

- Cactus (*Harrisia* sp.) (Category 3);
- Rats Tail Grass (*Sporobolus* sp.) (Category 3);
- Parthenium (*Parthenium hysterophorus*) (Category 3);
- Velvety Tree Pear (*Opuntia tormentosa*) (Category 3);
- Prickly Acacia (*Acacia nilotica*) (Category 3);
- Tiger Pear (*Opuntia aurantiaca*) (Category 3); and
- Prickly Pear (*Opuntia stricta*) (Category 3).

Specific weed control methods will be in accordance with those specified by the Department of Agriculture, Fisheries and Forestry (2017).

As described in Section 2.2.3, *Harrisia* Cactus, Prickly Pear and Rats Tail Grass were found to have a patchy distribution across the offset areas. These species will be controlled in accordance with Department of Agriculture, Fisheries and Forestry (2018) weed control specifications (Table 22).

Table 22
Weed Control Methods

Species	Control Methods ¹
Cactus (<i>Harrisia</i> sp.)	• Mechanical control to dig out plants (including tubers) and destroy. • Herbicide control with chemicals and application rates in accordance with the <i>Harrisia</i> Cactus fact sheet.
Parthenium	• Maintain pastures in good condition with high levels of ground and grass cover. • Herbicide control with chemicals and application rates in accordance with the Parthenium fact sheet. • Spray in a time of year before Parthenium sets seed. • Herbicide control will involve a knockdown herbicide to kill plants that are present and a residual herbicide to control future germinations. • Repeated spraying may be required even within a single growing season to prevent further seed production.
Velvety Tree Pear	• Herbicide control with chemicals and application rates in accordance with the prickly pear identification and control fact sheet.
Rats Tail Grass	• Herbicide control through spraying or wick wiping in accordance with the Rat's Tail Grasses identification and control fact sheet

¹ Source: Department of Agriculture, Fisheries and Forestry (2018).

One or multiple combination of treatments will be applied. The selected treatments employed will be documented and monitored.

Based on the baseline weed cover in the North-eastern Extension Commonwealth Offset Area (Table 15), target weed control is required in RE11.3.2, RE11.3.25, RE11.5.3 and RE11.7.4 in order to reduce the weed cover to below 20%.

² **Category 3** – includes weeds, vertebrate pest animals and noxious fish (e.g. gambusia, dingoes, yellow crazy ants). You must not distribute this restricted matter unless the distribution or disposal is authorised in a regulation or under a permit.

Buffel Grass is a widespread introduced pasture species which is dominant over large areas of the offset areas and surrounds. Buffel Grass is readily spread by the wind, overland water flow, animals and human activities. Buffel Grass has an extensive root system that enables the grass to bind soil particles to reduce erosion and dust generation. Uncontrolled Buffel Grass growth suppresses regrowth of native plant species (Franks, 2002; Grice *et al.*, 2012; Marshall *et al.*, 2012).

Buffel Grass in the offset areas will be managed with the aim of suppressing its dominance and to reduce the fire risk posed by high fuel loads. Buffel Grass growth in the offset areas can be managed by the following options:

- encouraging growth of overstorey vegetation (to form a canopy and shade-out Buffel Grass);
- strategic grazing in the offset areas to control biomass and reduce fuel load; and
- mosaic fire management to reduce Buffel Grass cover/old growth fuel load.

These possible treatments are further discussed below. One or multiple combinations of treatments will be applied. The selected treatments employed will be documented and monitored.

Rotational livestock grazing will be used as a method of managing Buffel Grass and reducing fuel loads in the offset management area. It is noted that inappropriate livestock grazing can pose a risk to native vegetation, though strategic grazing is likely to be an effective method of reducing Buffel Grass fuel loads over large areas (Butler and Fairfax, 2003). Grazing management is described in Section 3.8.

3.5 PEST ANIMAL MANAGEMENT STRATEGY

Aim

The aim of the Pest Animal Management Strategy is to reduce and minimise the presence of vertebrate pest species within the offset site, including but not limited to European Rabbit, Feral Cat and European Red Fox, consistent with EPBC 2016/7717 Commonwealth Approval Condition 2b.

Frequency, Timing and Duration

Appropriately qualified persons will be engaged to undertake pest animal control annually or more frequently as required. Monitoring of vertebrate pest animals is to be undertaken every 3 years by a suitably qualified practitioner using the most current best-practice methods.

Procedure for Controlling Vertebrate Pest Animals

Removing available feed and maintaining a clean, rubbish-free environment in order to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna (e.g. introduced rodents, predators and birds) will be undertaken.

The procedure for controlling vertebrate pest animals is as follows:

1. Identification of suitable control methods for target vertebrate pest animals (e.g. trapping, systematic 1080 baiting and/or shooting).
2. Implementation of the selected control methods on the target vertebrate pest animals (focusing on high activity areas).
3. Follow-up control where previous control has been sub-optimal.

Control measures will be implemented by mine staff or by an appropriate Pest Control Contractor(s) annually or as required. Control measures will consider the guidelines found on the Department of Agriculture, Fisheries and Forestry website. A selection of these techniques or additional techniques will be undertaken depending on the vertebrate pest animal species which is in an abundance that requires control (as determined through monitoring) and the success of these control techniques. The control of vertebrate pest animals is intended to be adaptive and will be informed/reviewed based on monitoring.

Control methods will target the following species listed under the *Biosecurity Act, 2014*³:

- Feral Pigs (Categories 3, 4 and 6);
- Wild Dogs (Categories 3, 4 and 6);
- European Rabbit (Categories 3, 4, 5 and 6);
- Feral Cats (Categories 3, 4 and 6); and
- European Red Fox (Categories 3, 4, 5 and 6).

Relevant threat abatement plans will be considered (e.g. DotE, 2015; DEE, 2016; and DEE, 2017).

3.6 FIRE MANAGEMENT

Fire Prevention

The current management regime is to exclude fire from the offset areas (Biodiversity Australia, 2018a). Fire can adversely affect some vegetation communities and destroy habitat components such as coarse woody debris. Hot crown fires can also lead to mortality of arboreal mammals. However, fire can also provide important ecosystem benefits, such as reduce Buffel grass biomass (in some instances) and assist natural regeneration. As such, opportunities for trial management burns are proposed.

Bushfire preventative measures will include:

- Educating employees and contractors on general fire awareness and response procedures.
- Creation and maintenance of fire tracks (fire breaks) for fire control.
- Fire will be excluded from Brigalow communities and non-remnant areas with regenerating saplings. Ground fuel loads will be controlled through the strategic rotational grazing of cattle to prevent thick grass biomass from accumulating over time. Reducing the fuel load will minimise the impact of uncontrolled fires (e.g. from lightning strike).
- When necessary, fuel management (e.g. hazard reduction burns prior to the dry season) will be undertaken in consultation with the Qld Rural Fire Service.
- Local fire wardens will be consulted and fire permits will be obtained prior to hazard reduction burns.

³ Category descriptions are as follows:

- **Category 3** – includes weeds, pest animals and noxious fish (e.g. gambusia, dingoes, yellow crazy ants). You must not distribute this restricted matter unless the distribution or disposal is authorised in a regulation or under a permit.
- **Category 4** – includes specific weeds, pest animals and noxious fish such as the bitou bush, feral pig or giant cichlid. You must not move this restricted matter to ensure that it does not spread into other areas of the state.
- **Category 5** – includes weeds, pest animals and noxious fish such as Mexican feather grass, rabbits and carp. You must not possess or keep this restricted matter under your control without a permit under the *Biosecurity Act, 2014* or another Act.
- **Category 6** – includes invasive animals such as feral deer, foxes, rabbits and wild dogs and noxious fish such as carp, gambusia and tilapia. You must not feed this category of restricted matter.

Uncontrolled Wildfire

In the event of a wild fire occurring within the offset management area, back burning from the established fire breaks will be undertaken, if appropriate, to prevent the spread of the wild fire. If the established fire breaks do not provide effective suppression of the wild fire then additional fire management lines will be cleared to control the wild fire.

Management Burn Trials

Management burn trial plots are proposed within both areas of remnant vegetation and non-remnant areas. The purpose of these trials is to determine if fire is an effective tool for stimulating natural regeneration and reducing weed biomass, or if the risks posed by burning outweigh the potential benefits.

The general methodology for trail burns is as follows:

- Identify location of trial plots in consideration of risks, access and vegetation types;
- Establish boundaries of trial plots on the ground, record vegetation attributes within plots (e.g. Biocondition plot), and take photographs;
- Identify timing of burns e.g. late wet season when soil moisture is high;
- Notify local fire wardens and obtain necessary approvals, consult with Rural Fire Service;
- Carry out risk assessments;
- Carry out burn in conjunction with RFS in suitable conditions;
- Record vegetation attributes and take photographs within trial plots at 3, 6 and 12 months following the fire; and
- Compare vegetation attributes and weed cover results of burnt areas against an unburnt area of the same RE type.

Guidance to conducting management burns can be found in the Brigalow Planned Burn Guideline (Department of National Parks, Recreation, Sport and Racing, 2013).

If the management burn trials are found to be effective in improving ecosystem health and diversity and enhancing regeneration of non-remnant vegetation, a fire management strategy should be developed. This would allow for more widespread management burns across the offset areas as per Regional Ecosystem fire guidelines. Management burns may also be used as a contingency method if regeneration outcomes across the offset areas are poor.

The Qld Herbarium (2016) Regional Ecosystem Fire Guidelines for relevant REs in the offset areas is provide in Appendix E.

3.7 EROSION AND SEDIMENT CONTROL

Erosion potential in the offset areas will be reduced by grazing management (Section 3.8), restricting vehicle access to the offset areas (Section 3.9) and control of animal pests (such as the European Rabbit) (Section 3.5).

Erosion control may be required in areas observed to be displaying relevant characteristics (e.g. gullyng), through visual monitoring (Section 5.1.6). Visual observations will focus on drainage areas and disturbed areas (e.g. access tracks including creek crossings).

Erosion in the offset areas is primarily restricted to access tracks and has the effect of impeding access rather than impacting biodiversity (Biodiversity Australia, 2018a).

The following measures will be used to control erosion within the offset area:

- selective plantings/direct seeding of local endemic species to stabilise the soil; and/or
- surface water management structures (e.g. contour banks and temporary sediment traps [such as hay bales]).
- grading of tracks and creek crossings after the wet season to minimise track degradation and erosion
- whoa-boy earth banks constructed on roads to manage runoff and reduce erosion and sedimentation
- Maintaining high groundcover (>60%) through grazing management

3.8 MANAGEMENT OF LIVESTOCK

Extended periods of intense grazing of livestock can suppress native plant species which can hinder the performance of regeneration. Long-term intense grazing of livestock is a recognised threat to Brigalow (*Acacia harpophylla* dominant and co-dominant) community (SEWPaC 2012).

Ultimately, it is intended to exclude grazing from the offset areas in the long-term once derived grassland communities have established canopy cover and grazing is not required for management of Buffel Grass. In the interim, strategic grazing will be used to manage Buffel Grass fuel load⁴.

Rotational livestock grazing will be used as a method of managing Buffel Grass and reducing fuel loads in the offset areas. Rotational grazing is where a period of grazing is followed by an extended period of rest which, depending on pasture growth and season conditions, may be up to a few months. Rotating livestock will provide periods throughout the year when there will be no grazing pressure in selected areas.

It is intended that the offset areas will progressively change from a grassland dominated system to woodland/forest. Grazing will be used in a way to still enable regeneration of native plant species in the offset areas. This will be achieved by maintaining high ground cover (i.e. greater than 60% [or as dictated by future monitoring]).

The rotation of stock will be undertaken in association with the livestock owner and will be dependent upon seasonal conditions, maintaining ground cover above 60%. Ground cover above 60% is considered “high cover”, which minimises soil loss from erosion and prevents declines in land condition (Fitzroy Basin Association, 2006). The areas grazed will be mapped annually and the intensity of grazing (number of cattle and duration) will be recorded.

⁴ Parrot Quarry Offset Area 1 and Rail Loop and Spur Offset Area 5 are not grazed (Biodiversity Australia, 2018a).

Stocking rates in the offset areas will be highly dependent upon seasonal conditions and will fluctuate from year to year, so a precise set stocking rate cannot be established. Publicly available literature indicates set stocking rates may not be the best tool for managing grazing pressure, due to the variability in seasonal conditions. During years with above average rainfall in the offset areas, higher stocking rates will be required for Buffel Grass and fire fuel load management. Conversely, lower stocking rates will be utilised during years with below average rainfall when Buffel pasture growth has been limited (e.g. grazing a sustainable/safe level of pasture utilisation). At no time will stocking rates exceed 1 adult equivalent animal per 10 acres (annualised) and the stocking rate will be dependent upon maintaining the ground cover above 60%, the Fitzroy Basin Association recommendations (Fitzroy Basin Association, 2006).

Stocking rates in the offset areas (in each paddock) will be documented annually.

As described above, it is intended that grazing is excluded from the offset areas once it is not required for management of Buffel Grass. The offset areas are divided up into a number of paddocks in which stock is managed (Figure 7). The need for grazing will be assessed on an individual paddock basis with the intension of progressively excluding livestock (Section 5.1.8). The assessment would consider the sensitivity of the native vegetation and landform (e.g. watercourses) to grazing livestock. The assessment would also need to consider the location of stock watering points.

As described in Section 5.1.8, if grazing is excluded from an individual paddock, monitoring would still continue to assess whether there is a need for management of fuel loads either through re-introduction of short-term grazing or controlled burns.

Cleared Land Likely to be Formerly Potential Habitat (Brigalow Woodland – RE11.3.1)

MCPL will fence the 'Cleared Land Likely to be Formerly Potential Habitat (Brigalow Woodland – RE 11.3.1) on Figure 9 to exclude grazing livestock within a year after approval to enhance the habitat for the Ornamental Snake.

3.9 RESTRICTIONS TO ACCESS

Access into the offset areas will be restricted to authorised personnel. Locks will be installed on gates into the offset areas. Vehicles will be restricted to designated access tracks. Access tracks through the offset areas will be maintained for fire management. Speed limits of 60 km per hour will be imposed on vehicles using access tracks.

Signage will be installed along main access roads which recognised that the area is protected for conservation purposes. The signs will describe:

- the area is a conservation area;
- access is restricted to authorised personnel only; and
- contact details for MCPL (Open Cut Examiner).

3.10 ADDITIONAL HABITAT FEATURES

Select habitat features (e.g. small hollow trunks/logs) will be salvaged during vegetation clearance activities at the Middlemount Mine and stockpiled for relocation to areas undergoing regeneration. These features will mainly be used in rehabilitation at the mine in accordance with Parsons Brinckerhoff (2010). These features can potentially provide habitat resources for a range of invertebrate and ground dwelling fauna.

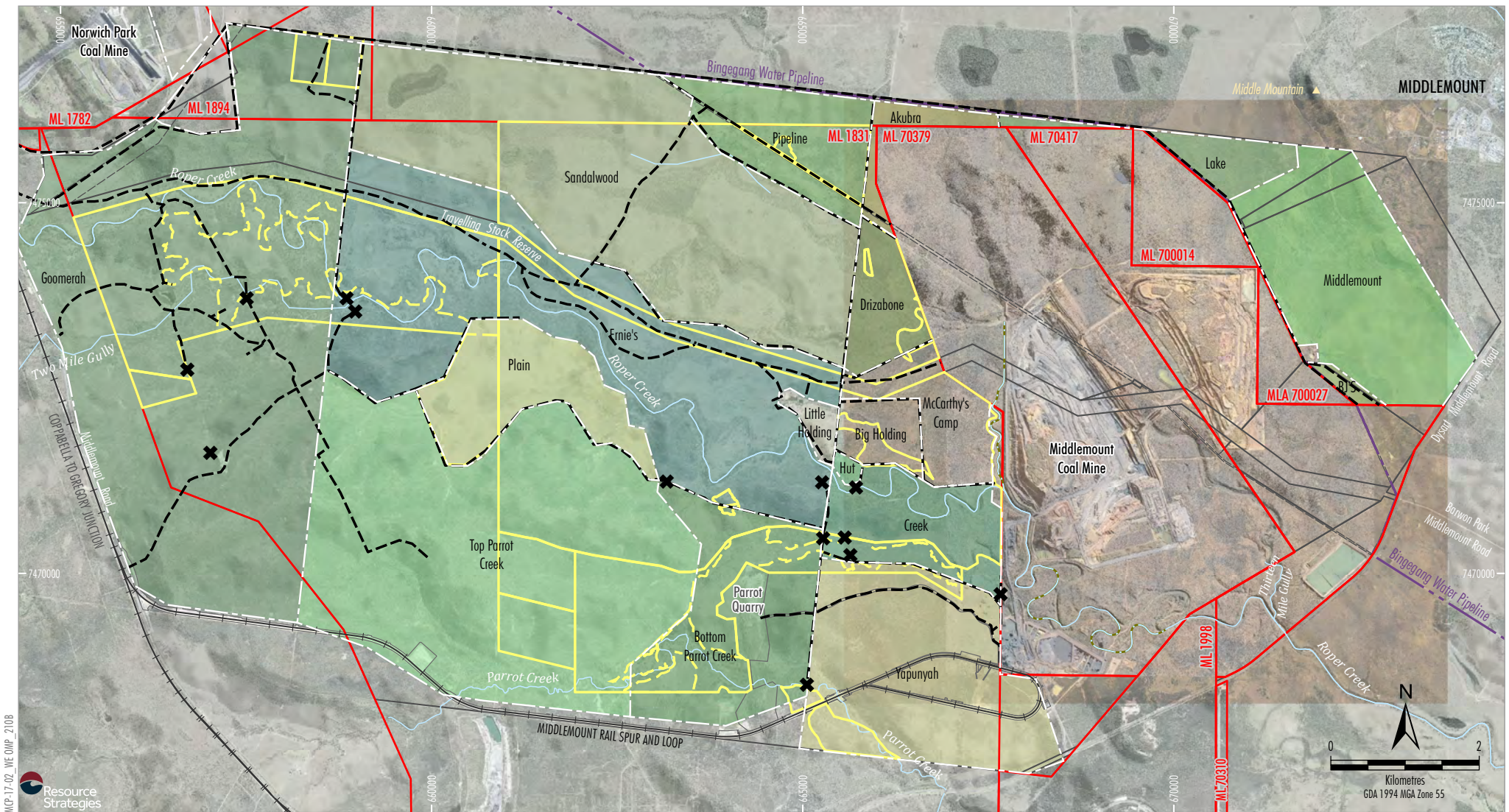


Figure 7

Select habitat features will also be added into the Regeneration Areas of the Middlemount Coal (Stage 2) Project Commonwealth Offset Area (currently non-remnant areas) without suitable ground habitat, but only done if the habitat features can be placed into the Regeneration Areas without disturbance to native vegetation or the existing ground habitats currently present in the regeneration areas.

3.11 REMOVAL OF BARBED WIRE

Barbed wire use in fencing is a recognised threat to a range of fauna (e.g. bats and gliders) and is particularly hazardous when used in new fences and across fauna movement paths.

Barbed wire fencing within the offset areas will be removed upon exclusion of grazing. Where practical, the top two wire strands will be replaced with plain wire. Visual inspections of the fencing will be undertaken and any breaches rectified. If livestock from outside the offset areas are found to be eluding the fence, the design of the fence will be modified as required.

3.12 EDUCATION

Contractors/MCPL staff entering the offset areas will receive an induction in regard to:

- threatened species present and their conservation value;
- understanding of the requirements of this management plan and the activity proposed to be undertaken by the individual;
- requirement of vehicles to stay on designated tracks;
- fire awareness and emergency response procedures; and
- prohibition of smoking in the offset areas (fire risk).

MCPL will maintain a register of training conducted including individual, date, trainer and a summary of training.

3.13 MANAGEMENT SCHEDULE

The *Middlemount Coal Mine North-eastern Extension Offset Delivery Plan* (MCPL, 2017) provided the broad management schedule in Table 23.

A more detailed management schedule was established in version 2 of the Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan. Table 24 provides a revision to the more detailed management schedule to include all offset areas (maintaining consistency with the broad management schedule in Table 23).

Table 23
Broad Management Schedule

Management Activity	How the Activity will be Undertaken	Where the Activity will be Undertaken	Timing of these Activities over the Life of the Offset	Who will Undertake the Activity
On-ground set up of the offset areas	Installation of fencing, locked gates, signage and maintenance of access tracks.	Within the offset areas as required	During initial set up of the offset areas	MCPL
Control of environmental weeds/restricted invasive plants	Physical removal, chemical application.	Within the offset areas as required	Annual, spring to early summer	MCPL
Control of vertebrate pest animals	As required, depending on pest animal, in consideration with animal ethics.	Within the offset areas as required	Annual	MCPL
Fire management	Preventative measures (e.g. fire track maintenance, controlled grazing to reduce ground fuel loads).	Within the offset areas as required	Ongoing	MCPL
Management of livestock	Controlled grazing through the installation of fencing and locked gates.	Within the offset areas as required	Ongoing	MCPL

Table 24
Detailed Management Schedule

Action	Section	Middlemount Coal (Stage 2) Project Commonwealth Offset Area		Rail Loop and Spur Offset Area		Parrot Quarry Offset Area	Thirteen Mile Gully Diversion Offset Area	North-eastern Extension Commonwealth Offset Area	North- eastern Extension State Offset Area	Western Extension Commonwealth Offset Area	Western Extension State Offset Area
		Parts 1a, 1b	Parts 2 and 3	Parts 1, 2, 4, 5 and 6	Parts 3a and 3b						
Year 1 (January to December 2019)											
Enduring protection to be provided for the offset areas.	1.4	March 2019	March 2019	March 2019	March 2019	March 2019	March 2019	March 2019	March 2019	March 2019	March 2019
Operational review of road and fire trail construction to be completed.	3.2	Complete	December 2019	Complete	December 2019	Complete	Complete	December 2019	December 2019	December 2019	December 2019
Additional access tracks (fire trails) to be constructed/repared.	3.2	N/A	December 2019	N/A	December 2019	N/A	N/A	December 2019	December 2019	December 2019	December 2019
Signage of the offset areas to be provided.	3.2 and 3.9	Complete	December 2019	Complete	December 2019	Complete	Complete	December 2019	December 2019	December 2019	December 2019
A fence to be installed between offset and the Middlemount Coal Mine	3.2	June 2019	N/A	Part 4 (June 2019)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Appropriate fencing of the offset areas to be provided for grazing management.	3.2 and 3.8	Refer above.	Complete	Refer above.	Complete	Complete	Complete	December 2019	December 2019	December 2019	December 2019
Excess fencing inside of the offset areas to be removed.	3.2 and 3.8	Complete	December 2019	N/A	December 2019	N/A	N/A	December 2019	December 2019	December 2019	December 2019
Gates with locks to be installed to restrict entry into the offset areas.	3.2 and 3.9	June 2019	June 2019	Complete	June 2019	Complete	Complete	December 2019	December 2019	December 2019	December 2019

Table 24 (Continued)
Detailed Management Schedule

Action	Section	Middlemount Coal (Stage 2) Project Commonwealth Offset Area		Rail Loop and Spur Offset Area		Parrot Quarry Offset Area	Thirteen Mile Gully Diversion Offset Area	North-eastern Extension Commonwealth Offset Area	North- eastern Extension State Offset Area	Western Extension Commonwealth Offset Area	Western Extension State Offset Area
		Parts 1a, 1b	Parts 2 and 3	Parts 1, 2, 4, 5 and 6	Parts 3a and 3b						
Access tracks not necessary for management purposes to be ripped and revegetated.	3.2 and 3.3	Complete	December 2019	N/A	N/A	N/A	N/A	December 2019	December 2019	December 2019	December 2019
Barbed wire to be removed where no longer required for stock management.	3.11	December 2019	December 2019	N/A	December 2019	N/A	N/A	December 2019	December 2019	December 2019	December 2019
Erosion areas to be identified.	3.7	Complete	December 2019	Complete	December 2019	Complete	Complete	December 2019	December 2019	December 2019	December 2019
Weed control to be undertaken.	3.4	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019	October to December 2019
Animal pest control to be undertaken.	3.5	October to December 2019	October to December 2019	N/A	N/A	N/A	N/A	October to December 2019	October to December 2019	October to December 2019	October to December 2019
Year 2 (January to December 2020)											
Maintenance of all access tracks, fences and gates.	3.6, 3.8 and 3.9	December 2020	December 2020	N/A	N/A	N/A	N/A	December 2020	December 2020	December 2020	December 2020
Weed control to be undertaken.	3.4	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020	October to December 2020
Animal pest control to be undertaken.	3.5	December 2020	December 2020	N/A	N/A	N/A	N/A	December 2020	December 2020	December 2020	December 2020
Fire management activities to be undertaken.	3.6	When soil moisture and seasonality is favourable spring to late summer/ autumn.									
Restoration thinning to be undertaken if required.	5.1.7	June-September 2020	June-September 2020	N/A	N/A	N/A	N/A	June-September 2020	June-September 2020	June-September 2020	June-September 2020

Table 24 (Continued)
Detailed Management Schedule

Action	Section	Middlemount Coal (Stage 2) Project Commonwealth Offset Area		Rail Loop and Spur Offset Area		Parrot Quarry Offset Area	Thirteen Mile Gully Diversion Offset Area	North-eastern Extension Commonwealth Offset Area	North- eastern Extension State Offset Area	Western Extension Commonwealth Offset Area	Western Extension State Offset Area
		Parts 1a, 1b	Parts 2 and 3	Parts 1, 2, 4, 5 and 6	Parts 3a and 3b						
Annually from January 2021 until Completion Criteria are Met											
Maintenance of all access tracks, fences and gates to be undertaken.	3.6, 3.8 and 3.9	Continue - Annually	Continue - Annually	N/A	N/A	N/A	N/A	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually
Weed control to be undertaken.	3.4	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually
Animal pest control to be undertaken.	3.5	Continue - Annually	Continue - Annually	N/A	N/A	N/A	N/A	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually
Fire management activities to be undertaken.	3.6	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually
Assessment of the requirement for restoration thinning to be undertaken.	5.1.7	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually	Continue - Annually

Note: Status of actions completed as per Biodiversity Australia (2018).

4 PERFORMANCE AND COMPLETION CRITERIA

4.1 PERFORMANCE CRITERIA

Key performance criteria are provided in this section as a means to check progress towards the outcome. If the performance criteria are not met then the relevant management measures will be reviewed consistent with an adaptive management framework (plan, do, check and review). Contingency measures are also described in Section 6.1.

4.1.1 Middlemount Coal (Stage 2) Project Commonwealth Offset Area

Performance criteria for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area were established in Version 2 of the Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan (Table 25). The timing has been updated to include the modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area.

Table 25
Performance Criteria - Middlemount Coal (Stage 2) Project Commonwealth Offset Area

Performance Criteria	Section	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	
		Parts 1a, 1b	Parts 2 and 3
Year 1 (January to December 2019)			
Enduring protection has been provided for the offset areas.	1.4	March 2019	March 2019
Operational review of road and fire trail construction has been completed.	3.2	Complete	December 2019
Additional access tracks have been constructed/repaired.	3.2	N/A	December 2019
Signage of the offset areas has been provided.	3.2 and 3.9	Complete	December 2019
A fence to be installed between offset and the Middlemount Coal Mine	3.2	June 2019	N/A
Excess fencing inside of the offset areas has been removed.	3.2 and 3.8	Complete	December 2019
Gates with locks have been installed to restrict entry into the offset areas.	3.2 and 3.8	June 2019	June 2019
Access tracks not necessary for management purposes have been ripped and revegetated.	3.2 and 3.9	Complete	December 2019
Access tracks across drainage lines in the offset areas have been repaired and stabilised.	3.2 and 3.3	December 2019	December 2019
Additional habitat features added	3.10	December 2019	December 2019
Barbed wire to be removed where no longer required for stock management.	3.11	December 2019	December 2019
Erosion areas have been identified.	3.7	Complete	December 2019
Weed control has been undertaken.	3.4	October to December 2019	October to December 2019
Animal pest control has been undertaken.	3.5	October to December 2019	October to December 2019

Table 25 (Continued)
Performance Criteria - Middlemount Coal (Stage 2) Project Commonwealth Offset Area

Middlemount Coal (Stage 2) Project Commonwealth Offset Area			
Performance Criteria	Section	Parts 1a, 1b	Parts 2 and 3
Annually from January 2020 until Completion Criteria are Met			
Maintenance of all access tracks, fences and gates have been undertaken.	3.2	Continue annually	Continue annually
Weed control has been undertaken.	3.4	Continue annually	Continue annually
Animal pest control has been undertaken.	3.5	Continue annually	Continue annually
Fire management activities have been undertaken.	3.6	Continue annually	Continue annually
Restoration thinning has been undertaken, if required.	5.1.7	Continue annually	Continue annually
Dominant canopy must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.	-	By the end of 2026	By the end of 2026
Non-remnant vegetation will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy).	-	By the end of 2032	By the end of 2032

4.1.2 Rail Loop and Spur Offset Area

Performance criteria are not required. Competition criteria are provided in Section 4.2.1.

4.1.3 Parrot Quarry Offset Area

Performance criteria are not required. Competition criteria are provided in Section 4.2.1.

4.1.4 Thirteen Mile Gully Diversion Offset Area

Performance criteria are not required. Competition criteria are provided in Section 4.2.1.

4.1.5 North-eastern Extension Commonwealth Offset Area

The performance criteria for the North-eastern Extension Commonwealth Offset Area is provided in Table 26.

Table 26
Performance Criteria - North-eastern Extension Commonwealth Offset Area

Benchmarks	Years														
	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15^
Infrastructure has been set up (fencing, locked gates, signage and access tracks)															
Existing Remnant Vegetation - Weed Cover															
Existing remnant vegetation must have a weed cover of 50% or less.															
Existing remnant vegetation must have a weed cover of 40% or less.															
Existing remnant vegetation must have a weed cover of 30% or less.															
Existing remnant vegetation must have a weed cover of 20% or less.															
Existing Remnant Vegetation - Shrub Canopy Cover															
Areas identified as RE11.5.2a, RE11.7.2 and RE11.7.4 must each have at least 10% shrub canopy cover.															
Areas identified as RE11.5.2a, RE11.7.2 and RE11.7.4 must each have at least 20% shrub canopy cover.															
Areas identified as RE11.5.2a, RE11.7.2 and RE11.7.4 must each have at least 30% shrub canopy cover.															
Non-remnant Vegetation															
Dominant canopy must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.															
Non-remnant vegetation will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy) where Eucalyptus, Corymbia, Acacia or Callitris spp. are the dominant canopy species (refer to EPBC Act Approval 2016/7717).															

* Year 1 is the start of January 2018 to end of December 2018.

^ 15 year anniversary of commencement of the action (i.e. prior to 16 August 2032).

4.1.6 North-eastern Extension State Offset Area

The performance criteria for the North-eastern Extension State Offset Area is provided in the *Middlemount Coal Mine North-eastern Extension Offset Delivery Plan* (MCPL, 2017) (Table 27). The performance criteria were developed to meet the prescribed environmental matter “connectivity area”.

4.1.7 Western Extension Commonwealth Offset Area

The performance criteria for the Western Extension Commonwealth Offset Area is provided in Tables 28.

4.1.8 Western Extension State Offset Area

The performance criteria for the Western Extension State Offset Area is provided in Table 29.

Table 27
Performance Criteria - North-eastern Extension State Offset Area

Benchmarks	Years																			
	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15^	16	17	18	19	20
Infrastructure has been set up (fencing, locked gates, signage and access tracks)																				
Dominant canopy must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.																				
Non-remnant vegetation will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (<i>dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy</i>) where Eucalyptus, Corymbia, Acacia or Callitris spp. are the dominant canopy species (refer to EPBC Act Approval 2016/7717).																				
Conservation outcomes met																				

Source: MCPL, 2017.

* Year 1 is the start of January 2018 to end of December 2018.

^ 15 year anniversary of commencement of the action (i.e. prior to 16 August 2032).

Table 28
Performance Criteria - Western Extension Commonwealth Offset Area

Benchmarks	Years																			
	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Infrastructure has been set up (fencing, locked gates, signage and access tracks)																				
Existing Remnant Vegetation/Habitat - Weed Cover																				
Existing remnant vegetation must have a weed cover of 50% or less.																				
Existing remnant vegetation must have a weed cover of 40% or less.																				
Existing remnant vegetation must have a weed cover of 30% or less.																				
Existing remnant vegetation must have a weed cover of 20% or less.																				
Cleared Land likely to have been formerly Brigalow Woodland and Ornamental Snake Habitat																				
Dominant canopy of the Brigalow Woodland and Ornamental Snake Habitat must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy, where Acacia is the dominant canopy species.																				
The Brigalow Woodland and Ornamental Snake Habitat will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (<i>dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy</i>), where Acacia is the dominant canopy species.																				
Regrowth habitat for the Squatter Pigeon (southern)																				
Dominant canopy of the regrowth habitat for the Squatter Pigeon (southern) must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy, where Eucalyptus, Corymbia, Acacia or Callitris spp. are the dominant canopy species.																				
Squatter Pigeon (southern) regrowth habitat will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (<i>dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy</i>).																				

Table 28 (Continued)
Performance Criteria - Western Extension Commonwealth Offset Area

Benchmarks	Years																			
	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cleared Land likely to have been formerly Koala and Greater Glider Habitat																				
Dominant canopy of the Koala and Greater Glider Habitat must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy, where Eucalyptus, Corymbia, Acacia or Callitris spp. are the dominant canopy species.																				
The Koala and Greater Glider Habitat will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (<i>dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy</i>), where Eucalyptus, Corymbia, Acacia or Callitris spp. are the dominant canopy species.																				

* Year 1 is the start of January 2019 to end of December 2019.

Table 29
Performance Criteria - Western Extension State Offset Area

Benchmarks	Years																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Infrastructure has been set up (fencing, locked gates, signage and access tracks)																				
Dominant canopy must have greater than 35% of the height and greater than 25% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.																				
Non-remnant vegetation will be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (<i>dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy</i>).																				
Conservation outcomes met																				

* Year 1 is the start of January 2019 to end of December 2019.

4.2 COMPLETION CRITERIA

4.2.1 All Offset Areas

This Offset Management Plan/Vegetation Management Plan is binding on current and future owners and occupiers, under the terms of the VDec. This Offset Management Plan/Vegetation Management Plan will continue to have effect until the objectives have been achieved. This Offset Management Plan/Vegetation Management Plan and monitoring requirements will conclude once the completion criteria in Table 30 have been achieved.

MCPL will demonstrate to the Commonwealth Minister that the completion criteria have been met prior to concluding management and monitoring outlined in this Offset Management Plan/Vegetation Management Plan.

Table 30
Completion Criteria

Aspect	Criteria
Enduring Security	Enduring protection for protection for the offset areas has been provided as described in Section 1.4.
Regeneration Areas (Non-remnant Areas) (Figure 5)	Non-remnant areas have achieved RE remnant status ¹ .
Minimum period of time	The Middlemount Coal (Stage 2) Project Commonwealth Offset Area is to be maintained for the life of the approval (EPBC 2010/5394) (until at least 1 November 2042). The North-eastern Extension Commonwealth Offset Area is to be maintained for the life of the approval (EPBC 2016/7717) (until at least 1 November 2042). The Western Extension Commonwealth Offset Area is to be maintained for the life of the approval (EPBC 2017/8130).

¹ For non-remnant vegetation to achieve woody vegetation remnant status the dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

The desired outcome of the offsets is that the land in the offset areas will be enhanced so as the currently degraded areas (non-remnant – Figure 5) reach remnant status through increasing the structural integrity and extent of vegetation in the area. Once the requirements of the development approval (if applicable), legally binding mechanism and offset area management plan have been achieved, the offset areas will be mapped by the Qld administering authority as remnant vegetation on a region map.

4.2.2 North-eastern Extension Commonwealth Offset Area

In addition to the general completion criteria outlined in Section 4.2.1, there are specific completion criteria for the North-eastern Extension Commonwealth Offset Area. In accordance with 2016/7717 Commonwealth Approval Condition 2d (i to iii), the following condition targets are to be met by the 15 year anniversary of commencement of the action (i.e. prior to 16 August 2032).

- Existing remnant vegetation in the North-eastern Extension Commonwealth Offset Area (Figure 5) must have a weed cover of 20% or less;
- Areas identified as RE11.5.2a, RE11.7.2 and RE11.7.4 in the North-eastern Extension Commonwealth Offset Area (Figure 5) must each have at least 30% shrub canopy cover; and
- Non-remnant vegetation in the North-eastern Extension Commonwealth Offset Area (Figure 5) must be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (as defined under the VM Act) where *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris spp* are the dominant canopy species.

In addition to the above, in accordance with 2016/7717 Commonwealth Approval Condition 2e, the weed cover in any Regional Ecosystem is not to exceed the baseline condition for the life of the approval. The baseline weed cover is reported in Section 2.6.4.

Once the above condition targets are met, the condition targets are to be maintained for the remainder of the approval in accordance with 2016/7717 Commonwealth Approval Condition 2f.

If the non-remnant vegetation in the North-eastern Extension Commonwealth Offset Area (Figure 5) is of a condition that is eligible to be mapped as a remnant woody regional ecosystem prior to the 15th anniversary of commencement of the action (i.e. prior to 16 August 2032), MCPL will aim to make an application to the Qld Government to have areas shown in Figure 5 identified as non-remnant to be listed as remnant vegetation under the VM Act.

4.2.3 North-eastern Extension State Offset Area

In addition to the general completion criteria outlined in Section 4.2.1, there are specific completion criteria for the North-eastern Extension State Offset Area. The performance criteria for the North-eastern Extension State Offset Area is provided in Table 27. After 20 years, the intended conservation outcome for the North-eastern Extension State Offset Area is the regeneration and re-vegetation (where needed) of approximately 181 ha of non-remnant vegetation to achieve (MCPL, 2017):

- a habitat quality score at least 1 point greater than the impact site habitat quality score (at the time of impact);
- a habitat quality score gain of 2 points; and
- remnant status⁵.

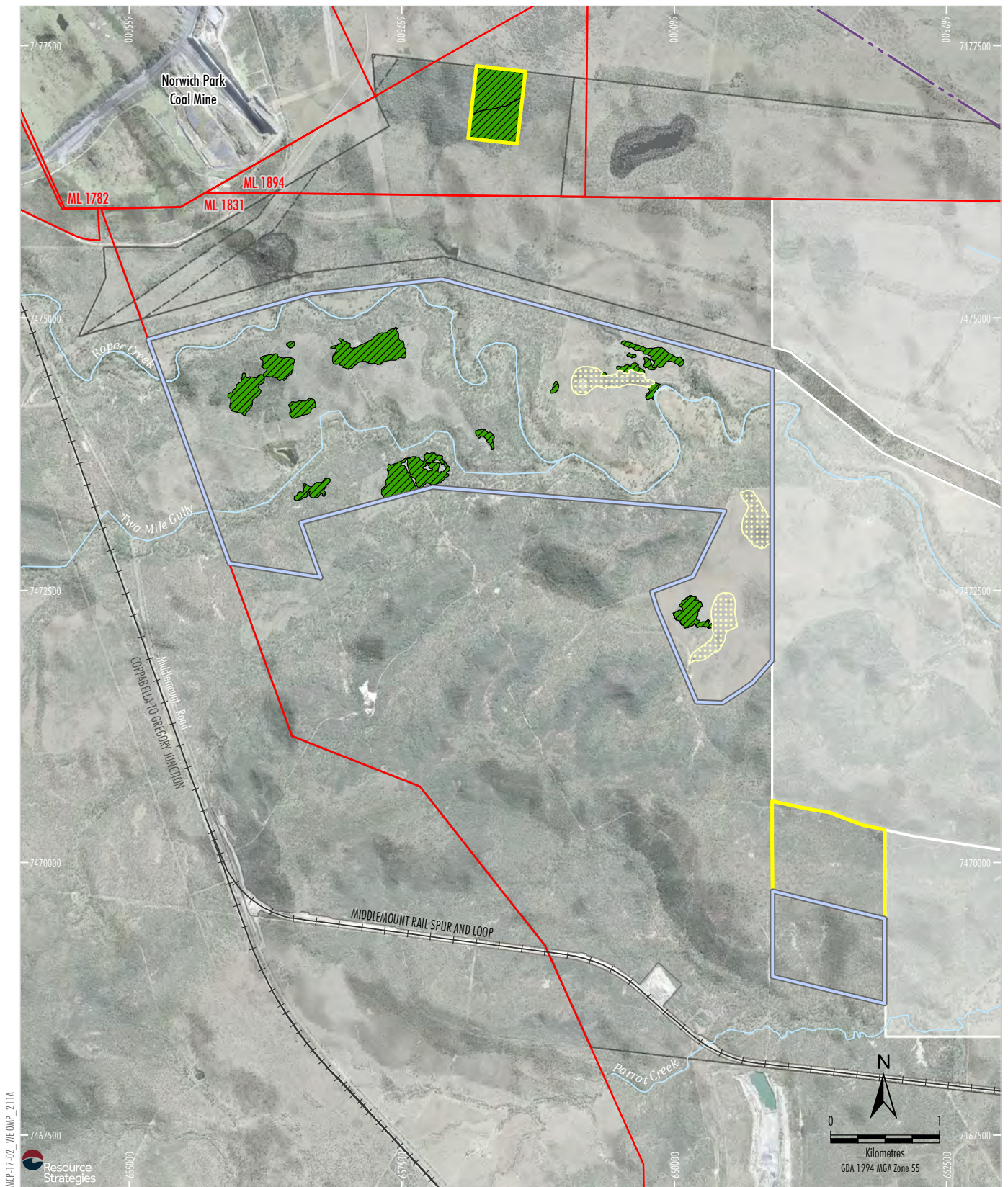
The habitat quality score of the impact site is assumed to be 7 and the current habitat quality score of the offset areas is 7.37 (MCPL, 2017). Given this, along with reaching remnant status, the offset areas will need to achieve a habitat quality score of 9.37 within 20 years (MCPL, 2017).

4.2.4 Western Extension Commonwealth Offset Area

In addition to the general completion criteria outlined in Section 4.2.1, there are specific completion criteria for the Western Extension Commonwealth Offset Area. The following condition targets are to be met by the 15 year anniversary of commencement of the action:

- i. Existing remnant vegetation in the Western Extension Commonwealth Offset Area (Figure 5) must have a weed cover of 20% or less;
- ii. Approximately 30 ha of cleared land likely to have been formerly Brigalow Woodland and Ornamental Snake habitat (Figures 8 and 9) must be of a condition that is eligible to be mapped as Brigalow TEC;
- iii. Approximately 405.5 ha of regrowth habitat for the Squatter Pigeon (southern) (Figure 10) must be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (as defined under the VM Act); and
- iv. Approximately 400 ha of cleared land likely to have been formerly Koala and Greater Glider habitat (Figures 11 and 12) must be of a condition that is eligible to be mapped as a remnant woody regional ecosystem (as defined under the VM Act).

⁵ For non-remnant vegetation to achieve woody vegetation remnant status the dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Coal Owned Land
- Railway
- Existing Offset Area
- Proposed Western Extension Commonwealth Offset Area (EPBC 2017/8130)
- Modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394)
- Brigalow Threatened Ecological Community
- Cleared Land Likely to be Formerly Brigalow Woodland (RE11.3.1)

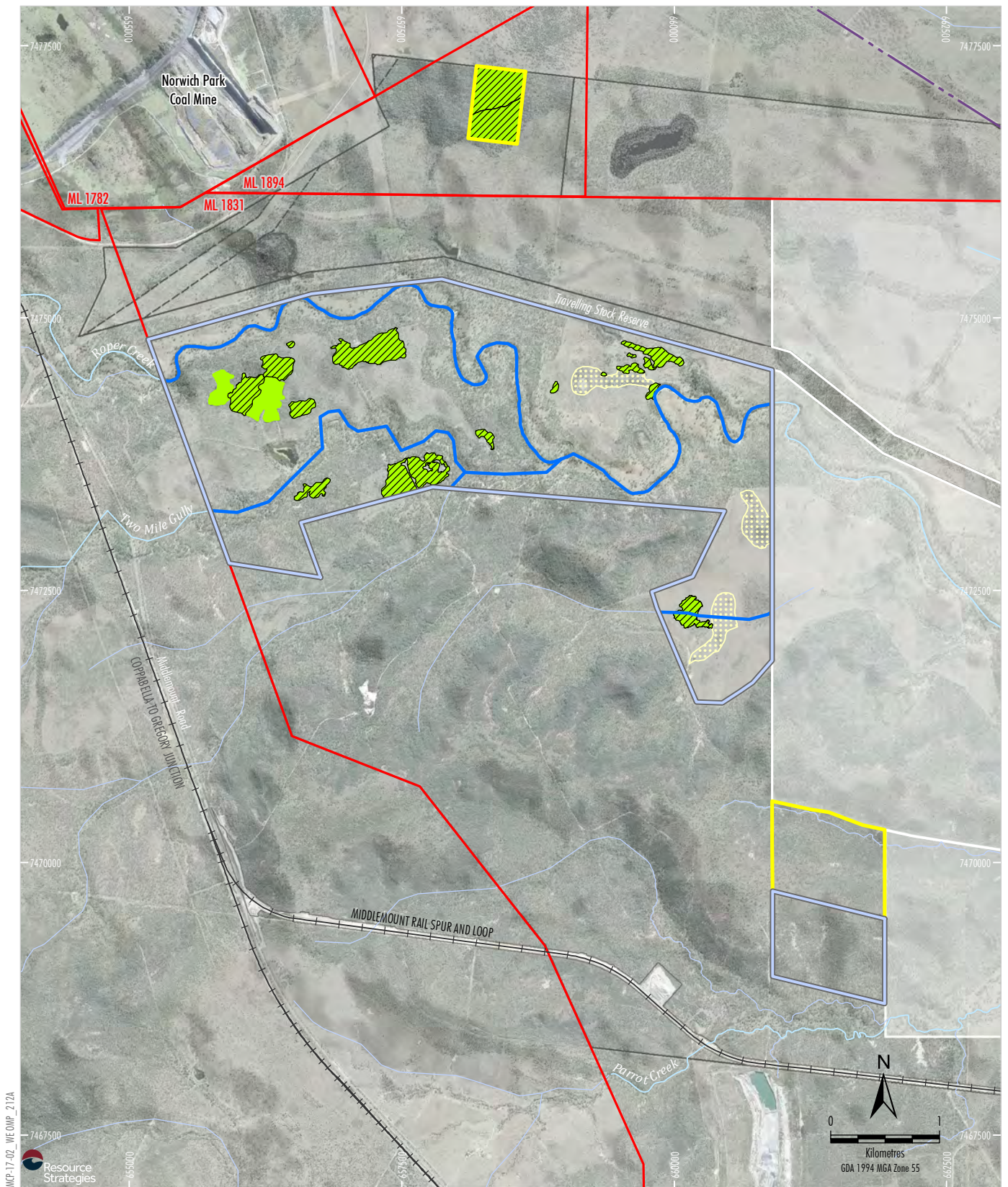
Source: MCPL (2018); Biodiversity Australia (2018, 2019); © State of Queensland (Department of Science, Information Technology and Innovation (2017); Department of Natural Resources and Mines (2016) Orthophoto: MCPL (June 2017, 2012)



OFFSET MANAGEMENT PLAN

Brigalow Woodland Threatened Ecological Community - Western Extension Commonwealth Offset Area

Figure 8



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Coal Owned Land
- Railway
- Existing Offset Area
- Proposed Western Extension Commonwealth Offset Area (EPBC 2017/8130)
- Modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394)

Potential Habitat

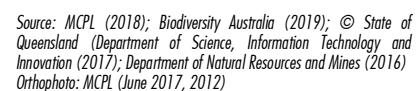
- Ornamental Snake Potential Suitable Habitat
- Other Map Units
- Seasonal Waterbody
- Brigalow Threated Ecological Community
- Cleared Land Likely to be Formerly Potential Habitat (Brigalow Woodland - RE11.3.1)

Source: MCPL (2018); Biodiversity Australia (2019); © State of Queensland (Department of Science, Information Technology and Innovation (2017); Department of Natural Resources and Mines (2016) Orthophoto: MCPL (June 2017, 2012)



OFFSET MANAGEMENT PLAN Ornamental Snake Potential Habitat Mapping - Western Extension Commonwealth Offset Area

Figure 9

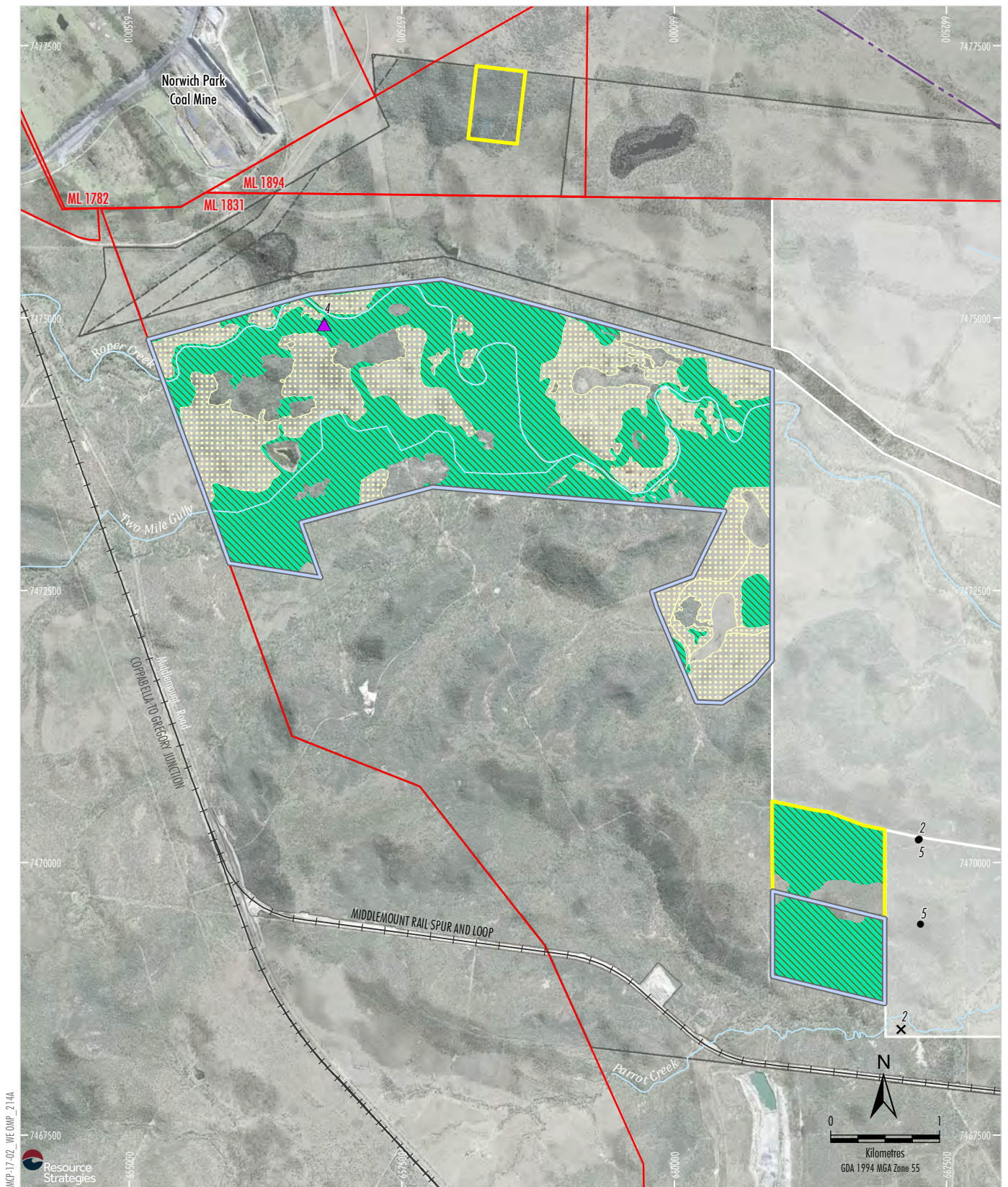


**Squatter Pigeon (Southern) Habitat Mapping
- Western Extension Commonwealth Offset Area**

Note: There are no references 1 and 3 on this figure.

- | Legend | |
|---|--|
|  | <u>Habitat</u>
Squatter Pigeon (Southern) Potential Breeding Habitat |
|  | Squatter Pigeon (Southern) Potential Foraging Habitat |
|  | Squatter Pigeon (Southern) Recorded Location |
| <u>Other Map Units</u> | |
|  | Dam |
|  | Seasonal Waterbody Associated with Habitat |
|  | 1 km Boundary from Seasonal Waterbody |
|  | Vegetation in the Early Stages of Regrowth from Past Clearing without a Suitable Groundcover |
|  | Area of Cleared Land Between Patches of Habitat (less than 100 m apart) |
|  | RE 11.7.2 Excluded due to Unsuitable Groundcover |

Figure 10



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Coal Owned Land
- Railway
- Existing Offset Area
- Proposed Western Extension Commonwealth Offset Area (EPBC 2017/8130)
- Modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area (EPBC 2010/5394)

Habitat

- Potential Habitat Mapping
- ▲ Koala Recorded Location
- Koala Scat
- × Koala Scratches
- Other Map Units
- Eucalypt Forests and Woodlands
- Cleared Land Likely to be Formerly Potential Habitat (Eucalypt Forests and Woodlands)

Reference: 2 Naturecall Environmental (2014)
 4 Biodiversity Australia (2019)
 5 Naturecall Environmental (2017)

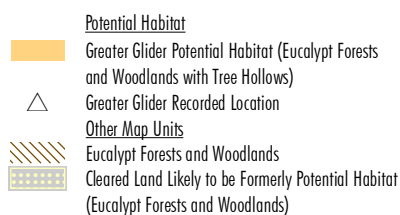
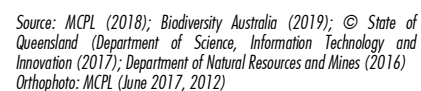
Note: There are no references 1 and 3 on this figure.

Source: MCPL (2018); Biodiversity Australia (2019); © State of Queensland (Department of Science, Information Technology and Innovation (2017); Department of Natural Resources and Mines (2016)
 Orthophoto: MCPL (June 2017, 2012)



OFFSET MANAGEMENT PLAN Koala Habitat Mapping - Western Extension Commonwealth Offset Area

Figure 11



Reference: 2 Naturecall Environmental (2014)
4 Biodiversity Australia (2019)
Note: There are no references 1 and 3 on this figure.



middlemount
coal PTY LTD

Figure 12

4.2.5 Western Extension State Offset Area

In addition to the general completion criteria outlined in Section 4.2.1, there are specific completion criteria for the Western Extension State Offset Area. The performance criteria for the Western Extension State Offset Area is provided in Table 29. After 20 years, the intended conservation outcome for the non-remnant vegetation within the Western Extension State Offset Area is the regeneration and re-vegetation (where needed) of approximately 213.5 ha of non-remnant vegetation to achieve:

- a habitat quality score at least 1 point greater than the impact site habitat quality score (at the time of impact);
- a habitat quality score gain of 2 points; and
- remnant status.

5 MONITORING PLAN

A programme will be undertaken to monitor and report the effectiveness of the measures and the performance of the regeneration in the biodiversity offset areas, with summary reporting to be carried out annually (Section 10.1). The monitoring will be undertaken by a suitably qualified person(s). The monitoring plan is summarised in Table 31. This monitoring plan will commence in 2019 and conclude once the competition criteria have been met.

Table 31
Monitoring Plan

Offset Area	Permanent Photo Monitoring	Permanent Transect Monitoring	Habitat Quality Assessments	Usage of the Offset Areas by Fauna	Effectiveness of the Weed Control	Effectiveness of the Pest Animal Control	Visual Inspections
Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	2021 (then every three years)	Annually (spring/early summer)	2021 (then every three years)	Quarterly
Rail Loop and Spur Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	N/A	Annually (spring/early summer)	N/A	Quarterly
Parrot Quarry Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	N/A	Annually (spring/early summer)	N/A	Quarterly
Thirteen Mile Gully Diversion Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	N/A	Annually (spring/early summer)	N/A	Quarterly
North-eastern Extension Commonwealth Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	2021 (then every three years)	Annually (spring/early summer)	2021 (then every three years)	Quarterly
North-eastern Extension State Offset Area	Biannually (autumn and spring)	Annually (autumn)	2024 (then every five years)	2021 (then every three years)	Annually (spring/early summer)	2021 (then every three years)	Quarterly
Western Extension Commonwealth Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	2021 (then every three years)	Annually (spring/early summer)	2021 (then every three years)	Quarterly
Western Extension State Offset Area	Biannually (autumn and spring)	Annually (autumn)	N/A	2021 (then every three years)	Annually (spring/early summer)	2021 (then every three years)	Quarterly

5.1.1 Monitoring the Effectiveness of Regeneration in the Offset Areas

Monitoring activities are linked to the offset area objectives, performance criteria defined in Section 4.1 and completion criteria. They measure the progression of the offset areas towards achieving those outcomes.

Permanent Photo Monitoring

Photo monitoring will be undertaken within the offset areas to provide a visual documentation of the performance of the offset area over time. Photos will be taken on a biannual basis, during the spring (September to mid-November) and autumn (March to mid-May) (MCPL, 2017).

Photo monitoring will be undertaken at each transect monitoring (Table 33) and additional photo monitoring sites (Table 32). Figure 13 shows the location of existing monitoring sites. Photo monitoring will be undertaken across representative REs (including Brigalow EEC and potential habitat for species listed in Table 20) and cleared/non-remnant areas within each offset area.

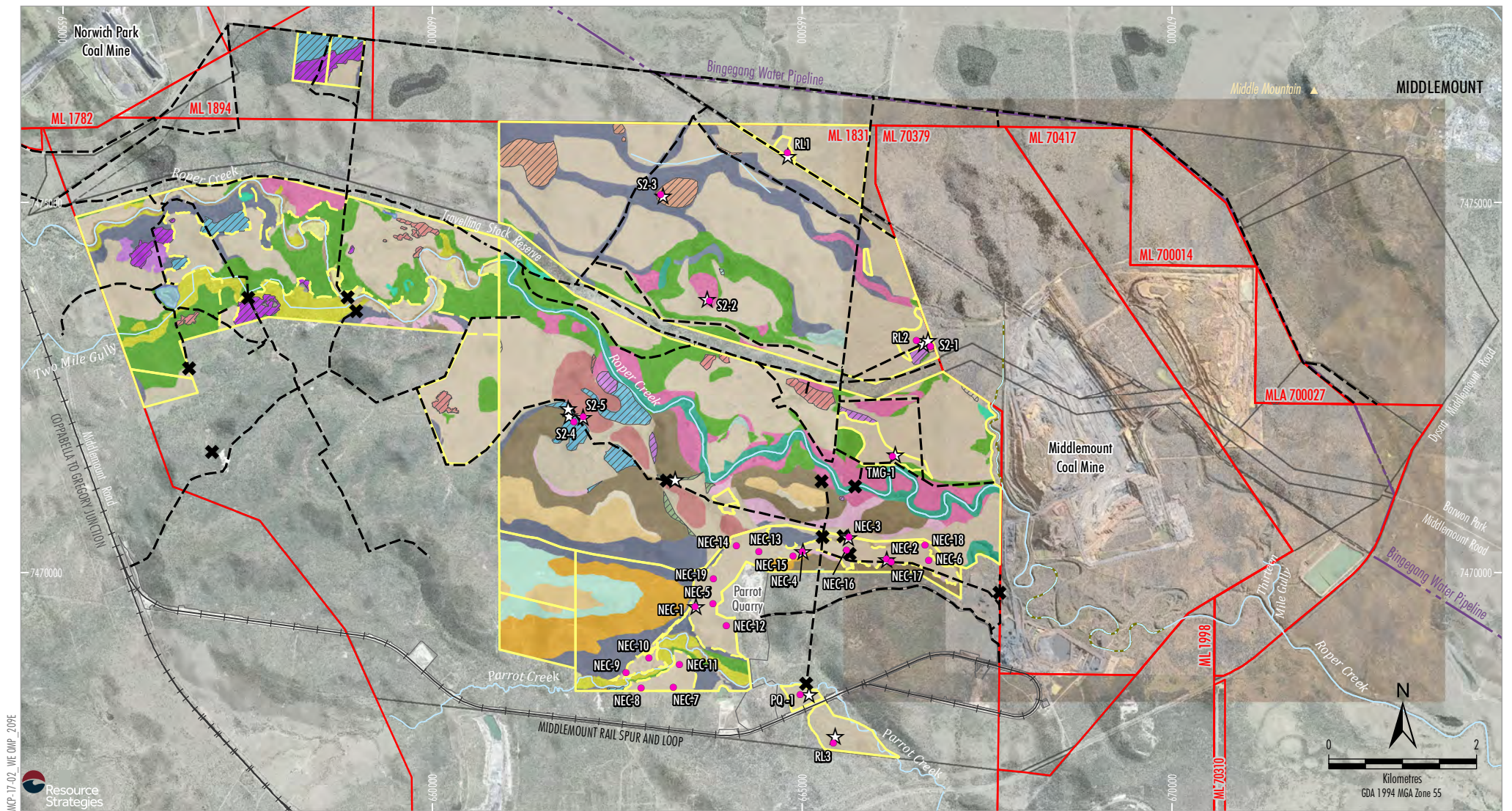
Photos will be taken in a consistent direction, location (at global positioning system [GPS] points), height above the ground and time of day. These aspects and the date will be recorded for each photo taken (north, south, east and west).

After the photographic monitoring event the photos will be compared to the photos from the previous monitoring periods. Natural regeneration of native understorey and overstorey species, the occurrence of habitat complexity (e.g. logs, litter), plant establishment and the status of environmental weeds/restricted invasive plants will all be noted.

Table 32
Additional Photo Points

Name	Easting*	Northing*	Offset Area	Regional Ecosystem	Source
2	664804	7475619	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
6	663713	7473687	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.3.7	Biodiversity Australia (2018a)
7	663121	7475086	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.4.3	Biodiversity Australia (2018a)
9	661849	7472110	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.7.2	Biodiversity Australia (2018a)
10	661838	7472215	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.4.8	Biodiversity Australia (2018a)
11	662043	7472097	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
12	663287	7471247	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
14	663562	7469541	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
15	666146	7470170	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
16	665625	7470475	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
17	665010	7470278	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
13	665094	7468352	Parrot Quarry Offset Area	Non-remnant	Biodiversity Australia (2018a)
4	666643	7473087	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
5	666701	7473135	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
8	665445	7467783	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
3	666263	7471592	Thirteen Mile Gully Diversion Offset Area and Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)

* Centre point



AMP-17-02_WE_OWP_2016

Resource Strategies

LEGEND

- Mining Lease Boundary (ML)
- Mining Lease Application Boundary (MLA)
- Middlemount Coal Owned Land
- Railway
- Offset Area
- Access Track
- X No Access
- ☆ PhotoPoint
- Existing Monitoring Site

Regional Ecosystem Mapping

- | | | |
|--|--|---|
| 11.3.1 | 11.4.3 | 11.5.3b |
| 11.3.2 | 11.4.3 High value re | 11.5.9 |
| 11.3.25 | 11.4.8 | 11.7.2 |
| 11.3.27 | 11.4.9 | 11.7.4 |
| 11.3.27b | 11.4.9a | 11.9.1 |
| 11.3.27d | 11.5.18 | Non-remnant |
| 11.3.4 | 11.5.18 with cerbera | Dam |
| 11.3.4a | 11.5.2a | Cleared Land |
| 11.3.7 | 11.5.3 | Disturbed/Erosion/Bare Ground |

Threatened Ecological Community

- Brigalow

Source: MCPL (2018); Biodiversity Australia (2018); Naturecall Environmental (2014, 2017); Parsons Brinkerhoff (2010); (Department of Natural Resources and Mines (2017); © State of Queensland (Department of Science, Information Technology and Innovation, 2017)
Orthophoto: MCPL (June 2017, 2012)



OFFSET MANAGEMENT PLAN

Monitoring Locations and Access Tracks

Figure 13

Aerial photographs may also be used to show enhancement of vegetation connectivity.

Permanent Transect Monitoring

Transect monitoring will be undertaken within the offset areas to provide a measure of the progress of the offset area towards the completion criteria. Transect monitoring will be undertaken annually, during autumn (March to mid-May).

Figure 13 shows the location of existing monitoring sites listed in Table 33⁶. Transect monitoring will be undertaken across representative REs (including Brigalow EEC and potential habitat for species listed in Table 20) and cleared/non-remnant areas within each offset area. The monitoring sites will be placed within a number of paddocks across the offset areas (Figure 7).

As described in Section 4.2.1, the general objective is for current non-remnant areas to achieve remnant status. For non-remnant vegetation to achieve woody vegetation remnant status, the dominant canopy must have greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

Transect monitoring will be undertaken annually within representative areas to assess the effectiveness of restoration and to assess performance, focusing on:

- canopy cover;
- average stem diameter at breast height (DBH) of canopy species (existing trees over 20 centimetres DBH cannot be utilised for this assessment);
- signs of canopy and shrub layer recruitment present;
- average height (and species composition) of each vegetation stratum;
- native plant species richness for four life-forms (trees, shrubs, grasses, forbs/other);
- shrub cover⁷;
- non-native (weed) cover⁸; and
- correct labelling with date, location, GPS points for end points of transect and any other observations.

Monitoring will focus on non-remnant areas of vegetation, as the objective is for these areas to reach remnant status. Detailed monitoring within non-remnant areas will allow any potential issues to be highlighted and will track the progress of regeneration over time to demonstrate completion criteria timeframes are met.

The above attributes will be monitored using the plot and transect layout within Eyre *et al.*, (2015). After each monitoring event the data for these attributes will be compared to the data from the previous monitoring periods.

⁶ The indicative locations of additional sites are to be ground-truthed during the first monitoring event.

⁷ Relevant to the North-eastern Extension Commonwealth Offset Area performance criteria described in Section 4.1.5.

⁸ Relevant to the North-eastern Extension Commonwealth Offset Area performance criteria described in Section 4.1.5.

Table 33
Transect Monitoring Sites

Name^	Easting, Northing*	Offset Area	Regional Ecosystem	Source
RL1 (BC2)	664802, 7475663	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
RL2 (BC3)	666543, 7473133	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
RL3 (BC8)	665425, 7467697	Rail Loop and Spur Offset Area	Non-remnant	Biodiversity Australia (2018a)
S2-1 (BC4)	666733, 7473055	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.3.1 (Brigalow EEC)	Biodiversity Australia (2018a)
S2-2 (BC6)	663745, 7473665	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.3.7	Biodiversity Australia (2018a)
S2-3 (BC7)	663085, 7475110	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.4.3 (Brigalow EEC)	Biodiversity Australia (2018a)
S2-4 (BC9)	661914, 7472038	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	11.4.8 (Brigalow EEC)	Biodiversity Australia (2018a)
S2-5 (BC10)	662038, 7472105	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
S2-6	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-7	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-8	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-9	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-10	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-11	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-12	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-13	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-14	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
S2-15	-	Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	New Site
NEC-1 (BC12)	663552, 7469539	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
NEC-2 (BC13)	666141, 7470179	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
NEC-3 (BC14)	665630, 7470480	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
NEC-4 (BC15)	665001, 7470278	N-E Extension State and Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
NEC-5	663790, 7469583	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-6	666709, 7470167	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-7	663256, 7468444	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-8	662822, 7468432	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-9	662619, 7468641	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-10	662929, 7468846	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)

Table 33 (Continued)
Transect Monitoring Sites

Name^	Easting, Northing*	Offset Area	Regional Ecosystem	Source
NEC-11	663341, 7468754	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-12	663978, 7469284	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-13	664411, 7470281	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-14	664107, 7470363	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-15	664877, 7470221	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-16	665599, 7470304	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-17	666201, 7470138	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-18	666662, 7470368	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-19	663797, 7469913	N-E Extension State and Commonwealth Offset Area	Non-remnant	MCPL (2017)
NEC-20	-	North-eastern Extension Commonwealth Offset Area	RE11.5.2a	New Site
NEC-21	-	North-eastern Extension Commonwealth Offset Area	RE11.5.2a	New Site
NEC-22	-	North-eastern Extension Commonwealth Offset Area	RE11.5.2a	New Site
NEC-23	-	North-eastern Extension Commonwealth Offset Area	RE11.7.2	New Site
NEC-24	-	North-eastern Extension Commonwealth Offset Area	RE11.7.2	New Site
NEC-25	-	North-eastern Extension Commonwealth Offset Area	RE11.7.2	New Site
NEC-26	-	North-eastern Extension Commonwealth Offset Area	RE11.7.4	New Site
NEC-27	-	North-eastern Extension Commonwealth Offset Area	RE11.7.4	New Site
NEC-28	-	North-eastern Extension Commonwealth Offset Area	RE11.7.4	New Site
PQ -1 (BC11)	664974, 7468352	Parrot Quarry Offset Area	Non-remnant	Biodiversity Australia (2018a)
TMG-1 (BC5)	666219, 7471565	Thirteen Mile Gully Diversion Offset Area and Middlemount Coal (Stage 2) Project Commonwealth Offset Area	Non-remnant	Biodiversity Australia (2018a)
WE-1	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-2	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-3	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-4	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-5	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-6	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-7	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-8	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-9	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-10	-	Western Extension State and Commonwealth Offset Area	Non-remnant	New Site
WE-11	-	Western Extension Commonwealth Offset Area	Remnant	New Site
WE-12	-	Western Extension Commonwealth Offset Area	Remnant	New Site
WE-13	-	Western Extension Commonwealth Offset Area	Remnant	New Site
WE-14	-	Western Extension Commonwealth Offset Area	Remnant	New Site
WE-15	-	Western Extension Commonwealth Offset Area	Remnant	New Site

^ Site in brackets (e.g. BC2) is the name assigned by Biodiversity Australia (2018a).

* Centre point

Weed and shrub cover within the existing remnant vegetation (RE11.5.2a, RE11.7.2 and RE11.7.4) in the North-eastern Extension Commonwealth Offset Area will be measures at sites NEC-20 to NCE-28 using the plot and transect layout within Eyre *et al.*, (2015).

If any non-remnant/regrowth areas qualify as remnant vegetation then the vegetation will be progressively mapped according to standard vegetation mapping methods in Qld (e.g. Nelder, *et al* 2017). This mapping will occur on an assessment of a particular area (not solely on the data from monitoring points).

5.1.2 Habitat Quality Assessments

The non-remnant areas in the North-eastern Extension State Offset Area and Western Extension State Offset Area have specific completion criteria based on a habitat quality score measured by the *Guide to Determining Terrestrial Habitat Quality* - Version 1.2 (DEHP, 2017 or its revision) (Sections 4.2.3 and 4.2.4).

Habitat quality assessments will be undertaken at each monitoring location in the non-remnant areas in the North-eastern Extension State Offset Area and Western Extension State Offset Area (Figure 13) every five years (MCPL, 2017). The *Guide to Determining Terrestrial Habitat Quality* - Version 1.2 (DEHP, 2017 or its revision) will be applied (MCPL, 2017).

5.1.3 Usage of the Offset Areas by Fauna

MNES fauna relevant to each offset area will be monitored over time to document their usage of the relevant offset area(s). The monitoring will target existing potential habitat in the first instance and then non-remnant areas as habitat resources in the non-remnant area increase over time. There are no performance or competition criteria based on the occurrence of fauna due to the variable factors influencing the detection of fauna species.

The next fauna surveys will be conducted in spring/summer 2021 and every three years thereafter.

Ornamental Snake

Targeted surveys for the Ornamental Snake will be undertaken within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area and Western Extension Commonwealth Offset Area. Targeted searches will be undertaken in consideration of the relevant survey guidelines (e.g. DEE, 2018; SEWPaC, 2011b and c). Methods will include herpetofauna searches and spotlighting.

Squatter Pigeon (southern)

Targeted surveys will be undertaken for the Squatter Pigeon (southern) within the Middlemount Coal (Stage 2) Project Commonwealth Offset Area, North-eastern Extension Commonwealth Offset Area and Western Extension Commonwealth Offset Area. Targeted searches will be undertaken in consideration of the relevant survey guidelines (e.g. Commonwealth Department of the Environment, Water, Heritage and the Arts, 2010). Methods will include diurnal bird surveys.

Greater Glider

Targeted surveys for the Greater Glider will be undertaken within the Western Extension Commonwealth Offset Area. Methods will include spotlighting and scat searches.

Koala

Targeted surveys for the Koala will be undertaken within the Western Extension Commonwealth Offset Area. Targeted searches will be undertaken in consideration of the relevant survey guidelines (e.g. DEE, 2018; DotE, 2014). Methods will include spotlighting, call playback and scat searches.

Other Fauna Species

Other fauna species recorded during the monitoring will be documented.

5.1.4 Effectiveness of the Weed Control

Weed control will be undertaken within the offset areas annually, during spring (September to mid-November) (Section 3.4). Follow-up inspections will be undertaken to assess the effectiveness of the weed management measures implemented (within 2 weeks of control) and the requirement for any additional management measures.

Weed occurrence/cover is also monitored during the permanent transect monitoring (Section 5.1.1) and quarterly inspection of the offset areas (Section 5.1.6).

5.1.5 Effectiveness of the Pest Animal Control

Pest animal control will be undertaken within the offset areas (Section 3.5). Monitoring of pest animals (Feral Pig, Wild Dog, European Rabbit, European Red Fox and Feral Cat) is to be undertaken every three years by a suitably qualified practitioner.

An estimate of the abundance of pest animals will be obtained using best practise monitoring techniques (e.g. the vehicle spotlight method [Mitchell and Balogh, 2007a to c], PIR cameras). Quarterly inspections of the offset areas will also be undertaken, noting requirements for pest animal control (Section 5.1.6).

5.1.6 Visual Inspections

A quarterly visual inspection of the offset areas will be undertaken to identify:

- risks to achieving the management outcomes;
- implementation difficulties;
- weeds species, particularly Prickly Pear, Velvet Tree Pear, Harrisia Cactus and Rats Tail Grass (also covered by Section 5.1.4);
- requirements for pest animal control (also covered by Section 5.1.5);
- current fire fuel loads and the risk they present to the offset;
- erosion or sedimentation as an impediment to meeting offset areas objectives;
- effectiveness of erosion or sediment control (if used);
- fencing and track maintenance (including erosion of tracks);
- uncontrolled presence of livestock in the offset areas;
- illegal access and vandalism;
- effects of flood and fire events if they occur; and
- general notes regarding enhancing success and reducing failure.

Visual inspections will be undertaken by a land manager who (as a minimum) will drive all access tracks in the offset area and along each fence in order to identify the above. All offset areas will be visually inspected.

5.1.7 Assessment of the Requirement for Restoration Thinning

An assessment of Brigalow regrowth and the requirement for restoration thinning will be made annually by a suitably qualified ecologist. The assessment will consider:

- tree density;
- species diversity; and
- remnant status

If thinning is to occur, secondary suckering will be monitored and controlled. Detailed methods for Brigalow restoration thinning are described in Section 6.1.2

5.1.8 Impacts of Grazing on Management Objectives

Stocking rates in the offset areas (in each paddock) will be documented annually within the annual monitoring report.

Monitoring will be undertaken to assess the impacts of grazing on achieving management outcomes. Monitoring methods will include transect monitoring (Section 5.1.1) and visual inspections (Section 5.1.6). The outcomes of these assessments will be used to assess if grazing pressure in a paddock is preventing MCPL achieving the performance and completion criteria.

As described in Section 3.8, it is intended that grazing is excluded from the offset areas once it is not required for management of Buffel Grass. The offset areas are divided up into a number of paddocks in which stock is managed (Figure 7). The need for grazing will be assessed on an individual paddock basis with the intention of progressively excluding livestock. The assessment would consider the sensitivity of the native vegetation and landform (e.g. watercourses).

If grazing is excluded from an individual paddock, monitoring would still continue to assess whether there is a need for management of fuel loads either through re-introduction of short-term grazing or controlled burns.

As stated in Section 3.8, MCPL will fence the 'Cleared Land Likely to be Formerly Potential Habitat (Brigalow Woodland – RE11.3.1) on Figure 9 to exclude grazing livestock within a year after approval to enhance the habitat for the Ornamental Snake.

6 CONTINGENCY MEASURES

6.1 POTENTIAL RISKS AND CONTINGENCY MEASURES

An analysis of potential risks is provided in Appendix F. Table 34 outlines some potential risks to successful management of the offset areas and a description of possible contingency measures that could be implemented to mitigate the risk. Risk management has been built into management specifications, but some unforeseen events may still restrict prescribed management outcomes.

Table 34
Potential Risks and Contingency Measures

Risk	Contingency
Consistent increase in weed extent	The weed control program provides for the control and monitoring of any new incursions of environmental weeds/restricted invasive plants. In the event that a consistent increase in weed extent is recorded, additional strategies to control the problematic weed species will be reviewed (e.g. changing the weed control method or increasing the frequency of weed control).
Consistent increase in vertebrate pest animals	In the event that a consistent increase in vertebrate pest animals is recorded, additional strategies to control the problematic vertebrate pest animal species will be reviewed (e.g. changing the control method or increasing the frequency of control).
Unplanned fires	- The Qld Rural Fire Service will be called for assistance if a significant bushfire was to occur within or move towards the offset areas. - Inspect and remedy issues with fences, gates or access.
Inappropriate grazing regimes	- Modify fencing. - Incorporate electric fencing. - Inspect and remedy issues. - Modify rotational grazing regime.
Illegal access and potential vandalism	Inspect and remedy issues.
Natural regeneration not occurring	Further active revegetation (Section 6.1.1).
Lock regrowth in Brigalow	Restoration thinning (Section 6.1.2).
Poor access for management/monitoring (e.g. due to adverse weather)	Wait until access is possible.

6.1.1 Active Seeding/Planting

Active seeding/planting will be a contingency measure in the event that natural regeneration is not readily occurring after at least 3 successive annual monitoring events. Active revegetation will be undertaken using appropriate plantings, brush mulching or seeding of local seed sources. The procedure is provided in Table 35.

The EPBC Act approval for the North-eastern Extension Commonwealth Offset Area requires 30 % shrub cover to be obtained in RE 11.5.2, 11.7.2 and 11.7.4. The baseline data indicates that the shrub cover is between 0 to 24.3 % (Section 2.6.3). In order to achieve 30 % shrub cover, active seeding/planting in the North-eastern Extension Commonwealth Offset Area is likely to be needed.

Table 35
Revegetation Methods

Method	Description
Seed Collection	A key aim of seed collection is to collect local provenance seed stock for propagation purposes. Required approvals are identified, sought and obtained from relevant authorities. All seed collection is to be conducted under the framework of the 'Florabank Guidelines'. This includes best practice in collection activities, cleaning, data collection, germination testing and storage.
Site Preparation	Site preparation involves stabilising and preparing the surface of the rehabilitation area so that it can absorb water and nutrients. A large proportion of weeds are also removed during site preparation to allow space for new seedlings and plantings. Weed removal may have to occur more than once to reduce the weed management measures needed during implementation of the revegetation programme.
Revegetation Method	The revegetation method will change site to site depending on the structure and floristic characteristics of each site. A combination of tubestock planting, brush mulching and direct seeding may be used, depending on the circumstances. These methods may also be used in conjunction with management burns to increase seed germination rates and competition with exotic grasses.
Timing	Revegetation will be undertaken during suitable climactic conditions, such as during and immediately after sufficient rainfall.

6.1.2 Brigalow Regrowth Restoration Thinning

Brigalow trees are capable of prolific resprouting after clearing which can result in regrowth with high stem densities (e.g. greater than 10,000 stems per hectare (stems/ha) [University of Queensland, 2011]). These densely spaced trees have slower growth and structural development as they compete for resources. With less resources for other plant species (light, water, etc.), Brigalow regrowth monocultures can have a lower floral diversity than mature Brigalow. A recent study has shown that restoration thinning can accelerate structural development in Brigalow as well as improve carbon sequestration (Dwyer *et al.*, 2010).

Brigalow regrowth occurs in the offset areas that does not currently meet the criteria of the Brigalow (*Acacia harpophylla* dominant and co-dominant) community under the EPBC Act. An assessment of the Brigalow regrowth and the requirement for restoration thinning will be made by a suitably qualified ecologist (Section 5.1.6).

If required, Brigalow regrowth restoration thinning will involve:

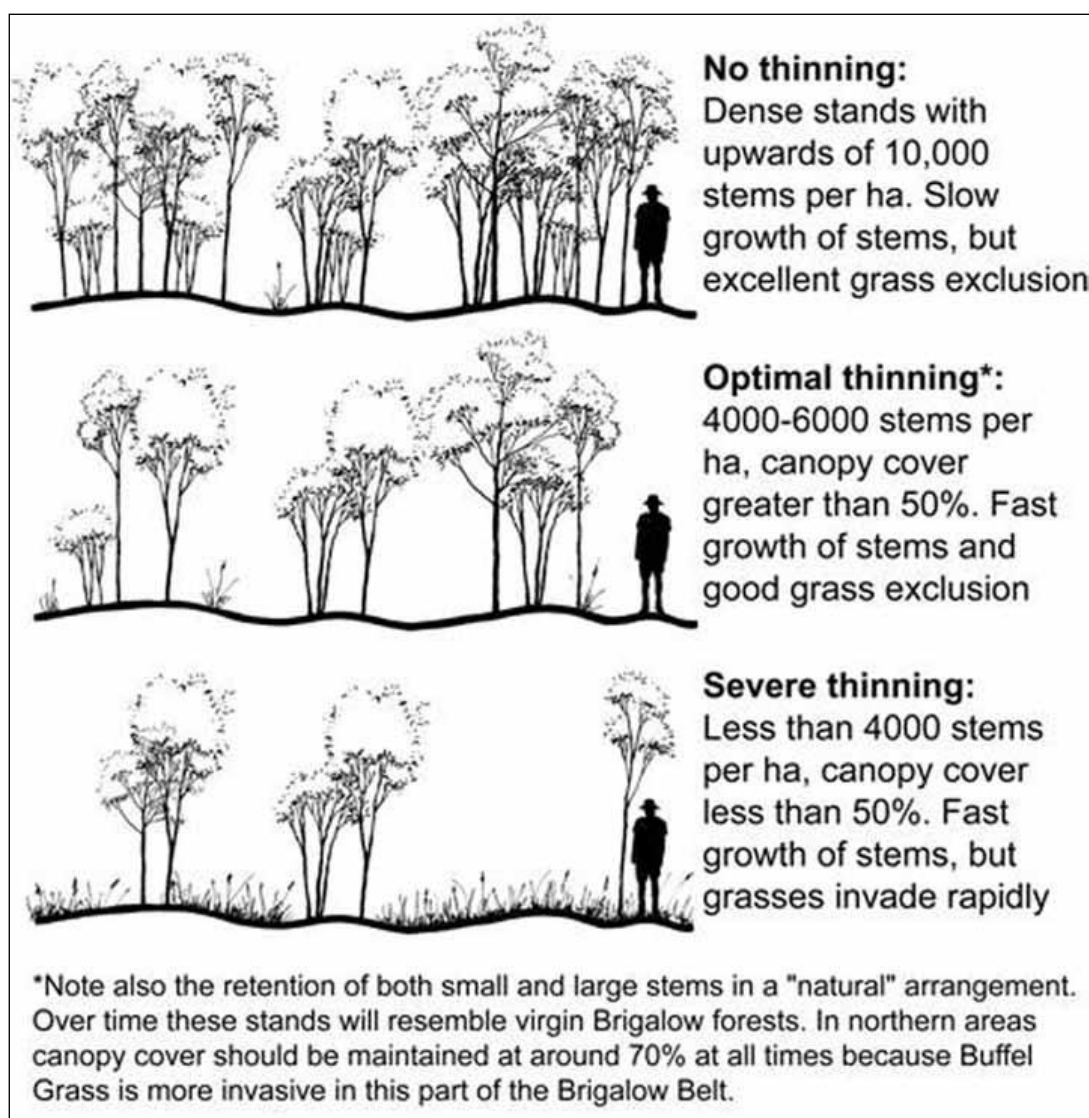
- Select thinning of Brigalow trees via ringbarking.
- Thinning Brigalow regrowth to a density of approximately 6,000 stems/ha (predicted to be the optimal thinning density for structural development [after Dwyer *et al.*, 2010] [Figure 14]).
- Thinning random Brigalow stems to mimic a natural ecosystem.
- Thinning Brigalow regrowth when the soil moisture is high to reduce the risk of prolific secondary suckering.
- Retaining buffers of dense stems (approximately 10 m wide) along boundaries of existing non-remnant areas to help reduce the spread of Buffel Grass, as required (after Dwyer *et al.*, 2010).
- Retaining dead stags in-situ.
- Monitoring (Section 5.1.6) and controlling secondary suckering via this method.

Grass cover is another aspect that needs to be considered. Less tree canopy provides greater sunlight to the understorey and higher grass growth (Figure 14). High grass cover can increase the risk of grass fires that present a risk to the Brigalow (*Acacia harpophylla* dominant and co-dominant) community. Dwyer *et al.* (2010) indicates that from their studies, the canopy cover should maintain at least 50% cover, but higher cover may be required to manage thick grass growth.

Any Brigalow regrowth restoration thinning will be conducted in accordance with relevant Qld environmental approvals. The following will be documented:

- the area that has been selectively thinned;
- species diversity prior to thinning;
- rate of selectively thinning and the density (stems/ha); and
- method of thinning (i.e. mechanical methods).

Restoration thinning of other vegetation communities is not proposed at this time and will only be considered if it can be demonstrated that there is a need for thinning and relevant Qld environmental approvals are obtained.



Source: University of Queensland (2011).

Figure 14 - Restoration Thinning Guide

6.2 IMPACTS FROM A THIRD PARTY

The offset areas will be fenced, locks will be installed on the gates and signage will be installed along main access roads (Sections 3.8 and 3.9). These provisions will deter third party access into the offset areas.

In the event that a third party impacts the offset areas, MCPL will notify DEE with the following details (where known):

- who has impacted the offset areas;
- the nature and extent of the impact;
- when the impact occurred;
- why the impact occurred; and
- if there is a proposal from the third party to remedy the impact.

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 9, if MCPL wishes to carry out any activity otherwise than in accordance with this Offset Management Plan/Vegetation Management Plan, MCPL will submit for the Commonwealth Minister's approval a revised version of this Offset Management Plan/Vegetation Management Plan as described in Section 10.4.2.

The offset areas are overlying ML 1831 and ML 1894 held by Anglo Coal. There is no current proposal to mine (underground or open cut) within the offset area. Any future mining proposals within the offset areas will need to account for the impacts to the offset areas. MCPL will notify DEE of any future mining proposal received from Anglo Coal or other party.

7 TIMING AND RESPONSIBILITIES

A schedule of timing for management activities and monitoring is provided in Sections 3.13 and 5.

If MCPL elect a third party to take on responsibilities for the management measures, in accordance with EPBC 2010/5394 Commonwealth Approval Condition 2, MCPL will obtain agreement from the third parties responsible for management measures and provide details of the responsible parties, including their position or status as a separate contractor, to DEE.

The MCPL Environmental Manager will be responsible for the monitoring, reviewing and implementation of this Offset Management Plan. The MCPL Environmental Manager will be responsible for the implementation of any revisions of this Offset Management Plan/Vegetation Management Plan in consultation with the DEE.

8 COST OF ACTIVITIES

In accordance with the *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011) the management costs associated with achieving the objectives, actions and outcomes of the offset areas are to be estimated. To this end, MCPL commissioned Greening Australia to undertake a costing model for the MCPL offset areas (Middlemount Coal Mine Rail Loop and Spur Offset Areas, Parrot Quarry Offset Areas and Thirteen Mile Gully Diversion Offset Area).

9 TRUST FUND

In accordance with the *Queensland Policy for Vegetation Management Offsets (Version 3)* (DERM, 2011), since the management of the offset areas (Middlemount Coal Mine Rail Loop and Spur Offset Areas, Parrot Quarry Offset Areas and Thirteen Mile Gully Diversion Offset Area) area required for more than three years, the trust account details (financial institution, bank account number and name) for the holding of funds for the ongoing management actions of the offset areas and details of any milestone payments are to be provided to DNRM.

Annual management costs for the Thirteen Mile Gully Offset Area, Rail loop and Spur Offset Areas and the Parrot Quarry Offset Areas will be transferred to the nominated trust account within four months of the relevant development permit being issued (for direct offsets [e.g. Thirteen Mile Gully Diversion Offset Area]) or at the time the offset areas is legally secured (offset transfers [e.g. Middlemount Coal Mine Rail Loop and Spur Offset Areas and the Parrot Quarry Offset Areas]). For every year thereafter, annual management costs (Thirteen Mile Gully Offset Area, Rail loop and Spur Offset Areas, Parrot Quarry offset areas) will be calculated and then transferred to the nominated trust account on the anniversary date of the first payment.

10 REPORTING, AUDIT AND REVIEWING

10.1 DOCUMENTATION

10.1.1 Middlemount Coal (Stage 2) Project Commonwealth Offset Area

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 12, MCPL will maintain accurate records of all activities associated with or relevant to the Commonwealth Approval (EPBC Act 2010/5394) and make them available on request by DEE. Such documents will be subject to audit by DEE and used to verify compliance with the conditions of approval. Summaries of audits will be posted on the DEE website. The results of audits will also be publicised through the general media.

Monitoring reports for the Middlemount Coal (Stage 2) Project Commonwealth Offset Area will contain, at a minimum:

- Name and contact details of company/persons undertaking management activities.
- Name and contact details of company/persons undertaking monitoring activities.
- Results of monitoring the effectiveness of the regeneration in the offset areas.
- Data collected from current and previous monitoring events.
- An analysis of the monitoring data and photo points over time.
- All data will be correctly labelled with date, location, GPS points for end points of transect and any other observations.
- An overview of the progress of achieving the performance and completion criteria.
- An indication of any risks or potential threats that have become apparent, and activities to be undertaken to manage these threats and/or risks.
- Identification of any need for improved management.

10.1.2 North-eastern Extension Commonwealth Offset Area

In accordance with 2016/7717 Commonwealth Approval Condition 7, MCPL will maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the offsets, monitoring results and the Annual Compliance Report required by this approval, and make them available upon request to DEE. Such records will be subject to audit by DEE or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on DEE's website. The results of audits will also be publicised through the general media.

Monitoring reports for the North-eastern Extension Commonwealth Offset Area will contain, at a minimum, the same information as listed in Section 10.1.1.

10.1.3 Western Extension Commonwealth Offset Area

MCPL will comply with Commonwealth Approval Conditions issued under EPBC 2017/8130, including any relating to documentation. Monitoring reports for the Western Extension Commonwealth Offset Area will contain, at a minimum, the same information as listed in Section 10.1.1.

10.1.4 Weed Monitoring Report

A weed monitoring report will be prepared annually by a suitably qualified person and will include:

- a map indicating the location and estimated abundance of noxious and/or environmental weeds recorded during monitoring;
- control methods, effort and timing;
- weeds controlled (species, area); and
- effectiveness of the weed control.

10.1.5 Pest Animal Monitoring Report

A pest animal monitoring report will be prepared annually by a suitably qualified person and will include:

- the location and abundance of pest animals recorded during monitoring;
- control methods, effort and timing;
- pest animals controlled (species, sex, number); and
- effectiveness of the control methods.

10.2 COMPLIANCE REPORTING

10.2.1 Qld State Requirements

In accordance with the *Middlemount Coal Mine North-eastern Extension Offset Delivery Plan* (MCPL, 2017), a monitoring report for the North-eastern Extension State Offset Area will be provided annually to DNRM (Rockhampton) for the first 5 years. After 5 years, reports will be provided every 2 years until the completion criteria have been met. These monitoring reports will contain, at a minimum:

- Name and contact details of landholder. If someone other than the landholder is undertaking management activities (i.e. a contractor) then their details must also be provided.
- eLVAS case number [if known].
- Lot on Plan property description and postal address.
- Photo monitoring results.
- If transects required, revegetation/restoration data collected from transects, outlining species present, average canopy cover and height of vegetation. All data should be correctly labelled with date, location, GPS points for end points of transect and any other observations.
- Annexure A - Management Activities Schedule with the progress section completed.
- An overview of the progress of the management area in achieving the management outcomes and how any risks or threats have impacted on the area.

- An indication of any risks or potential threats that have become apparent to the management area since the development of the management plan, and activities to be undertaken to manage these threats and/or risks.
- Where the proponent is proposing that the management outcomes have been achieved and the report is being submitted as the final report, the proponent must provide evidence that all management outcomes have been achieved in full.

10.2.2 EPBC Act Compliance Report - Middlemount Coal (Stage 2) Project Commonwealth Offset Area

MCPL notified DEE that the referred action (Middlemount Coal Mine [Stage 2 Project]) was to commence on the 17 September 2012. In accordance with EPBC 2010/5394 Commonwealth Approval Condition 7, within 3 months of every 12 month anniversary of the commencement of the action, MCPL will publish a report on their website addressing compliance with each of the conditions of the Commonwealth Approval, including implementation of any management plans.

10.2.3 EPBC Act Compliance Report - North-eastern Extension Commonwealth Offset Area

By 17 December each year, MCPL will submit to DEE an Annual Compliance Report for EPBC 2016/7717 Commonwealth Approval covering the period of 18 September of the previous year to 17 September of that year. The Annual Compliance Report will:

- Address compliance with each of the conditions of EPBC 2016/7717 Commonwealth Approval, including implementation of any management plans as specified in the conditions.
- Provide evidence of the progress achieved by the approval holder in reaching the condition targets for the North-eastern Extension Commonwealth Offset Area.

The Annual Compliance Report will include benchmarks, prepared by a suitably trained ecologist/s, that provide clear and measurable goals that will indicate whether the North-eastern Extension Commonwealth Offset Area is on track to be delivered by the 15 year anniversary of commencement of the action (i.e. prior to 16 August 2032⁹). The report will state whether each benchmark has been met. If the benchmarks have not been met, the report will state what measures are being taken to ensure that the condition targets will be met by the 15 year anniversary of the commencement of the action (i.e. prior to 16 August 2032).

Unless otherwise agreed to in writing by the Minister, MCPL will publish the Annual Compliance Report on its website. The Annual Compliance Report will be published on MCPL's website within 1 month of being provided to DEE. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to DEE in the following Annual Compliance Report. The Minister may provide written consent to cease the Annual Compliance Report if satisfied that the action is complete and there are no further outstanding requirements.

10.2.4 EPBC Act Compliance Report - Western Extension Commonwealth Offset Area

MCPL will comply with Commonwealth Approval Conditions issued under EPBC 2017/8130, including any relating to compliance reporting.

⁹ Commencement of the action under EPBC 2016/7717 Commonwealth Approval was 16 August 2017.

10.2.5 Publishing of this Plan

Middlemount Coal (Stage 2) Project Commonwealth Offset Area

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 13, unless otherwise agreed to in writing by the Commonwealth Minister, MCPL will publish this Offset Management Plan / Vegetation Management Plan on their website within 1 month of being approved by the Commonwealth Minister.

North-eastern Extension Commonwealth Offset Area

In accordance with EPBC 2016/7717 Commonwealth Approval Condition 2b, MCPL will publish this Offset Management Plan/ Vegetation Management Plan on their website within 1 month of the offset mechanism being granted by the Qld Government.

10.3 INDEPENDENT AUDIT

10.3.1 Middlemount Coal (Stage 2) Project Commonwealth Offset Area

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 8, upon the direction of the Commonwealth Minister, MCPL will ensure that an independent audit of compliance with the Commonwealth Approval (EPBC Act 2010/5394) is conducted and a report is 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.

10.3.2 North-eastern Extension Commonwealth Offset Area

In accordance with EPBC 2016/7717 Commonwealth Approval Condition 8, upon the direction of the Commonwealth Minister, MCPL will ensure that an independent audit of compliance with the Commonwealth Approval (EPBC 2016/7717) is conducted and a report submitted to the Minister. The independent auditor and the audit criteria will be approved by the Commonwealth Minister prior to the beginning of the audit. The audit report will address the criteria to the satisfaction of the Commonwealth Minister.

10.3.3 Western Extension Commonwealth Offset Area

MCPL will comply with Commonwealth Approval Conditions issued under EPBC 2017/8130, including any relating to independent audits of compliance.

10.4 REVIEW AND REVISION OF THIS PLAN

10.4.1 Qld State Requirements

Once a VDec is established over the offset areas, any amendments to this Offset Management Plan / Vegetation Management Plan are to be made by agreement between MCPL and the chief executive of DNRM. The *Guide to Voluntary Declarations under the Vegetation Management Act, 1999* (DNRM, 2017) states:

To maintain flexibility and ensure that the plan remains up to date, the management plan can be changed...The amendment provision provides flexibility and ensures the management plan remains up to date and relevant to achieving the purpose of the VDec.

10.4.2 Middlemount Coal (Stage 2) Project Commonwealth Offset Area

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 9, if MCPL wishes to carry out any activity otherwise than in accordance with this Offset Management Plan/Vegetation Management Plan, MCPL will submit for the Commonwealth Minister's approval a revised version of this Plan. If the Commonwealth Minister approves such a revised plan, that plan will be implemented in place of the plan originally approved.

In accordance with EPBC 2010/5394 Commonwealth Approval Condition 10, if the Commonwealth Minister believes that it is necessary or convenient for the better protection of listed threatened species and threatened ecological communities to do so, the Commonwealth Minister may request that MCPL make specified revisions to the plan approved under the Commonwealth Approval and submit the revised plan for the Commonwealth Minister's approval. MCPL will comply with any such request. The revised approved plan will be implemented in place of the plan originally approved.

10.4.3 North-eastern Extension Commonwealth Offset Area

If MCPL wishes to carry out any activity otherwise than in accordance with this Offset Management Plan/Vegetation Management Plan, MCPL will submit for the Commonwealth Minister's approval a revised version of this Plan.

10.4.4 Western Extension Commonwealth Offset Area

MCPL will comply with Commonwealth Approval Conditions issued under EPBC 2017/8130, including any relating to review and revision of this plan.

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APPENDIX A

ECOLOGICAL INVESTIGATIONS WITHIN THE OFFSET AREA FOR STAGE 2 OF THE MIDDLEMOUNT COAL MINE, QUEENSLAND

Ecological Investigations within the Offset Area for Stage 2 of the Middlemount Coal Mine, Queensland

PREPARED FOR:

Middlemount Coal Pty Ltd

OCTOBER 2012



Table of Contents

EXECUTIVE SUMMARY.....	1
1 Introduction	1
1.1 Background	1
1.2 Study Area.....	3
2 Methods.....	4
2.1 Desktop Assessment	4
2.2 Field Assessments	4
3 Results.....	6
3.1 Field Verified Regional Ecosystems	6
3.2 Regional Ecosystems of Conservation Significance.....	16
3.3 Threatened Ecological Communities.....	16
3.4 Broad Fauna Habitat Types.....	16
3.5 Flora Species.....	22
3.6 Species of Conservation Significance	22
3.7 Weed Species.....	26
3.8 Pest Animals	27
4 References	29

Tables

Table 1: Certified and Field Verified Regional Ecosystems and Conservation Status within the Study Area	8
Table 2: Fauna Habitats within the Study Area.	18
Table 3: Location of Conservation Significant Flora and Fauna Species Recorded Within the Study Area.	22

Figures

Figure 1. Location of the Approved Middlemount Coal Mine and Study Area

Figure 2. Department of Environment and Heritage Protection Certified Regional Ecosystems

Figure 3. Field-verified Regional Ecosystems

Figure 4. Non-remnant and Brigalow Regrowth within the Study Area

Figure 5. Field-verified Regional Ecosystems – Conservation Status

Figure 6. Fauna Habitats

Figure 7. Species of Conservation Significance

Figure 8. Pest Animals

Plates

Plate 1. *Desmodium macrocarpum* in RE 11.5.18

Plate 2. *Cerbera dumicola* in RE 11.5.18

Plate 3. Koala in RE 11.7.2

Attachments

Attachment 1. Flora Species Recorded During the Survey

Acknowledgments

We thank the following people for their contribution to the project:

- Mark Jacobs (Middlemount Coal) for project and site information;
- Shaun Collins (Middlemount Coal) for project, site information and GIS layers
- Wayne Pidgeon (Polylogics) for site access and logistic help
- The Department of Environment and Heritage Protection for access to the data on Regional Ecosystems

The following Ecology and Heritage Partners Pty Ltd employees
contributed to the preparation of this report:

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Monique Elsley and Amanda Feetham

Project number: 4166

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EXECUTIVE SUMMARY

Middlemount Coal Pty Ltd (MCPL) have established an offset area as part of the approval conditions under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) for the Stage 2 expansion of their coal-mining operations. The offset area is located on freehold land owned by MCPL approximately 270 kilometres (km) north-west of Rockhampton and 6 km south-west of Middlemount, Queensland (QLD).

Ecology and Heritage Partners Pty Ltd were engaged by MCPL to undertake ecological investigations within a study area within the offset area as part of Stage 2 works for the Middlemount Project, the results of which are contained within this report. Field assessments were conducted by a team of four botanists 10-14 July, 29 July - 3 August and 13-17 August 2012. Quaternary field assessments were conducted within each homogeneous patch of a Regional Ecosystem (RE). REs were identified and mapped in accordance with Neldner *et al.* (2005).

The study area contains 17 distinct REs. Of the approximate 3,289 hectares (ha) contained within the study area, approximately 50% (1,646 ha) is remnant vegetation. The remainder of the study area (approximately 50%) is non-remnant vegetation (1,643 ha).

Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community (listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* [EPBC Act] and *Vegetation Management Act 1999* [VM Act]) occurs over approximately 171.63 ha of the study area. Two REs listed under the VM Act as „Of Concern“ occur in the study area. Six REs with a Biodiversity Status Of Concern were recorded within the study area.

Two flora species of conservation significance, the Large-podded trefoil (*Desmodium macrocarpum*) and *Cerbera dumicola* (listed as Near Threatened under the *Nature Conservation Act 1992* [NC Act]) were recorded during the surveys.

Three fauna species of conservation significance were recorded during surveys, namely the: Koala (*Phascolarctos cinereus*) (listed as Vulnerable under the EPBC Act), Squatter Pigeon (*Geophaps scripta scripta*) (listed as Vulnerable under the EPBC Act and NC Act) and Rainbow Bee-eater (*Merops ornatus*) (listed as Migratory under the EPBC Act). Five broad fauna habitat types occur within the study area: non-remnant woodlands; Eucalypt woodlands; wetlands and riparian habitats; Brigalow woodlands and cracking clays; and escarpment with *Acacia* and mixed species woodlands.

Four pest animals (Pig [*Sus scrofa*], Dog [*Canis lupus familiaris*], Rabbit [*Oryctolagus cuniculus*] and Cat [*Felis catus*]) and three weed species (Harrisia Cactus [*Eriocereus martinii*], Velvety Tree Pear [*Opuntia tormentosa*] and Parthenium [*Parthenium hysterophorus*]) listed under the *Land Protection (Pest and Stock Route Management) Act 2002* were recorded during surveys.

1 INTRODUCTION

1.1 Background

Middlemount Coal Pty Ltd (MCPL) have established an offset area as part of the approval conditions under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) for the Stage 2 expansion of their coal-mining operations. The offset area is located on freehold land owned by MCPL approximately 270 kilometres (km) north-west of Rockhampton and 6 km south-west of Middlemount, Queensland (QLD) (Figure 1). It is positioned immediately west of the Middlemount Coal Mine (Figure 1).

Ecology and Heritage Partners Pty Ltd were engaged by Middlemount Coal Pty Ltd (MCPL) to undertake ecological investigations within a study area in the offset area as part of Stage 2 works for the Middlemount Project, the results of which are contained within this report. Scope of Assessment

The scope of works for this report includes:

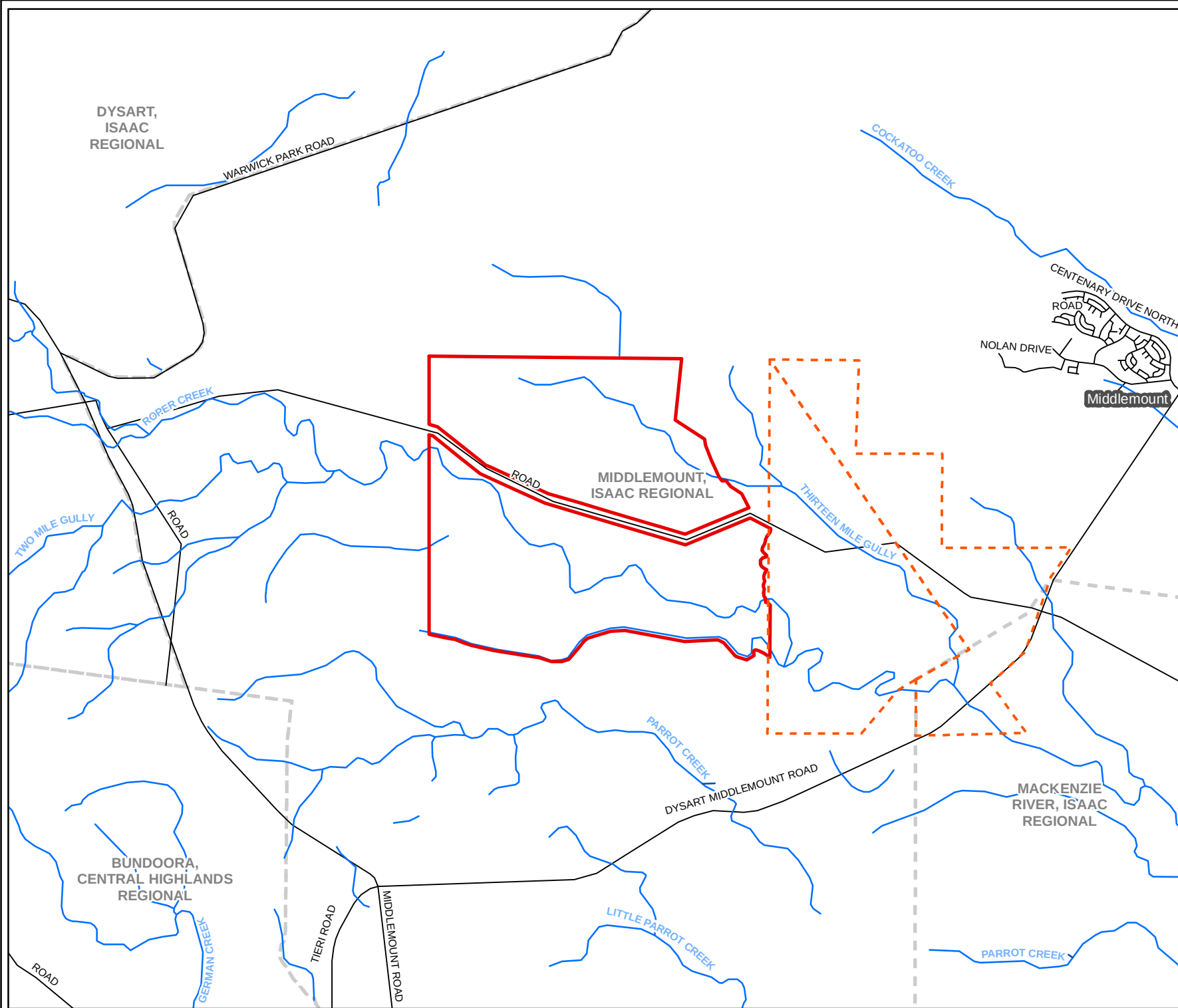
1. Mapping Regional Ecosystems (REs) and High Value Regrowth Vegetation, including:

- Field validating the presence and mapping of REs in the study area in accordance with Neldner *et al.* (2005).
- Ground truthing the QLD Department of Environment and Heritage Protection's (DEHP's) „high value regrowth vegetation“ mapping and identifying other areas of regrowth in the study area.
- Quantifying the area of each RE in the study area.
- Identifying the status of the REs in the study area under the QLD *Vegetation Management Act 1999* (VM Act) (particularly Endangered and Of Concern REs) and DEHP Biodiversity Status.

2. Surveys for flora species of conservation significance and recording all locations of species of conservation significance (including *Cerbera dumicola* and Large-podded Trefoil [*Desmodium macrocarpum*]).

3. Surveys for weeds and pest animals, including:

- Describing weeds in the study area, including declared plants under the QLD *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).
- Describing and mapping locations of pest animals in the study area, including declared animals under the LP Act.

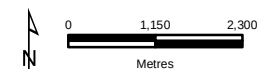


Legend

- Study Area
- Middlemount Coal Mine Mining Lease



Figure 1
Location of the Approved Middlemount Coal Mine and Study Area
Middlemount Coal Mine Stage 2 - Offset Area Report



4. Incidental sightings, including recording:

- Other ecological values (e.g. other Matters of National Environmental Significance) that are relevant to the Project.
- Opportunistic sightings of threatened and migratory species made during the field work.

1.2 Study Area

The study area consists of approximately 3,289.5 hectares (ha) of predominantly native vegetation, modified by grazing pressures and exotic plant species. The study area lies within the Isaac-Comet Downs subregion. The study area is part of a State-significant wildlife corridor under the Brigalow Belt Biodiversity Planning Assessment Version 1.3 (Environmental Protection Agency 2008a). Roper Creek, which bisects the study area approximately west-east is listed in the Brigalow Belt North Landscape Expert Panel Report (Environmental Protection Agency 2008b).

Land use within the study area is cattle grazing. The area is presently stocked.

2 METHODS

2.1 Desktop Assessment

The following resources were reviewed prior to undertaking the site assessment:

- current RE mapping, Biodiversity Planning Assessment: Brigalow Belt (v1.3) and descriptions of the environment within the study area (DEHP 2012);
- relevant flora and fauna databases (QLD Herbarium HERBRECS, Queensland Museum, Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) Protected Matters Search Tool, Wildlife Online [WildNet], Atlas of Living Australia and Birds Australia Atlas [1998-2008]);
- aerial photography of the study area;
- previous reports on environmental values in the region; and
- relevant federal and state legislation and policies.

2.2 Field Assessments

Field assessments were conducted by a team of four botanists on 10 - 14 July, 29 July - 3 August and 13-17 August 2012. The weather was unseasonably wet during the weeks preceding the surveys with over 80 millimetres (mm) of rain in the month of July, exceeding the monthly average of approximately 30 mm (Commonwealth Bureau of Meteorology 2012). This led to high amounts of grass cover, facilitating identification and detection of species. Due to cold weather conditions (0 °C - 20 °C daily) most reptile and amphibian species were inactive and not detectable.

Regional Ecosystem Mapping

The entire study area was traversed on foot and by vehicle in accessible areas within the study area. Quaternary field assessments were conducted within each homogeneous patch of an RE. REs were identified and mapped in accordance with Neldner *et al.* (2005) (with reference to the certified mapping and RE descriptions [DEHP 2012]).

Threatened Ecological Communities

Potentially occurring threatened ecological communities (TECs) listed under the EPBC Act were surveyed on foot and by off road vehicles. The extent of the communities was verified using the relevant listing and conservation advices on the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) website (SEWPaC, 2012a). TECs were identified following field-verification of REs.

Targeted Searches for Flora Species of Conservation Significance

Targeted searches were undertaken for flora species of conservation significance. Surveys were undertaken on foot either along randomly selected 50 metre (m) transects or involved thorough examination of potential habitat of threatened flora species. All locations of significant species were recording using a hand held global positioning system (GPS) unit.

Fauna Species

Conservation significant fauna species were opportunistically searched for and the locations of any threatened fauna species or migratory species seen during the surveys were recorded. No systematic surveys were conducted for fauna species (i.e. trapping, transect searches). A qualified zoologist was present during all flora and RE surveys to identify any incidental sightings of fauna species.

Fauna Habitat Assessment

Habitats were recorded within the entire study area which was traversed on foot and by vehicle in accessible areas. Habitats were determined according to structural components of the landscape and vegetation.

3 RESULTS

3.1 Field Verified Regional Ecosystems

The majority of mapped certified REs for the study area (DEHP 2012) were correct, however several refinements were made to the certified mapping following field survey verification (Table 1, Figures 2 and 3).

The five Land Zones contained within the study area are:

- Land zone 3: alluvial plains;
- Land zone 4: gently undulating clay;
- Land zone 5: uniform sand plains;
- Land zone 7: duricrusts and footslopes; and
- Land zone 9: fine-grained sedimentary rocks.

The study area contains 17 distinct REs (Table 1). Non-remnant and non-regrowth vegetation communities within the area consisted of grasslands typically dominated by exotic Buffel Grass (*Cenchrus ciliaris*) and a mixture of native and exotic grasses. The condition of these grasslands varied with grazing pressure, but each typically had good ground cover and dense grass due to recent heavy rainfall.

Of the approximate 3,289 ha contained within the study area, approximately 50% (1,646 ha) is remnant vegetation (Figure 3). The remainder of the study area (approximately 50%) is non-remnant vegetation (1,643 ha). Brigalow non-remnant regrowth occurs over approximately 2.9% (94 ha) of the study area (Figure 4).

Changes to DEHP Certified Mapping

As a result of field verification of DEHP certified mapping a number of changes to the RE mapping were made. Nine REs not mapped as homogenous patches were added to the verified RE mapping and 11 REs mapped in certified mapping were not found during verified mapping fieldwork. The predominant changes to certified mapping involved REs that were mapped as mosaics. Many of these mosaic REs were homogeneous REs and were thus remapped as a single RE unit, particularly within Landzone 3. Within Landzone 3 there were three RE mosaics that were remapped as homogenous patches: 11.3.1/11.3.2, 11.3.2/11.3.27 and 11.3.2/11.3.7. In Landzone 3 there were four REs that were not represented in certified mapping but were identified during field verification, these are 11.3.1, 11.3.1b, 11.3.21 and 11.3.27d.

Other changes resulted from assessing understorey and midstorey composition within REs, particularly within Landzone 4. The absence of *Terminalia oblongata* and presence of *Lysiphylum carronii* in areas mapped as 11.4.9 resulted in changing these REs to either 11.4.3

or 11.4.9a. Other substantial changes included remapping mosaics of 11.7.2 and 11.5.18 as homogenous patches.

REs that were mapped in DEHP certified mapping but not confirmed by field verification are: 11.3.1/11.3.2 mosaic, 11.3.2/11.3.27 mosaic, 11.3.2/11.3.7 mosaic, 11.3.21, 11.4.9, 11.4.9/11.4.7 mosaic, 11.4.9/11.4.8 mosaic, 11.5.9b, 11.5.9b/11.5.3 mosaic, 11.7.2/11.5.18 mosaic, 11.7.2/11.7.4 mosaic and 11.7.4/11.5.18 mosaic.

REs not mapped by DEHP certified mapping but mapped during field verification were 11.3.1, 11.3.1b, 11.3.27d, 11.4.3, 11.5.18, 11.5.3b and 11.7.2.

Table 1: Certified and Field Verified Regional Ecosystems and Conservation Status within the Study Area

Regional Ecosystem	Short Description	Status ¹			DEHP Certified Areas (ha)	Field Verified RE's (ha)
		VM Act	Biodiversity Status	EPBC Act		
Land zone 3: Alluvial Plains						
11.3.1/11.3.2	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains and <i>Eucalyptus populnea</i> woodland on alluvial plains.	E/OC	E/OC	E	13.72	0.00
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains.	E	E	E	0.00	16.60
11.3.1b	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains (Palustrine Wetland).	E	E	E	0.00	0.39
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	OC	OC	–	236.22	302.17
11.3.2/11.3.27	<i>Eucalyptus populnea</i> woodland on alluvial plains and Freshwater wetlands.	OC/LC	OC	–	73.19	0.00
11.3.2/11.3.7	<i>Eucalyptus populnea</i> woodland on alluvial plains and <i>Corymbia</i> spp. woodland on alluvial plains. Sandy soils	OC/LC	OC	–	7.87	0.00
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils.	E	E	E	0.41	0.00
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	LC	OC	–	159.24	127.34
11.3.27	Freshwater wetlands.	LC	OC	–	5.32	3.73
11.3.27b	Freshwater wetlands: Lacustrine wetland (e.g. lake). Vegetation ranges from open water +/- aquatics and emergents such as <i>Potamogeton crispus</i> , <i>Myriophyllum verrucosum</i> , <i>Chara</i> spp., <i>Nitella</i> spp., <i>Nymphaea violacea</i> , <i>Ottelia ovalifolia</i> , <i>Nymphoides indica</i> , <i>N. crenata</i> , <i>Potamogeton tricarinatus</i> , <i>Cyperus difformis</i> , <i>Vallisneria caulescens</i> and <i>Hydrilla verticillata</i> . Often with fringing woodland, commonly <i>Eucalyptus camaldulensis</i> or <i>E. coolabah</i> but also a wide range of other species including <i>Eucalyptus platyphylla</i> , <i>E. tereticornis</i> , <i>Melaleuca</i> spp., <i>Acacia holosericea</i> or other <i>Acacia</i> spp. Occurs on billabongs no longer connected to the channel flow.	LC	OC	–	11.00	11.00

Regional Ecosystem	Short Description	Status ¹			DEHP Certified Areas (ha)	Field Verified RE's (ha)
		VM Act	Biodiversity Status	EPBC Act		
11.3.27d	Freshwater wetlands: Palustrine wetland (e.g. vegetated swamp). <i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> woodland. A range of sedges and grasses occur in the ground layer including <i>Fimbristylis vagans</i> , <i>Myriophyllum striatum</i> , <i>Nitella pseudoflabellata</i> and <i>Pseudoraphis</i> spp. Occurs fringing large lakes.	LC	OC	–	0.00	11.50
11.3.7	<i>Corymbia</i> spp. woodland on alluvial plains. Sandy soils.	LC	OC	–	196.35	203.01
Land zone 4: Gently undulating clay						
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains.	E	E	E	0.00	56.06
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	E	E	E	25.24	47.56
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains.	E	E	E	6.27	0.00
11.4.9a	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains: <i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open-forest to woodland.	E	E	E	0.00	43.92
11.4.3 (Regrowth)	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains: <i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open-forest to woodland.	-	-	-	0.00	94.47
11.4.9/11.4.7	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains and Open forest to woodland of <i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on Cainozoic clay plains.	E	E	E	35.81	0.00

Regional Ecosystem	Short Description	Status ¹			DEHP Certified Areas (ha)	Field Verified RE's (ha)
		VM Act	Biodiversity Status	EPBC Act		
11.4.9/11.4.8	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains and <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	E	E	1.29	0.00
Land zone 5: Uniform sand plains						
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces: <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	LC	NOC	–	68.97	0.00
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	OC	OC	–	0.00	85.02
11.5.18 (with <i>Cerbera dumicola</i>)	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces with <i>Cerbera dumicola</i> .	OC	OC	–	0.00	11.08
11.5.3	<i>Eucalyptus populnea</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces.	LC	NOC	–	263.54	324.53
11.5.3b	<i>Eucalyptus populnea</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces: Palustrine wetland (e.g. vegetated swamp). <i>Eucalyptus populnea</i> on closed depressions.	LC	NOC	–	0.00	6.79
11.5.9b	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains/remnant surfaces. Plateaus and broad crests: <i>E. crebra</i> , <i>E. tenuipes</i> , <i>Lysicarpus angustifolius</i> +/- <i>Corymbia</i> spp. Woodland.	LC	NOC	–	23.01	0.00

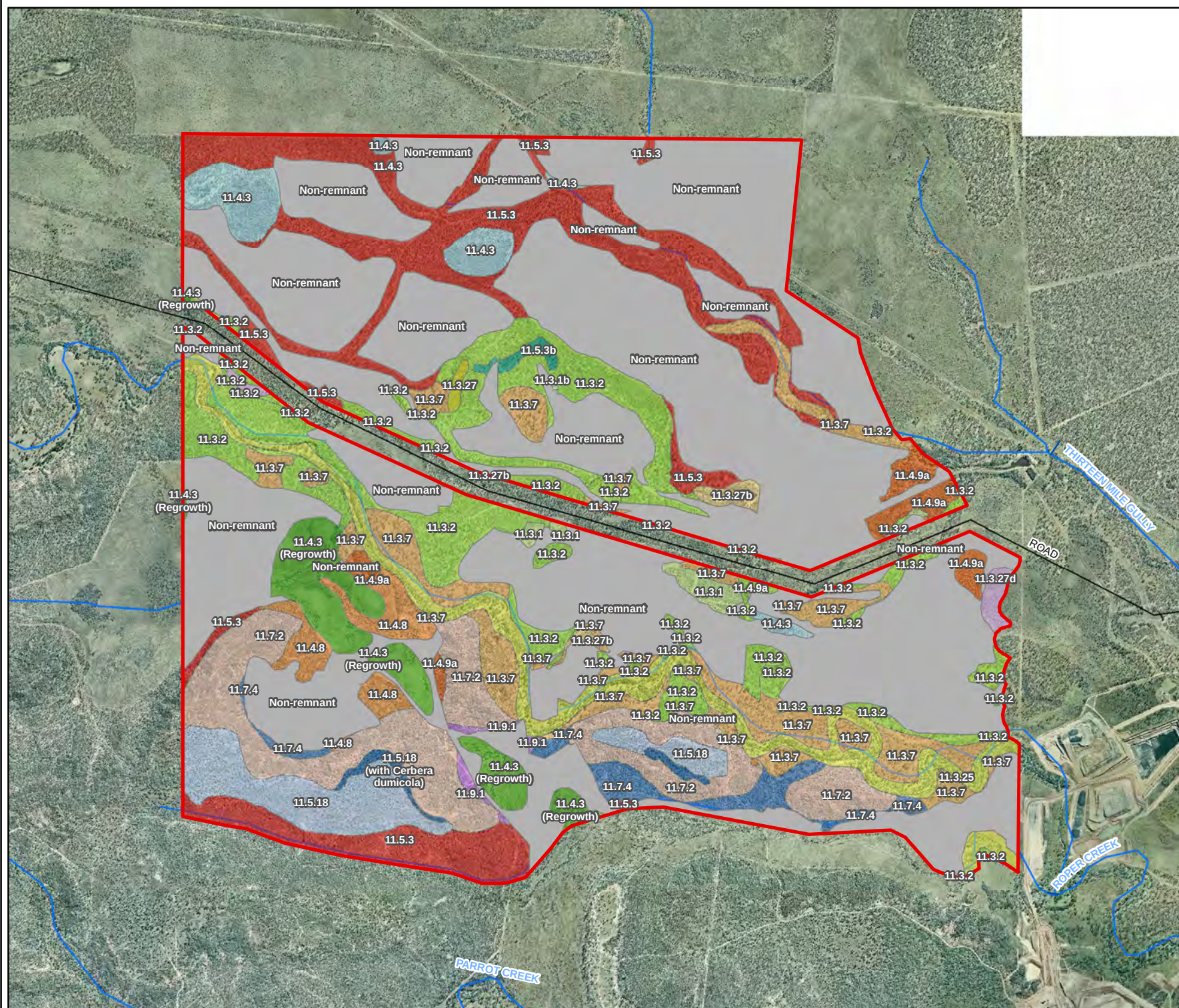
Regional Ecosystem	Short Description	Status ¹			DEHP Certified Areas (ha)	Field Verified RE's (ha)
		VM Act	Biodiversity Status	EPBC Act		
11.5.9b/11.5.3	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains/remnant surfaces. Plateaus and broad crests: <i>E. crebra</i> , <i>E. tenuipes</i> , <i>Lysicarpus angustifolius</i> +/- <i>Corymbia</i> spp. woodland. (BVG1M: 18b) and <i>Eucalyptus populnea</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces.	LC	NOC	–	92.24	0.00
Land zone 7: Duricrusts and footslopes						
11.7.2/11.5.18	<i>Acacia</i> spp. woodland on lateritic duricrust. Scarp retreat zone and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	LC	NOC	–	179.33	0.00
11.7.2/11.7.4	<i>Acacia</i> spp. woodland on lateritic duricrust. Scarp retreat zone and <i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust.	LC	NOC	–	53.19	0.00
11.7.2	<i>Acacia</i> spp. woodland on lateritic duricrust. Scarp retreat zone.	LC	NOC	–	0.00	231.29
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust.	LC	NOC	–	4.77	43.68
11.7.4/11.5.18	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	LC	NOC	–	38.91	0.00
Land zone 9: Fine-grained sedimentary rocks						
11.9.1	<i>Acacia harpophylla</i> - <i>Eucalyptus cambageana</i> open forest to woodland on fine-grained sedimentary rocks.	E	E	E	4.69	7.10
Total Area Remnant (ha)					1500.57	1645.73
Total Area Endangered VM Act, Biodiversity Status and EPBC Act (ha)					80.75	171.63
Total Area Of Concern VM Act (ha)					317.28	398.27

Regional Ecosystem	Short Description	Status ¹			DEHP Certified Areas (ha)	Field Verified RE's (ha)
		VM Act	Biodiversity Status	EPBC Act		
Total Area Of Concern Biodiversity Status (ha)					681.19	754.85
Total Area Non-Remnant (ha)					1788.91	1645.73
Total Study area Size					3289.50	3289.50

Note: Numbers may not add up due to rounding.

¹RE conservation status under the VM Act, its Biodiversity status and status under the EPBC Act (current at 11 September 2012).

E = Endangered, OC = Of Concern, LC = Least Concern, NOC = Not of Concern.



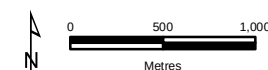
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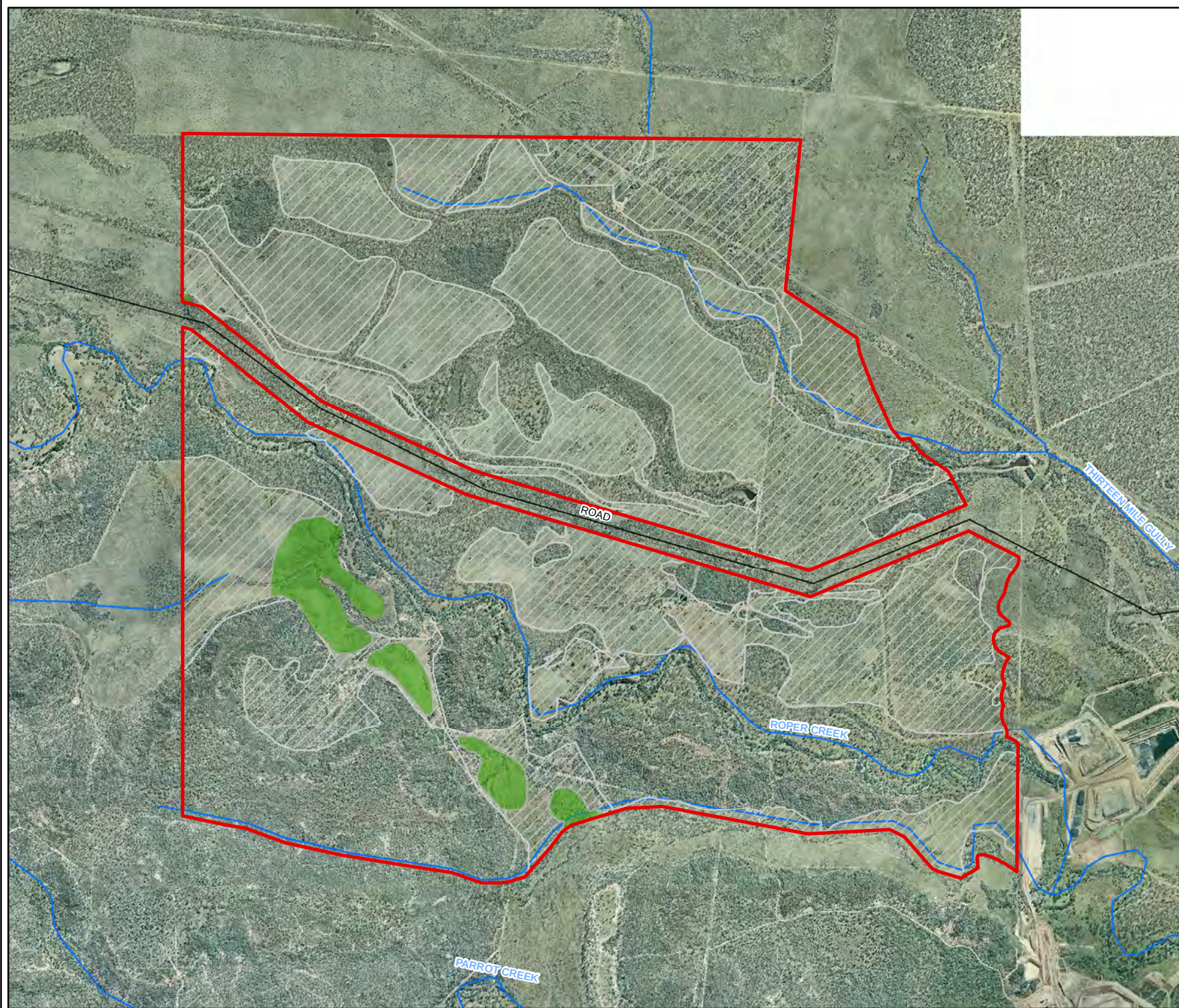
 Study Area

Regional Ecosystems

- 11.3.1
- 11.3.1b
- 11.3.2
- 11.3.25
- 11.3.27
- 11.3.27b
- 11.3.27d
- 11.3.7
- 11.4.3
- 11.4.3 (Regrowth)
- 11.4.8
- 11.4.9a
- 11.5.18
- 11.5.18 (with *Cerbera dumicola*)
- 11.5.3
- 11.5.3b
- 11.7.2
- 11.7.4
- 11.9.1
- Non-remnant

Figure 3
Field-verified Regional Ecosystems
 Middlemount Coal Mine
 Stage 2 - Offset Area Report





Legend

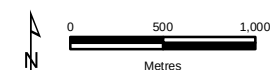
 Study Area

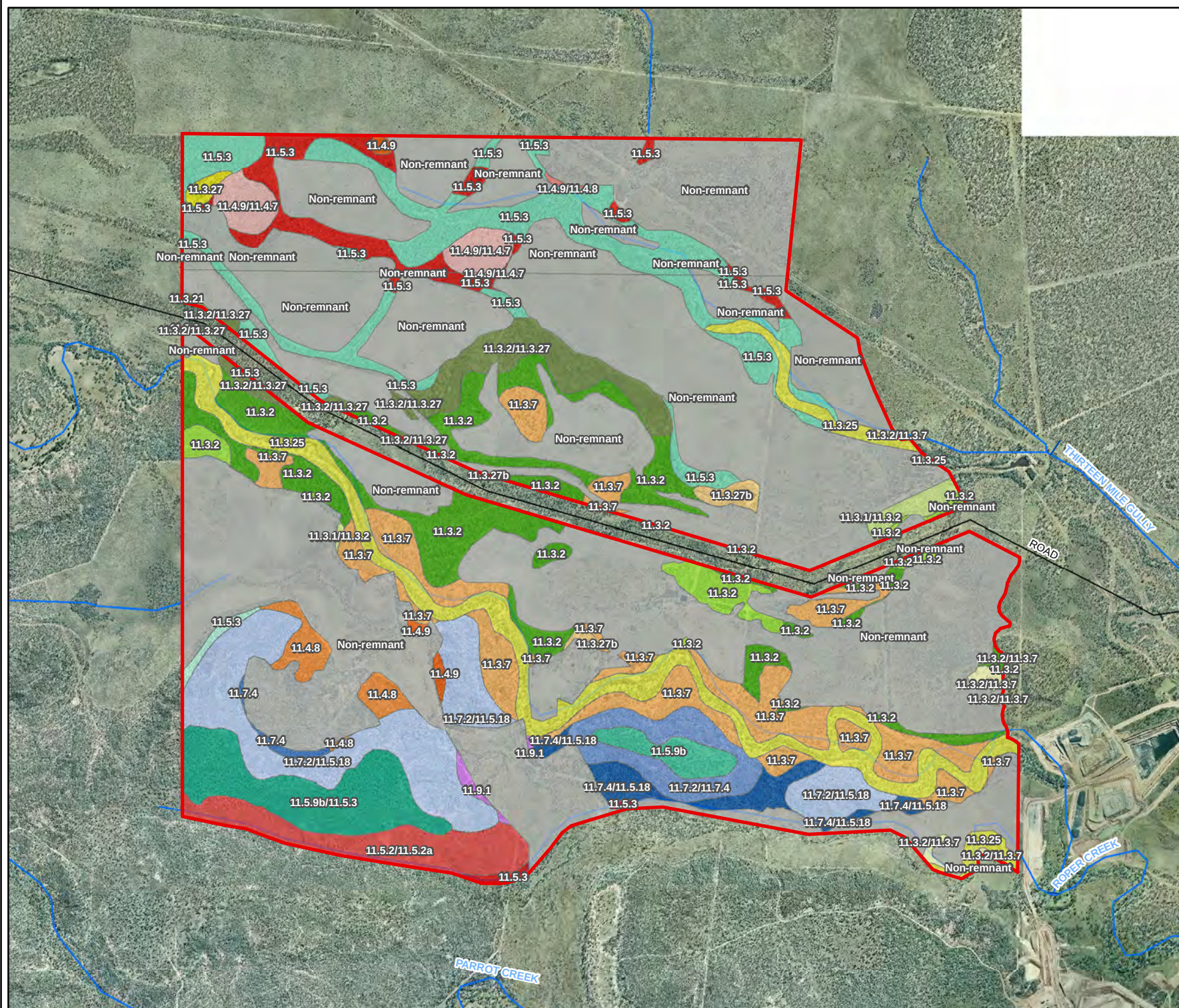
Regional Ecosystem

 11.4.3 - Regrowth Area

 Non-remnant

Figure 4
Non-remnant and Brigalow
Regrowth within the Study
Area
Middlemount Coal Mine
Stage 2 - Offset Area Report





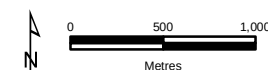
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Study Area

Regional Ecosystems

- 11.3.1/11.3.2
- 11.3.2
- 11.3.2/11.3.2
- 11.3.2/11.3.27
- 11.3.2/11.3.7
- 11.3.21
- 11.3.25
- 11.3.27
- 11.3.27b
- 11.3.7
- 11.4.3
- 11.4.8
- 11.4.9
- 11.4.9/11.4.7
- 11.4.9/11.4.8
- 11.5.2/11.5.2a
- 11.5.3
- 11.5.3/11.5.3
- 11.5.3/11.5.3/11.5.3
- 11.5.9b
- 11.5.9b/11.5.3
- 11.7.2/11.5.18
- 11.7.2/11.7.4
- 11.7.4
- 11.7.4/11.5.18
- 11.9.1
- Non-remnant

Figure 2
 Department of Environment
 and Heritage Protection
 Certified Regional
 Ecosystems
 Middelmount Coal Mine
 Stage 2 - Offset Area Report



3.2 Regional Ecosystems of Conservation Significance

The Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (listed as an EEC under the EPBC Act – described below in Section 4.4), comprised of six REs (REs 11.3.1, 11.3.1b, 11.4.3, 11.4.8, 11.4.9a and 11.9.1) was confirmed in the study area. Brigalow occurred over approximately 171.63 ha of the study area (Table 1, Figures 3 and 5). The areas of Brigalow occur as small isolates typically within areas of Eucalyptus-dominated or non-remnant REs.

Two REs listed under the VM Act as „Of Concern“ occur in the study area (RE 11.3.2 and RE 11.5.18). An area of RE 11.5.18 occurs with co-dominant *Cerbera dumicola* growing to >6 m high. While this area is approximately 11 ha and therefore not large enough to comprise a distinct RE, it is an area of distinct vegetation and is labelled “11.5.18 (with *Cerbera dumicola*)” for the purposes of this report to facilitate later reference (Table 1).

Five REs (including one RE with three variations) with a Biodiversity Status Of Concern were recorded within the study area (11.3.2, 11.3.7, 11.3.25, 11.3.27, 11.3.27b, 11.3.27d and 11.5.18) (Table 1; Figures 3 and 5).

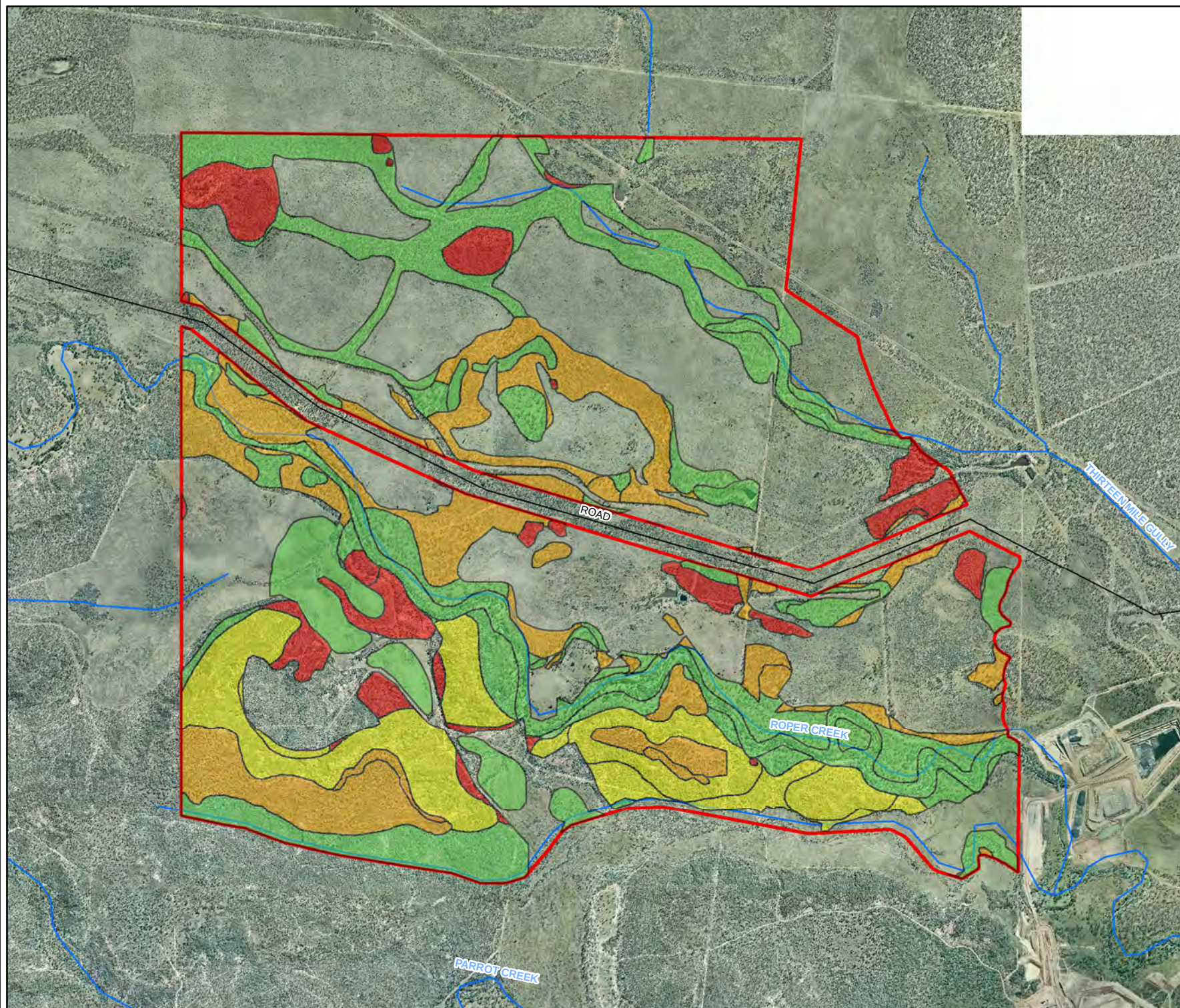
3.3 Threatened Ecological Communities

One TEC listed under the EPBC Act was identified in the study area, namely the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC.

A total of approximately 171.63 ha of Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC occurs within the study area (Table 1; Figures 3 and 5). Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC within the study area is comprised of six REs (Table 1; Figure 3). Each of these communities is in good ecological condition (for the most part) where they occur within the study area. There are few to no weeds within the patches and the only existing impact is from cattle grazing. Approximately 90 ha of Brigalow regrowth occurs in the study area, but does not meet the condition criteria for the Brigalow TEC because it is recent regrowth (after Butler [2007] in SEWPaC, 2012b). Although this Brigalow Open Forest currently does not meet the criteria for the Brigalow TEC, it is likely that these patches could meet the Brigalow TEC condition thresholds in the future (specifically the management of grazing and management of the area for conservation purposes).

3.4 Broad Fauna Habitat Types

Five broad habitat types occur within the study area (Table 2, Figure 6): non-remnant woodlands; Eucalypt woodlands; wetlands and riparian habitats; Brigalow woodlands and cracking clays; and escarpment with *Acacia* and mixed species woodlands.



Legend

Study Area

Conservation Status

- Endangered-dominant / EBPC Act-listed Brigalow TEC
- Of Concern-dominant
- Of Concern-subdominant
- Not Of Concern

Figure 5
Field-verified Regional Ecosystems - Conservation Status
Middlemount Coal Mine Stage 2 - Offset Area Report

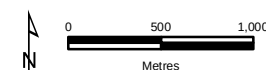
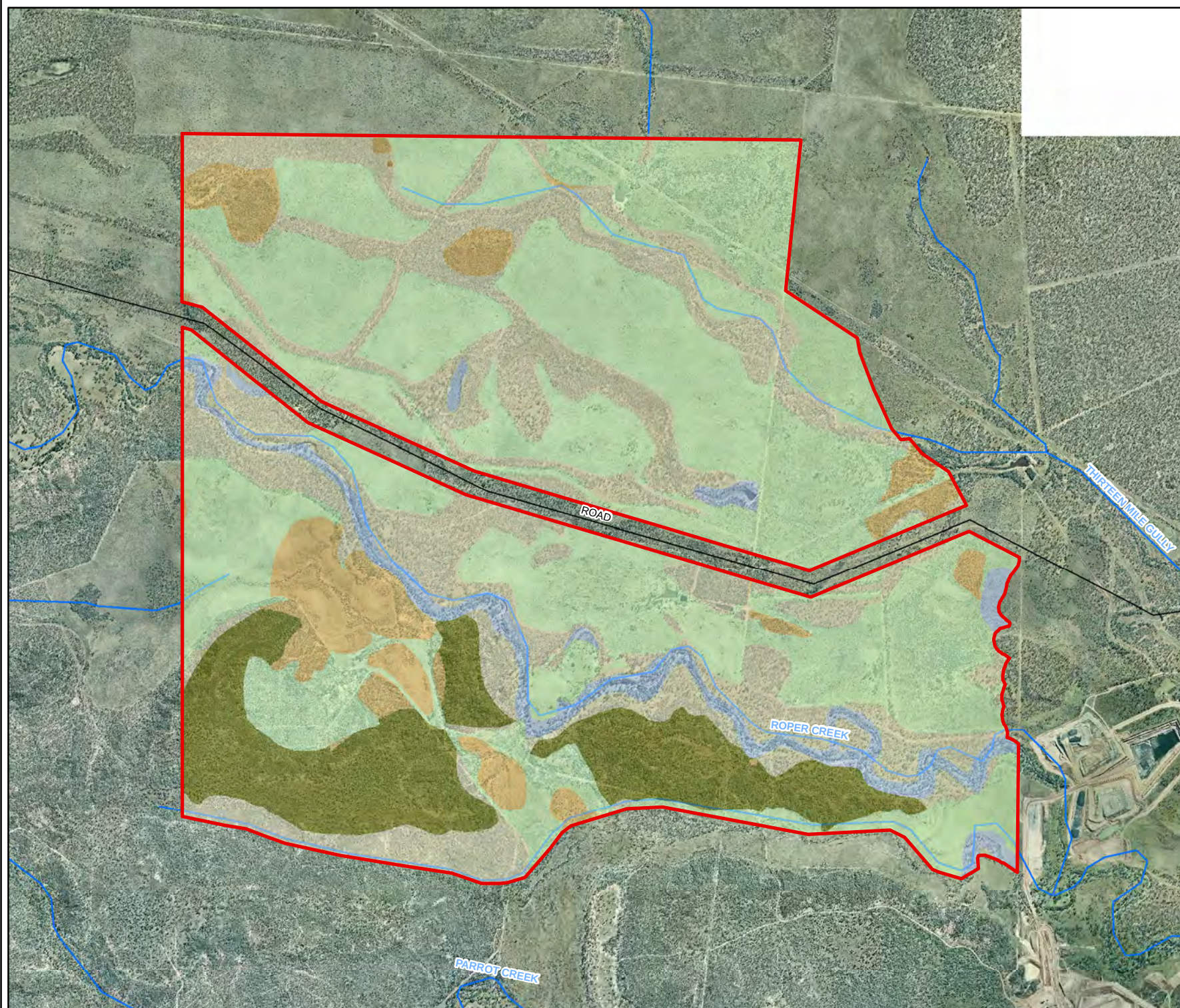


Table 2: Fauna Habitats within the Study Area.

Habitat Type and Description	Representative Photograph	Potential Threatened or 'Near Threatened' Taxa
Non-remnant grasslands Non-remnant grasslands are dominated predominantly by the exotic Buffel Grass (<i>Cenchrus ciliaris</i>). Buffel grass reduces the biodiversity value of areas where it is the dominant groundcover. The non-remnant grasslands are a degraded habitat that occur due to the removal of native vegetation cover and as such have low value as habitat and support lower biodiversity than remnant habitats. Many species will use non-remnant grasslands in a transitory manner while moving between higher quality remnant habitats.		Brigalow scaly-foot (<i>Paradelma orientalis</i>) Ornamental snake (<i>Denisonia maculata</i>)
Eucalypt woodlands These habitats are dominated by Silver-leaved Ironbark (<i>Eucalyptus melanophloia</i>) and Poplar Box (<i>E. populnea</i>), although in some locations a mix of eucalypt species (<i>Eucalyptus</i> and <i>Corymbia</i> spp.) occur. The canopy species include abundant hollows of a variety of sizes, providing good habitat opportunities for arboreal species. Native grass species were common between shrubs, although Buffel Grass (<i>Cenchrus ciliaris</i>) occurred in some areas. Ground debris, particularly fallen timber, was common throughout these habitats. Bare ground was also common, with a mosaic formed of open ground and grass cover, while thick leaf litter occurred beneath bushes or under trees. The soil was typically alluvial or clay. Eucalypt woodland with shrubs is one of the most common vertebrate habitat type within the study area.		Brigalow scaly-foot (<i>Paradelma orientalis</i>) Ornamental snake (<i>Denisonia maculata</i>) Dunmall's snake (<i>Furina dunmalli</i>) Yakka skink (<i>Egernia rugosa</i>) Little pied bat (<i>Chalinolobus picatus</i>)

Habitat Type and Description	Representative Photograph	Potential Threatened or 'Near Threatened' Taxa
Wetlands and riparian habitats Tall open riparian woodlands dominated by Forest Red Gum (<i>Eucalyptus tereticornis</i>) occur along Roper Creek within the study area. Little midstorey existed, restricted largely to regrowth canopy species. Numerous hollow-bearing trees were present within the habitat and arboreal species are likely to be well represented. The ground layer consisted predominantly of grasses, separated by open areas of ground. Debris, such as fallen timber and leaf litter was abundant. In most cases artificial waterbodies were small to moderate in size and highly disturbed, particularly around the edges due to cattle activity. These waterbodies provide important dry-season water sources for mobile species such as birds and mammals and are habitat for waterbirds.		Brigalow scaly-foot (<i>Paradelma orientalis</i>) Dunmall's snake (<i>Furina dunmalli</i>) Ornamental snake (<i>Denisonia maculata</i>) Yakka skink (<i>Egernia rugosa</i>) Squatter pigeon (<i>Geophaps scripta scripta</i>) Little pied bat (<i>Chalinolobus picatus</i>) Cotton pygmy-goose (<i>Nettapus coromandelianus</i>)

Habitat Type and Description	Representative Photograph	Potential Threatened or 'Near Threatened' Taxa
Brigalow woodlands and cracking clays Distinguished by a tall Brigalow canopy, this habitat type was distinct within the study area. Within the canopy, hollows were rare; however, exfoliating bark was common and provided a different sheltering opportunity. Small arboreal vertebrates such as geckos are likely to use these shelter sites. The cracking clay soils on which Brigalow habitats were found provide excellent dry-season refugia for many terrestrial vertebrates. The ponded water in the gilgais provides an important wet-season water resource and frog habitat. The shrub layer, while present, was typically limited to Currant Bush (<i>Carissa ovata</i>). The ground layer was relatively open and dominated by native grasses. Few weeds occur within the Brigalow woodlands.		Brigalow scaly-foot (<i>Paradelma orientalis</i>) Dunmall's snake (<i>Furina dunmalli</i>) Ornamental snake (<i>Denisonia maculata</i>) Yakka skink (<i>Egernia rugosa</i>) Little pied bat (<i>Chalinolobus picatus</i>)
Escarpments with Acacia and mixed species woodlands Acacia woodland consisted of a moderately dense, tall canopy dominated by Lancewood (<i>Acacia shirleyi</i>). Only a few emergent eucalypts were present, resulting in few hollows. Arboreal species are therefore not likely to be abundant. Shrubs were not common, but where present were typically regrowth canopy species. The ground stratum was dominated by short native grasses, separated by the occasional patch of bare ground. Fallen debris, particularly moderately sized logs, was common.		Brigalow scaly-foot (<i>Paradelma orientalis</i>) Dunmall's snake (<i>Furina dunmalli</i>) Yakka skink (<i>Egernia rugosa</i>) Little pied bat (<i>Chalinolobus picatus</i>) Koala (<i>Phascolarctos cinereus</i>)



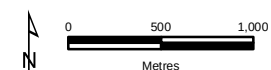
Legend

Study Area

Fauna Habitats

- Eucalypt woodlands
- Wetlands and riparian habitats
- Brigalow woodlands and cracking clays
- Escarpment with Acacia and mixed species woodlands
- Non-remnant grasslands

Figure 6
Fauna Habitats
 Middlemount Coal Mine
 Stage 2 - Offset Area Report



3.5 Flora Species

A total of 140 flora species were recorded within the study area during the recent surveys. A complete list of flora species recorded during the surveys is provided in Attachment 1.

3.6 Species of Conservation Significance

Two flora species and three fauna species of conservation significance were recorded during the surveys (Table 3, Figure 7).

Table 3: Location of Conservation Significant Flora and Fauna Species Recorded Within the Study Area.

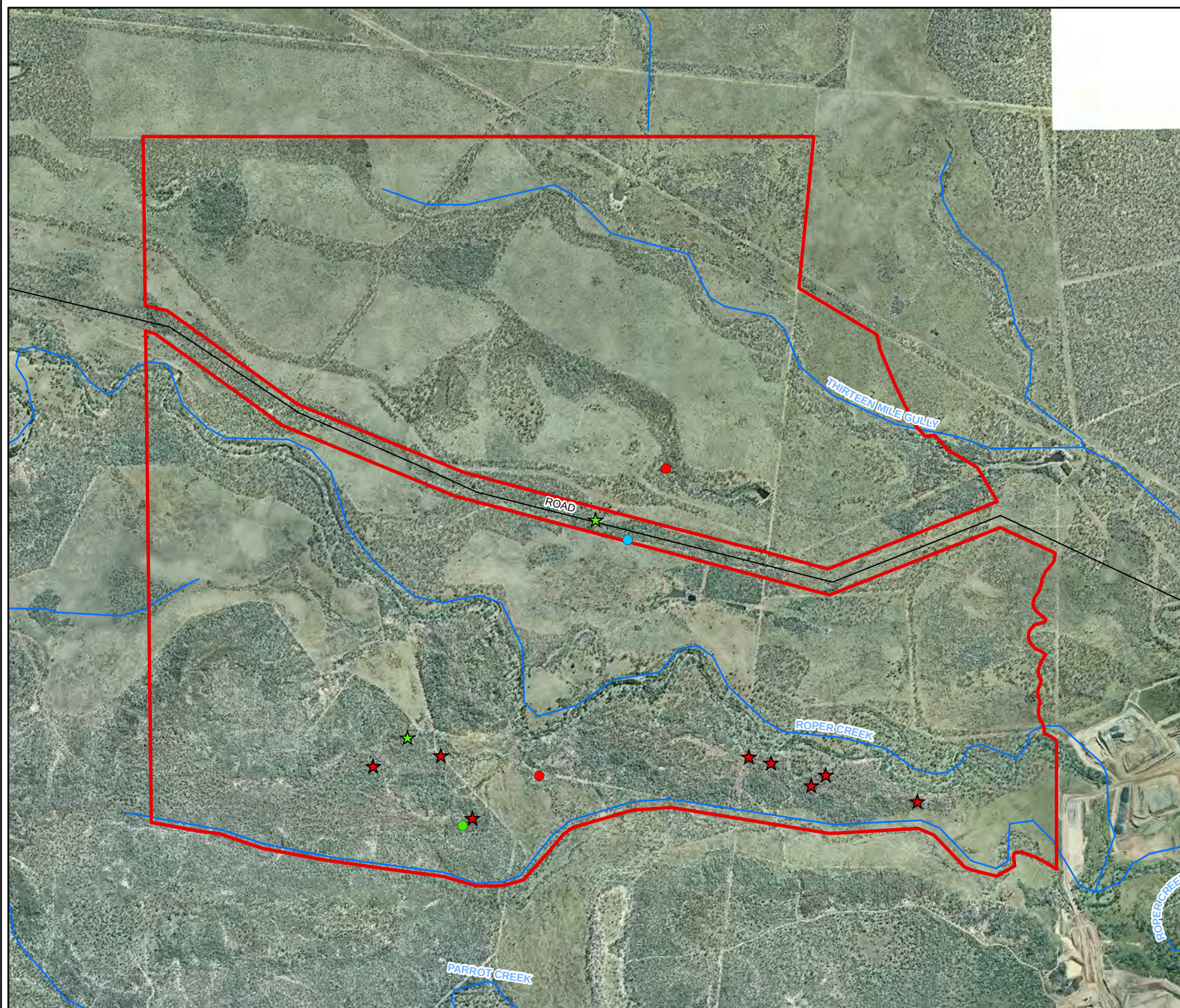
Scientific Name	Common Name	Status ¹		Count	Latitude	Longitude
		NC Act	EPBC Act			
Flora						
Cerbera dumicola	-	NT	-	> 100	-22.86	148.62
Cerbera dumicola	-	NT	-	> 100	-22.86	148.61
Cerbera dumicola	-	NT	-	20	-22.86	148.61
Cerbera dumicola	-	NT	-	30	-22.86	148.59
Cerbera dumicola	-	NT	-	20	-22.86	148.62
Cerbera dumicola	-	NT	-	20	-22.86	148.62
Cerbera dumicola	-	NT	-	> 100	-22.86	148.59
Cerbera dumicola	-	NT	-	> 100	-22.86	148.58
Desmodium macrocarpum	Large-podded trefoil	NT	-	100	-22.86	148.59
Desmodium macrocarpum	Large-podded trefoil	NT	-	5	-22.84	148.60
Fauna						
Phascolarctos cinerius	Koala	-	V	1	-22.87	148.59
Geophaps scripta scripta	Squatter Pigeon	V	-	2	-22.86	148.60
Geophaps scripta scripta	Squatter Pigeon	V	-	2	-22.84	148.61
Merops ornatus	Rainbow Bee-eater	-	M	2	-22.84	148.60
Merops ornatus	Rainbow Bee-eater	-	M	4	-22.84	148.65

¹ Conservation significant flora or fauna species listed under the QLD *Nature Conservation Act, 1992* (NC Act) and/or EPBC Act (current at 11 September 2012).

NT = Near Threatened, V = Vulnerable, E = Endangered, M= Migratory.

Flora Species

Two flora species of conservation significance, the Large-podded trefoil (*Desmodium macrocarpum*) and *Cerbera dumicola* were recorded during the surveys. A description of these two species is provided below.



Legend

Study Area

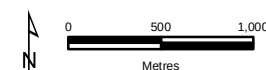
EPBC Act Listed Species

- Koala (*Phascolarctos cinereus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Squatter Pigeon (*Geophaps scripta scripta*)

NC Act Listed Species

- ★ Large-podded Trefoil (*Desmodium macrocarpum*)
- ★ *Cerbera dumicola*

Figure 7
Species of Conservation Significance
 Middlemount Coal Mine
 Stage 2 - Offset Area Report



Desmodium macrocarpum

Large-podded trefoil (*Desmodium macrocarpum*) is listed as near threatened under the NC Act. Small areas of *Desmodium macrocarpum* were found within REs 11.5.18 and 11.3.2. One patch of *Desmodium macrocarpum* contained over 100 individuals, while the other patch contained five individuals (Plate 1). The patch of *Desmodium macrocarpum* consisting of five individuals lies just outside the study area within the narrow stock route corridor that bisects the study area (Figure 7).

Cerbera dumicola

Cerbera dumicola is listed as Near Threatened under the NC Act. The species is abundant in scarp retreat zones and on remnant surfaces, particularly in association with Lancewood (*Acacia shirleyi*) woodlands (RE 11.7.2 and RE 11.5.18). Where *Cerbera dumicola* was recorded, there were between 100 and >1,000 individual plants (Plate 2).



Plate 1: *Desmodium macrocarpum* in RE 11.5.18.



Plate 2: *Cerbera dumicola* in RE 11.5.18.

Fauna Species

Three fauna species of conservation significance were opportunistically recorded during the surveys within the study area and are described below (Table 3, Figure 7).

Koala *Phascolarctos cinerius*

One Koala was sighted in *Acacia shirleyi*-dominated woodland (RE 11.7.2) (Plate 3). Koalas are listed as Vulnerable under the EPBC Act.



Plate 3: Koala in RE 11.7.2.

Squatter Pigeon *Geophaps scripta scripta*

Squatter Pigeons were recorded from two locations within the study area. Both sightings were of two individuals. Squatter pigeons are listed as Vulnerable under the EBPC Act and NC Act.

Rainbow Bee-eater *Merops ornatus*

Two Rainbow Bee-eaters were recorded within the study area along an access track. Rainbow Bee-eaters are listed as Migratory under the EPBC Act.

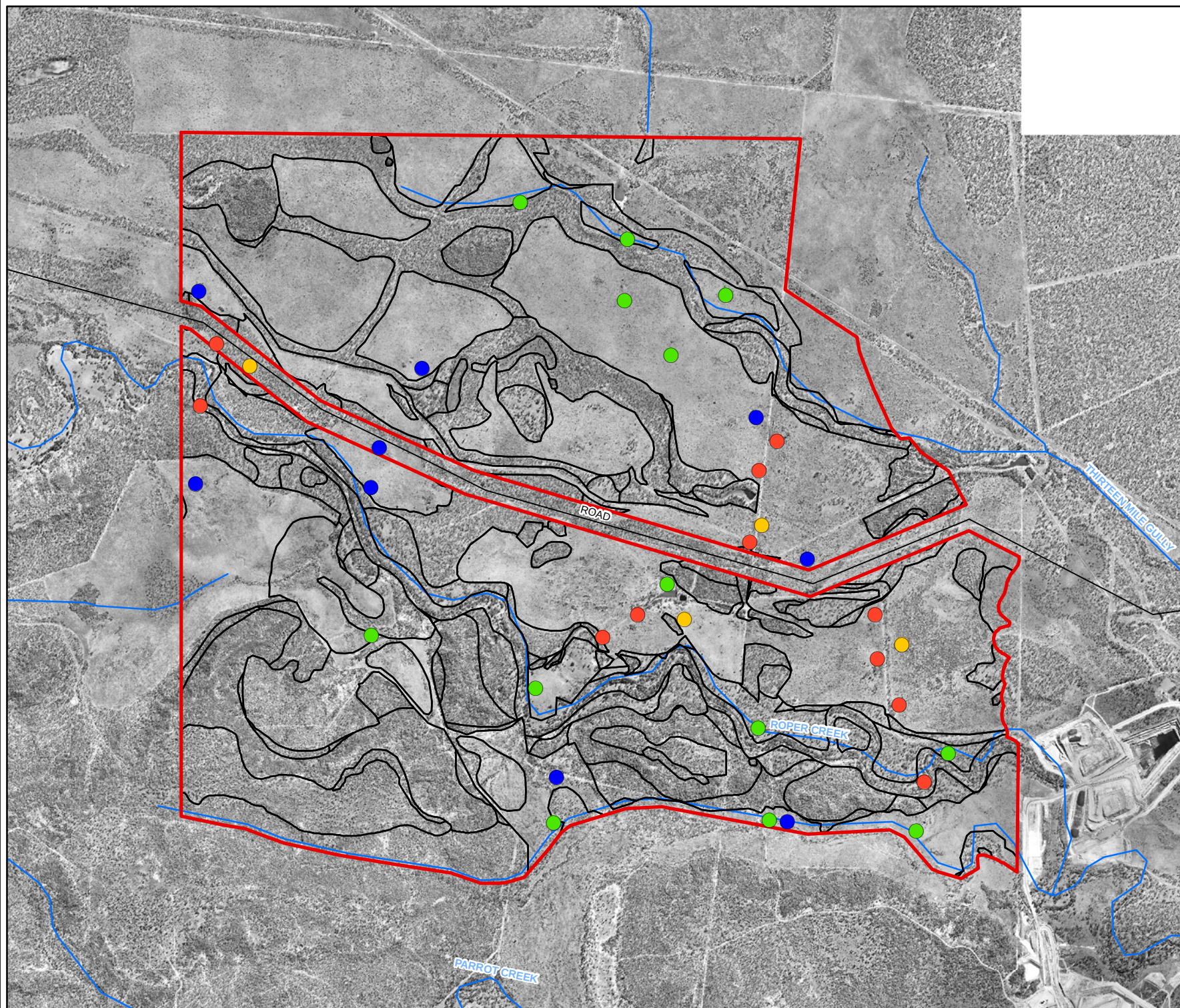
3.7 Weed Species

Three weed species listed as Class 1 and 2 weeds under the LP Act were detected within the study area. Harrisia Cactus (*Eriocereus martinii*) and Velvety Tree Pear (*Opuntia tormentosa*) (Class 1) and Parthenium (*Parthenium hysterophorus*) (Class 2) are sparsely distributed in low densities across the entire study area. No major infestations of any weed species were detected.

Parthenium is listed as a Weed of National Significance. Parthenium was most commonly recorded as small plants sparsely distributed along Roper Creek in RE 11.3.25.

3.8 Pest Animals

Four pest animal species were recorded within the study area. Signs of Pigs (*Sus scrofa*), Dogs (*Canis lupus familiaris*), Rabbits (*Oryctolagus cuniculus*) and Cats (*Felis catus*) were seen in all habitat types. Signs of each species included scats and tracks. Feral pigs appear to be the most prevalent of the pest animals within the study area. Signs of all four species are common and widespread across the entire study area (Figure 8).



Legend

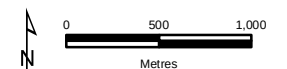
Study Area

Pest Animals*

- Cat
- Dog
- Pig
- Rabbit

* Presence of animals indicated by tracks, scats and diggings.

Figure 8
Pest Animals
Middlemount Coal Mine
Stage 2 - Offset Area Report



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Attachment 1: Flora Species Recorded During the Survey

Family and Species	Common Name	Status under the NC Act ¹
Acanthaceae		
<i>Rostellularia adscendens</i>	Pink Tongues	-
Ameranthaceae		
<i>Alternanthera denticulata</i>	Lesser Joyweed	-
<i>Alternanthera pungens</i> *	Khaki Weed	-
Amaryllidaceae		
<i>Crinum flaccidum</i>	Darling lily	-
Apocynaceae		
<i>Alstonia constricta</i>	-	-
<i>Carissa ovata</i>	Currant bush	-
<i>Cerbera dumicola</i>	-	NT
<i>Parsonsia lanceolata</i>	Northern Silkpod	-
Asteraceae		
<i>Arctotheca calendula</i> *	Cape Weed	-
<i>Bidens bipinnata</i> *	Spanish Needles	-
<i>Calotis hispidula</i>	Bogan Flea	-
<i>Calotis lappulacea</i>	Yellow Burr-daisy	-
<i>Centipeda cunninghamii</i>	Common Sneezeweed	-
<i>Cirsium vulgare</i> *	Spear Thistle	-
<i>Cotula australis</i>	Common Cotula	-
<i>Epaltes australis</i>	Spreading Nutheads	-
<i>Parthenium hysterophorus</i> *	Parthenium Weed	-
<i>Pterocaulon redolens</i>	-	-
<i>Pterocaulon sphacelatum</i>	Fruit Salad Plant	-
<i>Senecio lautus</i>	Fireweed	-
<i>Vittadenia</i> spp.	New-Holland Daisy	-
<i>Xanthium pungens</i>	Noogoora Burr	-
Boraginaceae		
<i>Heliotropium amplexicaule</i> *	Blue Heliotrope	-
Cactaceae		
<i>Eriocereus martinii</i> *	Harrisia Cactus	-
<i>Opuntia tormentosa</i> *	Prickly Pear	-
Caesalpiniaceae		
<i>Cassia brewsteri</i>	(Leichardt) Bean tree	-
<i>Lysiphyllum hookeri</i>	White-flowered Bauhinia	-
<i>Senna occidentalis</i> *	Coffee Senna	-
Capparaceae		
<i>Capparis canescens</i>	Wild Orange	-

Family and Species	Common Name	Status under the NC Act ¹
<i>Capparis lasiantha</i>	Wait-a-while	-
<i>Capparis loranthifolia</i>	-	-
Casuarinaceae		
<i>Allocasuarina luehmannii</i>	Bull Oak	-
<i>Casuarina cristata</i>	Belah	-
Chenopodiaceae		
<i>Atriplex semibaccata</i>	Creeping Saltbush	-
<i>Einadia hastata</i>	Berry Saltbush	-
<i>Einadia nutans</i> subsp. <i>linifolia</i>	Saltbush	-
<i>Einadia polygonoides</i>	-	-
<i>Enchylaena tomentosa</i>	Ruby Saltbush	-
<i>Maireana microphylla</i>	Small-leaved Cottonbush	-
<i>Salsola kali</i>	Prickly Saltwort	-
<i>Sclerolaena muricata</i>	-	-
Combretaceae		
<i>Terminalia oblongata</i>	Yellow Wood	-
Convolvulaceae		
<i>Evolvulus alsinoides</i>	Tropical Speedwell	-
Crassulaceae		
<i>Bryophyllum delagoense</i> *	Mother of Millions	-
Cyperaceae		
<i>Cyperus</i> spp.	Sedge	-
<i>Eleocharis</i> spp.	Spike-rush	-
Droseraceae		
<i>Drosera indica</i>	Flycatcher Sundew	-
Euphorbiaceae		
<i>Euphorbia drummondii</i>	Caustic Weed	-
<i>Petalostigma pubescens</i>	Quinine Tree	-
Erythroxylaceae		
<i>Erythroxylum australis</i>	-	-
Fabaceae		
<i>Crotalaria dissitiflora</i>	Grey Rattlepod	-
<i>Desmodium macrocarpum</i>	Large-podded Trefoil	NT
<i>Glycine tabacina</i>	Glycine Pea	-
<i>Hardenbergia violacea</i>	Native Sarsaparilla	-
<i>Rhynchosia minima</i>	Rhynchosia	-
<i>Stylosanthes scabra</i> *	Shrubby Stylo	-
<i>Vigna lanceolata</i>	Maloga Bean	-
Goodeniaceae		
<i>Goodenia heteromera</i>	Spreading Goodenia	-

Family and Species	Common Name	Status under the NC Act ¹
<i>Goodenia rotundifolia</i>	-	-
Hydrocharitaceae		
<i>Ottelia ovalifolia</i>	Swamp Lily	-
Lamiaceae		
<i>Ajuga australis</i>	Austral Bugle	-
Loranthaceae		
<i>Amyema quandang</i>	Grey Mistletoe	-
<i>Dendrophthoe glabrescens</i>	Orange Mistletoe	-
Malvaceae		
<i>Abutilon oxycarpum</i>	Flannel Flower	-
<i>Malva parviflora</i> *	Small-flowered Mallow	-
<i>Sida cordifolia</i> *	Flannel weed	-
Mimosaceae		
<i>Acacia catenulata</i>	Bendee	-
<i>Acacia excelsa</i>	Ironwood	-
<i>Acacia harpophylla</i>	Brigalow	-
<i>Acacia leiocalyx</i>	Black Wattle	-
<i>Acacia rhodoxylon</i>	Rosewood	-
<i>Acacia salicina</i>	Sally Wattle	-
<i>Acacia shirleyi</i>	Lancewood	-
<i>Archidendropsis basaltica</i>	Dead Finish	-
<i>Neptunia gracilis</i>	Native Sensitive-plant	-
Meliaceae		
<i>Owenia acidula</i>	Emu Apple	-
Menyanthaceae		
<i>Nymphoides indica</i>	Water Snowflake	-
Myoporaceae		
<i>Eremophila deserti</i>	Turkey Bush	-
<i>Eremophila mitchellii</i>	False Sandlewood	-
<i>Myoporum montanum</i>	-	-
Myrtaceae		
<i>Corymbia dallachiana</i>	Ghost-gum	-
<i>Corymbia clarksoniana</i>	Long-fruited Bloodwood	-
<i>Corymbia tessellaris</i>	Moreton Bay Ash	-
<i>Eucalyptus cambageana</i>	Dawson Gum	-
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	-
<i>Eucalyptus exserta</i>	-	-
<i>Eucalyptus populnea</i>	Poplar Box	-
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	-

Family and Species	Common Name	Status under the NC Act ¹
<i>Eucalyptus tereticornis</i>	Forest Red-gum	-
<i>Melaleuca leucadendra</i>	Weeping Paperbark	-
<i>Micromyrtus capricornia</i>	-	-
Onagraceae		
<i>Ludwigia octovalvis</i>	-	-
Orchidaceae		
<i>Cymbidium canaliculatum</i>	Black Orchid	-
Poaceae		
<i>Aristida calycina</i>	Dark Wiregrass	-
<i>Aristida latifolia</i>	Feathertop Wiregrass	-
<i>Aristida personata</i>	Purple Wiregrass	-
<i>Astrebla squarrosa</i>	Bull Mitchell-grass	-
<i>Bothriochloa bladhii</i> subsp. <i>bladhii</i>	Forest Bluegrass	-
<i>Bothriochloa pertusa</i>	Creeping bluegrass	-
<i>Calypochloa gracillima</i>	Tableland Couch	-
<i>Cenchrus ciliaris</i>	Buffel Grass	-
<i>Chloris divaricata</i>	Slender Chloris	-
<i>Chloris inflata</i> *	Purple-top Chloris	-
<i>Chloris truncata</i>	Windmill Grass	-
<i>Chloris virgata</i> *	Feathertop Rhodes-grass	-
<i>Cynodon dactylon</i> *	Couch	-
<i>Dicanthium sericeum</i> subsp. <i>sericeum</i>	Queensland Bluegrass	-
<i>Eragrostis sororia</i>	Woodland Lovegrass	-
<i>Heteropogon contortus</i>	Black Spear Grass	-
<i>Hyparrhenia rufa</i>	Thatch Grass	-
<i>Leptochloa digitata</i>	Umbrella Canegrass	-
<i>Melinis repens</i> *	Red Natal Grass	-
<i>Panicum</i> spp.	Panic Grass	-
<i>Paspalidium caespitosum</i>	Brigalow Grass	-
<i>Phragmites australis</i>	Common reed	-
<i>Sporobolus caroli</i>	Fairy Grass	-
<i>Themeda australis</i>	Kangaroo Grass	-
Phyllanthaceae		
<i>Phyllanthus virgatus</i>	Spurge	-
Polygonaceae		
<i>Persicaria orientalis</i>	Prince's Plum	-
<i>Rumex crispus</i>	Curled Dock	-
Portulacaceae		
<i>Portulaca pilosa</i> subsp. <i>pilosa</i>	Hairy Pigweed	-

Family and Species	Common Name	Status under the NC Act ¹
Proteaceae		
<i>Grevillea parallela</i>	Silver Oak	-
<i>Grevillea striata</i>	Beefwood	-
<i>Hakea lorea</i>	Gnarled Corkwood	-
Rhamnaceae		
<i>Alphintonia excelsa</i>	Red Ash	-
Rubiaceae		
<i>Canthium attenuatum</i>	Myrtle	-
<i>Larsenaikia ochreatea</i>	Native Gardenia	-
Rutaceae		
<i>Citrus glauca</i>	Limebush	-
<i>Flindersia dissosperma</i>	Scrub Leopardwood	-
<i>Phebalium</i> spp.	Phebalium	-
Sapindaceae		
<i>Atalaya hemiglaucula</i>	Whitewood	-
<i>Dodonaea viscosa</i>	Hop Bush	-
Sinopteridaceae		
<i>Cheilanthes sieberi</i>	Rock Fern	-
<i>Marsilae hirsuta</i>	Short-fruit Nardoo	-
Solanaceae		
<i>Solanum ellipticum</i>	Potato Bush	-
<i>Solanum ferocissimum</i>	Spiny Potato Bush	-
Sparrmanniaceae		
<i>Grewia latifolia</i>	-	-
Xanthorrhoeaceae		
<i>Lomandra longifolia</i>	Spiny-headed Matrush	-
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Matrush	-
<i>Lomandra patens</i>	Irongrass	-

Notes:

No threatened species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* were recorded during the surveys.

* Denotes introduced species.

¹ Threatened flora species status under the *Queensland Nature Conservation Act, 1992* (current at 3 October 2012).

NT = Near Threatened.

APPENDIX B

ECOLOGICAL EQUIVALENCE - RAIL LOOP AND SPUR OFFSET AREA, PARROT QUARRY OFFSET AREA AND THIRTEEN MILE GULLY DIVERSION OFFSET AREA

Table B1
Ecological Equivalence for the Middlemount Coal Mine Rail Spur and Loop Offset Areas

Ecological Condition Indicators ¹	Offset Areas					
Site	AU1*	AU2#	AU3*	AU4*	AU5*	AU6#
Regional Ecosystem	Offset Area 1 RE 11.4.9b (Site 1)	Offset Area 2 RE 11.3.2/ 11.5.3 (Site EEM01)	Offset Area 3 RE 11.3.2 (Site 3)	Offset Area 4 RE 11.3.1 (Site 4)	Offset Area 5 RE 11.3.4 (Site 5a)	Offset Area 6 RE11.5.18 (Site EEM05)
1. Recruitment of woody perennial species	5	5	5	5	5	5
2. Native plant species richness						
- Trees	2.5	5	5	2.5	5	5
- Shrubs	2.5	5	5	2.5	5	5
- Grasses	0	2.5	0	0	2.5	2.5
- Forbs	5	2.5	2.5	2.5	0	5
3. Tree canopy height	1.5	3	3	1.5	2.5	5
4. Tree canopy cover	2.5	2	5	2.5	2.5	5
5. Shrub canopy height	3	5	5	3	3	3
6. Native perennial grass cover	0	5	1	1	1	3
7. Organic litter	0	3	0	3	5	5
8. Large trees	0	5	5	0	7.5	15
9. Coarse woody debris	0	5	2	0	5	5
10. Weed cover	0	3	0	0	0	10
11. Size of patch (fragmented landscapes)	0	0	2	5	5	2
12. Connectivity (fragmented landscapes)	0	2	2	2	4	2
13. Context (fragmented landscapes)	2	2	4	2	2	4
14. Distance from water (intact landscapes)	-	-	-	-	-	-
Sum of Score	24	55	46.5	32.5	55	81.5
Area (ha)	4.5	2	10	26	41.6	2.1
Assessment Unit Ecological Condition Score	1.08	1.1	4.6	8.4	22	1.71
Ecological Condition Score	38.9					
Assessment Unit Special Features Score	2	0.82	8	9	11	1.85
Special Features Score	32.67					

* # Source: MCPL (2013a) Middlemount Coal Mine Rail Loop and Spur Vegetation Offset Proposal.

¹ Department of Environment and Resource Management (2011) *Managing Grazing Lands in Queensland*. June 2011.

Table B2
Ecological Equivalence for Parrot Quarry Offset Areas

Ecological Condition Indicators ¹	Clearing Area		Offset Areas	
	AU1	AU2	AU3	AU4
	RE11.3.4	RE11.5.18 (Assessment Site EMM06)	RE11.3.4 (Assessment Site EMM04)	RE11.5.18 (Assessment Site EMM05)
1. Recruitment of woody perennial species	-	5	3	5
2. Native plant species richness	-	-	-	-
- Trees	-	5	2.5	5
- Shrubs	-	5	5	5
- Grasses	-	5	2.5	2.5
- Forbs	-	5	5	5
3. Tree canopy height	-	5	5	5
4. Tree canopy cover	-	5	5	5
5. Shrub canopy height	-	5	5	3
6. Native perennial grass cover	-	3	0	3
7. Organic litter	-	5	5	5
8. Large trees	-	15	10	15
9. Coarse woody debris	-	5	2	5
10. Weed cover	-	5	0	10
11. Size of patch (fragmented landscapes)	-	2	2	2
12. Connectivity (fragmented landscapes)	-	5	2	2
13. Context (fragmented landscapes)	-	5	2	4
14. Distance from water (intact landscapes)	-	-	-	-
Sum of Score	67*	85	56	81.5
Area (ha)	1.266	1.9	11	4.37
Assessment Unit Ecological Condition Score	0.85	1.6	6.16	3.56
Ecological Condition Score	2.45		9.72	
Assessment Unit Special Features Score	0.47	0.86	5.28	3.84
Special Features Score	1.33		9.12	

Source: MCPL (2013b) Parrot Quarry Vegetation Offset Proposal.

¹ Department of Environment and Resource Management (2011) *Managing Grazing Lands in Queensland*. June 2011.

* Refer Middlemount Coal Pty Ltd (2013b) Parrot Quarry Vegetation Offset Proposal.

Table B3
Ecological Equivalence for Thirteen Mile Gully Diversion Offset Areas

Ecological Condition Indicators ¹	Clearing Area	Offset Area	
	AU1	AU2 [#]	
	Assessment Site EEMA	Assessment Site EEM02	Assessment Site EEM03
1. Recruitment of woody perennial species	5	5	5
2. Native plant species richness	-	-	-
- Trees	5	5	5
- Shrubs	5	5	5
- Grasses	2.5	5	5
- Forbs	5	5	5
3. Tree canopy height	3	3	3
4. Tree canopy cover	2	2	2
5. Shrub canopy height	3	3	3
6. Native perennial grass cover	5	5	0
7. Organic litter	5	5	1
8. Large trees	0	5	3
9. Coarse woody debris	2	2	2
10. Weed cover	3	3	0
11. Size of patch (fragmented landscapes)	5	5	5
12. Connectivity (fragmented landscapes)	4	4	4
13. Context (fragmented landscapes)	4	4	4
14. Distance from water (intact landscapes)	-	-	-
Sum of Score	58.5	66	52
Area (ha)	7.8	31	31
Ecological Condition Score	4.56	18.29	
Special Features Score	3.28	29.86	

Source: MCPL (2013c) Thirteen Mile Gully Diversion Vegetation Offset Proposal.

the two scores were averaged for this assessment unit.

¹ Department of Environment and Resource Management (2011) *Managing Grazing Lands in Queensland*. June 2011.

APPENDIX C

NORTH-EASTERN EXTENSION OFFSET AREA OFFSET BASELINE REPOT



NATURECALL
ENVIRONMENTAL

North-eastern Extension Offset Area

Offset Baseline Report

Client:

Middlemount Coal Pty Ltd

July 2017



Document Status

Version	Purpose	Author	Reviewed By	Approved By	Date
Rev 1.0	Draft for review	Mya Gaby	Karl Robertson	Christopher Doig	19/06/2017
Rev 2.0	Final Draft	Mya Gaby/Will Steggall	Karl Robertson	Christopher Doig	29/06/2017
Rev 3.0	Final	Mya Gaby/Will Steggall	Will Steggall	Christopher Doig	19/07/2017
Rev 4.0	Final	Mya Gaby/Will Steggall	Will Steggall	Christopher Doig	25/07/2017

Document Control

Copy No.	Date	Type/Via	Issued to	Name	Purpose
1	19/06/2017	Electronic	Naturecall Info	Elspeth Thorpe	File Copy
2	19/06/2017	Electronic/E-mail	Resource Strategies	Jamie Gleeson	Client Review
3	29/06/2017	Electronic	Naturecall Info	Elspeth Thorpe	File Copy
4	29/06/2017	Electronic/E-mail	Resource Strategies	Jamie Gleeson	Client Copy
5	19/07/2017	Electronic	Naturecall Info	Elspeth Thorpe	File Copy
6	19/07/2017	Electronic/E-mail	Resource Strategies	Jamie Gleeson	Client Copy
7	25/07/2017	Electronic	Naturecall Info	Elspeth Thorpe	File Copy
8	25/07/2017	Electronic/E-mail	Resource Strategies	Jamie Gleeson	Client Copy

Project Number: EC1533

Our Document Reference: EC1533-BEC-REP-MCPLOffsetAreaBaselineReport-rev4.0

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Contents

Document Status	i
Document Control	i
Contents	1
List of Figures	3
List of Tables	4
List of Photos	4
Executive Summary	5
1.0 Introduction	6
2.0 Background Information	6
2.1. Location of the Study Site	6
2.2. Study Objectives	6
3.0 Existing Environment	9
3.1. Soils, Topography and Geology	9
3.2. Regional Ecosystems	9
3.3. Pre-clearing Regional Ecosystems	9
3.4. Drainage Features	16
3.5. Landuse and Disturbance History	17
3.6. Summary of Previous Threatened Species Recorded	17
4.0 Methodology	18
4.1. Desktop Study and Literature Review	18
4.2. Flora Survey	19
4.2.1. Approved Commonwealth Offset Area	19
4.2.1.1. Vegetation Mapping and Sampling	19
4.2.1.2. Habitat Quality Assessment	20
4.2.1.3. Weed Cover Assessments	23
4.2.1.4. Sampling of Shrub Cover in RE 11.5.2a, 11.7.2 and 11.7.4	23
4.2.1.5. Documenting the Presence of <i>Eucalyptus</i> , <i>Corymbia</i> , <i>Acacia</i> and <i>Callitris spp.</i> in non-remnant areas	23
4.2.1.6. Surveys for Threatened Communities and Flora Species Listed under the EPBC Act	23



4.2.2. State Connectivity Offset Area	25
4.2.2.1. Site Condition Assessment	25
4.2.2.2. Field Validation of Pre-clearing Regional Ecosystems	25
4.3. Fauna Surveys	25
4.3.1. Habitat Suitability Assessment	26
4.3.2. Diurnal Bird Surveys	26
4.3.3. Track, Scat and Secondary Evidence Searches	26
4.3.4. Koala Food Trees	27
4.4. Weather Conditions During the Survey	29
5.0 Results	31
5.1. Vegetation Survey Results	31
5.1.1. Floristics	31
5.1.2. Regional Ecosystems	31
5.1.3. Baseline Condition of Regional Ecosystems	31
5.1.3.1. RE 11.3.2 – <i>Eucalyptus populnea</i> woodland on alluvial plains	31
5.1.3.2. RE 11.3.25 - <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	31
5.1.3.3. RE 11.3.4 - <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains	32
5.1.3.4. RE 11.5.2a – <i>Eucalyptus crebra</i> , <i>Corymbia spp.</i> , with <i>E. moluccana</i> woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces	32
5.1.3.5. RE 11.5.3 - <i>Eucalyptus populnea</i> ± <i>E. melanophloia</i> ± <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces	32
5.1.3.6. RE 11.5.9 - <i>Eucalyptus crebra</i> and other <i>Eucalyptus spp.</i> and <i>Corymbia spp.</i> woodland on Cainozoic sand plains and/or remnant surfaces	32
5.1.3.7. RE 11.7.2 - <i>Acacia spp.</i> woodland on Cainozoic lateritic duricrust. Scarp retreat zone	32
5.1.3.8. RE 11.7.4 - <i>Eucalyptus decorticans</i> and/or <i>Eucalyptus spp.</i> , <i>Corymbia spp.</i> , <i>Acacia spp.</i> , <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	33
5.1.3.9. RE 11.4.8 - <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plain	33
5.1.3.10. RE 11.5.18 - <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	33
5.1.3.11. Non-remnant Vegetation	33
5.1.4. Habitat Quality Assessment (Approved Commonwealth Offset Area)	41
5.1.5. Habitat Quality Assessment (State Connectivity Offset Area)	46
5.2. Threatened Flora	47



5.3.	Endangered and Of Concern Regional Ecosystems	50
5.3.1.	Queensland Vegetation Management Act Status	50
5.3.2.	Environmental Protection and Biodiversity Conservation Act Status	50
5.3.3.	Exotic Flora Species	53
5.3.4.	Weed Cover in RE 11.5.2a, 11.7.2 and 11.7.4 (Approved Commonwealth Offset Area)	53
5.3.5.	Shrub Cover in RE 11.5.2a, 11.7.2 and 11.7.4 (Approved Commonwealth Offset Area)	54
5.3.6.	Presence of <i>Eucalyptus</i> , <i>Corymbia</i> , <i>Acacia</i> and <i>Callitris</i> spp. in non-remnant areas (Approved Commonwealth Offset Area)	55
5.4.	Fauna Survey Results	56
5.4.1.	Fauna Habitat Types	56
5.4.2.	Fauna Species Detected	65
5.4.3.	Threatened Fauna Species	65
5.4.4.	Migratory Fauna Species	68
5.4.5.	Exotic Fauna Species	68
6.0	Summary and Conclusion	71
7.0	References	72
Appendix 1:	Site Flora Species List	75
Appendix 2:	Site Fauna Species List	80
Appendix 3:	Terrestrial Habitat Quality Data	83

List of Figures

Figure 1: Location of the Study Site	7
Figure 2: Existing MCPL Offset Areas.....	8
Figure 3: Geology and Drainage	10
Figure 4: Mapped Regional Ecosystems.....	14
Figure 5: Pre-clearing Mapping	15
Figure 6: Location of Survey Sites.....	24
Figure 7: Location of Diurnal Bird Surveys	28
Figure 8: Rainfall at Middlemount Coal Mine for the Months of May and June 2016.....	29
Figure 9: March-May 2017 Precipitation Recorded at Middlemount Coal Mine.	30
Figure 10: Field Verified Regional Ecosystems.....	34
Figure 11: Field Verified Pre-clearing Regional Ecosystems	35
Figure 12: Threatened Flora Observations.....	49
Figure 13: Endangered and Of Concern Regional Ecosystems Listed Under the VM Act	51



Figure 14: Threatened Ecological Communities Listed Under the EPBC Act.....	52
Figure 15: Broad Fauna Habitat Types Present on the Study Site	62
Figure 16: Threatened fauna species detected	69

List of Tables

Table 1: Mapped Regional Ecosystems Located Within the Study Site	11
Table 2: Pre-clearing Regional Ecosystems Mapped on Site	13
Table 3: Sampling Sites in Commonwealth Offset Area	21
Table 4: Survey Sites – State Connectivity Offset Area	25
Table 5: Mapped Regional Ecosystems and Ground-truthed Regional Ecosystems located within the Study Site	36
Table 6: Mapped Pre-clearing Regional Ecosystems and Ground-truthed Pre-clearing Regional Ecosystems located within the Study Site.....	38
Table 7: Habitat Quality Scores	43
Table 8: Final Habitat Quality Score for Commonwealth Offset Area	44
Table 9: Final Habitat Quality Score for Commonwealth Offset Area	45
Table 10: Habitat Quality Scores	46
Table 11: Final Habitat Quality Score for State Connectivity Offset Area	47
Table 12: Noxious Weeds Recorded Within the Study Site	53
Table 13: Weed Cover.....	53
Table 14: Shrub Cover.....	54
Table 15: Presence of Eucalypts, Corymbia, Acacia in non-remnant Areas.....	55
Table 16: Broad Fauna Habitat Types.....	56
Table 17: Fauna Habitat Assessment	57

List of Photos

Photo 1: Section of Parrot Creek (terrestrial habitat quality site 40)	16
Photo 2: RE 11.4.8 <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.....	40
Photo 3: RE 11.3.2 <i>Eucalyptus populnea</i> woodland on alluvial plains.....	40
Photo 4: RE 11.5.18 <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.....	41
Photo 5: Photo of <i>Cerbera dumicola</i> within the study site (terrestrial habitat quality site 33)	48
Photo 6: Potential Squatter Pigeon habitat in Eucalypt woodland/forest	63
Photo 7: Regrowth/derived grassland habitat	63
Photo 8: Leaf litter in <i>Acacia harpophylla</i> woodland/forest.....	64
Photo 9: Koala scats in the northwest of the study site (RE: 11.5.3)	66
Photo 10: Likely Koala scratches in the south of the study site (RE 11.3.4)	67
Photo 11: Wild dog tracks observed in dry creek bed	70
Photo 12: Feral cat tracks observed	70



Executive Summary

Biodiversity Australia Pty Ltd trading as Naturecall Environmental (hereafter referred to as 'Naturecall') has been requested by Middlemount Coal Pty Ltd (MCPL) to undertake a baseline ecological assessment consisting of vegetation validation and terrestrial habitat quality assessments of an offset area established for the Middlemount Coal Mine North-eastern Extension (the offset area herein referred to as the North-eastern Extension offset area).

The North-eastern Extension offset area has been approved by the Commonwealth Government under EPBC Act Approval (EPBC 2016/7717) to offset impacts on the Squatter Pigeon and South-eastern Long-eared Bat. A subcomponent of the offset is proposed to satisfy the State Environmental Authority (EPML00716913) for connectivity impacts. This Offset Baseline Report has been prepared to address the requirements under EPBC Act Approval (EPBC 2016/7717) and provide habitat quality data for the State Notice of Election.

Flora and fauna surveys were undertaken throughout the study site from 9 to 15 June 2016 and 29 May to 1 June 2017. Terrestrial habitat quality assessments in accordance with the *Guide to Determining Terrestrial Habitat Quality* were completed at a total of 36 locations across the study site. The fauna surveys comprised habitat suitability assessment, targeted surveys for threatened species, track, scat and secondary evidence searches, as well as, opportunistic fauna observations.

Pre-clearing Regional Ecosystems were ground-truthed during the 2017 surveys. The Regional Ecosystem valuation process identified a total of 11 distinct regional ecosystems across the study site. One of these is listed as Endangered and four are listed as Of Concern under the *Queensland Vegetation Management Act, 1999*. The Brigalow community within the study site is also listed as a Threatened Ecological Community (*Brigalow (Acacia harpophylla dominant and co-dominant)*) under the *Environment Protection and Biodiversity Conservation Act 1999*.

Remnant vegetation communities covered 339 ha (64%) of the study site. The less disturbed remnant areas (predominately in the western half of the study site) displayed attributes with similar values to the published benchmarks. Non-remnant vegetation communities covered 193 ha (36%) of the study site. While non-remnant areas generally contained more weed species they showed positive signs of natural regeneration.

Site condition and site context were assessed for both the Approved Commonwealth Offset Area and the State Connectivity Offset Area. Species habitat index scores were calculated for the Squatter Pigeon and South-eastern Long-eared Bat for each assessment unit within the Approved Commonwealth Offset Area. The overall Habitat Quality Score for the State Connectivity Offset Area is 7.37.



1.0 Introduction

Biodiversity Australia Pty Ltd trading as Naturecall Environmental (hereafter referred to as 'Naturecall') was commissioned by Middlemount Coal Pty Ltd (MCPL) to vegetation validation and terrestrial habitat quality assessments of an offset area established for the Middlemount Coal Mine North-eastern Extension (the offset area herein referred to as the North-eastern Extension offset area).

2.0 Background Information

2.1. Location of the Study Site

The North-eastern Extension offset area is located approximately 270 kilometres (km) north-west of Rockhampton and 9 km south-west of the Middlemount Township (Figure 1). It falls within in the Isaac-Comet Downs sub-region of the North Brigalow Belt Bioregion, and is within the Fitzroy catchment.

The North-eastern Extension offset area has been approved by the Commonwealth Government under EPBC Act Approval (EPBC 2016/7717) to offset impacts on the squatter pigeon and south-eastern long-eared bat. A subcomponent of the offset is proposed to satisfy the State Environmental Authority (EPML00716913) for connectivity impacts.

The North-eastern Extension offset area is located on freehold land owned by MCPL and is approximately 532 hectares (ha) in area. It includes a combination of forested/woodland areas and cleared grazing land. The study area is adjacent to three existing offset areas (Figure 2).

2.2. Study Objectives

This Offset Baseline Report has been prepared to address the requirements under EPBC Act Approval (EPBC 2016/7717) and provide habitat quality data for the State Notice of Election.

The primary objectives for this study were to:

- Conduct a baseline survey of the approved Commonwealth offset area as per the *Guide to Determining Terrestrial Habitat Quality* (DEHP, 2014).
- Apply the *Guide to Determining Terrestrial Habitat Quality* (DEHP, 2014) to the Regional Ecosystems predicted to occur in the State connectivity offset area prior to clearing.
- Gather baseline information relating to current weed cover.
- Gather baseline information relating to current shrub cover in RE 11.5.2a, 11.7.2 and 11.7.4.
- Document the presence of *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris* spp. in non-remnant areas.
- Provide an offset baseline report detailing the results of the survey and written descriptions about the baseline health and quality of each Regional Ecosystem within the offset site.
- Provide a geo-referenced map showing the location of survey sites.



Figure 1: Location of the Study Site

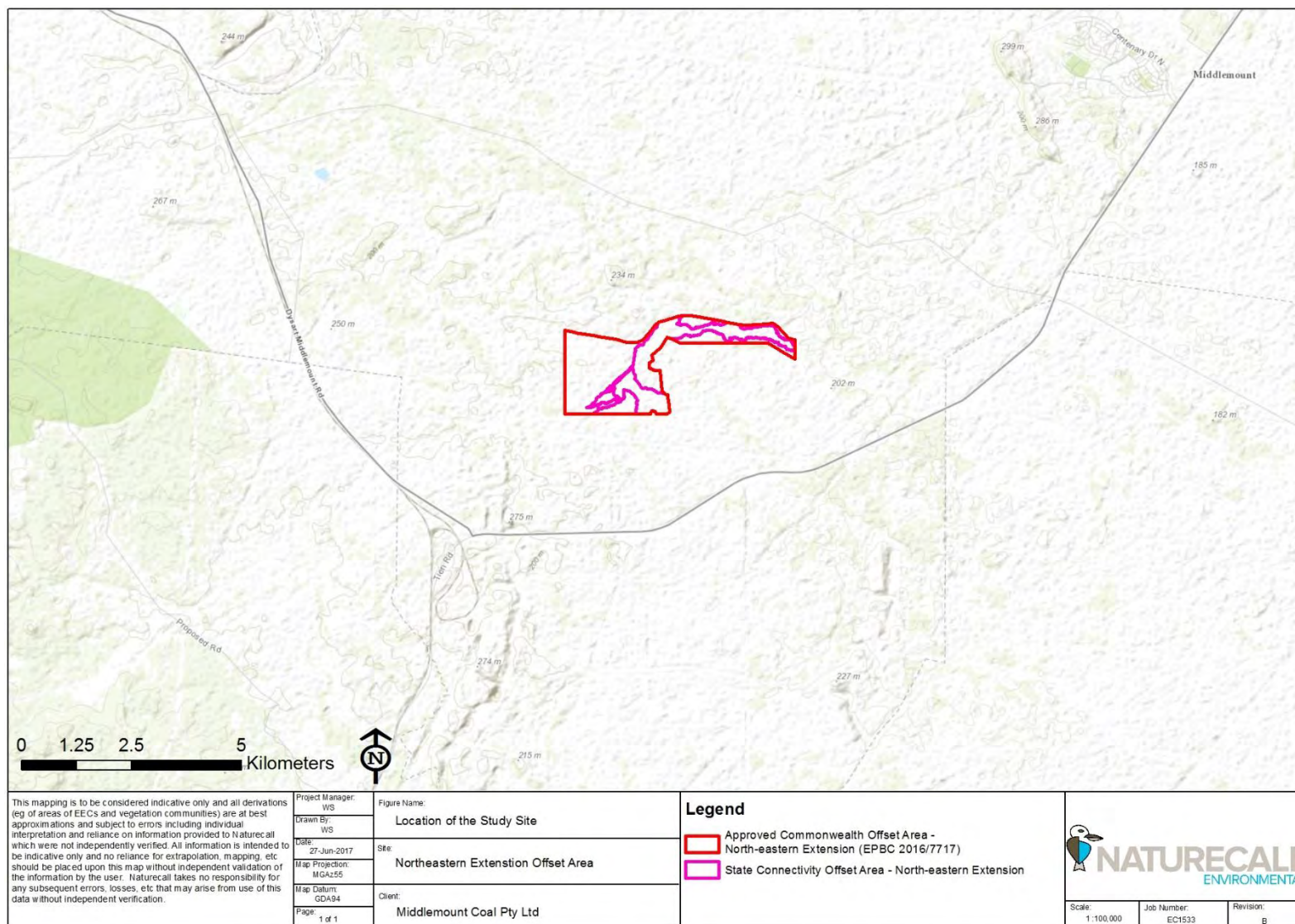
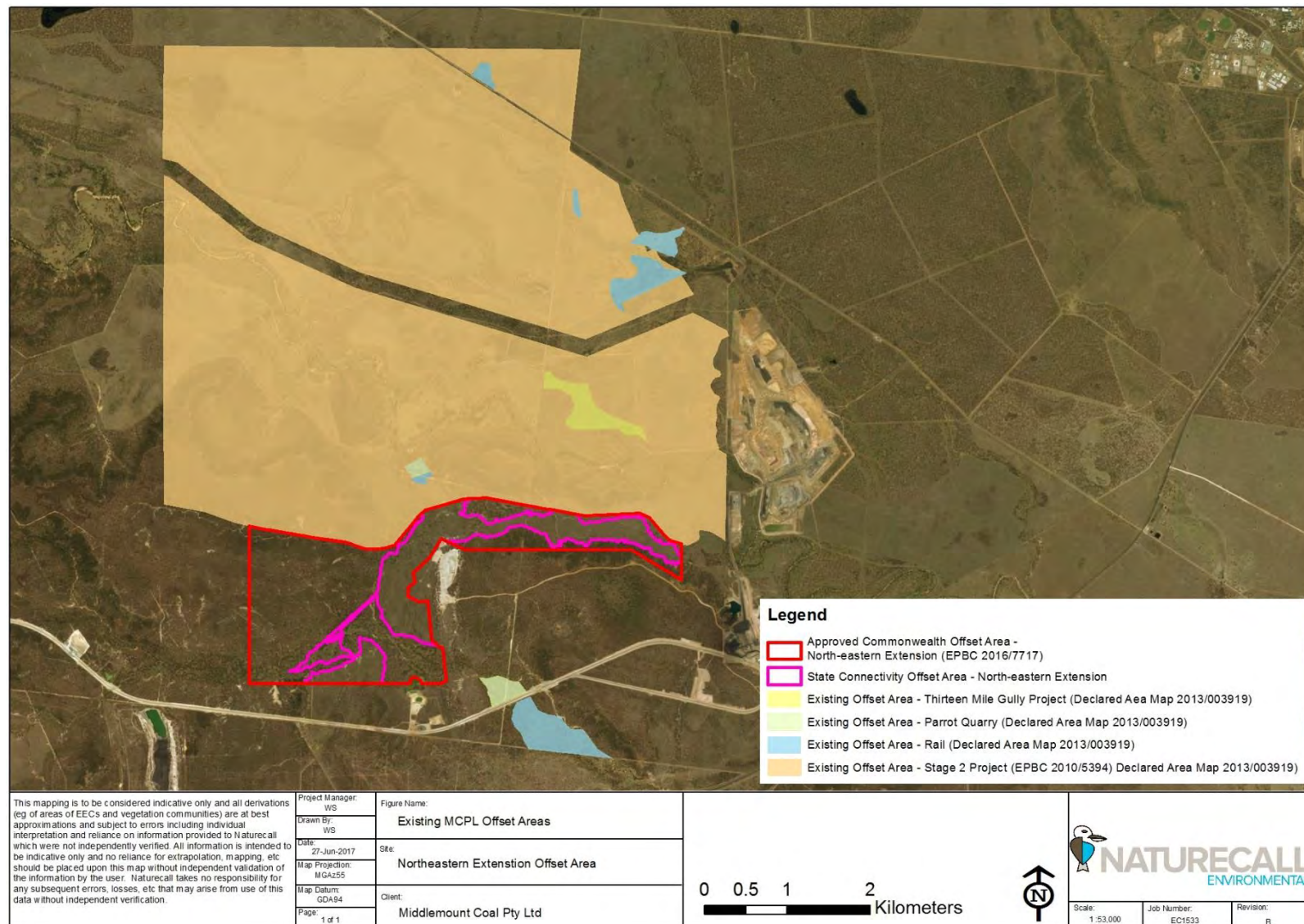




Figure 2: Existing MCPL Offset Areas





3.0 Existing Environment

3.1. Soils, Topography and Geology

The study site comprises gently undulating lowlands with slopes ranging from <5 to 30 degrees. Elevated areas are located in the east and west of the site with level and low lying areas occurring in the centre and north-east of the site along an alluvial plain associated with Parrot Creek (Figure 3). The hydrological features of the study site and Parrot Creek are discussed in Section 3.3.

Scarp retreat zones occur in the east of the site. These areas are characterised by skeletal soils with exposed rocky outcrops and deeply incised gullies.

Surface geology of the site comprises several formations including alluvium associated with Parrot Creek, sedimentary rocks and felsites (lavas, clastics and high level intrusives) as shown in Figure 3. The dominant underlying geology is the Duaringa Formation which comprises sedimentary rocks including mudstone, sandstone, siltstone and conglomerate (Department of Natural Resources and Mines [DNRM] 2015). The St Lawrence formation bisects the centre of the site and comprises volcanics (intrusive rhyolite, trachyte and microsyenite) while the Parrot Creek floodplain comprises quaternary alluvium comprising clay, silt, sand and gravel (DNRM 2015).

Soil types within the study site vary widely depending on the topographic location and underlying geology. The most prevalent soil type within the study site comprise silty to sandy loams and clays.

A total of four land zones were mapped over the study site (Wilson and Taylor 2012, DSITI 2017), comprising:

- Land Zone 3: Recent Quaternary alluvial systems.
- Land Zone 4: Tertiary-early Quaternary clay plains.
- Land Zone 5: Tertiary-early Quaternary loamy and sandy plains and plateaus.
- Land Zone 7: Cainozoic duricrusts.

3.2. Regional Ecosystems

Existing Department of Science, Information Technology and Innovation (DSITI) (2017) Regional Ecosystem mapping of the study site indicates that eleven Regional Ecosystems occur within the study site (Table 1; Figure 4). This DSITI mapping was verified in the field by Naturecall in 2016.

3.3. Pre-clearing Regional Ecosystems

The Pre-clearing Regional Ecosystems digital data layer (DSITI 2017) of the non-remnant vegetation through the centre of the site indicate that eight Regional Ecosystems formerly occurred in this area (Table 2; Figure 5). This layer was refined during the survey through field surveys.



Figure 3: Geology and Drainage

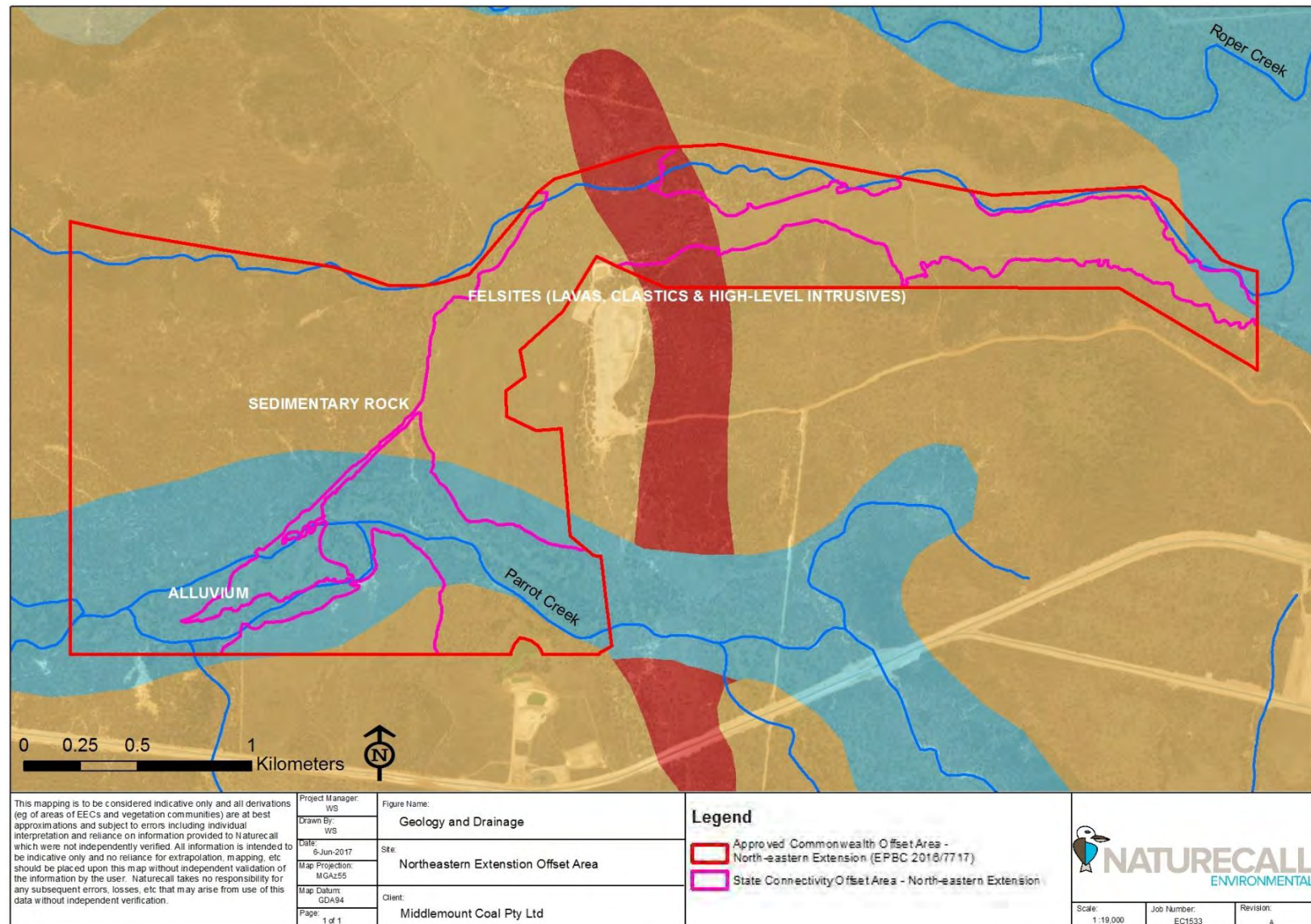



Table 1: Mapped Regional Ecosystems Located Within the Study Site

Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	VMA Status	BD Status	EPBC Status
11.3.2/11.3.7	<i>Eucalyptus populnea</i> woodland on alluvial plains and <i>Corymbia</i> spp. woodland on alluvial plains. sandy soils.	0.1	OC/LC	OC/OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	2.1	LC	OC	-
11.3.4/11.3.25	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	77.5	OC/LC	OC/OC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	16.6	E	E	E
11.4.9/11.4.8	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains; and <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	2.4	E/E	E/E	E
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces.	9.0	LC	NC	-
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces; and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	158	LC/LC	NC/NC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	23.7	LC	NC	-



Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	VMA Status	BD Status	EPBC Status
11.5.9b/11.5.18	<i>Eucalyptus crebra</i> and other <i>Eucalyptus spp.</i> and <i>Corymbia spp.</i> woodland on Cainozoic sand plains and remnant surfaces; and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces.	0.2	LC/OC	NC/OC	-
11.5.9b/11.5.3	<i>Eucalyptus crebra</i> and other <i>Eucalyptus spp.</i> and <i>Corymbia spp.</i> woodland on Cainozoic sand plains and remnant surfaces; and <i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	37.8	LC/LC	NC/NC	-
11.7.2/11.7.1	<i>Acacia spp.</i> woodland and or on Cainozoic lateritic duricrust. Scarp retreat zone/ <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. microcarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust.	29.5	LC/LC	NC/OC	-

E – Endangered, OC – Of Concern, NC – No Concern at present, LC – Least Concern, VMA – Vegetation Management Act, EPBC –Environmental Protection and Biodiversity Conservation Act, BD Status –Biodiversity Status (according to the Queensland Government).


Table 2: Pre-clearing Regional Ecosystems Mapped on Site

Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	VMA Status	BD Status	EPBC Status
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks.	1.0	LC	NC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	4.4	LC	OC	-
11.3.4/11.3.25	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	14.4	OC/LC	OC/OC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	68.4	E	E	E
11.4.9/11.4.8	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains and <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	12.7	E/E	E/E	E
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia spp.</i> , with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces: and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	17.1	LC/LC	NC/NC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	58.3	LC	NC	-
11.7.2/11.7.1	<i>Acacia spp.</i> woodland and or on Cainozoic lateritic duricrust. Scarp retreat zone/ <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. microcarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust.	6.5	LC/LC	NC/OC	-

E – Endangered, OC – Of Concern, NC – No Concern at present, LC – Least Concern, VMA – Vegetation Management Act, EPBC –Environmental Protection and Biodiversity Conservation Act, BD Status –Biodiversity Status (according to the Queensland Government).

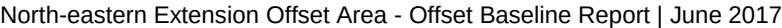


Figure 4: Mapped Regional Ecosystems

Source: DSITI 2017

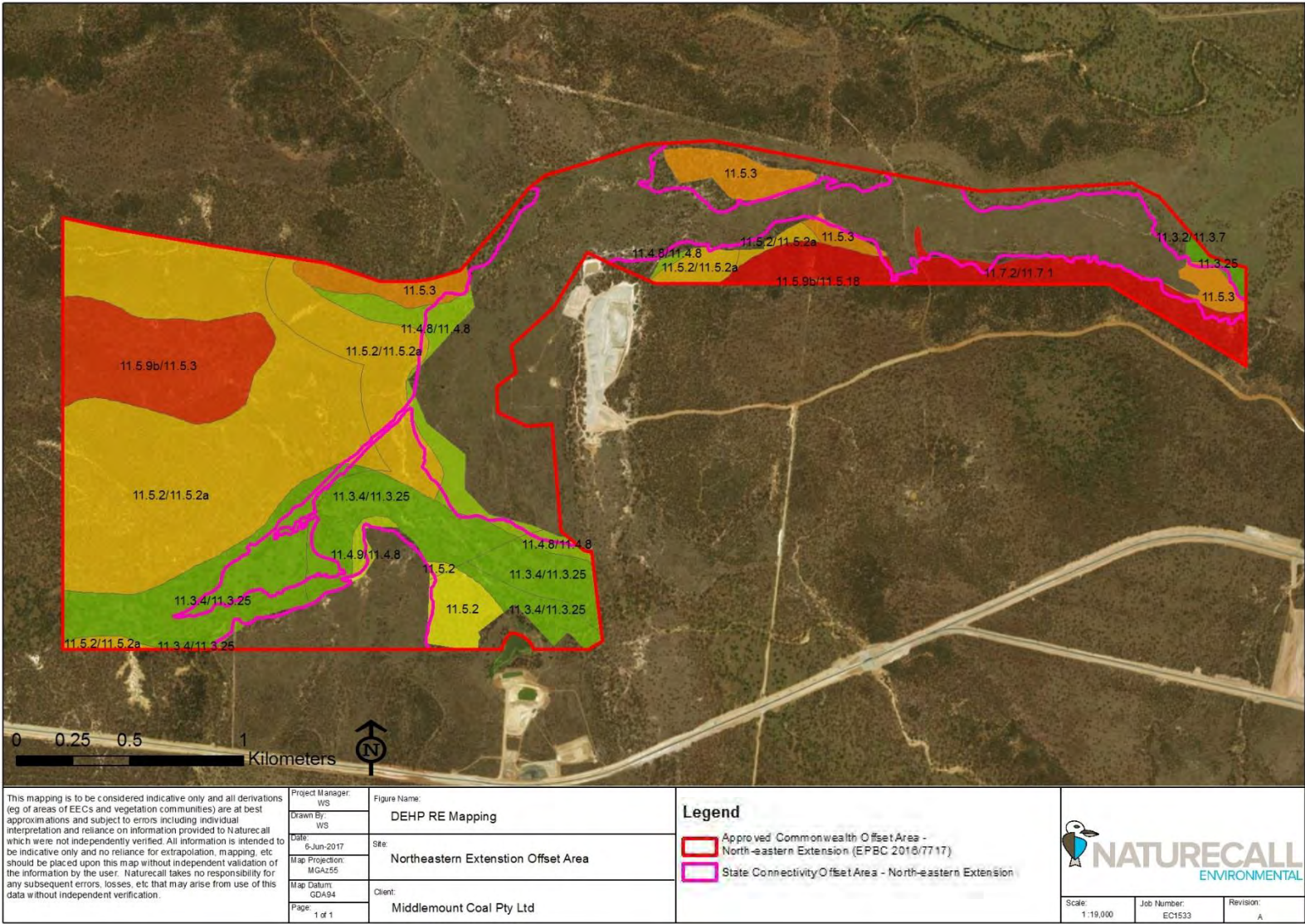
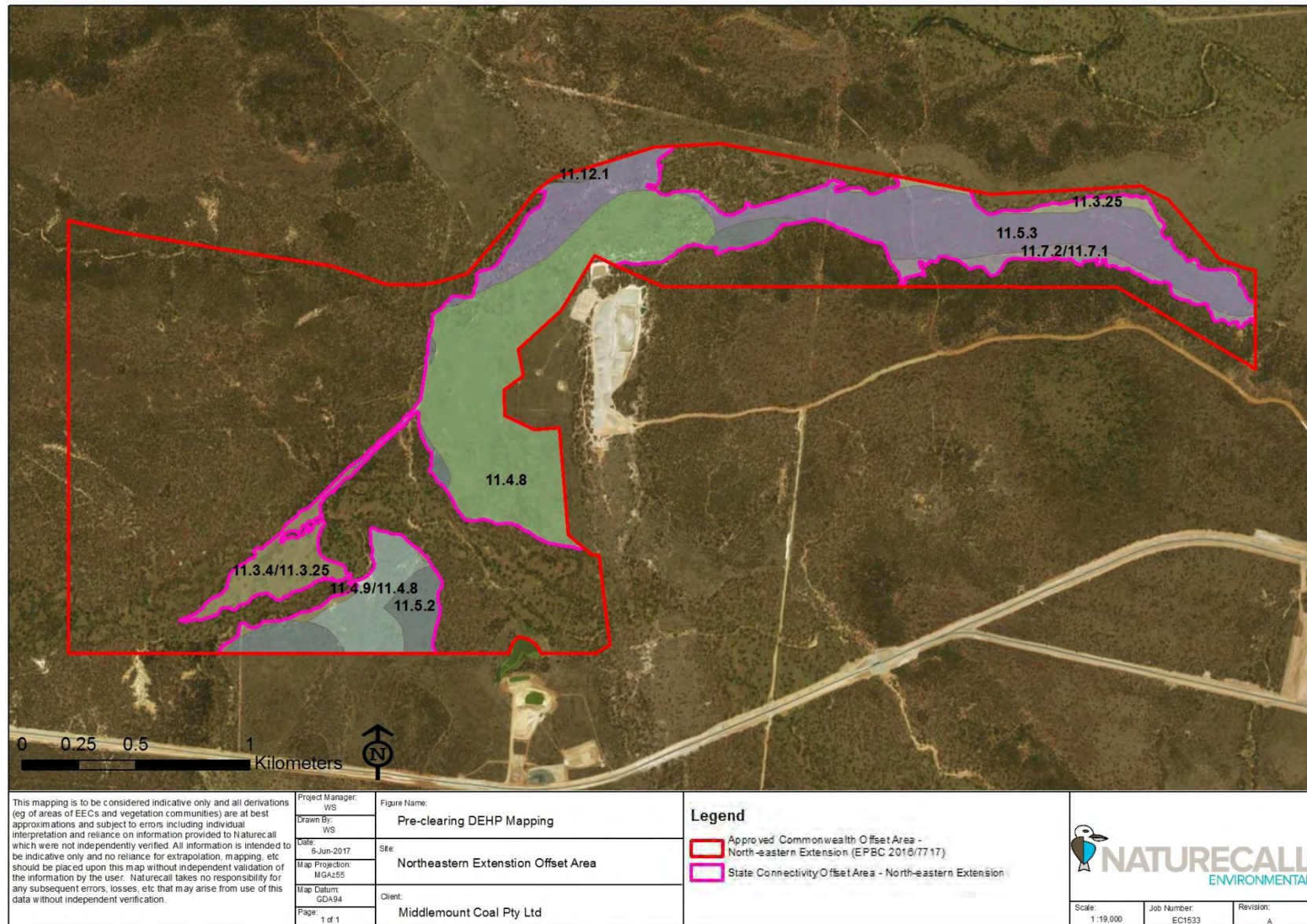




Figure 5: Pre-clearing Mapping





3.4. Drainage Features

The site is located in the Fitzroy River Basin which drains an area of approximately 150,000km² (DNRM 2015). The main drainage feature of the study site is Parrot Creek which passes through the southern half of the site (Figure 3). Parrot Creek was found to be largely dry during the field surveys (Photo 1), however some pools remained. A number of other smaller tributaries and drainage lines flow through the study site into Parrot Creek from the south.

A tributary of Roper Creek also runs along the site's northern boundary (adjacent the existing Middlemount Stage 2 Project offset area) and joins Roper Creek just to the north-east of the study site.

These watercourses are all ephemeral (i.e. flow is restricted to periods after rainfall). Whilst these watercourses were not flowing during the field surveys, recent rainfall events resulted in a number of temporary waterholes within the watercourses.

Permanent water sources were located within the study site, including two large dams in the central-south of the study site which were excavated for railway fill. These water sources would provide a permanent water source for native fauna and habitat for a range of bird species.

Photo 1: Section of Parrot Creek (terrestrial habitat quality site 40)





3.5. Landuse and Disturbance History

The study site does not contain any developed areas such as dwellings or farm infrastructure. The primary current landuse is beef cattle grazing, which mostly occurs along Parrot Creek and cleared areas in the centre and north-east of the site. No other agricultural activities are conducted within the study site.

Historically, the main disturbance activities within the study site were related to land clearing associated with cattle grazing, which has occurred extensively in low-lying areas including creek flats, and clay plains. These areas were most likely dominated by Brigalow prior to land clearing activities. Grazing and trampling by cattle has suppressed regeneration over some cleared areas, however natural regeneration is occurring extensively throughout the study site.

Vegetation thinning also appears to have been a common practice throughout the study site and has occurred more commonly in woodland areas in the east of the site, with the forested areas in the west of the site appearing to remain largely undisturbed.

3.6. Summary of Previous Threatened Species Recorded

A number of flora and fauna surveys have been undertaken on lands surrounding the study site (Parsons Brinckerhoff, 2010; Ecology and Heritage Partners, 2012; EHP, 2013a, 2013b, 2013c; Naturecall, 2013, 2014a, 2014b, 2014c, 2015, 2016; GHD, 2012). These surveys have resulted in the detection of a number of flora and fauna species listed under the *Nature Conservation Act, 1992* (NC Act) and/or *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) which includes:

- *Cerbera dumicola* which is listed as 'Near Threatened' under the NC Act (Parsons Brinckerhoff, 2010; EHP, 2012; Naturecall, 2013, 2016).
- Koala (*Phascolarctos cinereus*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (Parsons Brinckerhoff, 2010; Naturecall, 2014b, 2016; EHP, 2012).
- Greater Glider (*Petauroides volans*), which is listed as 'Vulnerable' under the EPBC Act (Naturecall, 2014b).
- Squatter Pigeon (*Geophaps scripta scripta*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (Parsons Brinckerhoff, 2010; EHP, 2012; Naturecall, 2013, 2014a, 2014c).
- Ornamental Snake (*Denisonia maculata*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (Parsons Brinckerhoff, 2010).



4.0 Methodology

4.1. Desktop Study and Literature Review

A desktop study was completed prior to the field survey to gather relevant information and data. The following databases and Geographic Information System (GIS) layers were searched/obtained:

- Department of the Environment and Energy (DEE) Protected Matters Search Tool (DEE, 2017a).
- DEHP Wildlife Online database (DEHP, 2017).
- DSITI Regional Ecosystems Mapping digital data layer (DSITI, 2017).
- DSITI Pre-clearing Regional Ecosystems digital data layer (DSITI, 2017).

In addition to the desktop searches, the following literature was reviewed:

- Ecology and Heritage Partners (2012). *Ecological Investigations within the Offset Area for Stage 2 of the Middelmont Coal Mine, Queensland*. Queensland, Australia. Middelmont Coal Pty Ltd.
- Ecology and Heritage Partners (2013a). *Vegetation Offsets for Middelmont Rail Spur and Loop*.
- Ecology and Heritage Partners (2013b). *Vegetation Offsets for Parrot Quarry*.
- Ecology and Heritage Partners (2013c). *Vegetation Offsets for Middelmont Coal Mine Thirteen Mile Gully Diversion*.
- MCPL (2013a) *Middelmont Coal Mine Rail Loop and Spur Vegetation Offset Proposal*.
- MCPL (2013b) *Parrot Quarry Vegetation Offset Proposal*.
- MCPL (2013c) *Thirteen Mile Gully Diversion Vegetation Offset Proposal*.
- MCPL (2013d). *Middelmont Coal Mine Offset Management Plan/Vegetation Management Plan*. Queensland, Australia. Middelmont Coal Pty Ltd.
- Naturecall (2013). *Ecological Monitoring for Offset Area*. Unpublished report to Middelmont Coal Pty Ltd.
- Naturecall (2014a). *Ecological Assessment Report for Bingegang Pipeline Relocation*, Middelmont Coal Mine.
- Naturecall (2014b). *Ecological Monitoring for Offset Area: Use of the Offset Area by Fauna*. Unpublished report to Middelmont Coal Pty Ltd.
- Naturecall (2014c). *Ecological Monitoring for Offset Area Year 2*. Unpublished report to Middelmont Coal Pty Ltd.
- Naturecall (2015). *Terrestrial Ecology Impact Assessment: North-eastern Extension*, Middelmont Coal Mine. Unpublished report to Middelmont Coal Pty Ltd.
- Naturecall (2016). *Vegetation Validation and Terrestrial Habitat Assessment*, Middelmont Coal Mine. Unpublished report to Middelmont Coal Pty Ltd.
- Parsons Brinckerhoff (2010). *Middelmont Coal Project (Stage 2) Terrestrial Ecological Impact Assessment*.



Existing DEHP Regional Ecosystem mapping of the study site (Section 3.2), as well as previous mapping on adjoining land (Parsons Brinckerhoff, 2010; Ecology and Heritage Partners, 2012) was obtained and used in conjunction with satellite imagery to identify the broad vegetation types present on the study site. This preliminary mapping assisted with survey design and allowed comparison to the floristic data collected during the survey.

4.2. Flora Survey

Flora and habitat assessment surveys were completed throughout the study site by Principal Ecologist Will Steggall and Ecologist Katie Selhorst from 9 to 15 June 2016 and 29 May to 1 June 2017. The primary aims of the flora survey were to apply the terrestrial habitat quality methodology to the site and ground-truth the Pre-clearing Regional Ecosystems digital data layer (DSITI, 2017).

Field surveys were undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al., 2012) and the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017).

4.2.1. Approved Commonwealth Offset Area

The approved Commonwealth offset area was subject to:

- vegetation mapping and sampling (Section 4.2.1.1);
- site conditions assessments (Section 4.2.1.2);
- weed cover assessments (Section 4.2.1.3);
- sampling of shrub cover in RE 11.5.2a, 11.7.2 and 11.7.4 (Section 4.2.1.4);
- documenting the presence of *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris spp.* in non-remnant areas (Section 4.2.1.5); and
- surveys for threatened communities and flora species listed under the EPBC Act (Section 4.2.1.6).

4.2.1.1. Vegetation Mapping and Sampling

In 2016, a total of seven quaternary survey sites were carried out across the approved Commonwealth offset area. This allowed accurate mapping of Regional Ecosystems, a more comprehensive species list of the study site (Appendix 1), and validation of vegetation status (i.e. remnant/non-remnant).

The following information was recorded at each quaternary survey site:

- Date.
- Structural Code.
- Ecologically Dominant Layer (EDL) Height.
- EDL Cover.
- Land Zone.
- Regional Ecosystem Map Unit.



- Collector/s.
- X/Y Coordinate.
- Remnant Vegetation Cover.

4.2.1.2. Habitat Quality Assessment

Habitat Quality Assessments were conducted throughout remnant and non-remnant areas of the approved Commonwealth Offset Area in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017).

Defining Assessment Units

Assessment units for the site condition assessments were defined according to the ground-truthed Regional Ecosystems (RE). Each distinct RE was assigned as a single assessment unit as per the *Guide to Determining Terrestrial Habitat Quality*.

Sampling Sites

Based on a desktop assessment of the study area and minimum effort requirements described in the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017) a minimum of 37 plots/transects were required as shown in Table 3 below.

A total of 36 plots/transects were undertaken; 8 plots/transects were undertaken in June 2016 and 28 were undertaken in May/June 2017. A geo-referenced map showing the location of survey sites is shown in Figure 6.

As seen in Table 3 below, assessment units 7, 8, 9, 11 and 16 were a single site less than the suggested number of sites in the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017), yet the guidelines describe that site numbers can be reduced. This is due to the small size of the assessment units (e.g. 0.9 to 26.6 ha) and the vegetation across the assessment unit being in very similar condition and not warranting additional condition assessments. In this circumstance, photographs were taken to demonstrate the similarity as allowed for in Section 4.4 of the guidelines (DEHP, 2017).

**Table 3: Sampling Sites in Commonwealth Offset Area**

Assessment Unit	Regional Ecosystem	Area (ha)	Suggested no. of Sampling Sites	Sampling Sites Completed 2016	Sampling Sites Completed 2017
AU1	11.3.2	12.5	2	0	2
AU2	11.3.25	18.8	2	1	2
AU3	11.3.4/11.3.4a	29.2	2	2	0
AU4	11.5.2a	98.3	3	1	2
AU5	11.5.3	108	4	2	2
AU6	11.5.9	34.8	2	0	2
AU7	11.7.2	26.6	2	0	1
AU8	11.7.4	5.1	2	0	1
AU9	11.4.8	0.9	2	0	1
AU10	11.5.18	6.8	2	0	2
AU11 (Non-Rem)	11.3.2	9.5	2	0	1
AU12 (Non-Rem)	11.3.4	11.9	2	0	2
AU13 (Non-Rem)	11.4.8	80	3	1	5
AU14 (Non-Rem)	11.5.2a	13.3	2	0	2
AU15 (Non-Rem)	11.5.3	64.7	3	1	2
AU16 (Non-Rem)	11.7.4	3.6	2	0	1

Site selection was targeted to sample a representative coverage of the site vegetation. The following information was recorded at each of the terrestrial habitat quality assessment sites using a combination of measured plots and transects:

- Observer, location and date.
- Regional Ecosystem (assessment unit).
- Photographic record of vegetation.
- Habitat description (e.g. presence of habitat resources for native fauna).
- Canopy and subcanopy height (measured using stick method).
- Canopy and subcanopy percentage cover.
- Native plant species richness (as a percentage) in each layer.
- Number of large trees located within a 100m x 50m plot.
- Recruitment of woody perennial species (i.e. proportion of dominant layer regenerating).
- Coarse woody debris within a 50m x 20m plot.
- Non-native plant cover percentage.
- Groundcover composition.

Reference Sites

In 2016, two reference sites were created within the study site to establish a local benchmark for RE 11.5.2a, as no benchmark has been established by the Queensland Herbarium and no local benchmark is known to have been established by previous surveys in the area.

In 2017, a reference site was undertaken in RE 11.7.4 to establish a local benchmark as no formal benchmark has been established by the Herbarium to date.



These reference sites were created in accordance with the *Methodology for the Establishment and Survey of Reference Sites for BioCondition* (DERM, 2011).

Site Condition Assessment

Habitat quality attributes were recorded at each sampling site. The values for each habitat quality attribute were recorded in the field on Biocondition data sheets (Eyre *et al.*, 2015). This data was then inputted into the Habitat Quality Scoring Template, Version 1.0 (DEHP, 2014).

For Assessment Units that had multiple sampling sites the values for each attribute were totaled and then averaged in order to have one value for each attribute. This approach was confirmed with EHP. For each Assessment Unit the values recorded at the sampling sites were then compared against the relevant Regional Ecosystem benchmark data for each attribute to give an overall score for each attribute. Summing these scores determined the overall score for Site Condition for each Assessment Unit. This was all calculated through the Habitat Quality Scoring Template.

Site Context Assessment

Site context attributes were measured via desktop assessment using GIS mapping and spatial analysis as per the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017). ArcGIS Version 10.2.2 was used for all GIS mapping and spatial analysis.

This data was then inputted into the Habitat Quality Scoring Template which automatically compares the site context attributes to the Site Context Scoring sheet to determine the overall site context score for each Assessment Unit.

It is important to note that the “Distance to permanent watering point” was not calculated as this attribute is measured for intact Bioregions only and the Brigalow Belt Bioregion is fragmented.

Fauna Species Habitat Assessment

A desktop review was completed prior to the field survey to gather relevant information and data on the Squatter Pigeon and South-eastern Long-eared Bat. Targeted surveys for the Squatter Pigeon and habitat suitability assessment for the South-eastern Long-eared Bat were then undertaken within the study area. Using the information gathered and expert knowledge of the site and area, the Species Habitat Index scores were determined using the Species Habitat Index Scoring Guide as per the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017).

Final Habitat Quality Score

The final Habitat Quality Score was automatically calculated within the Habitat Quality Scoring Template provided. Each of the above three indicators are scored then summed and translated to a final score out of 10, with a score of 10 representing a fully intact ecosystem and 1 representing a totally cleared area (DEHP, 2017).



4.2.1.3. Weed Cover Assessments

The current weed cover was documented during the *Terrestrial Habitat Quality Assessment*. During the site surveys, the following additional information was gathered in each site condition plot:

- The dominant weed species in each plot were recorded on the data sheet.
- A comprehensive list of weed species in each plot was recorded and documented on the data sheet.

4.2.1.4. Sampling of Shrub Cover in RE 11.5.2a, 11.7.2 and 11.7.4

The current shrub cover in RE 11.5.2a, 11.7.2 and 11.7.4 was documented during the *Terrestrial Habitat Quality Assessment*. The condition assessments within these Regional Ecosystems (T20, T29, T50, T45, T51) recorded the cover of shrubs along a 100m transect and also the diversity of shrub species present.

4.2.1.5. Documenting the Presence of *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris* spp. in non-remnant areas

Eucalyptus, *Corymbia*, *Acacia* and *Callitris* spp. in non-remnant areas were identified and documented where observed during the Terrestrial Habitat Quality Assessments. A total of 15 site condition assessments were undertaken in non-remnant areas which has provided good coverage of this area and ample data to document the presence of these trees.

4.2.1.6. Surveys for Threatened Communities and Flora Species Listed under the EPBC Act

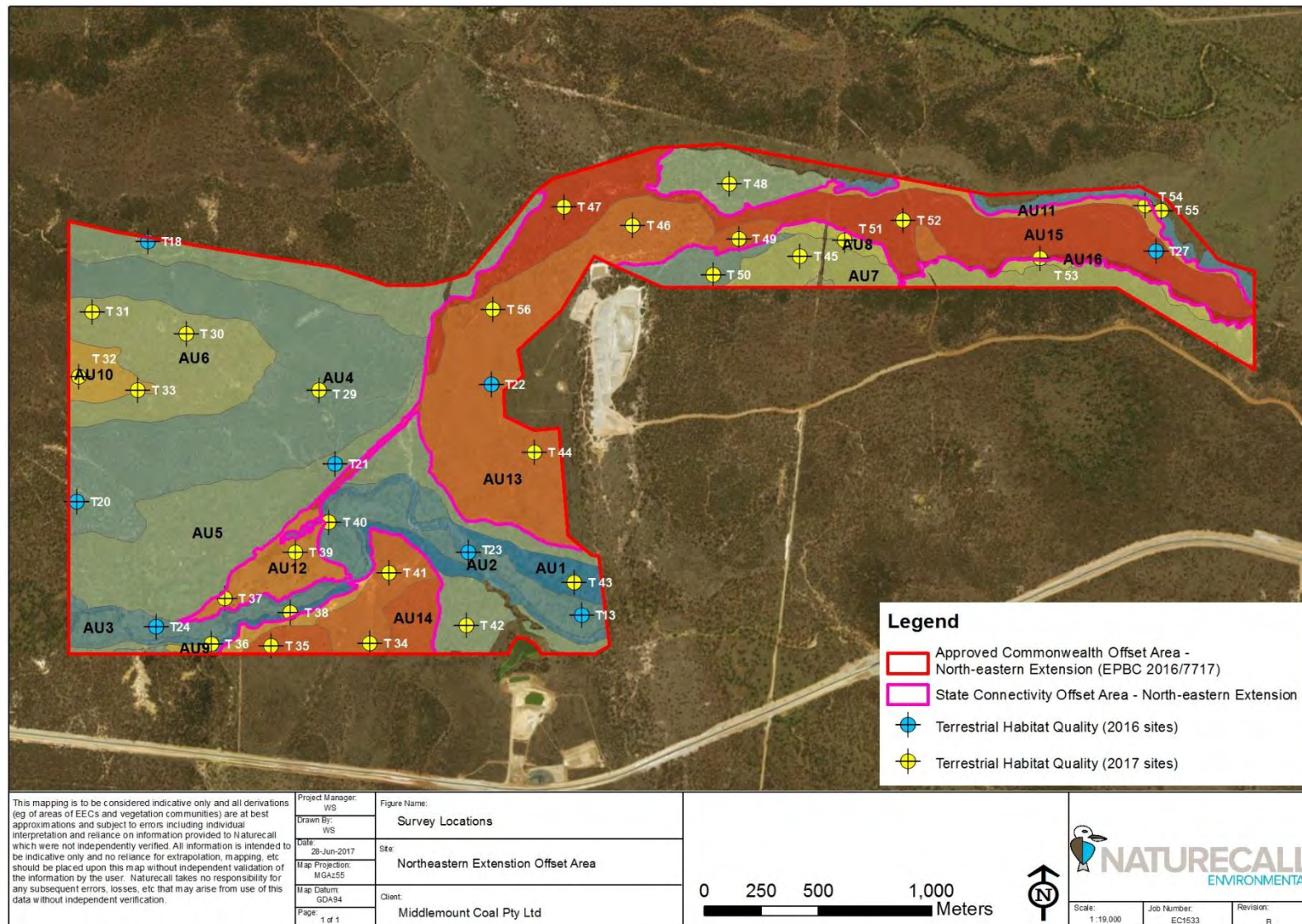
Threatened Ecological Communities were surveyed in both 2016 and 2017 via quaternary vegetation surveys and Terrestrial Habitat Quality Assessments. This has allowed accurate mapping of the extent of these communities on the site and their condition.

Desktop searches and literature reviews determined that there were no threatened flora species listed under the EPBC Act with potential to occur in the study site. As such, no formal targeted surveys for EPBC Act listed threatened flora species were undertaken.

The vegetation surveys undertaken over the offset area to date (e.g. quaternary surveys, opportunistic threatened flora surveys, terrestrial habitat quality assessments) have surveyed the site extensively and are likely to have detected any threatened flora species if present.



Figure 6: Location of Survey Sites





4.2.2. State Connectivity Offset Area

4.2.2.1. Site Condition Assessment

Site condition assessments were conducted throughout the non-remnant areas of the State connectivity offset area in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017) as previously described.

A total of 2 plots/transects were completed in this non-remnant area in June 2016 and a subsequent 13 were completed in May/June 2017 as shown in Table 4.

As seen in Table 4 below, assessment units 11 and 16 were a single site less than the suggested number of sites in the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP, 2017), yet the guidelines describe that site numbers can be reduced. This is due to the small size of the assessment units (e.g. 3.6 to 9.5 ha) and the vegetation across the assessment unit being in very similar condition and not warranting additional condition assessments.

Table 4: Survey Sites – State Connectivity Offset Area

Assessment Unit	Regional Ecosystem	Area (ha)	Suggested no. of Sampling Sites	Sampling Sites Completed 2016	Sampling sites completed 2017
AU11	11.3.2	9.5	2	0	1
AU12	11.3.4	11.9	2	0	2
AU13	11.4.8	80	3	1	5
AU14	11.5.2a	13.3	2	0	2
AU15	11.5.3	64.7	3	1	2
AU16	11.7.4	3.6	2	0	1

4.2.2.2. Field Validation of Pre-clearing Regional Ecosystems

In order for the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017) to be run on non-remnant areas, EHP advised MCPL that it is necessary to map Regional Ecosystems which are likely to have occurred prior to clearance. The Pre-clearing Regional Ecosystems digital data layer (DSITI, 2017) was ground-truthed during the 2017 field surveys via the site condition assessments and observations during field traverses. A field verified pre-clearing data layer was digitized in ArcGIS using existing pre-clearing mapping, the results of the field surveys and high resolution satellite imagery.

4.3. Fauna Surveys

Fauna surveys were completed throughout the study site during the flora surveys in the 2016 survey period. The fauna surveys comprised the following:

- Habitat suitability assessment.
- Diurnal bird surveys.
- Track, scat and secondary evidence searches.
- Koala food trees.
- Opportunistic fauna observations.



Further details are provided in Sections 4.3.1 to 4.3.4. Only opportunistic fauna surveys were undertaken during the 2017 surveys.

4.3.1. Habitat Suitability Assessment

Broad fauna habitat types on the study site were categorised and mapped using the same classifications as Parsons Brinckerhoff (2010). The condition and features (e.g. hollows, fallen logs and leaf litter) of the various habitat types within the study site were recorded during the field surveys. Any permanent and non-permanent water sources were also recorded and photographed.

Detailed data on habitat parameters such as groundcover density and composition, vegetation structure, coarse woody debris and weed cover was collected as part of the site condition assessment described in Section 4.2.1.

Potential foraging/roosting habitat suitability for threatened bat species was also determined based on the presence of food sources (e.g. feed trees), hollow-bearing trees and caves (or cave-like structures).

The site was inspected during winter which is not conducive to recording bat species via other survey techniques (as they hibernate). However, bat surveys have been undertaken in the adjoining offset areas in accordance with the Commonwealth *Survey Guidelines for Australia's Threatened Bats* (DEWHA, 2010) and a number of native bat species have been recorded (e.g. Little Pied Bat, Eastern Cave Bat, Eastern Bentwing-bat, etc) (Naturecall, 2014, 2014b, 2014c, 2015). Given the wide range of the potentially occurring threatened bat species (e.g. South-eastern Long-eared Bat [*Nyctophilus corbeni*]) and the continuity of habitats between the study site and the existing offset area, the surveys in the offset area are considered to provide a good indication of the presence (or likelihood of occurrence) of threatened bat species within the study site.

4.3.2. Diurnal Bird Surveys

The diurnal bird surveys consisted of specific censuses of at least 30 minutes duration and were undertaken twice a day (morning and afternoon) at each site. Bird species were generally surveyed by detecting calls and searching with binoculars at specific points or along a walking transect. The surveys targeted permanent water sources, roads/tracks and other areas of suitable habitat for the Squatter Pigeon.

Diurnal bird surveys targeting the Squatter Pigeon were undertaken in accordance with the Commonwealth *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010). The locations of the diurnal bird surveys are shown in Figure 7.

4.3.3. Track, Scat and Secondary Evidence Searches

Searches for scats and tracks were undertaken opportunistically throughout the study site in conjunction with other surveys and when traversing between vegetation survey sites. A total of approximately five hours was spent on this activity.

The sandy roads and dry creek beds within and around the study site provided ideal locations for track searches, and any tracks found were photographed and identified using Triggs (1996) as a



reference text. Predator scats were collected and analysed in order to identify cryptic fauna species which may occur in the study site.

Physical habitat searches of the site involved:

- Lifting of debris to search for reptiles and frogs.
- Inspection of dense vegetation for bird nests.
- Observation of likely basking sites for reptiles and frogs.
- Searching for scats, tracks, digging and scratches across the study site as they could indicate the presence of numerous native species (e.g. Koala).

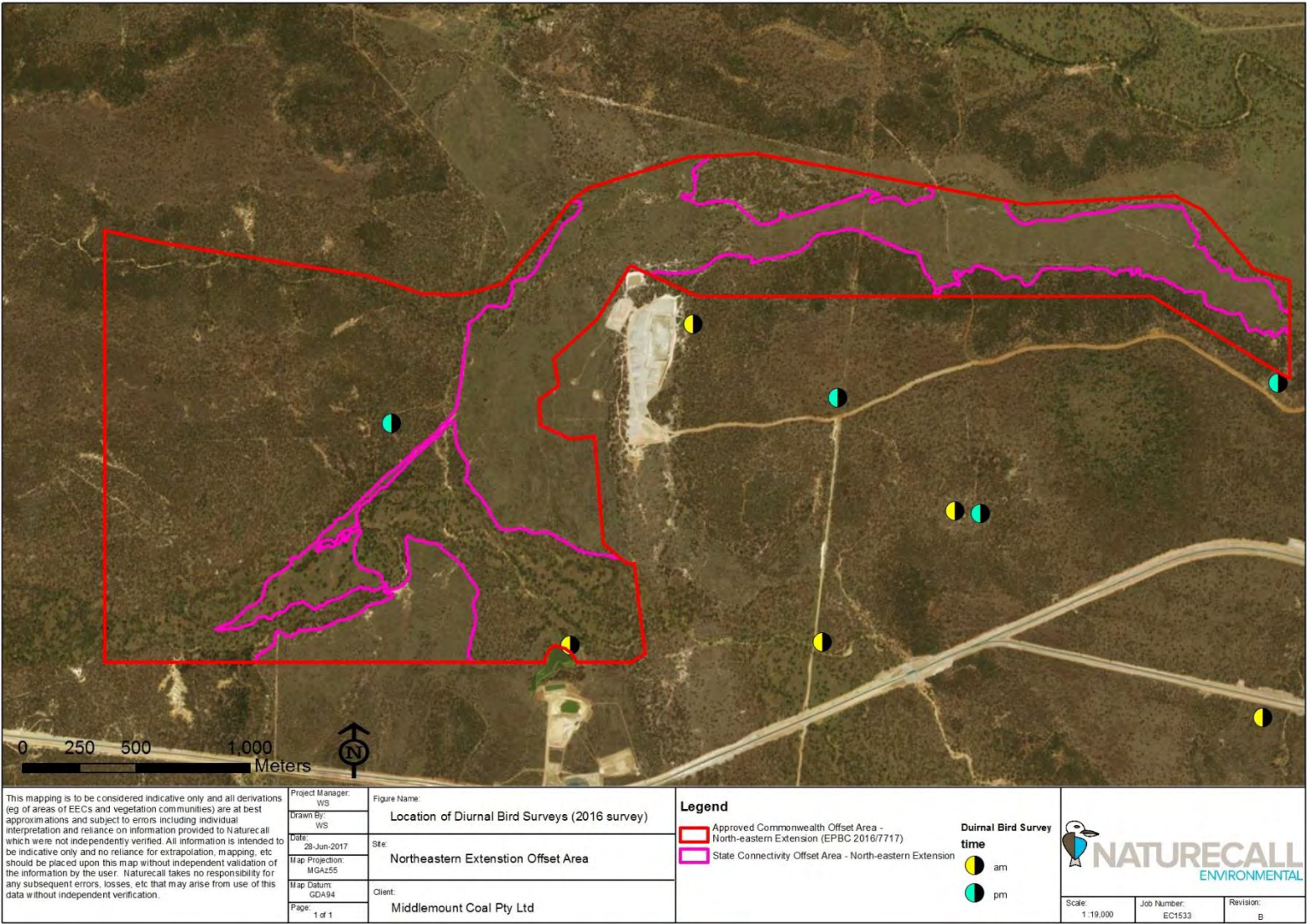
4.3.4. Koala Food Trees

The suitability of the study site to provide habitat for the Koala was determined by assessing the presence of Koala Food Trees (KFTs) as defined by the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DEE, 2014) and *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016* (Environmental Protection Agency [EPA], 2006).

The presence of KFTs throughout the study site was determined using the results of the flora surveys (and subsequent Regional Ecosystem mapping). The presence of KFTs is discussed in Section 5.3.1.



Figure 7: Location of Diurnal Bird Surveys





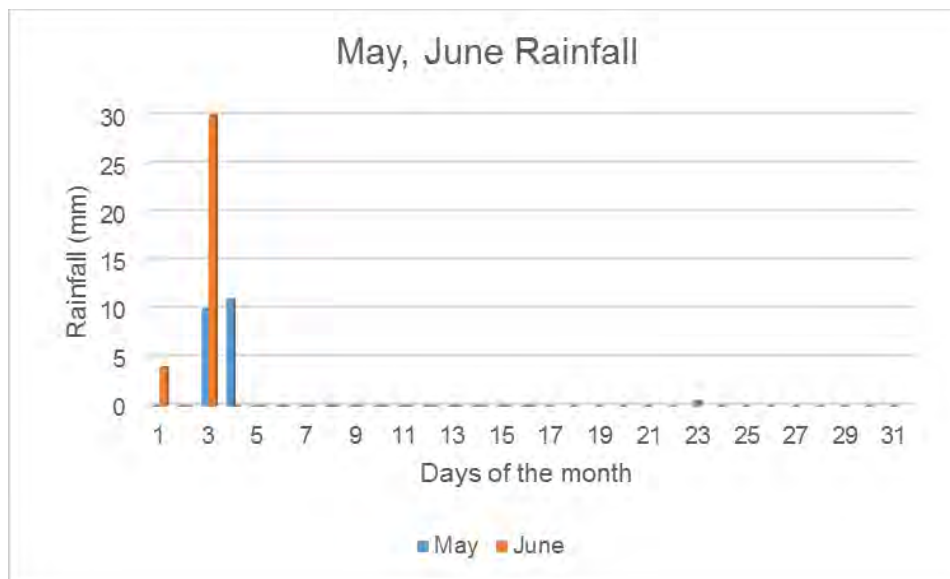
4.4. Weather Conditions During the Survey

Weather conditions during the 2016 survey were generally fine and sunny, with overcast conditions and very light rain experienced on 13th June. During the field survey, temperatures ranged from 9.6°C to 24.6°C (Bureau of Meteorology [BoM], 2017).

Heavy rains (>30mm recorded) were experienced during the week prior to the field survey. Rainfall recorded at Middlemount Coal Mine for the months of May and June is shown in Figure 8.

Figure 8: Rainfall at Middlemount Coal Mine for the Months of May and June 2016

Source: MCPL (2017)

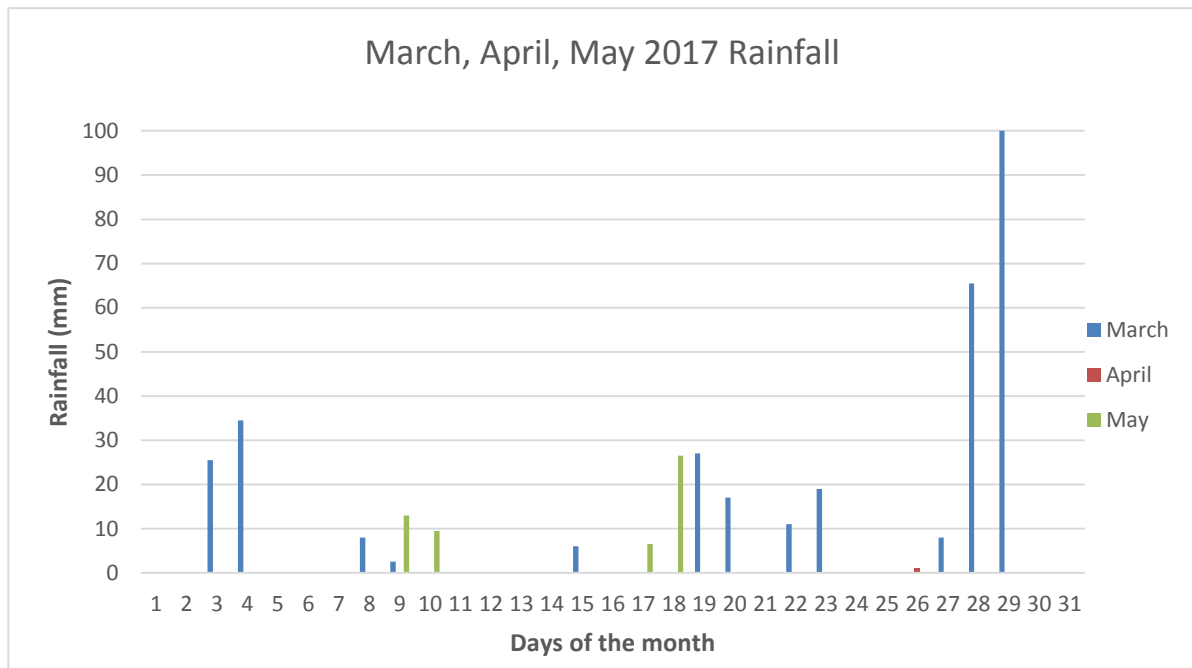


Weather conditions during the 2017 survey were fine and dry. According to Middlemount Mine rainfall data the total precipitation during May was 55.5mm. It is important to note that total precipitation for March 2017 was unusually high (324mm) reflecting the effects of the cyclone that hit the region, with 65.5mm and 100mm of precipitation recorded for March 28th and 29th respectively. Temperature ranged from a low of 8.7 °C to a high of 28.3 °C during the survey period (temperatures taken from BoM data recorded at Emerald Airport). Rainfall recorded at Middlemount Coal Mine for the months of March, April and May is shown in Figure 9.



Figure 9: March-May 2017 Precipitation Recorded at Middlemount Coal Mine.

Source: MCPL (2017)





5.0 Results

5.1. Vegetation Survey Results

5.1.1. Floristics

The site was found to have reasonable floristic diversity, however weeds and naturalised pasture species such as Buffel Grass are present over large areas of the site. The comprehensive flora list for the study site is presented in Appendix 1.

A total of 168 flora species were recorded during the surveys, including 20 exotic species (Appendix 1). The highest diversity was found at less disturbed sites where an intact ground layer was present and there was less evidence of disturbance from cattle grazing.

Regional Ecosystem descriptions are presented below and details on threatened flora species recorded are provided in Section 5.2.4.

5.1.2. Regional Ecosystems

The RE validation process identified a total of ten distinct regional ecosystems across the study site. Approximately 64% of the site, or 339 ha, qualified as remnant vegetation¹, with the remaining 193 ha (36%) determined to be non-remnant.

The DSITI mapped REs are shown in Figure 4 and updated ground-truthed RE mapping for the study site is shown in Figures 10 and 11. The areas of the DSITI mapped regional ecosystems and the ground-truthed REs is provided in Tables 5 and 6. A selection of the different regional ecosystems present within the study site are shown in Photos 2 to 4.

5.1.3. Baseline Condition of Regional Ecosystems

5.1.3.1. RE 11.3.2 – *Eucalyptus populnea* woodland on alluvial plains

Regional Ecosystem 11.3.2 within the study site was dominated by *Eucalyptus populnea*. Native grass and native forb species richness, tree canopy cover, native perennial grass cover, number of large trees and coarse woody debris all recorded lower attribute values compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.3.2 was average.

5.1.3.2. RE 11.3.25 - *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

Within the study site *Eucalyptus populnea*, *Eucalyptus tereticornis*, and *Melaleuca leucadendra* dominated this RE habitat. Parrot Creek ran through part of the RE but contained no water at the time. Weed cover was high, particularly along drainage lines and this was reflected in the score for this attribute. Native perennial grass cover, tree canopy cover and shrub canopy cover recorded higher values than the benchmark. However, attribute values for recruitment of woody perennial

¹ As defined by (Accad and Neldner 2015)



species, native forb species richness and number of large trees were lower than the recorded benchmark values. Overall the baseline health and quality of RE 11.3.25 was high.

5.1.3.3. RE 11.3.4 - *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains

Regional Ecosystem 11.3.4 habitat within the study site was characterised by *Eucalyptus tereticornis* open woodlands on alluvial formations associated with Parrot Creek. Previous clearing and thinning for grazing was evident in some areas. Over half of the attribute values recorded in this RE were lower than the benchmark values with recruitment of woody perennial species, native forb species richness, native perennial grass cover and number of large trees lower than the benchmark values. Overall the baseline health and quality of RE 11.3.4 was average.

5.1.3.4. RE 11.5.2a – *Eucalyptus crebra*, *Corymbia* spp., with *E. moluccana* woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces

Regional Ecosystem 11.5.2a habitat within the study site was in good condition with little evidence of disturbance. *Allocasuarina luehmannii* (Bull Oak) was the dominant species throughout this RE. The RE featured very low weed cover and there was a diverse groundcover of grasses. Recruitment of woody perennial species, tree canopy cover and shrub canopy cover were noticeably lower than the benchmark values but overall the baseline health and quality of RE 11.5.2a was high which was reflected in the habitat quality scoring.

5.1.3.5. RE 11.5.3 - *Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces

Regional Ecosystem 11.5.3 habitat within the study site was dominated by *Eucalyptus populnea*. The remnant Poplar Box woodland was in good condition and contained a number of habitat trees and stags. Tree canopy and sub-canopy cover, shrub canopy cover, organic litter cover and coarse woody debris values were a lot higher than the published benchmark values. Overall the baseline health and quality of RE 11.5.3 was average when compared to the benchmark.

5.1.3.6. RE 11.5.9 - *Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces

Regional Ecosystem 11.5.9 was in good remnant condition. Few weeds were present and a high number of tree species were recorded. *Corymbia clarksoniana* was the dominant canopy species within this RE. Recruitment of woody perennial species was significantly lower than the benchmark value (25% vs. 100%). Overall the baseline health and quality of RE 11.5.9 was high which was reflected in the habitat quality scoring.

5.1.3.7. RE 11.7.2 - *Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone

Within the study site, *Acacia shirleyi* (Lancewood) characterised this RE, with mono specific stands present throughout. Native grasses dominated ground cover with low weed cover and few shrub species present. Coarse woody debris were high but the value recorded was lower than the benchmark value for RE 11.7.2. Overall the baseline health and quality of RE 11.7.2 was average.



5.1.3.8. RE 11.7.4 - *Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust

The remnant woodland at the base of rock scarp zone was dominated by *Eucalyptus crebra*. Native tree species were diverse with 20 species recorded. Ground cover was dominated by grasses with low levels of coarse woody debris present. Overall the baseline health and quality of RE 11.7.4 was high, however there is no published benchmark to compare with the site recorded data to.

5.1.3.9. RE 11.4.8 - *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plain

Regional Ecosystem 11.4.8 within the study site was dominated by Brigalow (*Acacia harpophylla*). *Casuarina cristata* and *Eucalyptus cambageana* were also common throughout. Attribute values for native shrub, grass and forb species richness, shrub canopy cover, native perennial grass cover and coarse woody debris were lower than the benchmark values. Overall the baseline health and quality of RE 11.4.8 was average.

The Brigalow community identified on the site qualified as the Threatened Ecological Community (TEC) Brigalow (*Acacia harpophylla* dominant and co dominant) is listed as 'Endangered' under the EPBC Act. 5.2.1 and is also listed as an Endangered Ecosystem under the Queensland Vegetation Management Act (VMA). See Section 5.2 for further details.

5.1.3.10. RE 11.5.18 - *Micromyrtus capricornia* shrubland on Cainozoic sand plains and/or remnant surfaces

Regional Ecosystem 11.5.18 was characterised by a dense low shrubland of *Micromyrtus capricornia* with a sparse Eucalypt canopy. The groundcover comprised a high diversity of native grasses, largely *Aristida* species. Weed cover throughout the RE study site was low. Overall the baseline health and quality of RE 11.5.18 was average.

5.1.3.11. Non-remnant Vegetation

According to Accad and Nelder (2015):

Woody vegetation is mapped as remnant where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

The field surveys indicated that approximately 193 ha of the study site did not meet this definition and as such is mapped as non-remnant vegetation. These areas have been previously cleared, are grazed by cattle and displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses.

Overall, regrowth Eucalypts and Acacias were the most common of these trees recorded in non-remnant area while *Corymbia* species were only occasionally present.

Despite this, it was noted that these areas displayed positive signs of natural regeneration.



Figure 10: Field Verified Regional Ecosystems

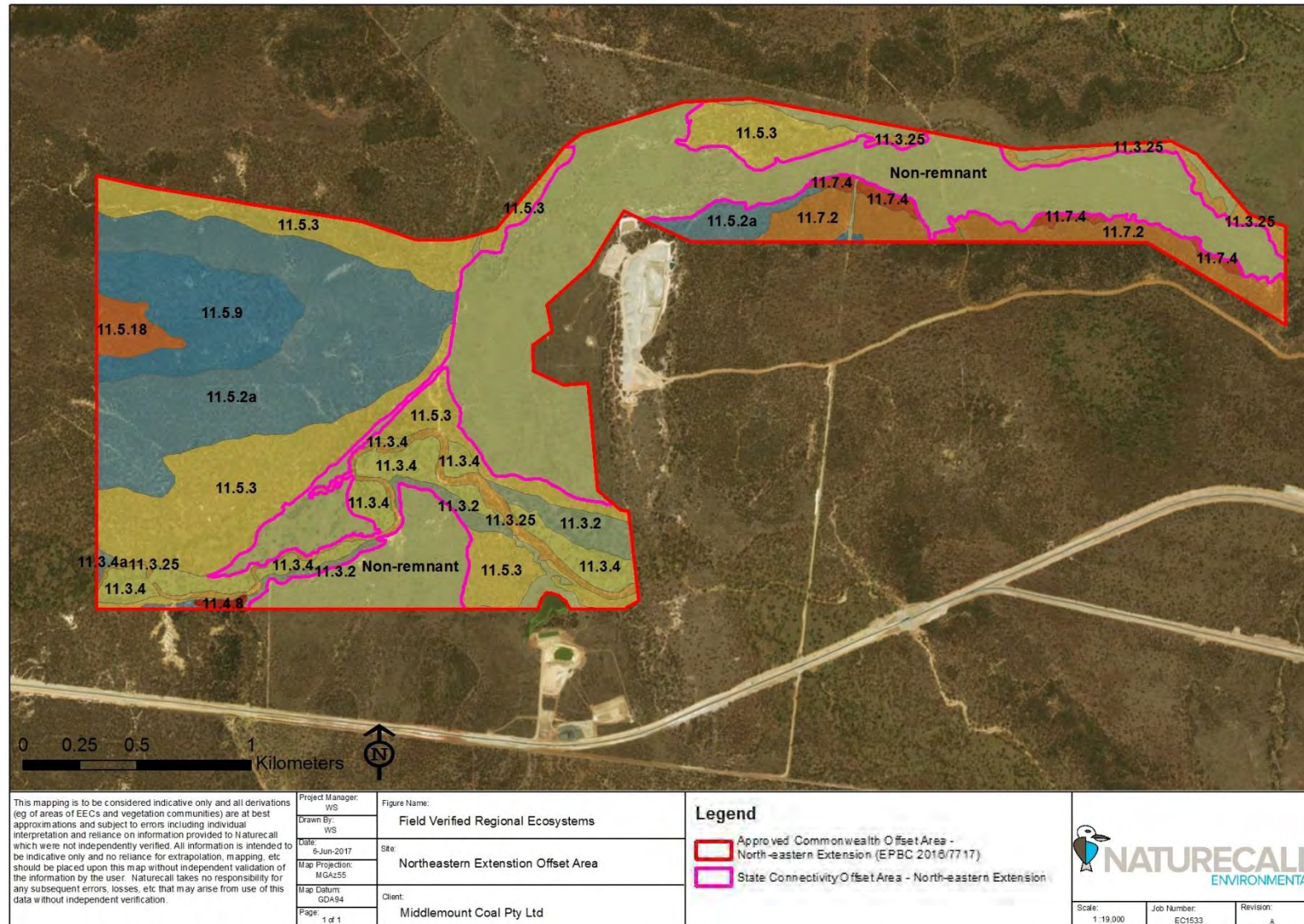




Figure 11: Field Verified Pre-clearing Regional Ecosystems

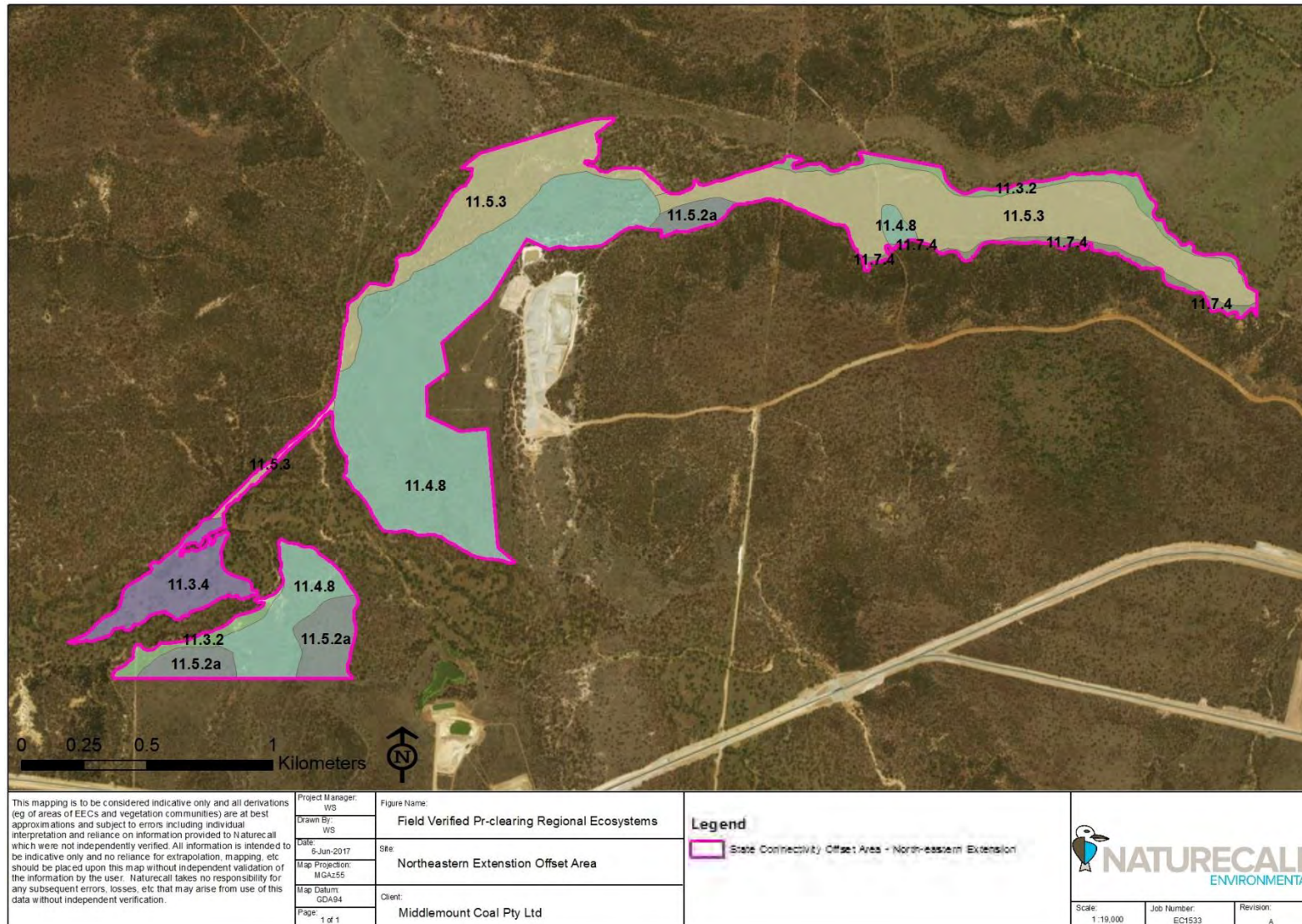




Table 5: Mapped Regional Ecosystems and Ground-truthed Regional Ecosystems located within the Study Site

Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	Field Verified Area (ha)	VMA Status	BD Status	EPBC Status
Land Zone 3: Recent Quaternary alluvial systems						
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	0	12.5	OC	OC	-
11.3.2/11.3.7	<i>Eucalyptus populnea</i> woodland on alluvial plains and <i>Corymbia</i> spp. woodland on alluvial plains. Sandy soils.	0.1	0	OC/LC	OC/OC	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains.	0	28	OC	OC	-
11.3.4a	Floodplain (other than floodplain wetlands). <i>Corymbia tessellaris</i> woodland. On alluvial sand ridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.	0	0.5	OC	OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	2.1	18.5	LC	OC	-
11.3.4/11.3.25	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	77.5	0	OC/LC	OC/OC	-
Land Zone 4: Tertiary - early Quaternary clay plains						
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	16.6	1	E	E	E
11.4.9/11.4.8	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains and <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	2.4	0	E/E	E/E	E



Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	Field Verified Area (ha)	VMA Status	BD Status	EPBC Status
Land Zone 5: Tertiary – early Quaternary loamy and sandy plains and plateaus						
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces.	9.0	0	LC	NC	-
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	0	98	LC	NC	-
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces: and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	158.0	0	LC/LC	NC/NC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	23.7	108.0	LC	NC	-
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces.	0	34.5	LC	NC	-
11.5.9b/11.5.18	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and remnant surfaces and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces.	0.2	0	LC/OC	NC/OC	-
11.5.9b/11.5.3	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and remnant surfaces and <i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces.	0.2	0	LC/LC	NC/NC	-
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces.	0	6.5	OC	OC	-



Regional Ecosystem	Short Description	DEHP Mapped Area (ha)	Field Verified Area (ha)	VMA Status	BD Status	EPBC Status
Land Zone 7: Cainozoic duricrusts						
11.7.2/11.7.1	<i>Acacia spp.</i> woodland and or on Cainozoic lateritic duricrust. Scarp retreat zone/ <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. microcarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust.	29.5	0	LC/LC	NC/OC	-
11.7.2	<i>Acacia spp.</i> woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	0	26.5	LC	NC	-
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus spp.</i> , <i>Corymbia spp.</i> , <i>Acacia spp.</i> , <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust.	0	5	LC	NC	-

E – Endangered, OC - Of Concern, NC – No Concern at present, LC- Least Concern.

Table 6: Mapped Pre-clearing Regional Ecosystems and Ground-truthed Pre-clearing Regional Ecosystems located within the Study Site

Regional Ecosystem (non-remnant)	Short Description	DEHP Mapped Area (ha)	Field Verified Area (ha)	VMA Status	BD Status	EPBC Status
Land Zone 3: Recent Quaternary alluvial systems						
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	0	9.4	OC	OC	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains.	0	11.9	OC	OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	4.4	0	LC	OC	-
11.3.4/11.3.25	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	14.4	0	OC/LC	OC/OC	-



Regional Ecosystem (non-remnant)	Short Description	DEHP Mapped Area (ha)	Field Verified Area (ha)	VMA Status	BD Status	EPBC Status
Land Zone 4: Tertiary - early Quaternary clay plains						
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains.	68.4	79.9	E	E	E
11.4.9/11.4.8	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains and <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	12.7	0	E/E	E/E	E
Land Zone 5: Tertiary – early Quaternary loamy and sandy plains and plateaus						
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	0	13.3	LC	NC	-
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces: and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland.	17.1	0	LC/LC	NC/NC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	58.3	64.7	LC	NC	-
Land Zone 7: Cainozoic duricrusts						
11.7.2/11.7.1	<i>Acacia</i> spp. woodland and or on Cainozoic lateritic duricrust. Scarp retreat zone/ <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. microcarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust	6.5	0	LC/LC	NC/OC	-
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust.	0	3.5	LC	NC	-
Land Zone 12: Mesozoic to Proterozoic igneous rocks						
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	1.0	0	LC	NC	-

E – Endangered, OC - Of Concern, NC – No Concern at present, LC- Least Concern.



Photo 2: RE 11.4.8 *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains



Photo 3: RE 11.3.2 *Eucalyptus populnea* woodland on alluvial plains





Photo 4: RE 11.5.18 *Micromyrtus capricornia* shrubland on Cainozoic sand plains/remnant surfaces



5.1.4. Habitat Quality Assessment (Approved Commonwealth Offset Area)

Site condition

The vegetation throughout the study site is in good condition overall. Large areas of vegetation in the west of the study site and regional ecosystems 11.7.2 and 11.7.4 showed minimal signs of disturbance.

Remnant vegetation communities covered 339 ha (64%) of the study site. The less disturbed remnant areas (predominately in the western half of the study site) displayed attributes with similar values to the published benchmarks (DSITI, 2017).

Across the study site, assessment units (within remnant vegetation) scored between 50 and 66 (out of a possible 80) for overall site condition (Table 7). Within remnant vegetation Assessment Unit 4 (RE 11.5.2a) scored the highest and Assessment Unit 10 (RE 11.5.18) scored the lowest for overall site condition (Table 7).

There are several areas in the central, north-east and south-east of the study site that have been previously cleared and are grazed by cattle, these are shown as non-remnant (regrowth/derived grassland) in Figure 10. These areas all displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses. Many of these non-remnant areas recorded positive signs of native tree recruitment and natural regeneration.

Across the study site, assessment units (within non-remnant vegetation) scored between 40 and 55 (out of a possible 80) for overall site condition (Table 7). Assessment Unit 14 (Re 11.5.2a) scored



the highest and Assessment Unit 13 (RE 11.4.8) scored the lowest for overall site condition (Table 7).

Site context

Across the Approved Commonwealth Offset Area study site, assessment units scored between 22 and 26 (out of a possible 26) for site context (Table 7). Assessment Units 4, 6, 9, 10 and 12 all scored the maximum 26 for site context (Table 7).

Species habitat index

Species habitat index scores for each assessment unit were calculated for the Squatter Pigeon and South-eastern Long-eared Bat.

- Squatter Pigeon: Across the study site, assessment scored between 18 and 38 (out of a possible 50) for the species habitat index. Assessment units 13 & 14 scored the lowest (18/50), while assessment units 2 & 6 scored the highest (38/50) for species habitat index (Table 7).
- South-eastern Long-eared Bat: Across the study site, assessment units scored between 28 and 46 (out of a possible 50) for the species habitat index. Assessment unit 14 scored the lowest (18/50), while assessment units 2, 5 & 6 scored the highest (46/50) for species habitat index (Table 7).

Assessment Unit Habitat Quality Scores

The following table summarises the site condition, site context and species habitat index scores for each assessment unit using the Squatter Pigeon species habitat index data and South-eastern Long-eared Bat species habitat index data.

Final Habitat Quality Scores

The following tables summarise the final habitat quality scores for each assessment unit and for the Approved Commonwealth Offset Area overall, using the Squatter Pigeon species habitat index data (Table 8) and the South-eastern Long-eared Bat species habitat index data (Table 9) respectively.

The final Total Habitat Quality Score for the Approved Commonwealth Offset Area is 7.02 for the Squatter Pigeon and 7.22 for the South-eastern Long-eared Bat .



Table 7: Habitat Quality Scores

Assessment Unit	RE Type	Site Condition Score	Site Context Score	Species Habitat Index Score (Squatter Pigeon)	Assessment Unit Habitat Quality Score (Squatter Pigeon)	Species Habitat Index Score (South-eastern Long-eared Bat)	Assessment Unit Habitat Quality Score (South-eastern Long-eared Bat)
1	11.3.2	54	24	28	6.79	36	7.31
2	11.3.25	58	24	38	7.05	36	7.56
3	11.3.4	52	25	33	6.73	36	7.24
4	11.5.2	66	26	28	8.01	36	8.21
5	11.5.3	56	22	33	7.44	41	7.63
6	11.5.9	62.5	26	38	8.11	46	8.62
7	11.7.2	56.5	25	33	7.34	32	7.28
8	11.7.4	58	22	28	7.24	36	7.44
9	11.4.8	56	26	20	7.05	28	7.05
10	11.5.18	50	26	28	6.99	32	6.92
11 (non rem)	11.3.2	44	24	22	6.38	28	6.81
12 (non rem)	11.3.4	43.5	26	24	5.99	28	6.25
13 (non rem)	11.4.8	40	22	18	5.67	24	6.10
14 (non rem)	11.5.2a	55	22	18	6.74	18	6.74
15 (non rem)	11.5.3	50	22	28	7.09	24	6.81
16 (non rem)	11.7.4	52	25	20	6.88	20	6.88


Table 8: Final Habitat Quality Score for Commonwealth Offset Area

(Squatter Pigeon Species Index Data)

Assessment Unit	1	2	3	4	5	6	7	8	9	10	11(NR)	12(NR)	13(NR)	14(NR)	15(NR)	16(NR)
RE	11.3.2	11.3.25	11.3.4	11.5.2	11.5.3	11.5.9	11.7.2	11.7.4	11.4.8	11.5.18	11.3.2	11.3.4	11.4.8	11.5.2	11.5.3	11.7.4
Habitat Quality Score (measured)	106	110	105	125	116	127	115	113	110	109	90	93.5	80	95	100	97
Habitat Quality Score (max)	156	156	156	156	156	156	156	156	156	156	141	156	141	141	141	141
Assessment Unit Area (ha)	12.5	18.8	29.2	98.3	108.0	34.8	26.6	5.1	0.9	6.8	9.5	11.9	80	13.3	64.7	3.6
Assessment Unit Habitat Quality Score	7	7	7	8	7	8	7	7	7	7	6	6	6	7	7	7
Size weighting	0.02	0.04	0.05	0.18	0.20	0.07	0.05	0.01	0.00	0.01	0.02	0.02	0.15	0.03	0.12	0.01
Weighted Assessment Unit Habitat Quality Score	0.16	0.25	0.37	1.48	1.51	0.53	0.37	0.07	0.01	0.09	0.11	0.13	0.85	0.17	0.86	0.05
FINAL TOTAL HABITAT QUALITY SCORE	7.02															



Table 9: Final Habitat Quality Score for Commonwealth Offset Area

(South-eastern Long-eared Bat Species Index Data)

Assessment Unit	1	2	3	4	5	6	7	8	9	10	11(NR)	12(NR)	13(NR)	14(NR)	15(NR)	16(NR)
RE	11.3.2	11.3.25	11.3.4	11.5.2	11.5.3	11.5.9	11.7.2	11.7.4	11.4.8	11.5.18	11.3.2	11.3.4	11.4.8	11.5.2	11.5.3	11.7.4
Habitat Quality Score (measured)	114	118	113	128	119	135	114	116	110	108	96	97.5	86	95	96	97
Habitat Quality Score (max)	156	156	156	156	156	156	156	156	156	156	141	156	141	141	141	141
Assessment Unit Area (ha)	12.5	18.8	29.2	98.3	108.0	34.8	26.6	5.1	0.9	6.8	9.5	11.9	80	13.3	64.7	3.6
Assessment Unit Habitat Quality Score	7	8	7	8	8	9	7	7	7	7	7	6	6	7	7	7
Size weighting	0.02	0.04	0.05	0.18	0.20	0.07	0.05	0.01	0.00	0.01	0.02	0.02	0.15	0.03	0.12	0.01
Weighted Assessment Unit Habitat Quality Score	0.17	0.27	0.40	1.52	1.55	0.56	0.36	0.07	0.01	0.09	0.12	0.14	0.92	0.17	0.83	0.05
FINAL TOTAL HABITAT QUALITY SCORE	7.22															



5.1.5. Habitat Quality Assessment (State Connectivity Offset Area)

Site condition

Non-remnant vegetation communities covered 193 ha (36%) of the study site.

Vegetation condition throughout the non-remnant Regional Ecosystems varied but overall showed positive signs of natural regeneration. There are several areas in the center and east of the study site that have been previously cleared and are grazed by cattle. These areas all displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses. The less disturbed non-remnant areas such as RE 11.5.2a and 11.7.4 displayed attribute values closer to the published benchmark values (Table 10).

Across the study site, assessment units (within non-remnant vegetation) scored between 40 and 55 (out of a possible 80) for overall site condition (Table 10). Assessment Unit 14 (RE 11.5.2a) scored the highest and Assessment Unit 13 (RE 11.4.8) scored the lowest for overall site condition (Table 9).

Site context

Across the study site, assessment units scored between 22 and 26 (out of a possible 26) for site context (Table 10). Assessment Unit 12 (RE 11.3.4) scored the maximum 26 for site context (Table 10).

Assessment Unit Habitat Quality Scores

The following table summarises the site condition and site context scores for each assessment unit.

Table 10: Habitat Quality Scores

Assessment Unit	RE	Site Condition Score	Site Context Score	Assessment Unit Habitat Quality Score
11	11.3.2	44	24	7.47
12	11.3.4	43.5	26	6.56
13	11.4.8	40	22	6.81
14	11.5.2a	55	22	8.46
15	11.5.3	50	22	7.91
16	11.7.4	52	25	8.46

Final Habitat Quality Scores

The following table summarises the final habitat quality scores for each assessment unit. The overall Habitat Quality Score for the State Connectivity Offset Area is 7.37.


Table 11: Final Habitat Quality Score for State Connectivity Offset Area

Assessment Unit	11	12	13	14	15	16
RE	11.3.2	11.3.4	11.4.8	11.5.2	11.5.3	11.7.4
Habitat Quality Score (measured)	68	69.5	62	77	72	77
Habitat Quality Score (max)	91	106	91	91	91	91
Assessment Unit Area (ha)	9.5	11.9	80	13.3	64.7	3.6
Assessment Unit Habitat Quality Score	7.47	6.56	6.81	8.46	7.91	8.46
Size weighting	0.05	0.07	0.44	0.07	0.35	0.02
Weighted Assessment Unit Habitat Quality Score	0.39	0.43	2.98	0.61	2.80	0.17
FINAL TOTAL HABITAT QUALITY SCORE	7.37					

5.2. Threatened Flora

A single threatened flora species, *Cerbera dumicola*, was identified on the study site during the survey (Photo 5). This species is listed as Near Threatened under the NC Act.

The species was identified in eight locations within the study site (Figure 12). It occurred in isolated patches in moderate to high density in RE 11.7.2 east of Parrot Quarry and in the west of the study site in RE 11.5.18 and 11.5.9.

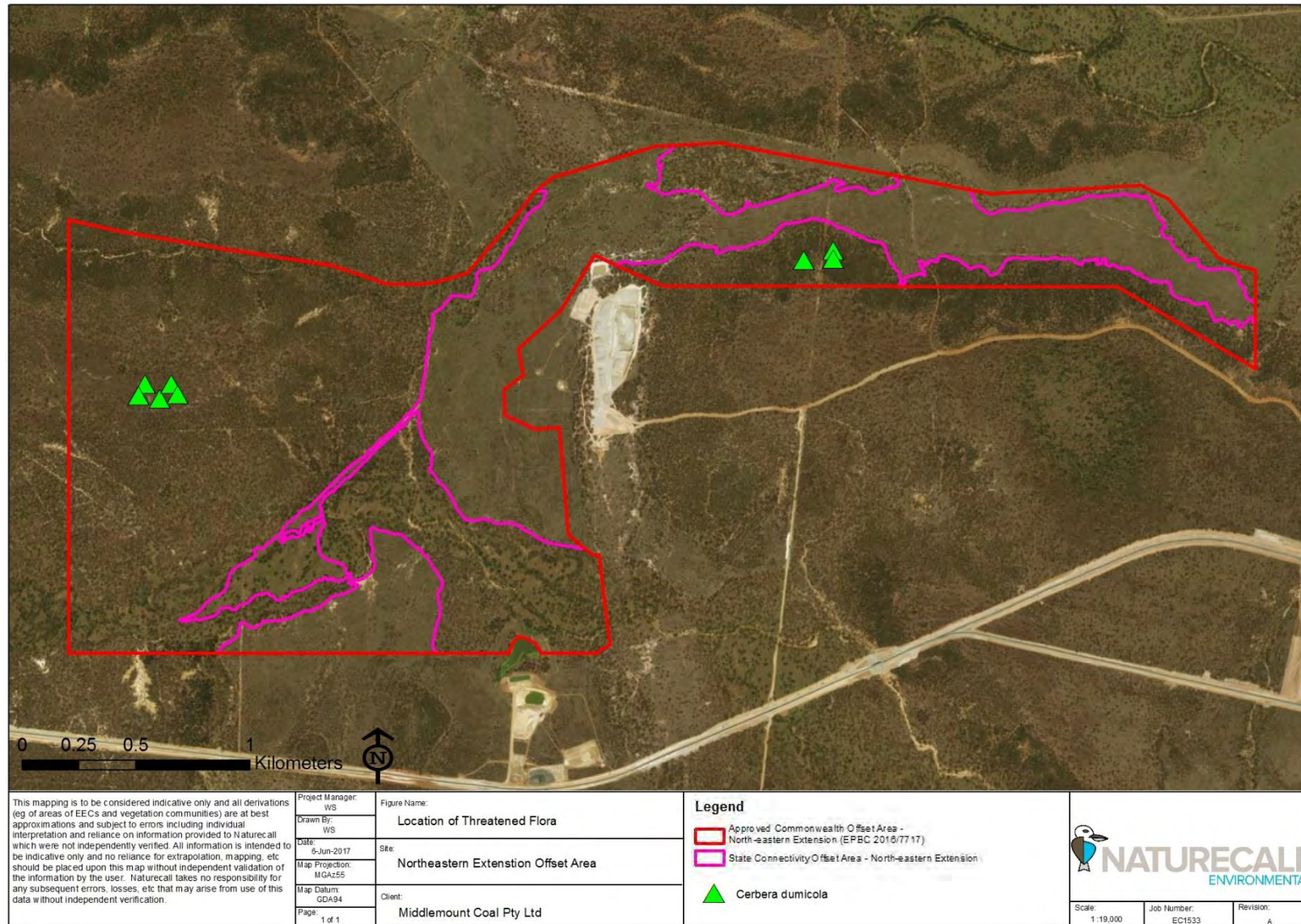


Photo 5: Photo of *Cerbera dumicola* within the study site (terrestrial habitat quality site 33)





Figure 12: Threatened Flora Observations





5.3. Endangered and Of Concern Regional Ecosystems

5.3.1. Queensland Vegetation Management Act Status

Under the VM Act, the following Endangered and Of Concern REs were identified and ground-truthed within the study site:

Endangered Regional Ecosystems:

- RE 11.4.8 - *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.

Of Concern Regional Ecosystems:

- RE 11.3.2 - *Eucalyptus populnea* woodland on alluvial plains.
- RE 11.3.4 - *Eucalyptus tereticornis* and/or *Eucalyptus spp.* woodland on alluvial plains.
- RE 11.3.4a - *Corymbia tessellaris* woodland. On alluvial sand ridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.
- RE 11.5.18 - *Micromyrtus capricornia* shrubland on Cainozoic sand plains/remnant surfaces.

The area (ha), of each of these communities is presented in Table 4 and their extent and location within the study site is illustrated in Figure 13.

5.3.2. Environmental Protection and Biodiversity Conservation Act Status

The Brigalow community identified on the site (RE 11.4.8) qualified as the Threatened Ecological Community (TEC) *Brigalow (Acacia harpophylla dominant and co-dominant)* listed as 'Endangered' under the EPBC Act.

An assessment of these communities against the threshold criteria outlined in the *Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (Threatened Species Scientific Committee, 2013) was undertaken. It was concluded that this regional ecosystem met the area and condition thresholds (i.e. not cleared within the last 15 years, >0.5ha in area and have less than 50% weed cover) for them to be included as the TEC under the EPBC Act.

Regional ecosystem 11.4.8 comprises one patch in the southwest of the site totaling 0.9 ha in area. It forms the northern extent of a larger patch of Brigalow which continues outside of the study area (Figure 14).



Figure 13: Endangered and Of Concern Regional Ecosystems Listed Under the VM Act

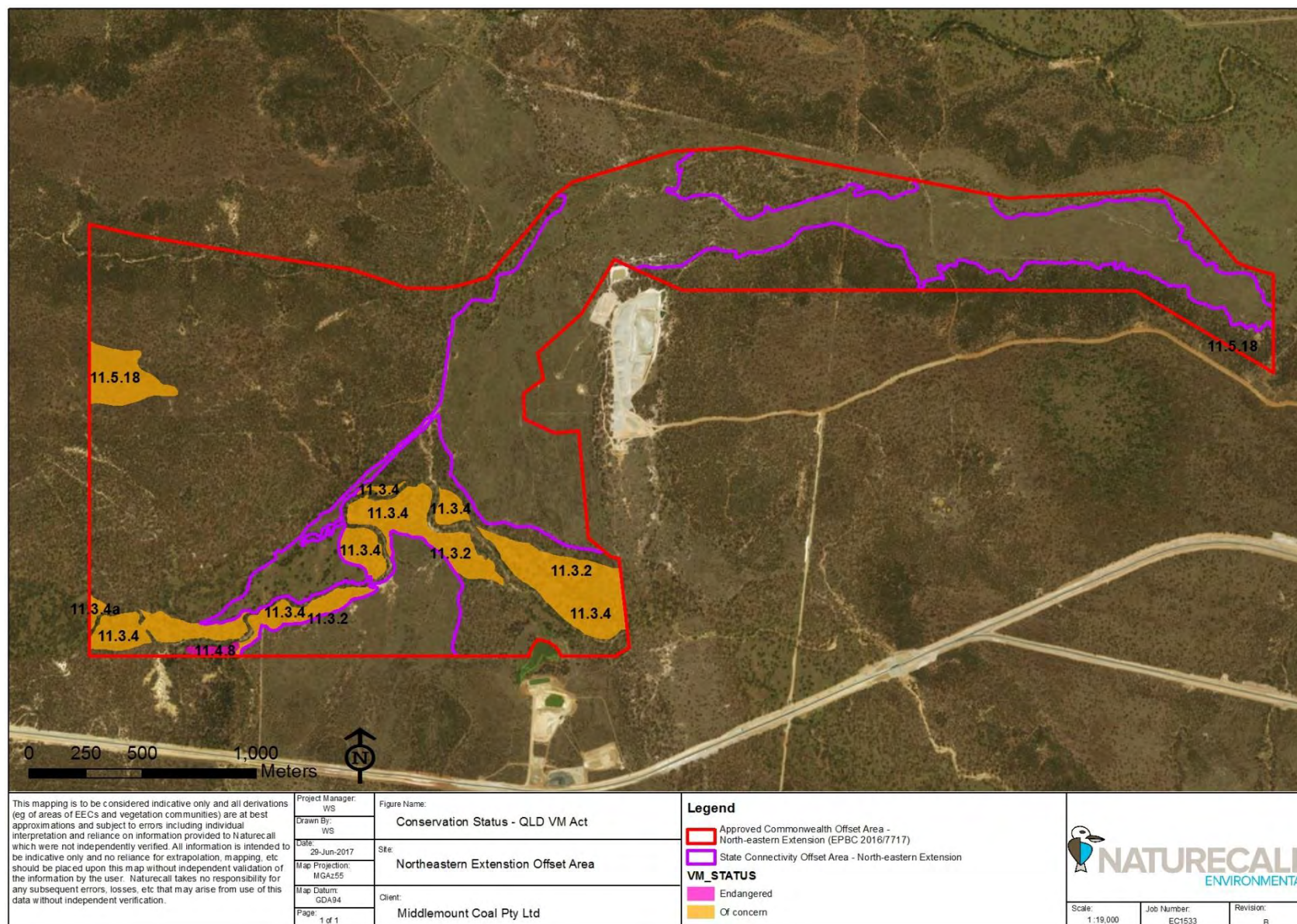
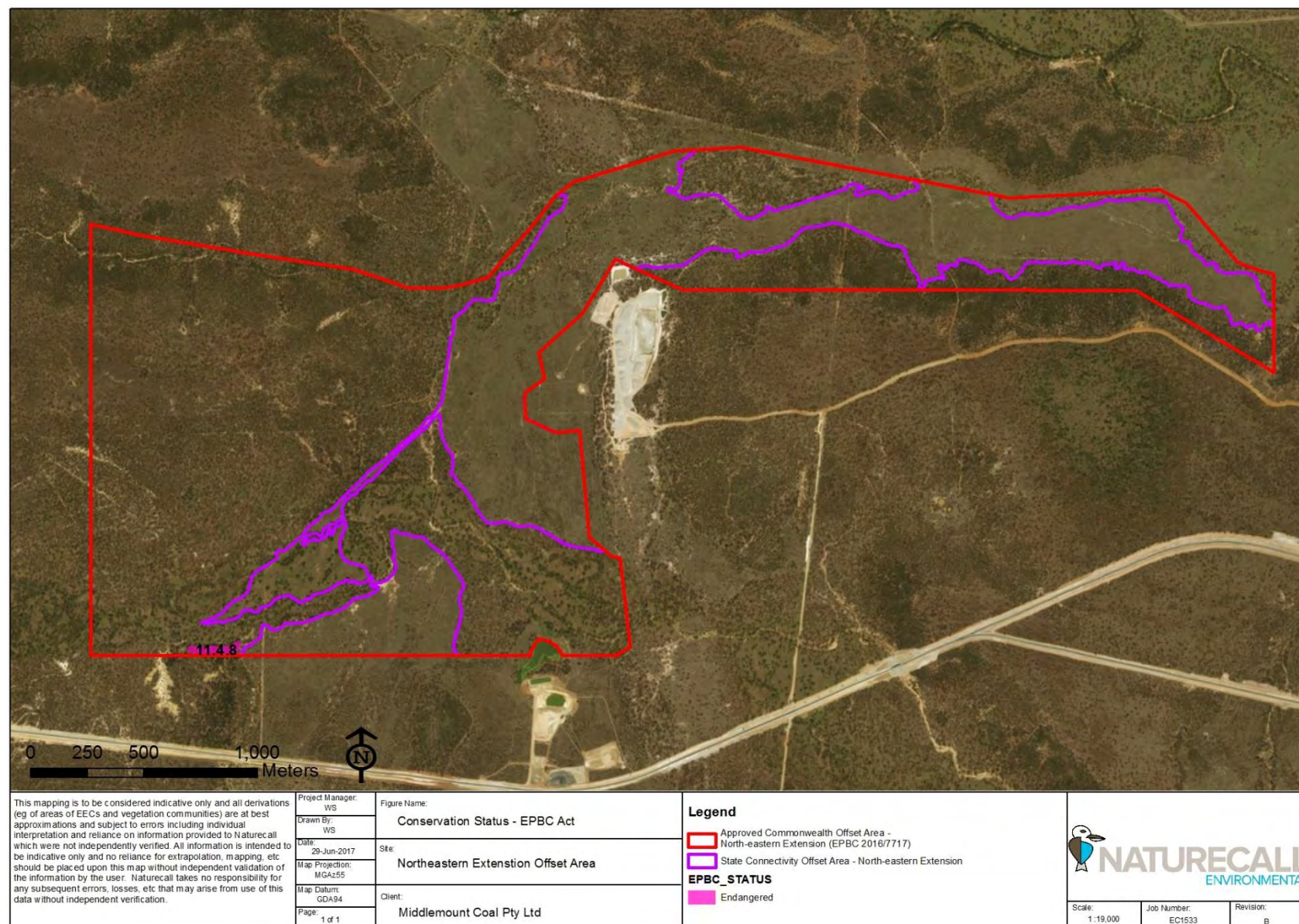




Figure 14: Threatened Ecological Communities Listed Under the EPBC Act





5.3.3. Exotic Flora Species

As detailed in Section 5.2.1, a total of 20 exotic flora species were recorded within the study site. Weed invasion is common throughout the study site, especially in disturbed areas, however it is largely limited to the groundcover stratum. Naturalised introduced pasture species such as Buffel Grass (*Cenchrus ciliaris*), Sabi Grass (*Urochloa mosambicensis*) and Red Natal Grass (*Melinis repens*) along with herbs including *Sida* spp. Cobblers Pegs (*Bidens pilosa*), Gomphrena Weed (*Gomphrena celosioides*) and Stylo (*Stylosanthes scabra*) were the main weeds encountered. These species dominated the ground layer in the derived grassland habitats, and incursion of these species into adjacent eucalypt woodlands was common.

Table 12 lists the noxious weeds declared under the *Biosecurity Act 2014* recorded within the study site. Occasional Prickly Pear (*Opuntia stricta*), Harrisia Cactus (*Harrisia martini*) and Rats Tail Grass (*Sporobolus* sp.) were recorded. The noxious weed distribution of these species was patchy and these species are unlikely to pose a significant risk to the ecological integrity of the study site due to their low density.

Table 12: Noxious Weeds Recorded Within the Study Site

Scientific Name	Common name	Biosecurity Act Category	Weed of National Significance	Abundance
<i>Opuntia stricta</i>	Prickly Pear	Class 3	Yes	Low
<i>Opuntia tomentosa</i>	Velvet Tree Pear	Class 3	Yes	Low
<i>Harrisia martini</i>	Harrisia Cactus	Class 3	No	Low
<i>Sporobolus fertilis</i>	Rats Tail Grass	Class 3	No	Low

5.3.4. Weed Cover in RE 11.5.2a, 11.7.2 and 11.7.4 (Approved Commonwealth Offset Area)

The following table presents weed cover data for these three Regional Ecosystems.

Table 13: Weed Cover

RE Type	Weed cover percentage at survey sites	Weed species recorded	General description of weed cover across RE	Biosecurity Act Listed Species Present?
11.5.2a	T20 – 5% T29 – 1% T50 – 5%	Velvet Tree Pear, Red Natal Grass, Stylosanthes, Gomphrena Weed	Weed cover across this RE was very low overall. Weeds were limited to occasional exotic grasses and herbs in the ground layer and the occasional Prickly Pear.	Yes – Velvet Tree Pear (Class 3) in low abundance.
11.7.2	T45 – 5%	Spiked Sida	Very low weed cover due to minimal disturbance, exclusion of grazing and dense canopy cover. Only occasional Spiked Sida present.	No



RE Type	Weed cover percentage at survey sites	Weed species recorded	General description of weed cover across RE	Biosecurity Act Listed Species Present?
11.7.4	T51 – 25%	Prickly Pear, Spiked Sida, Stylosanthes, Cobblers Pegs, Khaki Weed, Red Natal Grass, Buffel Grass	Low to moderate weed cover present. Higher weed cover occurs on disturbed and exposed edges of the RE that adjoin non-remnant areas. In these areas, exotic grasses and herbs have invaded the forest edge. Occasional Prickly Pear also present.	Yes – Prickly Pear (Class 3) in low abundance

5.3.5. Shrub Cover in RE 11.5.2a, 11.7.2 and 11.7.4 (Approved Commonwealth Offset Area)

The following table presents weed cover data for these three Regional Ecosystems.

Table 14: Shrub Cover

RE Type	Shrub cover percentage at site condition plots	General description of shrub cover across RE	Shrub species recorded
11.5.2a	T20 – 0 T29 – 4.5% T50 – 7.2%	Generally comprises a sparse shrub cover to approximately 4m in height, but also noted to be absent in some areas. Areas of this community in the vicinity of T29 and south of T50 contain a low open shrub cover of <i>Prostanthera cryptandroides</i> .	- Sticky Hop Bush - Coffee Bush - Currant Bush - Red Ash <i>Prostanthera cryptandroides</i> - Turkey Bush - Vine tree - Medicine Bush
11.7.2	T45 – 10.5%	The shrub layer in this community varies. In some areas it is absent, while other areas contain an open to mid-dense cover of shrubs ranging from approximately 0.7-3m in height. Shrub cover recorded at T45 exceeds the benchmark for this attribute which is 4%.	<i>Prostanthera cryptandroides</i> <i>Cerbera dumicola</i> <i>Psydrax attenuata</i>
11.7.4	T51 – 24.3%	This community generally comprises an open to mid-dense shrub layer ranging from 0.5-4m in height. It comprises a mix of low shrub species such as Currant Bush along with taller shrubs such as Hop Bush and Turkey Bush.	<i>Cerbera dumicola</i> - Sticky Hop Bush - Currant Bush - Nepine - Turkey Bush - Coffee Bush



5.3.6. Presence of *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris* spp. in non-remnant areas (Approved Commonwealth Offset Area)

The presence of Eucalypts, Corymbias, Acacias and Callitris across non-remnant is described in the following table which has been categorised per the Pre-clearing Regional Ecosystems.

Overall, regrowth Eucalypts and Acacias were the most common of these trees recorded in non-remnant areas. Corymbia species were only occasionally present, while no Callitris species have been recorded in the Commonwealth Offset Area or surrounding lands.

Table 15: Presence of Eucalypts, Corymbia, Acacia in non-remnant Areas

Pre-clearing Regional Ecosystem (field verified)	General description	Species present	Frequency*
11.3.2	Contains young regrowth Poplar Box throughout as well as scattered Acacia species in the understorey.	Poplar Box	D
		Ironwood	U
11.3.4	Contains scattered mature Moreton Bay Ash. Regrowth Eucalypts and Corymbia's are also present along with Ironwood which is uncommon.	Poplar Box	C
		Moreton Bay Ash	C
		Clarkson's Bloodwood	U
		Ironwood	U
11.4.8	Is dominated by regrowth Brigalow in most situations. In the north and west of this community around T56 and T45, regrowth Dawson Gum are also common. Regrowth Poplar Box were generally uncommon. No Corymbias were recorded in this RE.	Brigalow	D
		Dawson's Gum	O
		Poplar Box	U
11.5.2a	Regrowth Poplar Box are common throughout with Corymbia species also present in some areas. Acacia species are uncommon.	Poplar Box	C
		Clarkson's Bloodwood	O
		Dallachy's Gum	U
		<i>Acacia bancroftiorum</i>	U
		Ironwood	U
		Dawson's Gum	R
11.5.3	Dominated by regrowth Polar Box with Dawson's Gum also common in the western most patch. Regrowth and mature Acacias are also present in varying densities	Poplar Box	D
		Dawson's Gum	O
		Native Willow	U
		Ironwood	C
		<i>Acacia cretata</i>	U

* Frequency: D Dominant at least in some areas,
C Common,
O Occasional,
U Uncommon,
R Rare on site, few specimens.



5.4. Fauna Survey Results

5.4.1. Fauna Habitat Types

Broad fauna habitats within the study site were categorized and mapped into six broad habitat types using the same classifications as Parsons Brinckerhoff (2010) (Figure 15). The broad fauna habitat types include:

- Eucalypt woodland/forest.
- Micromyrtus shrubland.
- Riparian habitat.
- *Acacia shirleyi* forest.
- *Acacia harpophylla* woodland/forest.
- Regrowth/derived grassland.

Table 16 details the regional ecosystems which make up each broad fauna habitat type along with the area (in ha) of each.

Table 16: Broad Fauna Habitat Types

Broad Fauna Habitat Type	Regional Ecosystem	Field Verified Area (ha)
Eucalypt Woodland	11.3.2	12.5
	11.3.4/11.3.4a	28.5
	11.5.2a	98
	11.5.3	108
	11.5.9	34.5
	11.7.4	5
Subtotal (Eucalypt Woodland)		286.5
Micromyrtus shrubland	11.5.18	6.5
Riparian habitat	11.3.25	18.5
<i>Acacia shirleyi</i> forest	11.7.2	26.5
<i>Acacia harpophylla</i> woodland/forest	11.4.8	1
Regrowth	-	193
Total		532

Table 17 describes the habitat values per category, with focus on habitat value and suitability for foraging, nesting, roosting, and breeding requirements for potentially occurring threatened species listed under the NC Act and EPBC Act. Selected habitat features located within the study site are shown in Photos 6 to 8.



Table 17: Fauna Habitat Assessment

Habitat Attribute/Category	Site Values					
	1. Eucalypt Woodland	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Groundcover	Variable density and composition depending on disturbance history e.g. rotational grazing regime. Some areas feature a moderately dense cover of exotic grasses while some are more open and dominated by native grasses and shrubs. A number of native grass species provide a potential food resource for the Squatter Pigeon. Some areas also have a mosaic of open sandy areas and native grasses which is preferred habitat for this species.	Comprises open grassy groundcover (mostly native grasses) and areas of bare ground. A number of native grass species provide potential food resources for the Squatter Pigeon.	Generally a good cover of native grasses, sedges and herbs. Some areas dominated by Buffel Grass.	Sparse to open ground cover of native grasses, with areas of bare ground.	Sparse to open ground cover of mostly native grasses, with areas of bare ground. Provides potential shelter and prey habitat for threatened reptiles.	Dominant ground cover composition of exotic grasses with native grasses and herbs being less common. Areas with a higher percentage of native grass species would provide food resources for the Squatter Pigeon.
Leaf Litter	High under canopy trees, and scattered throughout the mixed grass undergrowth.	Overall low density of leaf litter present due to the lack of canopy trees.	Generally thin leaf litter throughout due to open canopy.	Density of leaf litter was low overall with some small accumulations noted.	Mature Brigalow habitats contained dense accumulations of leaf litter which would provide shelter and prey habitat for a range of small reptiles.	Sparse leaf litter.



Habitat Attribute/Category	Site Values					
	1. Eucalypt Woodland	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Logs and Debris	Reasonable abundance of hollow logs and debris present due to the nature of Eucalyptus shedding limbs. Larger logs provide shelter and prey habitat for ground dwelling reptiles.	Low density of coarse woody debris in the form of small fallen timber at the base of scattered canopy eucalypts. Marginal potential habitat values for threatened fauna overall.	Some accumulations of coarse woody debris and logs under canopy trees. Marginal potential habitat values for threatened fauna overall.	High density of coarse woody debris, which is typical of this habitat type.	High density of coarse woody debris, which is typical of this habitat type.	Very few logs observed. Some log and debris piles as a result of past clearing occur.
Rocky outcrops	Only some small to medium surface rock present.	Some small surface rock present.	Absent	Rocky outcrops are very common in this habitat type. Provide potential shelter, basking sites and prey habitat for a range of common reptiles and small mammals.	Absent	Absent



Habitat Attribute/Category	Site Values					
	1. Eucalypt Woodland	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Aquatic habitat	Aquatic habitats in this habitat type were largely limited to small ephemeral creeks and soaks that would only hold water for short periods.	Absent	Some sections of the ephemeral creeks and drainage lines had temporary flows recorded. The recent rainfall events prior to the survey increased the quantity of water within the riparian areas. Semi-permanent billabongs and pools in the creek bed would provide water sources for the Squatter Pigeon.	Absent	Brigalow habitats contain small depressions and melon holes that would hold water during the wet season.	A few large dams were located within non-remnant areas. One large dam in the south of the site contained established aquatic vegetation, while others that had been excavated more recently were devoid of aquatic vegetation. Dams on site attracted a range of wetland birds and provided permanent water sources for a range of fauna including the Squatter Pigeon.



Habitat Attribute/ Category	Site Values					
	1. Eucalypt Woodland	2. <i>Micromyrtus</i> shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Hollows	Hollow-bearing trees and stags were common within this habitat type. A range of hollow-sizes are present i.e. <5cm to >20cm diameter cavities. Hollows provide nesting/denning/roosting habitat for a number of threatened fauna species such as the Corben's Long-eared bat.	Scattered eucalyptus and corymbias in this habitat type contained hollows. Hollows that are present would provide potential roosting habitat for threatened bat species such as the South-eastern Long-eared Bat.	Hollow-bearing trees were generally uncommon in this habitat type and would largely be occupied by common birds such as Galahs and Lorikeets.	Absent.	Low occurrence of tree hollows in occasional eucalyptus species present. Hollows that are present would provide potential roosting habitat for threatened bat species such as the South-eastern Long-eared Bat.	No hollow bearing trees present due to previous clearing history.
Nectar sources	Woodland habitats contains a range of nectar producing species e.g. eucalypts, acacias and grevilleas. Narrow-leaved ironbark was one of the main flowering species recorded during the field survey	Low nectar source overall. Flowering <i>Micromyrtus</i> shrubs would be an insect attractant for the South-eastern Long-eared Bat.	Nectar sources in riparian habitats include eucalypts and Melaleucas, some of which were flowering during the survey.	<i>Acacia shirleyi</i> is the primary nectar source and would provide foraging resources for fauna when in flower.	<i>Acacia harpophylla</i> is the primary nectar source and would provide foraging resources for fauna when in flower.	This habitat type does not provide a significant nectar source due to the lack of mature trees.



Habitat Attribute/Category	Site Values					
	1. Eucalypt Woodland	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Koala food trees	Moreton Bay Ash, Poplar Box and Narrow-leaved Ironbark are the main Koala browse species in this community (DEE, 2014). Koalas were recorded in this habitat type via scats and indicative trunk scratches (Photos 9 and 10).	Absent aside from a few Narrow-leaved Ironbark.	This community is dominated by Queensland Blue Gum which is a preferred browse species for Koalas.	Absent	<i>Eucalyptus cambageana</i> is located within this habitat type and, although a less common food source for the Koala, meets the definition of a Koala food tree (DEE, 2014).	Absent aside from occasional areas of regrowth <i>Eucalypts</i> and <i>Corymbia spp.</i>
Connectivity values	Provides strong habitat links and connectivity values across the site, especially north-south connections with adjacent habitat in the east and west of the site. Some areas of woodland are fragmented by roads and cleared areas. This habitat type would benefit the local movements of a range of fauna species, including arboreal species such as the Koala. Two squatter pigeons were recorded in Eucalypt woodland.	The shrubland habitats would complement the connectivity values of other habitat types and provide shelter and cover for small terrestrial species and passerine birds.	Riparian habitats provide connectivity along Parrot Creek. Due to the open nature of this habitat type, it is only likely to be used by mobile species capable of crossing open ground. Important connectivity values for the Koala.	This habitat type is generally surrounded by woodland habitats and would provide similar connectivity values. Rocky scarp habitats are likely to assist local movements of reptiles and small mammals.	The small patches of Brigalow habitats would contribute to the connectivity values of the other site habitats, however it is generally isolated, and would not provide any specific connectivity values for fauna.	Continued regeneration of non-remnant areas over time would help re-establish linkages for flora and fauna across the site and broader landscape.



Figure 15: Broad Fauna Habitat Types Present on the Study Site

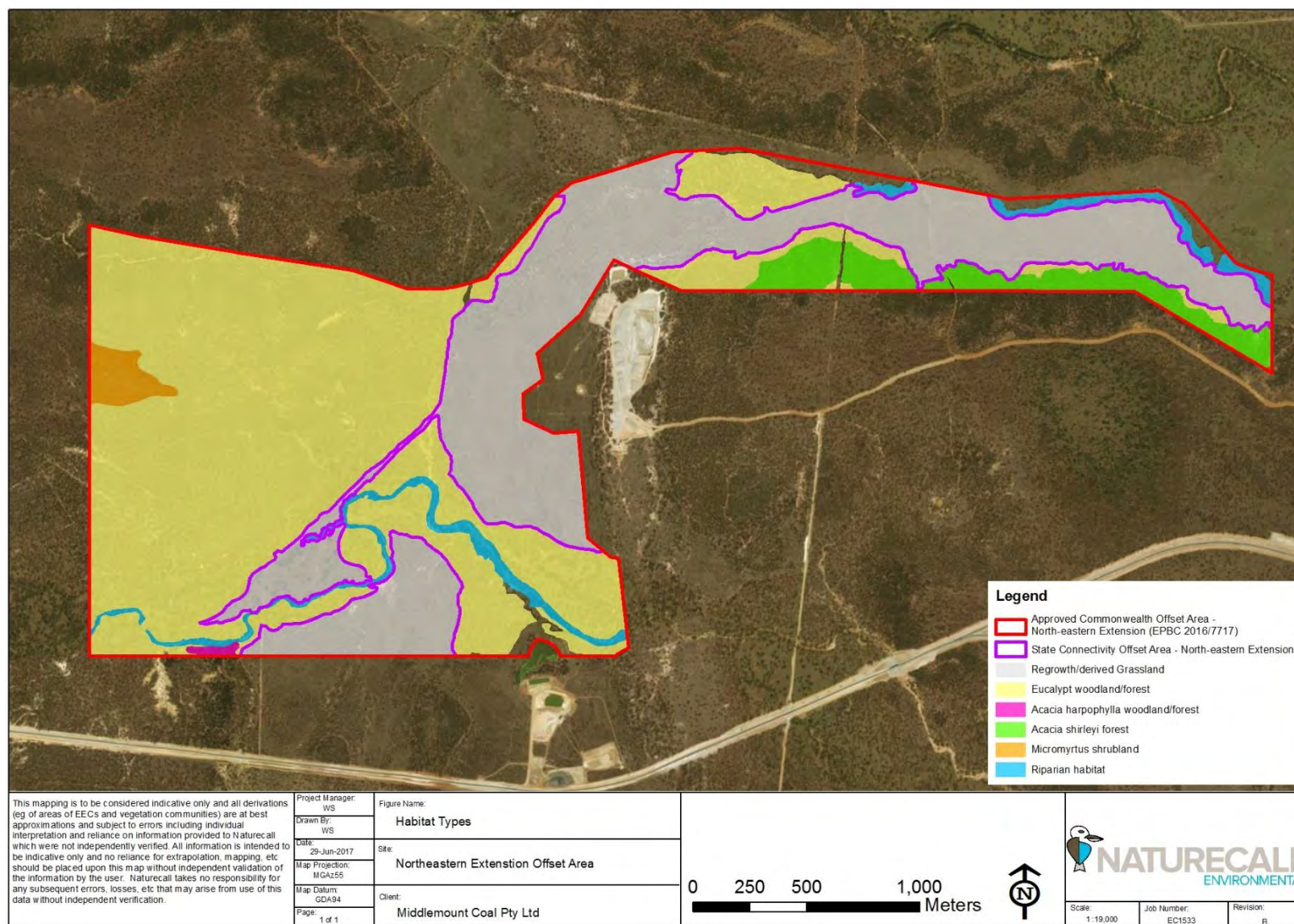




Photo 6: Potential Squatter Pigeon habitat in Eucalypt woodland/forest



Photo 7: Regrowth/derived grassland habitat





Photo 8: Leaf litter in *Acacia harpophylla* woodland/forest





5.4.2. Fauna Species Detected

A total of 90 fauna species were detected during the survey either opportunistically or during specific survey methods. A list of fauna species detected is provided in Appendix 2. Birds were the most common fauna group observed with a total of 73 species detected. One amphibian, thirteen mammals (including four introduced species) and three reptiles were also detected (Appendix 2).

The species assemblage on the study site is considered typical for the area based on results of previous surveys on adjacent and nearby lands (e.g. Parsons Brinckerhoff, 2010; Ecology and Heritage Partners, 2012; Naturecall 2013, 2014b, 2015, 2016).

5.4.3. Threatened Fauna Species

The Koala (*Phascolarctos cinereus*), which is listed as Vulnerable under the NC Act and EPBC Act was detected at three locations within the study site via secondary evidence (i.e. scats and scratches) during the 2016 and 2017 surveys. The Squatter Pigeon Southern Subspecies (*Geophaps scripta scripta*), which is listed as Vulnerable under the NC Act and EPBC Act was directly observed during the 2017 surveys.

Koala (*Phascolarctos cinereus*)

Koala scats were found during the 2017 surveys - under *Eucalyptus exserta* in the central-west of the study site in the Eucalypt woodland habitat type. Koala scats were also recorded during the 2016 surveys under an Ironbark in the north-west of the study site in the Eucalypt woodland habitat type (Figure 16; Photo 9). The estimated age of the scat from visual identifiers was 6-8 months old. In addition, trunk scratches attributed to the Koala were recorded on a Moreton Bay Ash growing in the Eucalypt woodland habitat type near Parrot Creek in the south-west of the study site (Photo 10).

Koalas have also been recorded on adjacent land to the north by Ecology and Heritage Partners (2012) and adjacent to Parrot Quarry Road by Naturecall (2014b).

Koala food trees (as defined in the *EPBC Act Referral Guidelines for the Vulnerable Koala* [DEE, 2014] and *Nature Conservation [Koala] Conservation Plan 2006 and Management Program 2006-2016* [EPA, 2006]) are present within the study site, in particular Queensland Blue Gum (identified as an important food species for the Koala [Van Dyck and Strahan, 2008; Land for Wildlife, 2014]), Moreton Bay Ash, Poplar Box, Forest Red Gum and Narrow-leaved Ironbark.

A large portion of the Regional Ecosystems mapped within the study site would provide potential habitat for the Koala based on the occurrence of potential Koala food trees. This includes RE 11.3.2, RE 11.3.4, RE 11.3.4a, RE 11.3.25, RE 11.4.8, RE 11.5.2a, RE 11.5.3, RE 11.5.9 and RE 11.7.4 equating to approximately 499 ha of potential Koala habitat.

These Regional Ecosystems are in good condition, however as described in Section 5.2.3, there are areas within the study site that have been subject to thinning and grazing. In addition, these areas would provide beneficial movement corridors (i.e. connectivity) for the Koala throughout the landscape, particularly along Parrot creek.



Photo 9: Koala scats in the northwest of the study site (RE: 11.5.3)





Photo 10: Likely Koala scratches in the south of the study site (RE 11.3.4)





Squatter Pigeon (Geophaps scripta scripta)

The Squatter Pigeon was recorded in the northwest of the study site during the 2017 field surveys (Figure 16). Two adult birds were observed at close range (in RE 11.5.9) and subsequently flew to cover nearby.

This species has also been previously recorded on MCPL lands to the north. As identified in Table 16 a number of habitat attributes which would provide suitable habitat for the Squatter Pigeon are present. These include a number of native grass species, permanent water resources and a mosaic of open sandy areas.

As identified by DEE (2017b), the Squatter Pigeon is known to utilize habitat located on land zones 3, 4, 5, 7 and 10. Within the study site, this consists of RE 11.3.2, RE 11.3.4, RE 11.3.4a, RE 11.3.25, RE 11.4.8, RE 11.5.2a, RE 11.5.3, RE 11.5.9, RE 11.5.18, RE 11.7.2, RE 11.7.4 equating to approximately 532 ha of potential Squatter Pigeon habitat.

These regional ecosystems provide good quality habitat for the Squatter Pigeon as they contain a number of native grass species which would provide a potential food resource. In addition there are a number of permanent water bodies within the study site which would provide a suitable water source.

South-eastern Long-eared Bat (Nyctophilus corbeni)

All of the woodland communities located within the study site (i.e. 532 ha) would provide suitable foraging and breeding habitat for the South-eastern Long-eared Bat. Tree hollows were identified within the Eucalypt Woodland, Micromyrtus shrubland and *Acacia harpophylla* woodland/forest (Table 16). In addition, a number of flora species present would provide suitable habitat for insect species on which the South-eastern Long-eared Bat could forage. The South-eastern Long-eared Bat could forage over the non-remnant (regrowth/derived grassland) habitat from time to time.

5.4.4. Migratory Fauna Species

No migratory species were recorded during the field surveys.

5.4.5. Exotic Fauna Species

During the field survey two wild Dogs were directly observed in the south-west of the site during the 2016 surveys. A large number of wild Dog tracks were also recorded across the study site on tracks and in dry creek beds (Photo 11). The feral Cat was also directly observed to the west of Parrot Quarry, and tracks were found to the north of Parrot Quarry (Photo 12). Other exotic species detected on site were the European Rabbit and Fox. However, very few Fox tracks were found, indicating a low abundance.



Figure 16: Threatened fauna species detected

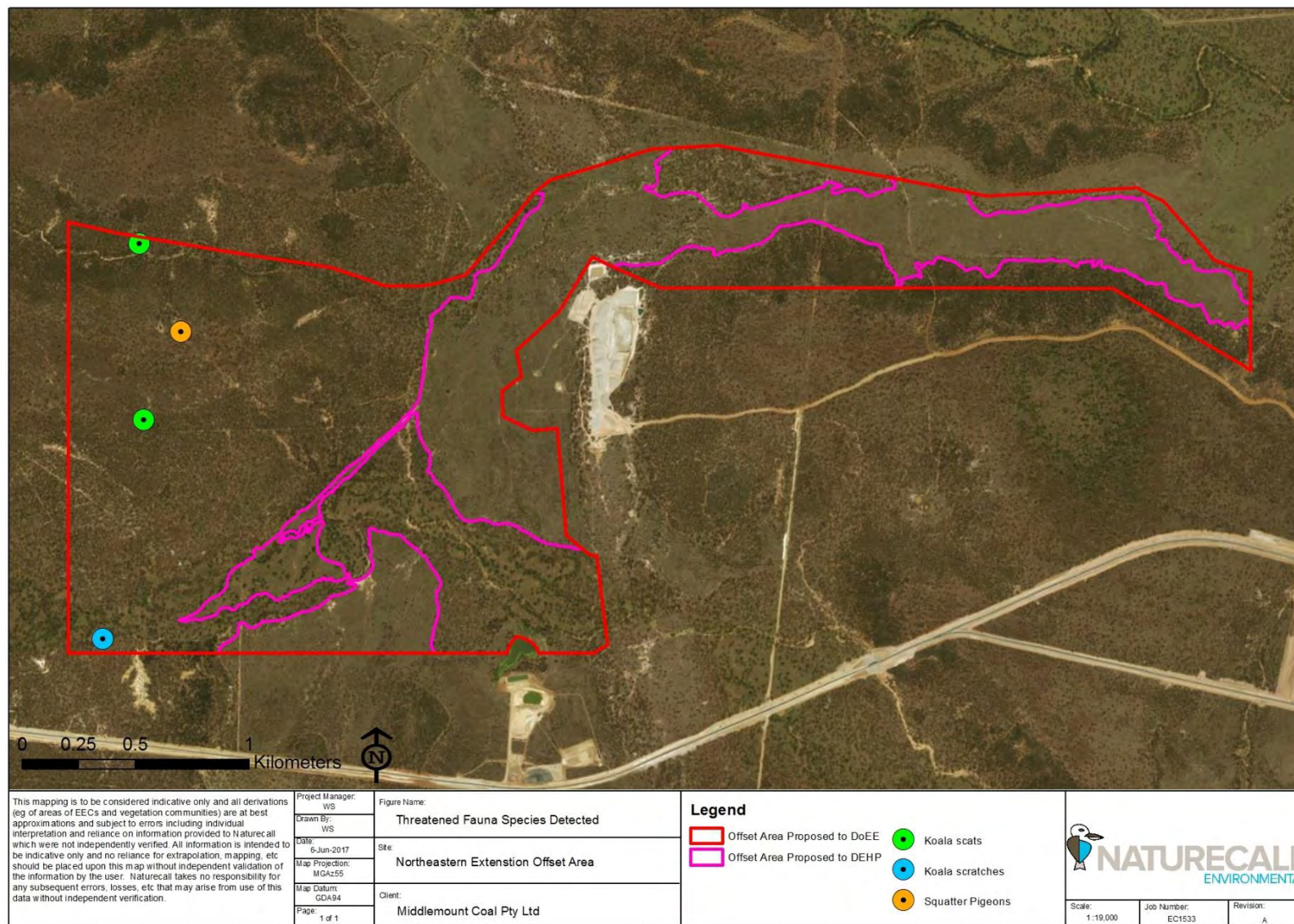




Photo 11: Wild dog tracks observed in dry creek bed



Photo 12: Feral cat tracks observed





6.0 Summary and Conclusion

The study site is located approximately 270 km north-west of Rockhampton and 9 km south-west of the Middlemount township. The study site comprises freehold land owned by MCPL and is approximately 532 ha in area. It includes a combination of forested/woodland areas along with cleared grazing land.

A desktop study (including comprehensive literature review) was carried out prior to the field survey to gather relevant information and data. Existing Department of Environment and Heritage Regional Ecosystem mapping of the study site, as well as previous mapping on adjoining land was obtained and used in conjunction with satellite imagery to identify the broad vegetation types present on the study site.

Flora and fauna surveys were undertaken throughout the study site from May 29th to June 1st 2017. Terrestrial habitat quality assessments were completed at 36 locations across the study site. Some of these were completed in June 2016. The fauna surveys comprised habitat suitability assessment, targeted surveys for threatened species, track, scat and secondary evidence searches as well as opportunistic fauna observations.

The study site was categorised into six broad fauna habitat types (i.e. eucalypt woodland/forest, *Micromyrtus* shrubland, riparian habitat, *Acacia shirleyi* forest, *Acacia harpophylla* woodland/forest, and regrowth/derived grassland). Eucalypt woodland was the most common habitat type on the study site. A number of habitat features were well represented in eucalypt woodlands such as hollow-bearing trees, coarse woody debris, nectar sources and native groundcover. It is considered that the various habitat types present on site would provide suitable habitat for a range of conservation significant fauna species including the Squatter Pigeon and South-eastern Long-eared Bat.

Remnant vegetation communities covered 339 ha (64%) of the study site. The less disturbed remnant areas (predominately in the western half of the study site) displayed attributes with similar values to the published benchmarks. Non-remnant vegetation communities covered 193 ha (36%) of the study site. While non-remnant areas generally contained more weed species they showed positive signs of natural regeneration.

Site condition and site context were assessed for both the Approved Commonwealth Offset Area and the State Connectivity Offset Area. Species habitat index scores were calculated for the Squatter Pigeon and South-eastern Long-eared Bat for each assessment unit within the Approved Commonwealth Offset Area. The overall Habitat Quality Score for the State Connectivity Offset Area is 7.37.

The shrub species *Cerbera dumicola*, which listed as 'Near Threatened' under the Queensland Nature Conservation Act (1992) was identified at eight locations during the field survey. In addition, the Koala was recorded via secondary evidence (i.e. scats and scratches) at three locations within the study site and the Squatter Pigeon was observed at one site within the study area.



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Appendix 1: Site Flora Species List

Common name	Scientific name	NC Act Status
Canopy Trees		
Ironwood	<i>Acacia excelsa</i>	LC
Brigalow	<i>Acacia harpophylla</i>	LC
Inland Rosewood	<i>Acacia rhodoxylon</i>	LC
Lancewood	<i>Acacia shirleyi</i>	LC
Clarkson's Bloodwood	<i>Corymbia clarksoniana</i>	LC
Dallachy's Gum	<i>Corymbia dallachiana</i>	LC
Moreton Bay Ash	<i>Corymbia tessellaris</i>	LC
Dawson's Gum	<i>Eucalyptus cambageana</i>	LC
Narrow-leaved Ironbark	<i>Eucalyptus crebra</i>	LC
Peppermint	<i>Eucalyptus exserta</i>	LC
Silver-leaved Ironbark	<i>Eucalyptus melanophloia</i>	LC
Poplar Box	<i>Eucalyptus populnea</i>	LC
Queensland Blue Gum	<i>Eucalyptus tereticornis</i>	LC
Mountain Coolabah	<i>Eucalyptus orgadophila</i>	LC
Weeping Paperbark	<i>Melaleuca leucadendra</i>	LC
Understorey Trees and Shrubs		
Bendee	<i>Acacia catenulata</i>	LC
-	<i>Acacia cretata</i>	LC
Black Wattle	<i>Acacia leiocalyx</i>	LC
Native Willow	<i>Acacia salicina</i>	LC
Currawang	<i>Acacia sparsiflora</i>	LC
Bull Oak	<i>Allocasuarina luehmannii</i>	LC
Red Ash	<i>Alphitonia excelsa</i>	LC
Dead Finish	<i>Archidendropsis basaltica</i>	LC
Whitewood	<i>Atalaya hemiglauca</i>	LC
Coffee Bush	<i>Breynia oblongifolia</i>	LC
Wild Orange	<i>Capparis canescens</i>	LC
Currant Bush	<i>Carissa ovata</i>	LC
Leichhardt Bean	<i>Cassia brewsteri</i>	LC
Belah	<i>Casuarina cristata</i>	LC
River Oak	<i>Casuarina cunninghamiana</i>	LC
-	<i>Cerbera dumicola</i>	NT
Lolly Bush	<i>Clerodendrum floribundum</i>	LC
-	<i>Denhamia cunninghamii</i>	LC
Native Ebony	<i>Diospyros humilis</i>	LC
Hop Bush	<i>Dodonaea viscosa</i>	LC
Turkey Bush	<i>Eremophila deserti</i>	LC
Harrisia Cactus	<i>Harrisia martinii</i> *	-
False Sandalwood	<i>Eremophila mitchellii</i>	LC



Common name	Scientific name	NC Act Status
Cocaine Tree	<i>Erythroxylum australe</i>	LC
Sandpaper Fig	<i>Ficus opposita</i>	LC
Scrub Leopardwood	<i>Flindersia dissosperma</i>	LC
Wilga	<i>Geijera parviflora</i>	LC
Silver Oak	<i>Grevillea parallela</i>	LC
Beefwood	<i>Grevillea striata</i>	LC
Dysentery Bush	<i>Grewia latifolia</i>	LC
Bootlace Oak	<i>Hakea lorea</i>	LC
Native Gardenia	<i>Larsenaikia ochreatea</i>	LC
Fibre bark	<i>Melaleuca nervosa</i>	LC
-	<i>Micromyrtus capricornia</i>	LC
Boobialla	<i>Myoporum montanum</i>	LC
Native Olive	<i>Notelaea microcarpa</i>	LC
Prickly Pear	<i>Opuntia stricta</i> *	-
Velvet Tree Pear	<i>Opuntia tomentosa</i> *	-
Gooya	<i>Owenia acidula</i>	LC
Quinine Tree	<i>Petalostigma pubescens</i>	LC
-	<i>Prostanthera cryptandroides</i> subsp. <i>euphrasioides</i>	LC
-	<i>Psydrax attenuata</i>	LC
Native Guava	<i>Rhodomyrtus psidioides</i>	LC
-	<i>Solanum parvifolium</i>	LC
Tipuana	<i>Tipuana tipu</i> *	-
Vine Tree	<i>Ventilago viminalis</i>	LC
Grasses		
Cockatoo Grass	<i>Alloteropsis semialata</i>	LC
Dark Wiregrass	<i>Aristida calycina</i>	LC
Many-headed Wiregrass	<i>Aristida caput-medusae</i>	LC
Jericho Wiregrass	<i>Aristida jerichoensis</i>	LC
Feathertop Wiregrass	<i>Aristida latifolia</i>	LC
White Speargrass	<i>Aristida leptopoda</i>	LC
Purple Wire-grass	<i>Aristida personata</i>	LC
Pitted Bluegrass	<i>Bothriochloa decipiens</i>	LC
Desert Bluegrass	<i>Bothriochloa ewartiana</i>	LC
Buffel Grass	<i>Cenchrus ciliaris</i> *	-
Slender Chloris	<i>Chloris divaricata</i>	LC
Rhodes Grass	<i>Chloris gayana</i> *	-
Windmill Grass	<i>Chloris truncata</i>	LC
Hairy Chloris	<i>Chloris virgata</i>	LC
Golden Beard Grass	<i>Chrysopogon fallax</i>	LC
Barbed Wire Grass	<i>Cymbopogon refractus</i>	LC
Couch Grass	<i>Cynodon dactylon</i>	LC
Queensland Bluegrass	<i>Dichanthium sericeum</i>	LC



Common name	Scientific name	NC Act Status
-	<i>Digitaria brownii</i>	LC
Spreading Umbrella Grass	<i>Digitaria divaricatissima</i>	LC
Nineawn	<i>Enneapogon sp.*</i>	-
Wiry Panic	<i>Entolasia stricta</i>	LC
Brown's Lovegrass	<i>Eragrostis brownii</i>	LC
Clustered Lovegrass	<i>Eragrostis elongata</i>	LC
Purple Lovegrass	<i>Eragrostis lacunaria</i>	LC
Woodland Lovegrass	<i>Eragrostis sororia</i>	LC
Silky Browntop	<i>Eulalia aurea</i>	LC
Black Speargrass	<i>Heteropogon contortus</i>	LC
Golden Weather-grass	<i>Hypoxis hygrometrica</i>	LC
Blady Grass	<i>Imperata cylindrica</i>	LC
Red Natal Grass	<i>Melinis repens*</i>	-
Green Panic	<i>Megathyrsus maximus var. pubiglumis*</i>	-
Bandicoot Grass	<i>Monachather paradoxus</i>	LC
-	<i>Ottochloa gracillima</i>	LC
Native Millet	<i>Panicum decompositum</i>	LC
Hairy Panic	<i>Panicum effusum</i>	LC
Brigalow Grass	<i>Paspalidium caespitosum</i>	LC
-	<i>Paspalidium distans</i>	LC
Freshwater Couch	<i>Paspalum distichum</i>	LC
Comet Grass	<i>Perotis rara</i>	LC
Spiked Sida	<i>Sida hackettiana</i>	LC
-	<i>Sorghum sp.*</i>	-
Fairy Grass	<i>Sporobolus caronii</i>	LC
Giant Rats tail Grass	<i>Sporobolus pyramidalis</i>	LC
Stylo	<i>Stylosanthes scabra*</i>	-
-	<i>Themeda avenacea</i>	LC
Kangaroo Grass	<i>Themeda triandra</i>	LC
Sabi Grass	<i>Urochloa mosambicensis*</i>	-
Groundcovers		
Khaki Weed	<i>Alternanthera pungens*</i>	-
Creeping Saltbush	<i>Atriplex semibaccata</i>	LC
Cobbler's Pegs	<i>Bidens pilosa*</i>	-
Purple Trumpet	<i>Brunoniella australis</i>	LC
Rock Fern	<i>Cheilanthes sieberi</i>	LC
Yellow Buttons	<i>Chrysocephalum apiculatum</i>	LC
Native Wandering Jew	<i>Commelina cyanea</i>	LC
Yellow Rattlepod	<i>Crotalaria mitchellii</i>	LC
Blue Flax-lily	<i>Dianella longifolia</i>	LC



Common name	Scientific name	NC Act Status
Sundew	<i>Drosera sp.</i>	LC
Lilac Tasselflower	<i>Emilia sonchifolia</i>	LC
Ruby Saltbush	<i>Enchylaena tomentosa</i>	LC
Gomphrena Weed	<i>Gomphrena celosioides*</i>	-
-	<i>Goodenia heteromera</i>	LC
-	<i>Goodenia rotundifolia</i>	LC
-	<i>Lobelia sp.</i>	LC
Small-flowered Mallow	<i>Malva parvifolia*</i>	-
Spiked Malvastrum	<i>Malvastrum americanum*</i>	-
Common Yellow Woodsorrel	<i>Oxalis perennans</i>	LC
-	<i>Phyllanthus maderaspatensis</i>	LC
Pigweed	<i>Portulaca oleracea</i>	LC
Hairy Pigweed	<i>Portulaca pilosa</i>	LC
Soft Roly-poly	<i>Salsola kali</i>	LC
-	<i>Sauropus hirtellus</i>	LC
Galvanized Burr	<i>Sclerolaena birchii</i>	LC
Sesbania Pea	<i>Sesbania cannabina</i>	LC
Flannel Weed	<i>Sida cordifolia*</i>	-
Fine Sida	<i>Sida filiformis</i>	LC
Paddy's Lucerne	<i>Sida rhombifolia*</i>	-
Spiked Sida	<i>Sida subspicata</i>	LC
Hairy Sida	<i>Sida trichopoda</i>	LC
Stylo	<i>Stylosanthes scabra*</i>	-
Bluebell	<i>Wahlenbergia gracilis</i>	LC
Noogoora Burr	<i>Xanthium occidentale*</i>	-
Sedges, Rushes and Aquatics		
-	<i>Bulbostylis barbata</i>	LC
Tall Sedge	<i>Carex appressa</i>	LC
Tassel Sedge	<i>Carex fascicularis</i>	LC
Variable Flat-sedge	<i>Cyperus difformis</i>	LC
Slender Flat-sedge	<i>Cyperus gracilis</i>	LC
Nutgrass	<i>Cyperus rotundus</i>	LC
-	<i>Fimbristylis sp.</i>	LC
Saw Sedge	<i>Gahnia aspera</i>	LC
Common Rush	<i>Juncus usitatus</i>	LC
Wattle Matrush	<i>Lomandra filiformis</i>	LC
Spiny-headed Matrush	<i>Lomandra longifolia</i>	LC
-	<i>Lomandra sp.</i>	LC
-	<i>Ludwigia octovalvis</i>	LC
Nardoo	<i>Marsilea hirsuta</i>	LC
Water Snowflake	<i>Nymphoides indica</i>	LC
-	<i>Persicaria attenuata</i>	LC



Common name	Scientific name	NC Act Status
Narrow-leaved Cumbungi	<i>Typha domingensis</i>	LC
Lianas, Scramblers and Twiners		
Nepine	<i>Capparis lasiantha</i>	LC
-	<i>Desmodium macrocarpum</i>	LC
Native Yam	<i>Dioscorea transversa</i>	LC
-	<i>Glycine clandestina</i>	LC
-	<i>Marsdenia sp.</i>	LC
Wonga Wonga Vine	<i>Pandorea pandorana</i>	LC
Rough Silkpod	<i>Parsonsia lanceolata</i>	LC
Orchids and Epiphytes		
Tiger Orchid	<i>Cymbidium canaliculatum</i>	LC

* Denotes an introduced species



Appendix 2: Site Fauna Species List

Common Name	Scientific Name	Detection Method ¹
Amphibians		
Scarlet-sided Pobblebonk	<i>Limnodynastes terraereginae</i>	OBS
Birds		
Grey Teal	<i>Anas gracilis</i>	OBS
Pacific Black Duck	<i>Anas superciliosa</i>	OBS, HC
Australasian Darter	<i>Anhinga novaehollandiae</i>	OBS
Richards Pipit	<i>Anthus novaeseelandiae</i>	OBS
Red-winged Parrot	<i>Aprosmictus erythropterus</i>	OBS
Wedge-tailed Eagle	<i>Aquila audax</i>	OBS
Great Egret	<i>Ardea alba</i>	OBS
White-necked Heron	<i>Ardea pacifica</i>	OBS
Australian Bustard	<i>Ardeotis australis</i>	OBS
Hardhead	<i>Aythya australis</i>	OBS
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	OBS, HC
Australian Magpie	<i>Cracticus tibicen</i>	OBS, HC
Pheasant Coucal	<i>Centropus phasianinus</i>	OBS
Red-capped Plover	<i>Charadrius ruficapillus</i>	OBS
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	OBS
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	OBS, HC
Australian Raven	<i>Corvus coronoides</i>	HC
Torresian Crow	<i>Corvus orru</i>	HC
Brown Quail	<i>Coturnix ypsilophora</i>	OBS
Pied Butcherbird	<i>Cracticus nigrogularis</i>	HC
Grey Butcherbird	<i>Cracticus torquatus</i>	OBS
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	OBS, HC
Blue-winged Kookaburra	<i>Dacelo leachii</i>	OBS
White-faced Heron	<i>Egretta novaehollandiae</i>	OBS
Black-fronted Dotterel	<i>Elseya melanops</i>	OBS
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	OBS
Eurasian Coot	<i>Fulica atra</i>	OBS
Bar-shouldered Dove	<i>Geopelia humeralis</i>	OBS
Peaceful Dove	<i>Geopelia placida</i>	OBS, HC
White-throated Gerygone	<i>Gerygone albogularis</i>	OBS, HC
Brown Gerygone	<i>Gerygone mouki</i>	HC
Magpie-lark	<i>Grallina cyanoleuca</i>	OBS
Australian Magpie	<i>Gymnorhina tibicen</i>	OBS, HC
Whistling Kite	<i>Haliastur sphenurus</i>	OBS, HC



Common Name	Scientific Name	Detection Method ¹
Black-winged Stilt	<i>Himantopus himantopus</i>	OBS
Welcome Swallow	<i>Hirundo neoxena</i>	OBS
Comb Crested Jacana	<i>Irediparra gallinacean</i>	OBS
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	OBS
White-throated Honeyeater	<i>Melithreptus albogularis</i>	OBS
Red-backed Fairy-wren	<i>Malurus melanocephalus</i>	OBS
Variegated Fairy Wren	<i>Malurus lamberti</i>	OBS
Noisy Miner	<i>Manorina melanocephala</i>	OBS, HC
Rainbow Bee-eater	<i>Merops ornatus</i>	HC
Black Kite	<i>Milvus migrans</i>	OBS
Restless Flycatcher	<i>Myiagra inquieta</i>	OBS
Crested Pigeon	<i>Ocyphaps lophotes</i>	OBS
Squatter Pigeon (southern subspecies) ⁺^	<i>Geophaps scripta scripta</i>	OBS
Rufous Whistler	<i>Pachycephala rufiventris</i>	OBS, HC
Striated Pardalote	<i>Pardalotus striatus</i>	OBS, HC
Pied Cormorant	<i>Phalacrocorax varius</i>	OBS
Common Bronzewing	<i>Phaps chalcoptera</i>	OBS
Little Friarbird	<i>Philemon citreogularis</i>	OBS,HC
Noisy Friarbird	<i>Philemon corniculatus</i>	OBS, HC
Pale-headed Rosella	<i>Platycercus adscitus</i>	OBS, HC
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	OBS
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	OBS, HC
Grey Fantail	<i>Rhipidura albiscarpa</i>	OBS
Willie Wagtail	<i>Rhipidura leucophrys</i>	OBS
Apostlebird	<i>Struthidea cinerea</i>	OBS
Australian Grebe	<i>Tachybaptus novaehollandiae</i>	OBS
Double-barred Finch	<i>Taeniopygia bichenovii</i>	OBS
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	OBS
Forest Kingfisher	<i>Todiramphus macleayii</i>	OBS
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>	OBS
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	HC
Masked Lapwing	<i>Vanellus miles</i>	OBS
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	OBS
Singing Honeyeater	<i>Lichenostomus virescens</i>	OBS,HC
Peaceful Dove	<i>Geopelia striata</i>	OBS
Pied Currawong	<i>Strepera graculina</i>	OBS
Unidentified Quail	-	OBS



Common Name	Scientific Name	Detection Method ¹
Unidentified Thornbill	<i>Acanthiza sp.</i>	OBS
Mammals		
Dog	<i>Canis lupus familiaris</i> *	TRA
Feral Cat	<i>Felis catus</i> *	TRA
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	OBS, SC, TRA
Common Wallaroo	<i>Macropus robustus</i>	OBS
Whiptail Wallaby	<i>Macropus parryi</i>	OBS
Swamp Wallaby	<i>Wallabia bicolor</i>	OBS
Red-necked Wallaby	<i>Macropus rufogriseus</i>	OBS
Rufous Bettong	<i>Aepyprymnus rufescens</i>	TRA
European Rabbit	<i>Oryctolagus cuniculus</i> *	SC
Koala ⁺	<i>Phascolarctos cinereus</i>	SC
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	TRA
European Fox	<i>Vulpes vulpes</i> *	TRA
Water Rat	<i>Hydromys chrysogaster</i>	SC
Reptiles		
Open Litter Rainbow Skink	<i>Carlia pectoralis</i>	OBS
Wall Skink	<i>Cryptoblepharus virgatus</i>	OBS
Copper-tailed Skink	<i>Ctenotus taeniolatus</i>	OBS
¹ Codes: Direct Observation (OBS), Heard Call (HC), Tracks (TRA), Scat (SC) * Denotes exotic species ^ Vulnerable EPBC Act + Vulnerable NC Act # Migratory EPBC Act		



Appendix 3: Terrestrial Habitat Quality Data

Assessment Unit	AU1 - RE 11.3.2					
Assessment Unit Area (ha)	12.5					
Survey Site	T38					
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	85	5	100	100	5
Native plant species richness- trees	2	8	5	2	5	5
Native plant species richness- shrubs	2	2	5	2	2	5
Native plant species richness- grasses	9	9	5	9	4	3
Native plant species richness- forbs	17	8	3	17	9	3
Tree canopy height	18	17.5	5	18	18	5
Tree subcanopy height	N/A	N/A		N/A	N/A	
Tree canopy cover (%)	40	30.4	5	40	22.7	5
Tree sub-canopy cover (%)	N/A	N/A		N/A	N/A	
Shrub canopy cover (%)	2	5.4	3	2	0	0
Native perennial grass cover (%)	35	11	1	35	9	1
Organic litter cover (%)	30	13	3	30	51	5
Large Euc. trees	22	6	5	22	6	5
Large Non - Euc. trees	N/A	N/A		N/A	N/A	
Coarse woody debris (m per ha)	307	167	5	307	103	2
Non-native plant cover (%)	0	45	3	0	35	3



Assessment Unit	AU2 - RE 11.3.25								
Assessment Unit Area (ha)	18.8								
Survey Site	T40			T23			T55		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition									
Recruitment of woody perennial species in EDL (%)	100	90	5	100	66	3	100	33	3
Native plant species richness- trees	4	11	5	4	8	5	4	8	5
Native plant species richness- shrubs	2	1	3	2	2	5	2	1	3
Native plant species richness- grasses	8	6	3	8	5	3	8	8	5
Native plant species richness- forbs	12	5	3	12	7	3	12	3	3
Tree canopy height	23	25	5	23	20	5	23	17	5
Tree subcanopy height	N/A	N/A		N/A	N/A		N/A	N/A	
Tree canopy cover (%)	22	59.6	3	22	77.5	3	22	38	5
Tree sub-canopy cover (%)	N/A	N/A		N/A	N/A		N/A	N/A	
Shrub canopy cover (%)	1	0	0	1	10.2	3	1	9.9	3
Native perennial grass cover (%)	12	22	5	12	18	5	12	20	5
Organic litter cover (%)	15	9	5	15	29	5	15	6	3
Large Euc. trees	14	10	15	14	4	5	14	2	5
Large Non - Euc. trees	7	26		7	4		7	0	
Coarse woody debris (m per ha)	375	384	5	375	154	2	375	159	2
Non-native plant cover (%)	0	40	3	0	50	3	0	75	0



Assessment Unit	AU3 - RE 11.3.4/11.3.4a					
Assessment Unit Area (ha)	29.2					
Survey Site	T13			T24		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	50	3	100	75	3
Native plant species richness- trees	4	7	5	4	7	5
Native plant species richness- shrubs	2	1	3	2	1	3
Native plant species richness- grasses	7	8	5	7	4	3
Native plant species richness- forbs	10	6	3	10	4	3
Tree canopy height	22	18	4	22	25	5
Tree subcanopy height	12	8		12	12	
Tree canopy cover (%)	17	74.7	3	17	17.5	3.5
Tree sub-canopy cover (%)	5	16.4		5	1.2	
Shrub canopy cover (%)	1	2.2	3	1	6.5	3
Native perennial grass cover (%)	43	28	3	43	30	3
Organic litter cover (%)	20	32	5	20	23	5
Large Euc. trees	26	8	5	26	8	5
Large Non - Euc. trees	9	0		9	8	
Coarse woody debris (m per ha)	384	603	5	384	160	2
Non-native plant cover (%)	0	20	5	0	20	5



Assessment Unit	AU4 - RE 11.5.2a								
Assessment Unit Area (ha)	98.3								
Survey Site	T29			T50			T20		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition									
Recruitment of woody perennial species in EDL (%)	100	100	5	100	50	3	100	25	3
Native plant species richness- trees	8.5	12	5	8.5	11	5	8.5	6	3
Native plant species richness- shrubs	2.5	5	5	2.5	4	5	2.5	0	0
Native plant species richness- grasses	6	8	5	6	15	5	6	6	5
Native plant species richness- forbs	5.5	9	5	5.5	8	5	5.5	5	5
Tree canopy height	13	15	5	13	15	5	13	10	5
Tree subcanopy height	N/A			N/A			N/A		
Tree canopy cover (%)	53.65	11.9	2	53.65	41.3	5	53.65	57.8	5
Tree sub-canopy cover (%)	N/A			N/A			N/A		
Shrub canopy cover (%)	11.85	4.5	3	11.85	7.2	5	11.85	0	0
Native perennial grass cover (%)	23.5	20	3	23.5	16	3	23.5	19	3
Organic litter cover (%)	37.5	52	5	37.5	52	5	37.5	27	5
Large Euc. trees	31	16	10	31	8	5	31	4	15
Large Non - Euc. trees		4			6			54	
Coarse woody debris (m per ha)	106.4	256	2	106.4	221	2	106.4	519	2
Non-native plant cover (%)	0	1	10	0	5	5	0	5	5



Assessment Unit	AU5 - RE 11.5.3											
Assessment Unit Area (ha)	108											
Survey Site	T42			T48			T18			T21		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition												
Recruitment of woody perennial species in EDL (%)	100	75	3	100	100	5	100	75	3	100	50	3
Native plant species richness- trees	6	8	5	6	10	5	6	11	5	6	9	5
Native plant species richness- shrubs	6	6	5	6	2	3	6	5	3	6	6	5
Native plant species richness- grasses	6	5	3	6	11	5	6	7	5	6	7	5
Native plant species richness- forbs	10	4	3	10	8	3	10	4	3	10	5	3
Tree canopy height	16	20	5	16	17	5	16	16	5	16	17	5
Tree subcanopy height	7	12		7	12		7	12		7	10	
Tree canopy cover (%)	20	18.2	4	20	39.1	4	20	23.7	4	20	40.6	3
Tree sub-canopy cover (%)	3	8.8		3	48.7		3	71.8		3	56.6	
Shrub canopy cover (%)	3	11.4	3	3	4.3	5	3	10.4	3	3	11.5	3
Native perennial grass cover (%)	19	23	5	19	14	3	19	19	5	19	29	5
Organic litter cover (%)	20	40	3	20	46	3	20	41	3	20	29	5
Large Euc. trees	9	2	5	9	4	10	9	0	5	9	0	10
Large Non - Euc. trees	1	0		1	2		1	2		1	6	
Coarse woody debris (m per ha)	314	570	5	314	91	2	314	893	2	314	623	5
Non-native plant cover (%)	0	20	5	0	60	0	0	5	5	0	20	5



Assessment Unit	AU6 - RE 11.5.9					
Assessment Unit Area (ha)	34.8					
Survey Site	T30			T31		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	50	3	100	0	0
Native plant species richness- trees	3	12	5	3	10	5
Native plant species richness- shrubs	6	1	2.5	6	1	2.5
Native plant species richness- grasses	9	8	3	9	9	5
Native plant species richness- forbs	11	5	3	11	7	3
Tree canopy height	17	19	5	17	16	5
Tree subcanopy height	8	8		8	8	
Tree canopy cover (%)	25	13.7	4	25	17.6	4
Tree sub-canopy cover (%)	5	36.1		5	20.7	
Shrub canopy cover (%)	10	6.6	5	10	0.2	0
Native perennial grass cover (%)	26	39	5	26	40	5
Organic litter cover (%)	30	35	5	30	22	5
Large Euc. trees	19	6	5	19	12	10
Large Non - Euc. trees	1	4		1	4	
Coarse woody debris (m per ha)	342	114	2	342	173	5
Non-native plant cover (%)	0	1	10	0	5	5



Assessment Unit	AU7 - RE 11.7.2		
Assessment Unit Area (ha)	26.6		
Survey Site	T45		
Attribute	Benchmark	Value	Score
Site Condition			
Recruitment of woody perennial species in EDL (%)	100	100	5
Native plant species richness- trees	3	6	5
Native plant species richness- shrubs	4	0	0
Native plant species richness- grasses	5	5	5
Native plant species richness- forbs	5	4	3
Tree canopy height	15	13	2.5
Tree subcanopy height	5	0	
Tree canopy cover (%)	40	55.1	2.5
Tree sub-canopy cover (%)	4	0	
Shrub canopy cover (%)	4	10.5	3
Native perennial grass cover (%)	15	47	5
Organic litter cover (%)	20	44	3
Large Euc. trees	10	2	5
Large Non - Euc. trees	26	2	
Coarse woody debris (m per ha)	1214	983	5
Non-native plant cover (%)	0	5	5



Assessment Unit	AU8 - RE 11.7.4		
Assessment Unit Area (ha)	5.1		
Survey Site	T51		
Attribute	Benchmark	Value	Score
Site Condition			
Recruitment of woody perennial species in EDL (%)	100	75	3
Native plant species richness- trees	17	20	5
Native plant species richness- shrubs	3	4	5
Native plant species richness- grasses	8	12	5
Native plant species richness- forbs	5	7	5
Tree canopy height	18	18	5
Tree subcanopy height			
Tree canopy cover (%)	34.9	38.4	5
Tree sub-canopy cover (%)			
Shrub canopy cover (%)	12.6	24.3	5
Native perennial grass cover (%)	38	30	3
Organic litter cover (%)	27	47	5
Large Euc. trees	22	8	5
Large Non - Euc. trees		2	
Coarse woody debris (m per ha)	206	84	2
Non-native plant cover (%)	0	25	5



Assessment Unit	AU9 - RE 11.4.8		
Assessment Unit Area (ha)	0.9		
Survey Site	T36		
Attribute	Benchmark	Value	Score
Site Condition			
Recruitment of woody perennial species in EDL (%)	100	100	5
Native plant species richness- trees	4	5	5
Native plant species richness- shrubs	7	5	3
Native plant species richness- grasses	6	3	3
Native plant species richness- forbs	8	2	3
Tree canopy height	14.5	17	5
Tree subcanopy height	-	7	
Tree canopy cover (%)	48	57	5
Tree sub-canopy cover (%)	-	15.1	
Shrub canopy cover (%)	4.2	0	0
Native perennial grass cover (%)	43.6	5	0
Organic litter cover (%)	30.3	90	3
Large Euc. trees	8.25	0	15
Large Non - Euc. trees	-	14	
Coarse woody debris (m per ha)	831.2	425	5
Non-native plant cover (%)	0	5	5



Assessment Unit	AU10 - RE 11.5.18					
Assessment Unit Area (ha)	6.8					
Survey Site	T32			T33		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	100	5	100	100	5
Native plant species richness- trees	9	5	3	9	8	3
Native plant species richness- shrubs	1	0	2.5	1	1	5
Native plant species richness- grasses	10	8	3	10	10	5
Native plant species richness- forbs	2	6	5	2	5	5
Tree canopy height	3	2	3	3	2	3
Tree subcanopy height						
Tree canopy cover (%)	41.3	10.6	2	41.3	18	2
Tree sub-canopy cover (%)						
Shrub canopy cover (%)	0.1	47.7	3	0.1	30.5	3
Native perennial grass cover (%)	43	50	5	43	18	1
Organic litter cover (%)	24	9	3	24	20	5
Large Euc. trees	32	4	5	32	2	5
Large Non - Euc. trees		0			0	
Coarse woody debris (m per ha)	346	0	0	346	25	0
Non-native plant cover (%)	0	0	10	0	1	10



Assessment Unit	AU 11 - RE 11.3.2 non rem		
Total Assessment Unit Area (ha)	9.5		
Survey Site	T54		
Attribute	Benchmark	Value	Score
Site Condition			
Recruitment of woody perennial species in EDL (%)	100	100	5
Native plant species richness- trees	4	8	5
Native plant species richness- shrubs	2	2	5
Native plant species richness- grasses	8	9	5
Native plant species richness- forbs	12	7	3
Tree canopy height	23	10	3
Tree subcanopy height	N/A	N/A	
Tree canopy cover (%)	22	2	0
Tree sub-canopy cover (%)	N/A	N/A	
Shrub canopy cover (%)	1	20.7	3
Native perennial grass cover (%)	12	57	5
Organic litter cover (%)	15	4	3
Large Euc. trees	14	0	0
Large Non - Euc. trees	7	0	
Coarse woody debris (m per ha)	375	72	2
Non-native plant cover (%)	0	20	5



Assessment Unit	AU 12 - 11.3.4 non rem					
Total Assessment Unit Area (ha)	11.9					
Survey Site	T37			T39		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	66	3	100	100	5
Native plant species richness- trees	4	6	5	4	3	3
Native plant species richness- shrubs	2	0	0	2	0	0
Native plant species richness- grasses	7	4	3	7	2	3
Native plant species richness- forbs	10	7	3	10	8	3
Tree canopy height	22	17	5	22	25	5
Tree subcanopy height	12	10		12	15	
Tree canopy cover (%)	17	12.5	5	17	7.5	3.5
Tree sub-canopy cover (%)	5	3		5	4.7	
Shrub canopy cover (%)	1	0	0	1	0	0
Native perennial grass cover (%)	43	4	0	43	0	0
Organic litter cover (%)	20	6	3	20	7	3
Large Euc. trees	26	0	0	26	4	5
Large Non - Euc. trees	9	0		9	0	
Coarse woody debris (m per ha)	384	108	2	384	104	2
Non-native plant cover (%)	0	60	0	0	80	0



Assessment Unit	AU 13 - 11.4.8 non rem								
Total Assessment Unit Area (ha)	80								
Survey Site	T46			T44			T56		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition									
Recruitment of woody perennial species in EDL (%)	100	100	5	100	100	5	100	100	5
Native plant species richness-trees	4	7	5	4	2	3	4	2	3
Native plant species richness-shrubs	7	6	3	7	2	3	7	5	3
Native plant species richness-grasses	6	11	5	6	3	3	6	6	5
Native plant species richness-forbs	8	5	3	8	5	3	8	6	3
Tree canopy height	14.5	12	5	14.5	6	3	14.5	6	3
Tree subcanopy height	N/A	N/A		N/A	N/A		N/A	N/A	
Tree canopy cover (%)	48	5.4	2	48	17.4	2	48	21.4	2
Tree sub-canopy cover (%)	N/A	N/A		N/A	N/A		N/A	N/A	
Shrub canopy cover (%)	4.2	28.5	3	4.2	8.5	3	4.2	16.7	3
Native perennial grass cover (%)	43.6	22	3	43.6	0	0	43.6	4	0
Organic litter cover (%)	30.3	6	3	30.3	23	5	30.3	11	3
Large Euc. trees	8.25	0	0	8.25	0	0	8.25	0	0
Large Non - Euc. trees		0			0			0	
Coarse woody debris (m per ha)	831.2	67	0	831.2	20	0	831.2	47	0
Non-native plant cover (%)	0	30	3	0	60	0	0	50	3



Assessment Unit	AU 13 - 11.4.8 non rem								
Total Assessment Unit Area (ha)	80								
Survey Site	T34			T41			T22		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition									
Recruitment of woody perennial species in EDL (%)	100	83	5	100	75	3	100	100	5
Native plant species richness-trees	4	6	5	4	4	5	4	4	5
Native plant species richness-shrubs	7	5	3	7	5	3	7	3	3
Native plant species richness-grasses	6	2	3	6	5	3	6	3	3
Native plant species richness-forbs	8	0	0	8	4	3	8	3	3
Tree canopy height	14.5	12	5	14.5	12	5	14.5	4	3
Tree subcanopy height	N/A	N/A		N/A	N/A		N/A	N/A	
Tree canopy cover (%)	48	3.7	0	48	8.6	2	48	2.4	0
Tree sub-canopy cover (%)	N/A	N/A		N/A	N/A		N/A	N/A	
Shrub canopy cover (%)	4.2	1.8	3	4.2	9.4	3	4.2	1.3	3
Native perennial grass cover (%)	43.6	4	0	43.6	2	0	43.6	20	1
Organic litter cover (%)	30.3	20	5	30.3	51	5	30.3	9	3
Large Euc. trees	8.25	0	0	8.25	0	0	8.25	0	0
Large Non - Euc. trees		0			0			0	
Coarse woody debris (m per ha)	831.2	0	0	831.2	240	2	831.2	201	2
Non-native plant cover (%)	0	70	0	0	40	3	0	80	0



Assessment Unit	AU 14 - 11.5.2a non rem					
Total Assessment Unit Area (ha)	13.3					
Survey Site	T35			T49		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition						
Recruitment of woody perennial species in EDL (%)	100	70	3	100	100	5
Native plant species richness- trees	8.5	13	5	8.5	13	5
Native plant species richness- shrubs	2.5	5	5	2.5	3	5
Native plant species richness- grasses	6	7	5	6	8	5
Native plant species richness- forbs	5.5	3	3	5.5	4	3
Tree canopy height	13	11	5	13	8	3
Tree subcanopy height	N/A	N/A		N/A	N/A	
Tree canopy cover (%)	53.65	12.9	2	53.65	19.7	2
Tree sub-canopy cover (%)	N/A	N/A		N/A	N/A	
Shrub canopy cover (%)	11.85	7	5	11.85	18.1	5
Native perennial grass cover (%)	23.5	9	1	23.5	22	5
Organic litter cover (%)	37.5	45	5	37.5	12	3
Large Euc. trees	31	0	0	31	0	0
Large Non - Euc. trees		0			0	
Coarse woody debris (m per ha)	106.4	170	5	106.4	220	2
Non-native plant cover (%)	0	40	3	0	30	3



Assessment Unit	AU 15 - 11.5.3 non rem								
Total Assessment Unit Area (ha)	64.7								
Survey Site	T27			T47			T52		
Attribute	Benchmark	Value	Score	Benchmark	Value	Score	Benchmark	Value	Score
Site Condition									
Recruitment of woody perennial species in EDL (%)	100	50	3	100	100	5	100	100	5
Native plant species richness- trees	6	3	3	6	10	5	6	10	5
Native plant species richness- shrubs	6	6	5	6	3	3	6	5	3
Native plant species richness- grasses	6	2	3	6	14	5	6	10	5
Native plant species richness- forbs	10	2	2.5	10	3	3	10	0	0
Tree canopy height	16	8	1.5	16	10	4	16	8	1.5
Tree subcanopy height	7	0		7	6		7	0	
Tree canopy cover (%)	20	5.9	3.5	20	50	1.5	20	19.8	2.5
Tree sub-canopy cover (%)	3	1.7		3	0		3	0	
Shrub canopy cover (%)	3	0	0	3	6.1	3	3	22.8	3
Native perennial grass cover (%)	19	32	5	19	27	5	19	9	1
Organic litter cover (%)	20	18	5	20	15	5	20	14	5
Large Euc. trees	9	0	0	9	0	0	9	0	0
Large Non - Euc. trees	1	0		1	0		1	0	
Coarse woody debris (m per ha)	314	361	5	314	374	5	314	292	5
Non-native plant cover (%)	0	50	3	0	30	3	0	75	0



Assessment Unit	AU 16 - RE 11.7.4 non rem		
Total Assessment Unit Area (ha)	3.6		
Survey Site	T53		
Attribute	Benchmark	Value	Score
Site Condition			
Recruitment of woody perennial species in EDL (%)	100	100	5
Native plant species richness- trees	17	8	3
Native plant species richness- shrubs	3	4	5
Native plant species richness- grasses	8	9	5
Native plant species richness- forbs	5	4	3
Tree canopy height Tree subcanopy height	18	10	3
Tree canopy cover (%) Tree sub-canopy cover (%)	34.9	21	5
Shrub canopy cover (%)	12.6	4.3	3
Native perennial grass cover (%)	38	41	5
Organic litter cover (%)	27	29	5
Large Euc. trees Large Non - Euc. trees	22	0 0	0
Coarse woody debris (m per ha)	206	328	5
Non-native plant cover (%)	0	30	3

APPENDIX D

WESTERN EXTENSION PROJECT OFFSET AREA BASELINE REPORT



Biodiversity
AUSTRALIA

Western Extension Project

Offset Area Baseline Report

Client:

Middlemount Coal Pty Ltd

March 2019



Document Status

Version	Purpose	Author	Reviewed By	Approved By	Date
Rev 0.3	Draft	Mya Gaby	Will Steggall		23/02/2018
Rev 1.0	Draft	Mya Gaby	Will Steggall	Will Steggall	19/03/2018
Rev 2.0	Final draft	Mya Gaby	Will Steggall	Will Steggall	03/05/2018
Rev 3.0	Final	Mya Gaby	Will Steggall	Will Steggall	07/03/2019

Document Control

Copy No.	Date	Type/Via	Issued to	Name	Purpose
1	23/02/2018	Electronic	Naturecall Info	Clare Fitch	File Copy
2	23/02/2018	Electronic/E-mail	Resource Strategies	Joe Fittell	Client Review
3	19/03/2018	Electronic	Naturecall Info	Clare Fitch	File Copy
4	19/03/2018	Electronic/E-mail	Resource Strategies	Joe Fittell	Client Review
5	03/05/2018	Electronic	Biodiversity Australia Info	Clare Fitch	File Copy
6	03/05/2018	Electronic/E-mail	Resource Strategies	Joe Fittell	Client Copy
5	07/03/2019	Electronic	Biodiversity Australia Info	Clare Fitch	File Copy
6	07/03/2019	Electronic/E-mail	Resource Strategies	Joe Fittell	Client Copy

Project Number: EC1687

Our Document Reference: EC1687-BEC-REPMCPLOffsetAreaBaselineReport-rev3.0

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Executive Summary	4
1.0 Introduction	5
2.0 Background Information	6
2.1. Location of the Study Sites	6
2.2. Study Objectives	6
3.0 Existing Environment	9
3.1. Soils, Topography and Geology	9
3.2. Regional Ecosystems	11
3.3. Pre-clearing Regional Ecosystems	11
3.4. Drainage Features	17
3.5. Landuse and Disturbance History	18
3.6. Summary of Previous Threatened Species Recorded	18
4.0 Methodology	20
4.1. Desktop Study and Literature Review	20
4.2. Field Surveys	21
4.2.1. Vegetation and Habitat Quality Surveys	21
4.2.2. Threatened Ecological Community Identification	22
4.2.3. Threatened Fauna Surveys	27
5.0 Results	29
5.1. Vegetation Survey Results	29
5.1.1. Floristics	29
5.1.2. Regional Ecosystems	29
5.1.3. Pre-clearing Regional Ecosystems	38
5.1.4. Threatened Flora	45
5.1.5. Endangered and Of Concern Regional Ecosystems	45
5.1.6. Exotic Flora Species	49
5.1.7. Baseline Condition of Regional Ecosystems (Western Extension Commonwealth Offset Area (1 and 2) and Western Extension State Offset Area)	49
5.1.8. Baseline Condition of Regional Ecosystems (Modified Stage 2 Commonwealth Offset Area 2 and 3)	53
5.1.9. Baseline Condition of Regional Ecosystems (Modified Rail Loop and Spur Offset Area 3a and 3b)	54



5.2. Habitat Quality Assessment (Western Extension Commonwealth Offset Area 1 and 2)	55
5.3. Habitat Quality Assessment (Western Extension State Offset Area)	56
5.4. Habitat Quality Assessment (Modified Stage 2 Commonwealth Offset Area 2 and 3)	58
5.5. Habitat Quality Assessment (Modified Rail Loop and Spur Offset Area 3a and 3b)	58
5.6. Fauna Survey Results	61
5.6.1. Fauna Habitat Types	61
5.6.2. Fauna Species Detected	66
5.6.3. Threatened Fauna Species	66
5.6.4. Migratory Fauna Species	77
5.6.5. Exotic Fauna Species	77
6.0 Summary and Conclusion	79
7.0 References	80
Appendix 1: Site Flora Species List	83
Appendix 2: Site Fauna Species List	86

List of Figures

Figure 1: Location of the Offset Areas	7
Figure 2: Offset Areas	8
Figure 3: Geology and Drainage	10
Figure 4: DSITI Mapped Regional Ecosystems	15
Figure 5: Mapped Pre-clearing Regional Ecosystems	16
Figure 6: Location of survey sites	26
Figure 7: Field verified Regional Ecosystems – Western Extension Commonwealth Offset Area	31
Figure 8: Field verified Regional Ecosystems – Western Extension State Offset Area	33
Figure 9: Field verified Regional Ecosystems – Rail Loop and Spur Offset Area	35
Figure 10: Field verified Regional Ecosystems – Modified Stage 2 Commonwealth Offset Area	37
Figure 11: Field-verified Pre-clearing RE – Western Extension Commonwealth Offset Area	40
Figure 12: Field verified Pre-clearing RE – Western Extension State Offset Area	42
Figure 13: Field-verified Pre-clearing RE – Modified Rail Loop and Spur Offset Area	44
Figure 14: Endangered and Of Concern Regional Ecosystems Listed Under the VM Act	47
Figure 15: Threatened Ecological Communities Listed Under the EPBC Act	48
Figure 16: Broad Fauna Habitat Types Present on the Study Site	65
Figure 17: Previously recorded threatened species in the surrounding area	68
Figure 18: Koala habitat within each Offset Area	69
Figure 19: Greater Glider habitat within the study sites	72
Figure 20: Squatter Pigeon (southern) habitat within the study sites	74
Figure 21: Ornamental Snake habitat within the study sites	76
Figure 22: Threatened fauna species detected during recent surveys	78



List of Tables

Table 1: DSITI Mapped Regional Ecosystems within the study sites	12
Table 2: Pre-clearing Regional Ecosystems mapped by DSITI within the study sites	13
Table 3: Sampling Sites in all Offset areas.....	23
Table 4: Western Extension Commonwealth Offset Area Regional Ecosystems	30
Table 5: Western Extension State Regional Ecosystems	32
Table 6: Rail Loop and Spur Offset Area Regional Ecosystems.....	34
Table 7: Modified Stage 2 Commonwealth Offset Area Regional Ecosystems	36
Table 8: Western Extension Commonwealth Offset Area Pre-clearing Regional Ecosystems.....	39
Table 9: Western Extension State Offset Area Pre-clearing Regional Ecosystems	41
Table 10: Rail Loop and Spur Offset Area Pre-clearing Regional Ecosystems	43
Table 11: Type and area of Brigalow EEC communities in the study sites.....	46
Table 12: Noxious Weeds Recorded Within the Study Sites	49
Table 13: Habitat Quality Scores for Western Extension State Offset Area	57
Table 14: Final Habitat Quality Score for Western Extension State Offset Area	57
Table 15: Habitat Quality Scores for Modified Rail Loop and Spur Offset Area.....	59
Table 16: Final Habitat Quality Score for Modified Rail Loop and Spur Offset Area (Squatter Pigeon [southern]).....	59
Table 17: Broad Fauna Habitat Types.....	61
Table 18: Fauna Habitat Assessment	62
Table 19: Area of potential habitat for threatened species within the Offset Areas	77

List of Photos

Photo 1: Section of Roper Creek.....	17
Photo 2: Permanent dam in Offset Area.....	18
Photo 3: Koala recorded in the Offset Area.....	67
Photo 4: Greater Glider recorded	71
Photo 5: Greater Glider on barbed wire fence.....	71



Executive Summary

Biodiversity Australia Pty Ltd has been requested by Middlemount Coal Pty Ltd (MCPL) to undertake a baseline ecological assessment consisting of vegetation validation and terrestrial habitat quality assessments of four offset areas to be established for the Middlemount Coal Mine Western Extension Project (the Project).

The study sites are located approximately 270 kilometers (km) north-west of Rockhampton and 9 km south-west of the Middlemount Township and comprise the following areas:

1. Western Extension Commonwealth Offset Area (1) and (2)
2. Western Extension State Offset Area
3. Modified Stage 2 Commonwealth Offset Area (2) and (3)
4. Modified Rail Loop and Spur Offset Area (3a) and (3b)

Flora and fauna surveys were undertaken throughout the study sites from 18-21 July 2017 and 20-26 November 2017. Terrestrial habitat quality assessments were conducted in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.2* at a total of 44 locations spread across the study sites. The fauna surveys comprised habitat suitability assessment, opportunistic surveys for threatened species, track, scat and secondary evidence searches, as well as, opportunistic fauna observations.

No threatened flora species were detected during the survey. Ecosystems were ground-truthed during the 2017 surveys and the Regional Ecosystem valuation process identified a total of fourteen distinct regional ecosystems across the study sites. Four of these are listed as Endangered (RE 11.3.1, RE 11.4.8, RE 11.4.9 and RE 11.4.9a) and three are listed as Of Concern (RE 11.3.2, RE 11.3.4 and RE 11.5.18) under the *Queensland Vegetation Management Act, 1999*.

The surveys also ground-truthed areas of the *Brigalow* (*Acacia harpophylla* dominant and co-dominant) threatened ecological community listed as Endangered under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

Three threatened fauna species were recorded during the field surveys, namely the Koala, Greater Glider and Squatter Pigeon (southern). These species are listed as Vulnerable under the *Queensland Nature Conservation Act, 1992* [NC Act] and EPBC Act. A fourth threatened species, the Ornamental Snake, was also considered a potential occurrence in the study sites based on local records identified in the literature and database searches and presence of suitable habitat.

Species habitat index scores were calculated for the Squatter Pigeon (southern), Greater Glider, Koala and Ornamental Snake for each assessment unit within the Western Extension Commonwealth Offset Area.



1.0 Introduction

Middlemount Coal Pty Ltd (MCPL) has lodged an amendment application to the Middlemount Coal Mine Environmental Authority (EA) EPML00716913 in accordance with section 224 of the Queensland (Qld) *Environmental Protection Act, 1994* (EP Act) to approve an extension of the Middlemount Coal Mine (Figure 1) (herein referred to as the Middlemount Coal Mine Western Extension Project [the Project]).

On 8 January 2018, the Project was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) (2016/7649). On 8 February 2018, a delegate of the Commonwealth Minister for the Environment declared the Action to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on the following controlling provisions under Part 3 of the EPBC Act:

- sections 18 and 18A of the EPBC Act (listed threatened species and communities); and
- sections 24D and 24E of the EPBC Act (a water resource, in relation to coal seam gas development and large coal mining development).

Biodiversity Australia Pty Ltd (formerly trading as Naturecall Environmental) was commissioned by MCPL to validate vegetation and undertake terrestrial habitat quality assessments of four offset areas to be established for the Middlemount Coal Mine Western Extension Project (the Project).



2.0 Background Information

2.1. Location of the Study Sites

The study sites are located approximately 270 kilometres (km) north-west of Rockhampton and 3 km south-west of the Middlemount Township (Figure 1). They fall within in the Isaac-Comet Downs sub-region of the North Brigalow Belt Bioregion, and are within the Fitzroy catchment.

The study sites, as shown in Figure 2, comprise the following Offset Areas:

1. Western Extension Commonwealth Offset Area (1) and (2)
2. Western Extension State Offset Area
3. Modified Stage 2 Commonwealth Offset Area (2) and (3)
4. Modified Rail Loop and Spur Offset Area (3a) and (3b)

The Offset Areas are located on freehold land owned by MCPL and total approximately 1,843 hectares (ha) in area. The four Offset Areas include a combination of forested/woodland areas and cleared grazing land. The four Offset Areas are adjacent to three existing MCPL offset areas.

2.2. Study Objectives

The primary objectives of the Offset Baseline Report were to:

- ground truth Regional Ecosystems;
- providing written descriptions of the baseline health and quality of each Regional Ecosystem;
- characterise vegetation (remnant and non-remnant);
- identify and map the pre-clearing regional ecosystem of the study area (considering the Government pre-clear layer);
- identify and map any Matters of State Environmental Significance (MSES) and Matters of National Environmental Significance (MNES);
- apply the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (Department of Environment and Heritage Protection [DEHP] 2017a). to the Regional Ecosystems;
- apply the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a) to the Regional Ecosystems predicted to occur prior to clearing;
- map threatened ecological communities listed under the EPBC Act;
- map potential habitat for potentially occurring threatened species relevant to the Project (Ornamental Snake, Squatter Pigeon (southern), Koala and Greater Glider);
- apply the Habitat Quality Scoring Template to calculate the habitat quality score of the four Offset Areas; and
- undertake targeted surveys for threatened species relevant to the Project (Ornamental Snake, Squatter Pigeon (southern), Koala and Greater Glider).



Figure 1: Location of the Offset Areas

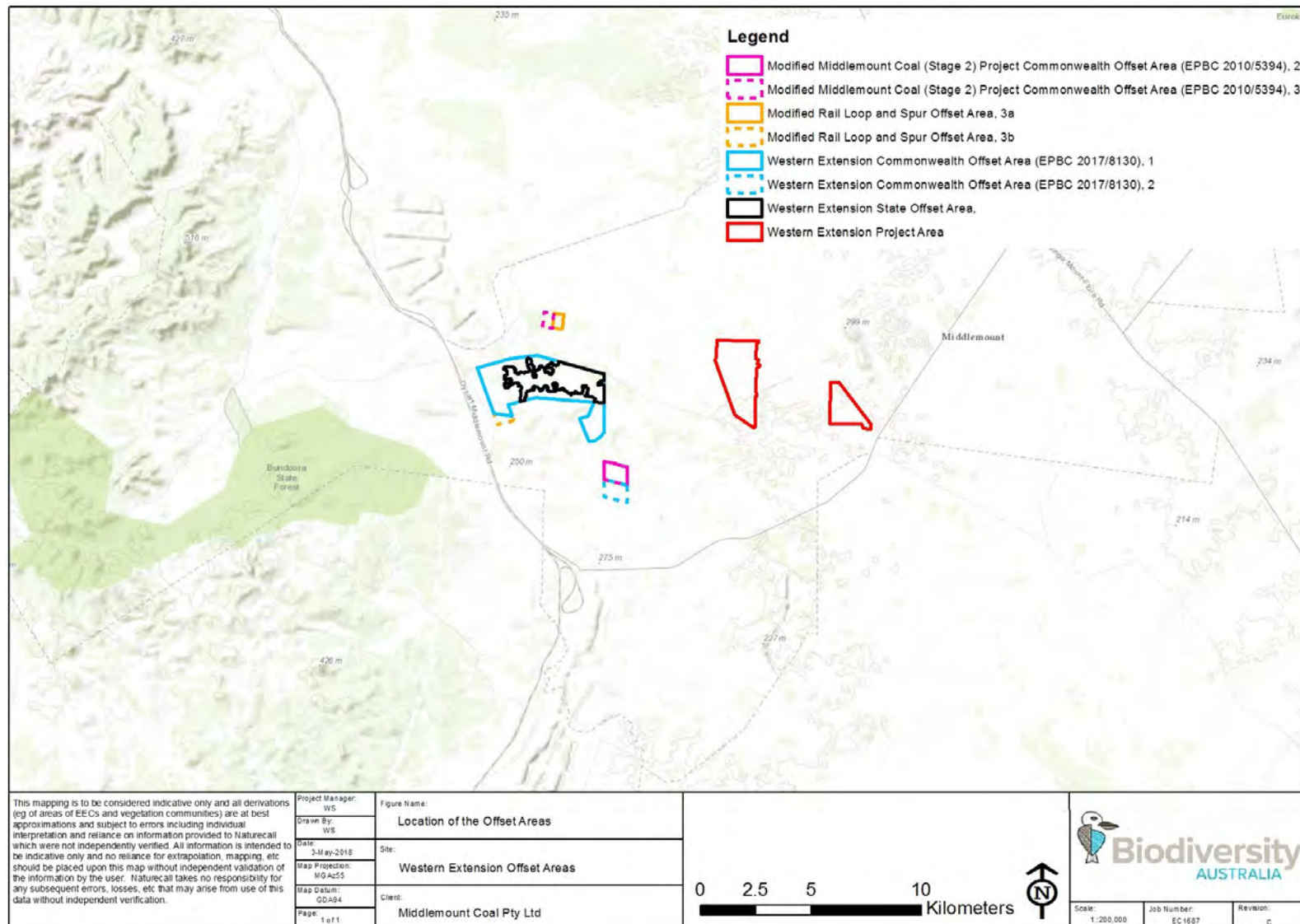
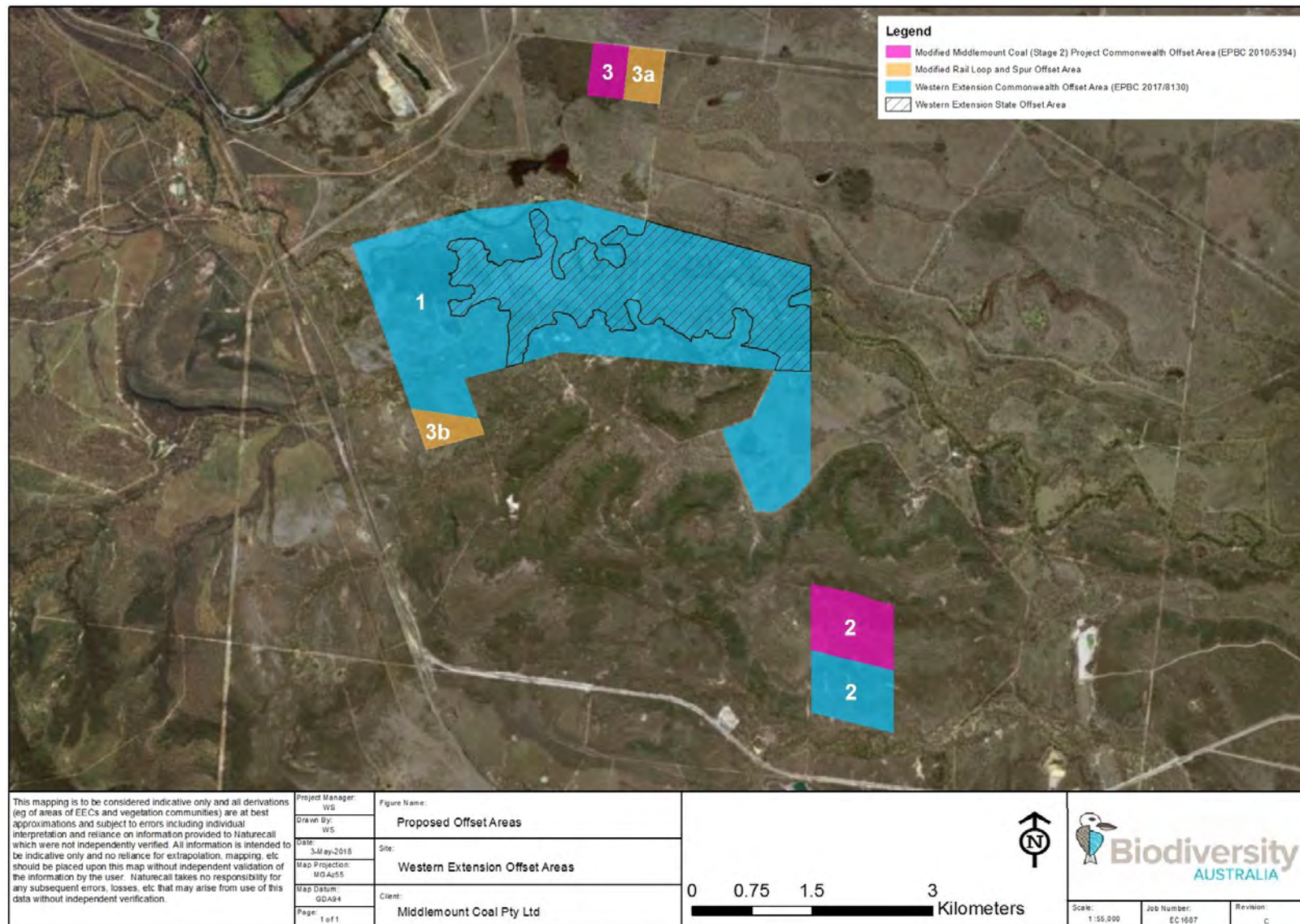




Figure 2: Offset Areas





3.0 Existing Environment

3.1 Soils, Topography and Geology

The study area comprises gently undulating lowlands with slopes ranging from <5 to 30 degrees. Elevated areas and scarp retreat zones are located in the Western Extension Commonwealth Offset Area (2) and the Modified Stage 2 Commonwealth Offset Area (2). Level and low lying areas occurring in the Modified Stage 2 Commonwealth Offset Area (3) and in the central and northern extent of the Western Extension Commonwealth Offset Area (1) along an alluvial plain associated with Roper Creek (Figure 3). The hydrological features of the study site and Roper Creek are discussed in Section 3.4.

Surface geology of the study area comprises several formations including alluvium associated with Roper Creek (clay, silt, sand and gravel), sedimentary rocks and felsites (lavas, clastics and high level intrusives) as shown in Figure 3. The dominant underlying geology is the Duaringa Formation which comprises sedimentary rocks including mudstone, sandstone, siltstone and conglomerate (Department of Natural Resources and Mines [DNRM] 2015).

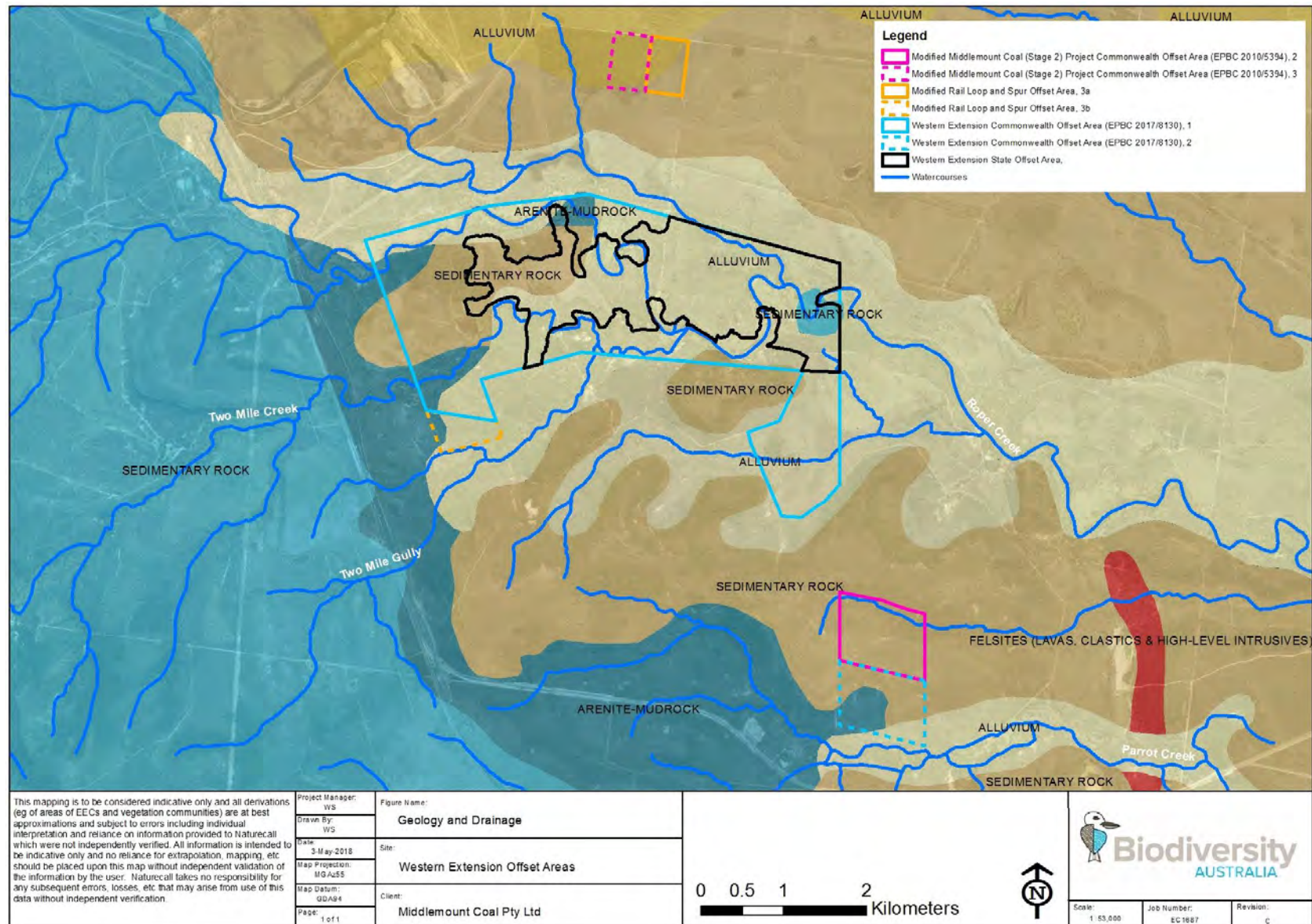
Soil types within the study sites vary widely depending on the topographic location and underlying geology. The most prevalent soil type within the study area comprise silty to sandy loams and clays.

A total of four land zones are mapped over the study sites (Wilson and Taylor 2012; Department of Science, Information Technology and Innovation [DSITI] 2017), comprising:

- Land Zone 3: Recent Quaternary alluvial systems.
- Land Zone 4: Tertiary-early Quaternary clay plains.
- Land Zone 5: Tertiary-early Quaternary loamy and sandy plains and plateaus.
- Land Zone 7: Cainozoic duricrusts.



Figure 3: Geology and Drainage





3.2. Regional Ecosystems

Existing DSITI (2017) Regional Ecosystem mapping of the Offset Areas indicates that 19 Regional Ecosystems are present (Table 1, Figure 4). This DSITI mapping was verified in the field by Biodiversity Australia in 2017.

3.3. Pre-clearing Regional Ecosystems

The Pre-clearing Regional Ecosystems digital data layer (DSITI 2017) of the non-remnant vegetation throughout the study sites indicate that 21 Regional Ecosystems formerly occurred in this area (Table 2; Figure 5). This layer was refined by Biodiversity Australia through field surveys.


Table 1: DSITI Mapped Regional Ecosystems within the study sites

Regional Ecosystem	Short Description	VMA Status	EPBC Status
11.10.12	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	LC	-
11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	LC	-
11.3.1/11.3.2	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains; and <i>Eucalyptus populnea</i> woodland on alluvial plains	E/OC	E
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	-
11.3.2/11.3.27	<i>Eucalyptus populnea</i> woodland on alluvial plains and Freshwater wetlands	OC/LC	-
11.3.2/11.3.7	<i>Eucalyptus populnea</i> woodland on alluvial plains and <i>Corymbia spp.</i> woodland on alluvial plains	OC/LC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains	OC	-
11.3.4/11.3.7	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains; and <i>Corymbia spp.</i> woodland on alluvial plains	OC/LC	-
11.3.7	<i>Corymbia spp.</i> woodland on alluvial plains	LC	-
11.4.2	<i>Eucalyptus spp.</i> and/or <i>Corymbia spp.</i> grassy or shrubby woodland on Cainozoic clay plains	OC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	E
11.4.8/11.4.9	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains; and <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	E
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open forest to woodland.	E	E
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia spp.</i> , with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains and/or remnant surfaces; and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	LC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	-



Regional Ecosystem	Short Description	VMA Status	EPBC Status
11.5.911.5.3	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces; and <i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	-
11.7.2/11.5.18	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone; and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	LC/OC	-
11.7.2/11.7.4	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone; and <i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	LC	-

E – Endangered, OC – Of Concern, NC – No Concern at present, LC – Least Concern, VMA – Vegetation Management Act, EPBC –Environmental Protection and Biodiversity Conservation Act, BD Status –Biodiversity Status (according to the Queensland Government).

Source: DEHP 2017b

Table 2: Pre-clearing Regional Ecosystems mapped by DSITI within the study sites

Regional Ecosystem	Short Description	VMA Status	EPBC Status
11.10.12	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	LC	-
11.10.7/11.10.12	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks; and <i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	LC	-
11.3.1/11.3.2	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on alluvial plains; and <i>Eucalyptus populnea</i> woodland on alluvial plains	E/OC	-
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	-
11.3.2/11.3.21	<i>Eucalyptus populnea</i> woodland on alluvial plains; and <i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils	OC/E	E
11.3.2/11.3.27	<i>Eucalyptus populnea</i> woodland on alluvial plains; and Freshwater wetlands	OC/LC	-
11.3.2/11.3.7	<i>Eucalyptus populnea</i> woodland on alluvial plains; and <i>Corymbia</i> spp. woodland on alluvial plains	OC/LC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	LC	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	OC	-



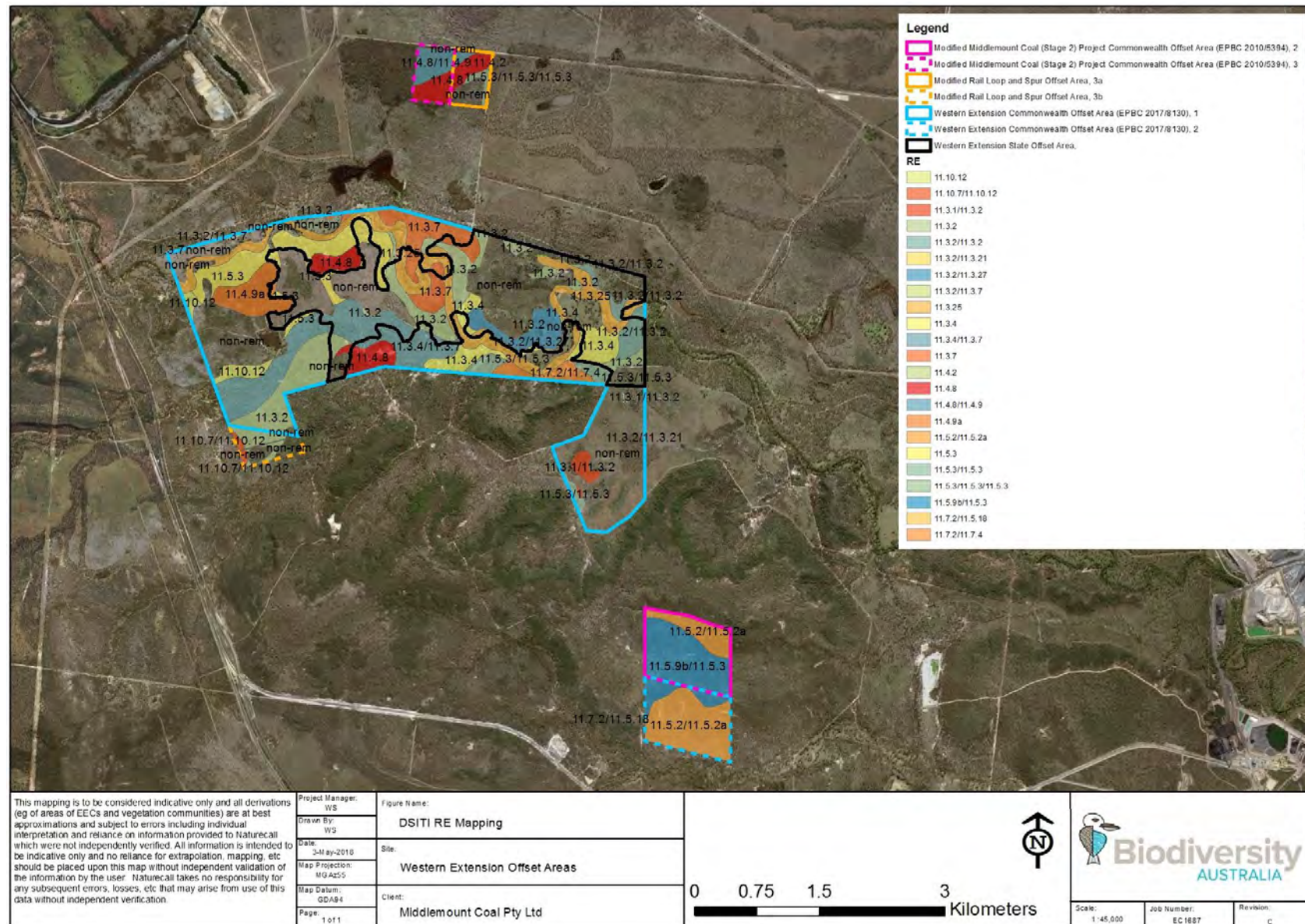
Regional Ecosystem	Short Description	VMA Status	EPBC Status
11.3.4/11.3.7	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains; and <i>Corymbia</i> spp. woodland on alluvial plains	OC/LC	-
11.3.7	<i>Corymbia</i> spp. woodland on alluvial plains	LC	-
11.4.2	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. grassy or shrubby woodland on Cainozoic clay plains	OC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	E
11.4.8/11.4.9	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains; and <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	E
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open forest to woodland	E	E
11.5.2/11.5.2a	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces; and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	LC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	-
11.5.3/11.5.2a	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces; and <i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	LC	-
11.5.9/11.5.3	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces; and <i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	LC	-
11.7.2/11.5.18	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone; and <i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	LC/OC	-
11.7.2/11.7.4	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone; and <i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	LC	-

E – Endangered, OC – Of Concern, NC – No Concern at present, LC – Least Concern, VMA – Vegetation Management Act, EPBC –Environmental Protection and Biodiversity Conservation Act, BD Status –Biodiversity Status (according to the Queensland Government).

Source: DEHP 2017b



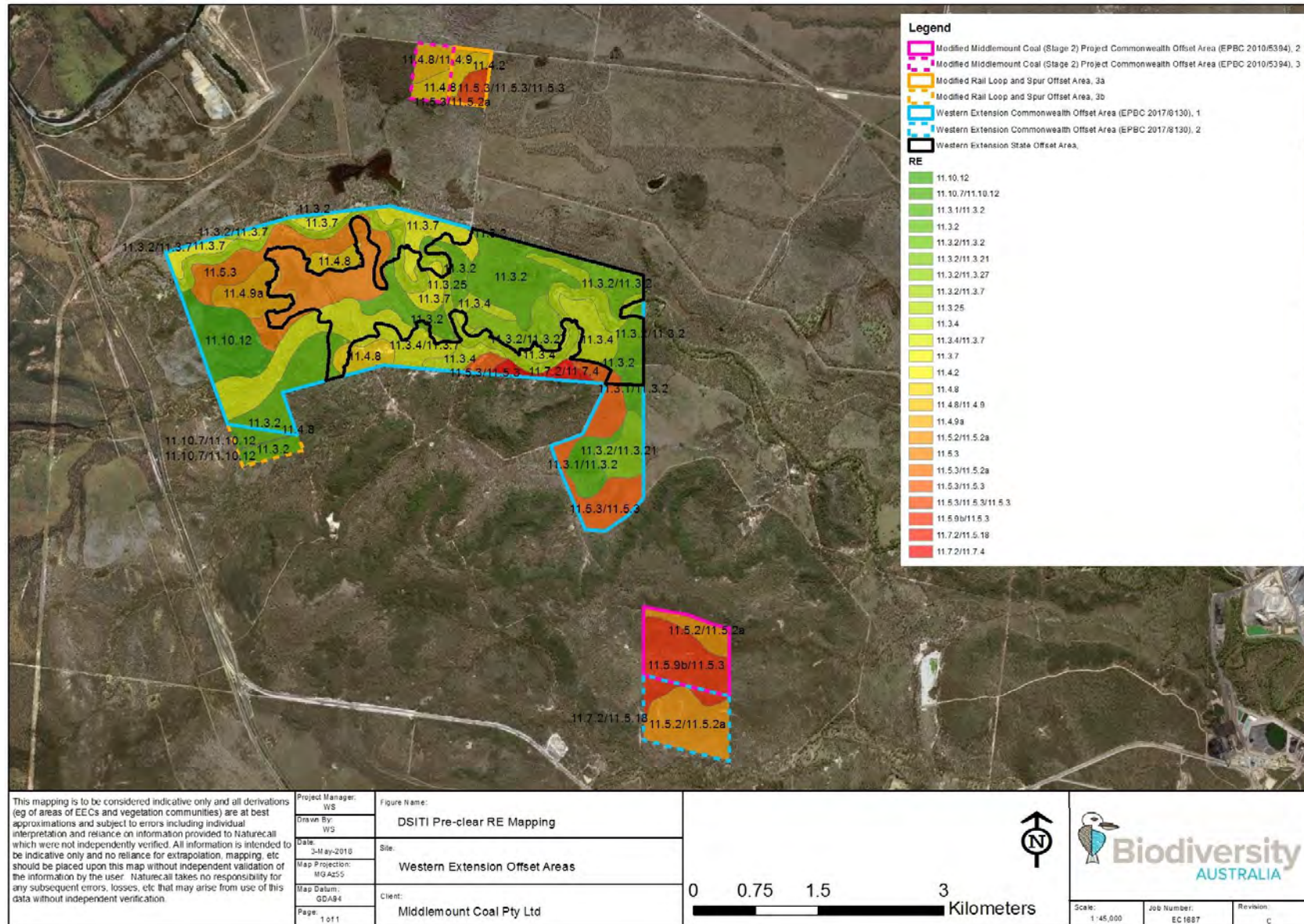
Figure 4: DSITI Mapped Regional Ecosystems



Source: DSITI 2017



Figure 5: Mapped Pre-clearing Regional Ecosystems





3.4. Drainage Features

The study site is located in the Fitzroy River Basin which drains an area of approximately 150,000km² (DNRM 2015). The main drainage feature of the study site is Roper Creek which passes through the Western Extension Commonwealth Offset Area (1) (Figure 3). Roper Creek was found to be largely dry during the field surveys (Photo 1), however some pools remained. A number of other smaller tributaries and drainage lines flow through the Offset Areas into Roper Creek.

These watercourses are all ephemeral (i.e. flow is restricted to periods after rainfall). Whilst these watercourses were not flowing during the field surveys, recent rainfall events resulted in a number of temporary waterholes within the watercourses.

Only the Western Extension Commonwealth Offset Area (1) contains a permanent water source, comprising a large dam in the western extent of the area (Photo 2) and several smaller dams. These water sources would provide a permanent water source for native fauna and habitat for a range of bird species.

Photo 1: Section of Roper Creek





Photo 2: Permanent dam in Offset Area



3.5. Landuse and Disturbance History

The study sites do not contain any developed areas such as dwellings or farm infrastructure. The primary current landuse for the study site is beef cattle grazing, which mostly occurs along Roper Creek and other cleared areas of the Western Commonwealth Extension Offset Area (1). No other agricultural activities are conducted within the study site.

Historically, the main disturbance activities within the locality were related to land clearing associated with cattle grazing, which has occurred extensively in low-lying areas including creek flats, and clay plains. Grazing and trampling by cattle has suppressed regeneration over some cleared areas, however natural regeneration is occurring extensively throughout the study sites.

The Modified Rail Loop and Spur and Modified Stage 2 Commonwealth Offset Areas show few signs of disturbance and largely comprise remnant vegetation.

3.6. Summary of Previous Threatened Species Recorded

A number of flora and fauna surveys have been undertaken on lands surrounding the study site (Parsons Brinckerhoff [PB] 2010; Ecology and Heritage Partners [EHP] 2012, 2013a, 2013b, 2013c; Naturecall, 2013, 2014a, 2014b, 2014c, 2015, 2016, 2017a, 2017b; GHD 2012). These surveys have resulted in the detection of a number of flora and fauna species listed under the *Nature Conservation Act, 1992* (NC Act) and/or EPBC Act which include:

- *Cerbera dumicola* which is listed as 'Near Threatened' under the NC Act (PB 2010; EHP 2012; Naturecall 2016).



- Koala (*Phascolarctos cinereus*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (PB 2010; Naturecall 2014b, 2016, 2017a; EHP 2012).
- Greater Glider (*Petauroides volans*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (Naturecall 2014b, 2017a, 2017b).
- Squatter Pigeon (southern) (*Geophaps scripta scripta*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (PB 2010; EHP 2012; Naturecall 2013, 2014a, 2014c, 2017a).
- Ornamental Snake (*Denisonia maculata*), which is listed as 'Vulnerable' under the NC Act and EPBC Act (PB 2010).



4.0 Methodology

4.1. Desktop Study and Literature Review

A desktop study was completed prior to the field survey to gather relevant information and data. The following databases and Geographic Information System (GIS) layers were searched/obtained:

- Department of the Environment and Energy (DEE) Protected Matters Search Tool (DEE 2017a) using a 2km search radius.
- DEHP Wildlife Online database (DEHP 2017c) using a 10km search radius.
- DSITI Regional Ecosystems Mapping digital data layer (DSITI 2017).
- DSITI Pre-clearing Regional Ecosystems digital data layer (DSITI 2017).

In addition to the desktop searches, the following literature was reviewed:

- *Ecological Investigations within the Offset Area for Stage 2 of the Middelmount Coal Mine, Queensland* (EHP 2012).
- *Vegetation Offsets for Middelmount Rail Spur and Loop* (EHP 2013a).
- *Vegetation Offsets for Parrot Quarry* (EHP 2013b).
- *Vegetation Offsets for Middelmount Coal Mine Thirteen Mile Gully Diversion* (EHP 2013c).
- *Middelmount Coal Mine Rail Loop and Spur Vegetation Offset Proposal* (MCPL 2013a).
- *Parrot Quarry Vegetation Offset Proposal* (MCPL 2103b).
- *Thirteen Mile Gully Diversion Vegetation Offset Proposa.* (MCPL 2013c).
- *Middelmount Coal Mine Offset Management Plan/Vegetation Management Plan* (MCPL 2013d).
- *Ecological Monitoring for Offset Area* (Naturecall 2013).
- *Ecological Assessment Report for Bingegang Pipeline Relocation, Middelmount Coal Mine* (Naturecall 2014a).
- *Ecological Monitoring for Offset Area: Use of the Offset Area by Fauna* (Naturecall 2014b).
- *Ecological Monitoring for Offset Area Year 2* (Naturecall 2014c).
- *Terrestrial Ecology Impact Assessment: Western Extension, Middelmount Coal Mine* (Naturecall 2015).
- *Vegetation Validation and Terrestrial Habitat Assessment, Middelmount Coal Mine* (Naturecall 2016).
- *Ecological Impact Assessment: Western Extension, Middelmount Coal Mine (in prep)* (Naturecall 2018).
- *Ecological Monitoring for Offset Area Year 4* (Naturecall 2017a).
- *North-eastern Extension Offset Area - Offset Baseline Report, Middelmount Coal Mine.*(Naturecall 2017b).
- *Middelmount Coal Project (Stage 2) Terrestrial Ecological Impact Assessment* (PB 2010).



Existing DSITI Regional Ecosystem mapping of the study site (Section 3.2), as well as previous mapping on adjoining land (PB 2010; EHP 2012; Naturecall 2016) was obtained and used in conjunction with satellite imagery to identify the broad vegetation types present. This preliminary mapping assisted with survey design and allowed comparison to the floristic data collected during the survey.

4.2. Field Surveys

Field surveys were undertaken across the study site to achieve the various project objectives (see Section 2.2). The different offset areas were subject to various survey methods and effort over two survey periods from 18-21 July and 20-26 November 2017.

Field surveys over the Modified Stage 2 Commonwealth Offset Area (2) and Western Extension Commonwealth Offset Area (2) study sites were also undertaken from 9-15 June 2016 as part of the Northeast Extension Offset Area project.

A detailed summary of the methods applied to the Offset Areas is provided in the following sections.

4.2.1. Vegetation and Habitat Quality Surveys

Regional Ecosystem and Non-remnant Vegetation Verification

Vegetation surveys were initially carried out over the study site to ground truth Regional Ecosystem mapping and Pre-clearing RE mapping. This was undertaken by Biodiversity Australia Ecologists from 18-21 July 2017. Further refinement of RE mapping was undertaken during the November survey period.

Field surveys were undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al. 2017). A total of 15 quaternary survey sites were carried out across the study site (Figure 6). This allowed accurate mapping of Regional Ecosystems, and validation of vegetation status (i.e. remnant/non-remnant).

The following information was recorded at each quaternary survey site:

- Date.
- Structural Code.
- Ecologically Dominant Layer (EDL)
Height.
- EDL Cover.
- Land Zone.
- Regional Ecosystem Map Unit.
- Collector/s.
- X/Y Coordinate.
- Remnant Vegetation Cover



The location of quaternary survey sites is shown in Figure 6.

4.2.2. Threatened Ecological Community Identification

Vegetation communities identified during the surveys were assessed for their conservation status under the EPBC Act, VM Act and DEHP Biodiversity Status. Brigalow communities were also assessed according to the Approved conservation advice for the Brigalow EEC (Department of the, Environment, [DofE] 2013) and the Species Profile and Threats Database (DEE, 2019).

Habitat Quality Assessment

Habitat Quality Assessments were conducted throughout the study site in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a). These surveys were carried out by Biodiversity Australia ecologists from 20-26 November 2017.

The following sections describe the procedures involved in the surveys.

Defining Assessment Units

Assessment units for the site condition assessments were defined according to the ground-truthed Regional Ecosystems. Each distinct RE was assigned as a single assessment unit as per the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a).

Sampling Sites

Based on a desktop assessment of the study site and minimum effort requirements described in the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a) a minimum of 49 plots/transects were suggested as shown in Table 3 below.

A total of 44 plots/transects were undertaken in November 2017. A geo-referenced map showing the location of survey sites is shown in Figure 6. Site selection was targeted to sample a representative coverage of the site vegetation.

As seen in Table 3 below, some assessment units had less than the suggested number of sites in the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a), yet the guidelines describe that site numbers can be reduced. This was due to the vegetation across the assessment unit being in very similar condition and not warranting additional condition assessments. In this circumstance, photographs were taken to demonstrate the similarity (streamlines sites) as allowed for in Section 4.4 of the guidelines (DEHP 2017a).

No field assessment of AU4 (RE 11.3.27d) was undertaken as it was not identified until after the field survey was carried out.


Table 3: Sampling Sites in all Offset areas

Assessment Unit	Regional Ecosystem	Area (ha)	Suggested no. of Sampling Sites	Sampling Sites Completed 2017
Western Extension Commonwealth Offset Area				
AU1	11.3.1	16.5	2	2
AU2	11.3.2	281	4	7
AU3	11.3.25	57	3	3
AU4	11.3.27d	4	2	0
AU5	11.3.4/11.3.4a	117.5	4	6
AU6	11.3.7	29	2	2
AU7	11.4.8	17	2	2
AU8	11.4.9/11.4.9a	42.5	2	4
AU9	11.5.18	4	2	1
AU10	11.5.2a	52.5	3	1
AU11	11.5.3	86.5	3	5
AU12	11.5.9	18.5	2	1
AU13	11.7.2	3	2	2
AU14	11.7.4	13.5	2	2
AU15 (Non-Rem)	11.3.1	32	2	2
AU16 (Non-Rem)	11.3.2	144	4	2
AU17 (Non-Rem)	11.3.4/11.3.4a	46	2	2
AU18 (Non-Rem)	11.3.7	13	2	1
AU19 (Non-Rem)	11.5.3	209	4	3
Western Extension State Offset Area				
AU1	11.3.1	8	2	1
AU2	11.3.2	185	4	4
AU3	11.3.25	17.5	2	1
AU4	11.3.27d	4	2	0
AU5	11.3.4/11.3.4a	17	2	2
AU6	11.5.3	8.5	2	1
AU7 (Non-Rem)	11.3.1	13.5	2	1
AU8 (Non-Rem)	11.3.2	105	4	2
AU9 (Non-Rem)	11.3.4/11.3.4a	12	2	1
AU10(Non-Rem)	11.5.3	83	3	2
Modified Commonwealth Stage 2 (a and b) Offset Area				



Assessment Unit	Regional Ecosystem	Area (ha)	Suggested no. of Sampling Sites	Sampling Sites Completed 2017
AU1	11.4.8	15.5	2	1
AU2	11.4.9	14	2	1
AU3	11.5.18	18	2	2
AU4	11.5.2a	7	2	1
AU5	11.5.3	12.5	2	1
AU6	11.5.9	47	2	2
Rail Loop and Spur (a and b) Offset Area				
AU1	11.3.2	10	2	2
AU2	11.4.8	7	2	1
AU3	11.4.9	9.0	2	1
AU4	11.5.3	6	2	2
AU5 (Non-Rem)	11.3.2	13	2	1
AU6 (Non-Rem)	11.5.3	11.5	2	2

Site Condition Assessment

The following information was recorded at each of the terrestrial habitat quality assessment sites using a combination of measured plots and transects:

- Observer, location and date.
- Regional Ecosystem (assessment unit).
- Photographic record of vegetation.
- Habitat description (e.g. presence of habitat resources for native fauna).
- Canopy and subcanopy height (measured using stick method).
- Canopy and subcanopy percentage cover.
- Native plant species richness (as a percentage) in each layer.
- Number of large trees located within a 100m x 50m plot.
- Recruitment of woody perennial species (i.e. proportion of dominant layer regenerating).
- Coarse woody debris within a 50m x 20m plot.
- Non-native plant cover percentage.
- Groundcover composition.

The values for each habitat quality attribute were recorded in the field on Biocondition data sheets (Eyre et al, 2015). This data was then added to the *Habitat Quality Scoring Template, Version 1.0* (DEHP 2014).



For Assessment Units that had multiple sampling sites the values for each attribute were totaled and then averaged in order to have one value for each attribute. This approach was confirmed with DES. For each Assessment Unit the values recorded at the sampling sites were then compared against the relevant Regional Ecosystem benchmark data for each attribute to give an overall score for each attribute. Summing these scores determined the overall score for Site Condition for each Assessment Unit. This was all calculated through the Habitat Quality Scoring Template.

Site Context Assessment

Site context attributes were measured via desktop assessment using GIS mapping and spatial analysis as per the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a). ArcGIS Version 10.2.2 was used for all GIS mapping and spatial analysis.

This data was then added to the Habitat Quality Scoring Template which automatically compares the site context attributes to the Site Context Scoring sheet to determine the overall site context score for each Assessment Unit.

It is important to note that the “Distance to permanent watering point” was not calculated as this attribute is measured for intact Bioregions only and the Brigalow Belt Bioregion is fragmented (DEHP 2017a).

Fauna Species Habitat Assessment

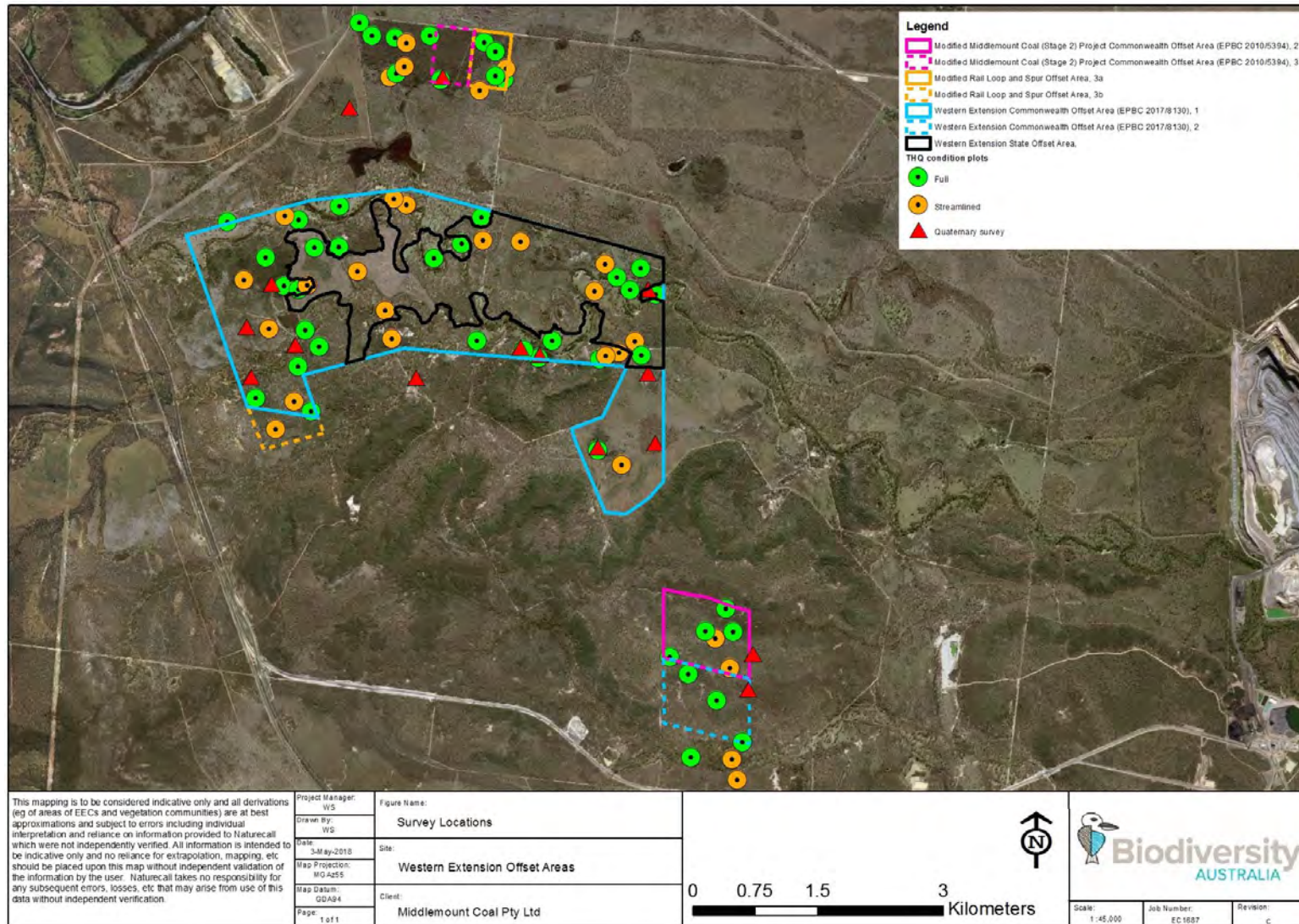
A desktop review was completed prior to the field survey to gather relevant information and data on the Squatter Pigeon (southern), Greater Glider, Koala and Ornamental Snake. Opportunistic surveys and habitat suitability assessment for the Squatter Pigeon (southern), Greater Glider, Koala and Ornamental Snake were then undertaken within the study site (See Section 4.2.2). Using the information gathered and expert knowledge of the general locality (based on previous field surveys), the Species Habitat Index scores were determined using the Species Habitat Index Scoring Guide as per the *Guide to Determining Terrestrial Habitat Quality Version 1.2* (DEHP 2017a).

Final Habitat Quality Score

The final Habitat Quality Score was automatically calculated within the Habitat Quality Scoring Template provided. Each of the above three indicators are scored then summed and translated to a final score out of 10, with a score of 10 representing a fully intact ecosystem and 1 representing a totally cleared area (DEHP 2017a).



Figure 6: Location of survey sites





4.2.3. Threatened Fauna Surveys

Opportunistic fauna surveys were carried out throughout the study sites during the November 2017 survey period. The surveys comprised the following:

- Habitat suitability assessment.
- Diurnal bird surveys.
- Track, scat, secondary evidence and physical habitat searches.
- Spotlighting transects
- Opportunistic fauna observations.

Further details are provided in the following sections.

Habitat Suitability Assessment

The condition and features (e.g. hollows, fallen logs, foraging resources and leaf litter) of the various habitat types within the study sites were recorded during the field surveys. Any permanent and non-permanent water sources were also recorded and photographed.

Detailed data on habitat parameters such as groundcover density and composition, vegetation structure, coarse woody debris and weed cover was collected as part of the site condition assessment described in Section 4.2.1.

Diurnal Bird Surveys

The diurnal bird surveys consisted of specific censuses of at least 30 minutes duration and were undertaken at a different location each morning during the survey period. Bird species were generally surveyed by detecting calls and searching with binoculars at specific points or along a walking transect. The surveys targeted permanent water sources, roads/tracks and other areas of suitable habitat for the Squatter Pigeon (southern).

Track, Scat ,Secondary Evidence and Physical Habitat Searches

Searches for scats and tracks were undertaken opportunistically throughout the study sites in conjunction with other surveys and when traversing between vegetation survey sites.

The sandy roads and dry creek beds within and around the study sites provided ideal locations for track searches, and any tracks found were photographed and identified using Triggs (1996) as a reference text.

Physical habitat searches of the site involved:

- Lifting of debris to search for reptiles and frogs.
- Inspection of dense vegetation for bird nests.
- Observation of likely basking sites for reptiles and frogs.
- Searching for scats, tracks, digging and scratches across the study site as they could indicate the presence of numerous native species (e.g. Koala).



Spotlighting Transects

Spotlighting was undertaken throughout the Western Extension Commonwealth Offset Area (1) over one night during the November survey period for a total of three hours.

This involved driving transects from a vehicle moving at walking pace along roads and tracks. Two hand held LED spotlights and a thermal imagery camera were utilised.

All habitat components (i.e. understory/canopy trees, dense vegetation, logs), were searched for terrestrial and arboreal fauna.



5.0 Results

5.1. Vegetation Survey Results

5.1.1. Floristics

The study sites were found to have reasonable floristic diversity, however weeds and naturalised pasture species such as Buffel Grass are present over large areas. The comprehensive flora list for the study sites is presented in Appendix 1.

A total of 115 flora species were recorded during the surveys, including 16 exotic species (Appendix 1). The highest diversity was found at less disturbed sites where an intact ground layer was present and there was less evidence of disturbance from cattle grazing.

5.1.2. Regional Ecosystems

The RE validation process identified a total of fourteen distinct regional ecosystems across the study sites. Approximately 66% of the Offset Areas (approximately 899ha) qualified as remnant vegetation¹, with the remaining 34% (approximately 469 ha) determined to be non-remnant. The following sections provide a detailed description of the ground-truthed RE mapping across the study sites.

Western Extension Commonwealth Offset Area

Table 4 details the RE's present in the Western Extension Commonwealth Offset Area (1 and 2) along with the area (in ha) and conservation status. A map of the RE's in the Western Extension Commonwealth Offset Area is provided in Figure 7.

¹ As defined by Neldner et al. (2017)

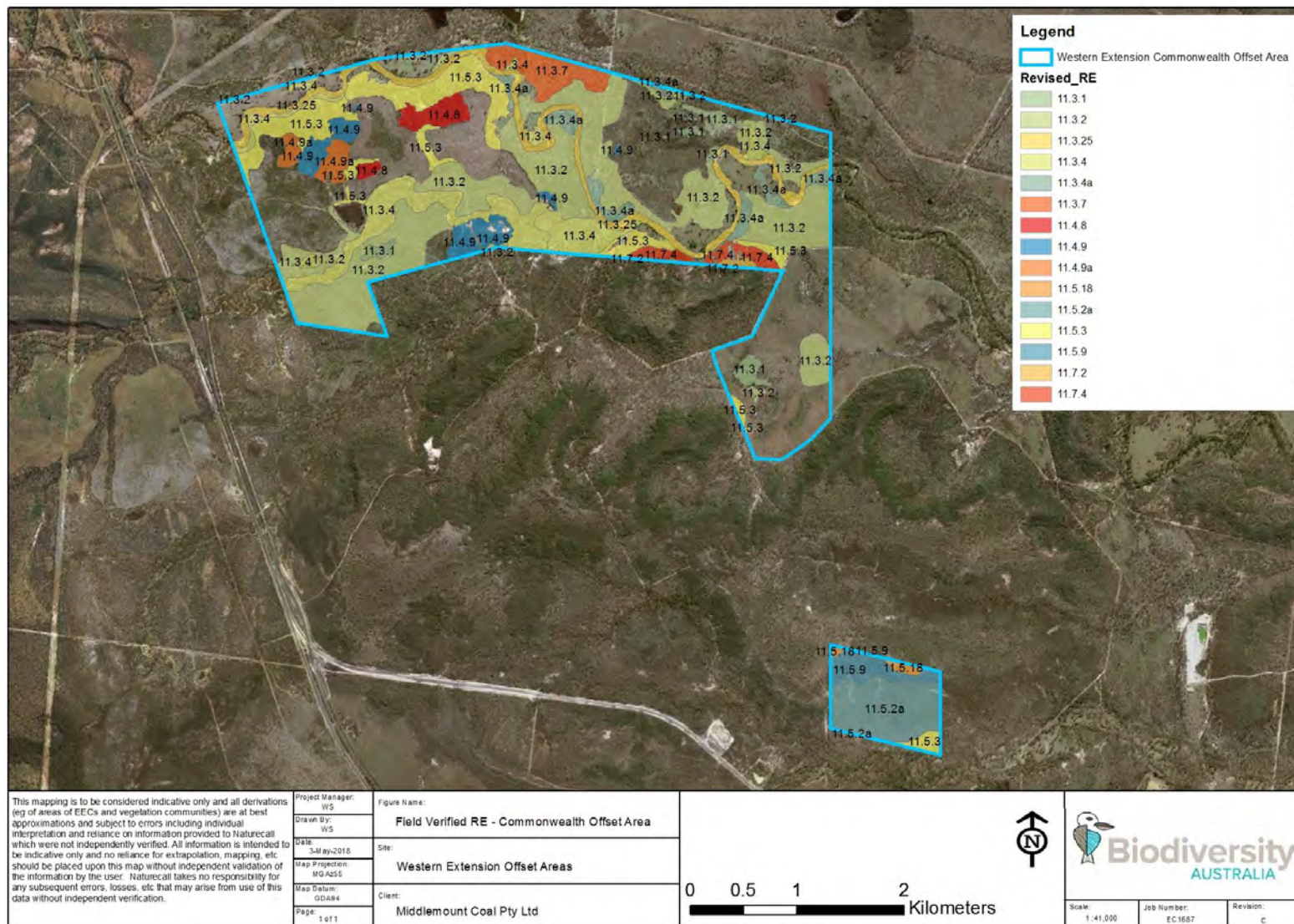


Table 4: Western Extension Commonwealth Offset Area Regional Ecosystems

Regional Ecosystem	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	16.5	E	E
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	281	OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	57	LC	-
11.3.27d	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> woodland. A range of sedges and grasses occur in the ground layer including <i>Fimbristylis vagans</i> , <i>Myriophyllum striatum</i> , <i>Nitella pseudoflabellata</i> and <i>Pseudoraphis</i> sp. Occurs fringing large lakes. Palustrine wetland (e.g. vegetated swamp)	4	LC	-
11.3.4/11.3.4a	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains; and <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	117.5	OC	-
11.3.7	<i>Corymbia</i> spp. woodland on alluvial plains	29	LC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	17	E	E
11.4.9/11.4.9a	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains; <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles . Floodplain (other than floodplain wetlands)	42.5	E/ E	E/E
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	52.5	LC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	86.5	LC	-
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces	23.5	LC	-
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	9	OC	-
11.7.2	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	3	LC	-
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	13.5	LC	-



Figure 7: Field verified Regional Ecosystems – Western Extension Commonwealth Offset Area





Western Extension State Offset Area

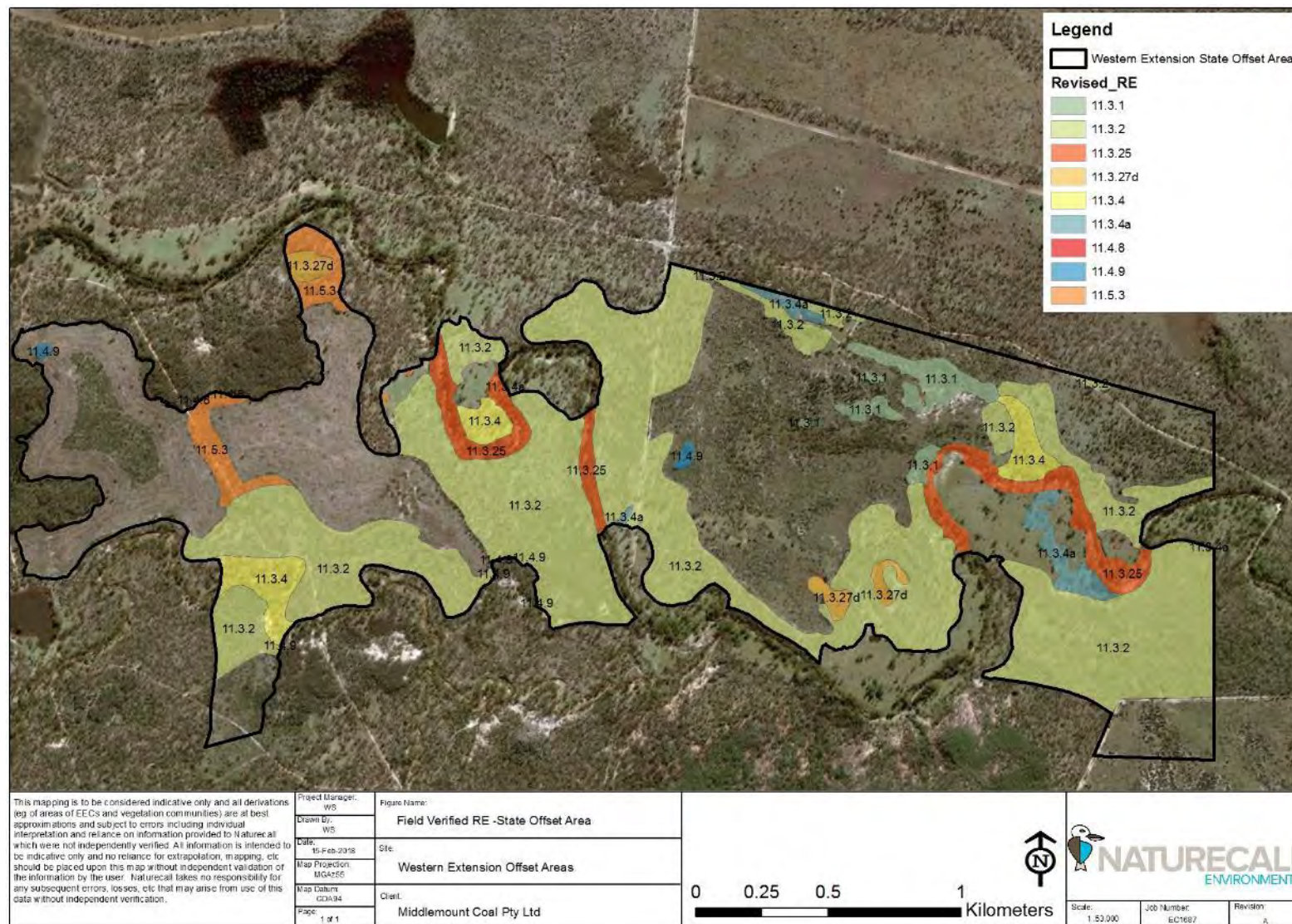
Table 5 details the RE's present in the Western Extension State Offset Area along with the area (in ha) and conservation status. A map of the RE's in the Western Extension State Offset Area is provided in Figure 8.

Table 5: Western Extension State Regional Ecosystems

Regional Ecosystem	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open-forest on alluvial plains	8	E	-
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	185	OC	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	17.5	LC	-
11.3.27d	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> woodland. A range of sedges and grasses occur in the ground layer including <i>Fimbristylis vagans</i> , <i>Myriophyllum striatum</i> , <i>Nitella pseudoflabellata</i> and <i>Pseudoraphis</i> sp. Occurs fringing large lakes. Palustrine wetland (e.g. vegetated swamp).	4	LC	-
11.3.4/11.3.4a	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains; <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles. Floodplain (other than floodplain wetlands)	17	OC	-
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	0.5	E	E
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	8.5	LC	-



Figure 8: Field verified Regional Ecosystems – Western Extension State Offset Area





Modified Rail Loop and Spur Offset Area

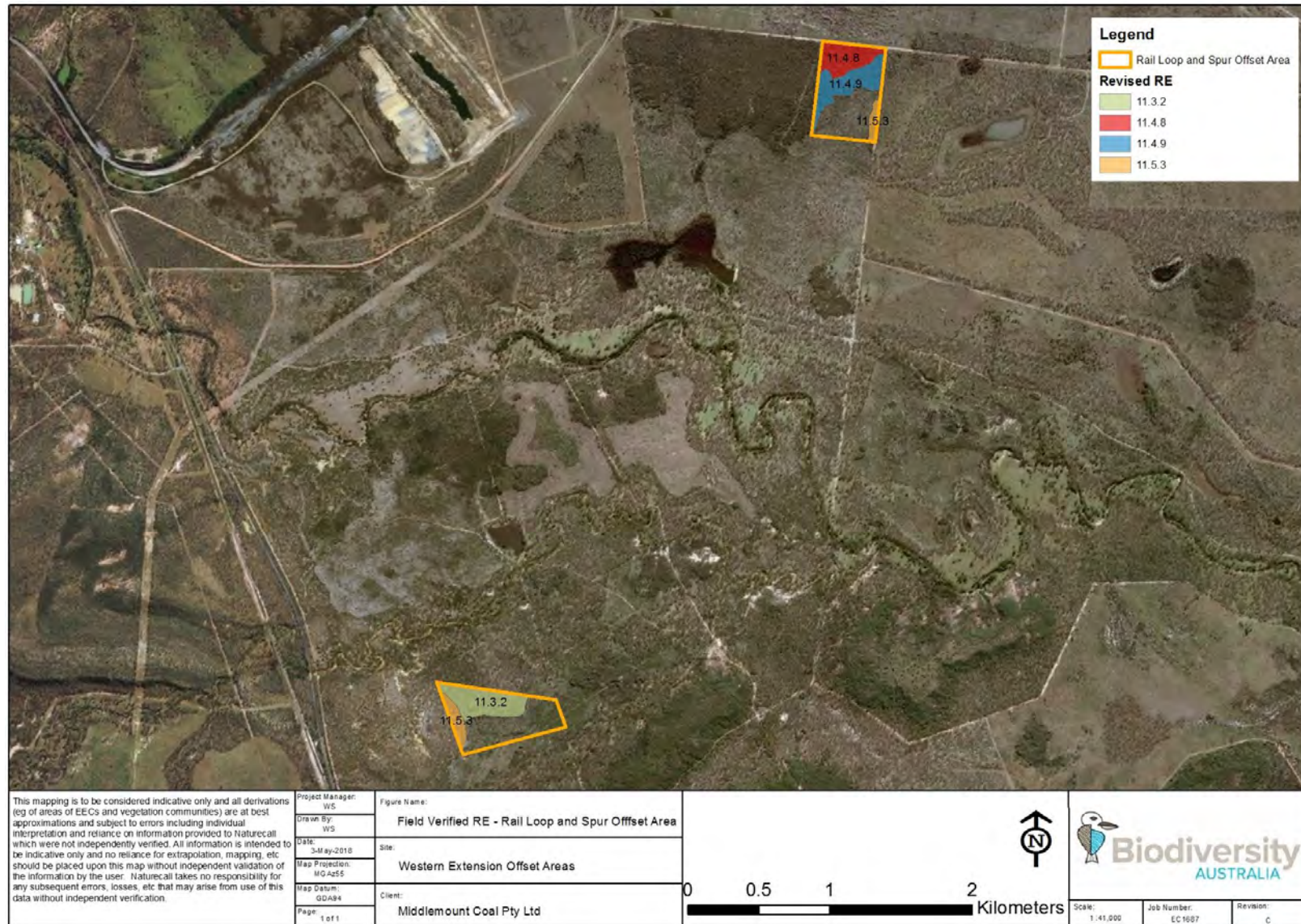
Table 6 details the RE's present in the Modified Rail Loop and Spur Offset Area (3a and 3b) along with the area and conservation status. A map of the RE's in this Offset Area is provided following the table.

Table 6: Rail Loop and Spur Offset Area Regional Ecosystems

Regional Ecosystem	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	10	OC	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	7	E	E
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains; and <i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i> open forest to woodland	9	E	E
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	6	LC	-



Figure 9: Field verified Regional Ecosystems – Rail Loop and Spur Offset Area





Modified Stage 2 Commonwealth Offset Area

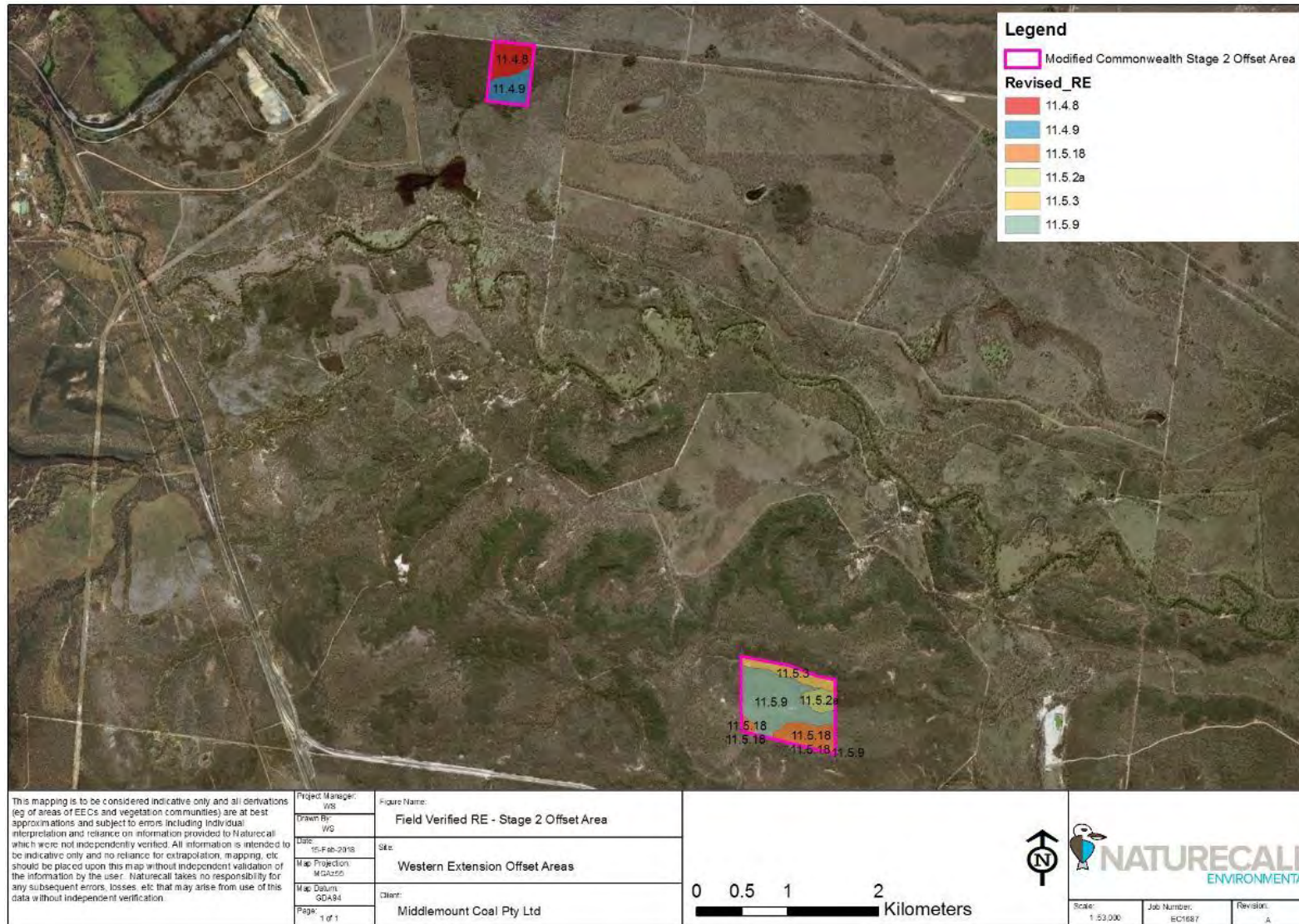
Table 7 details the RE's present in the Modified Stage 2 Commonwealth Offset Area (2 and 3) along with the area (in ha) and conservation status. A map of the RE's in the Modified Stage 2 Commonwealth Offset Area (2 and 3) is provided in Figure 10.

Table 7: Modified Stage 2 Commonwealth Offset Area Regional Ecosystems

Regional Ecosystem	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	15.5	E	E
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	14	E	E
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	18	OC	-
11.5.2a	<i>Allocasuarina luehmannii</i> low tree layer with or without emergent woodland	7	LC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	12.5	LC	-
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus spp.</i> and <i>Corymbia spp.</i> woodland on Cainozoic sand plains and/or remnant surfaces	47	LC	-



Figure 10: Field verified Regional Ecosystems – Modified Stage 2 Commonwealth Offset Area





5.1.3. Pre-clearing Regional Ecosystems

The Pre-clearing RE validation process refined the DSITI pre-clearing RE mapping for non-remnant areas. This identified five RE's likely to occur within non-remnant areas of the study sites which covered an area of approximately 469 ha.

The following sections identify and describe the Pre-clearing RE's identified per offset area.

Western Extension Commonwealth Offset Area

Table 8 details the Pre-clearing RE's present within non-remnant areas of the Western Extension Commonwealth Offset Area (1 and 2) along with the area (in ha) and conservation status. A map of the field verified Pre-clearing RE's in the Western Extension Commonwealth Offset Area is provided in Figure 11.

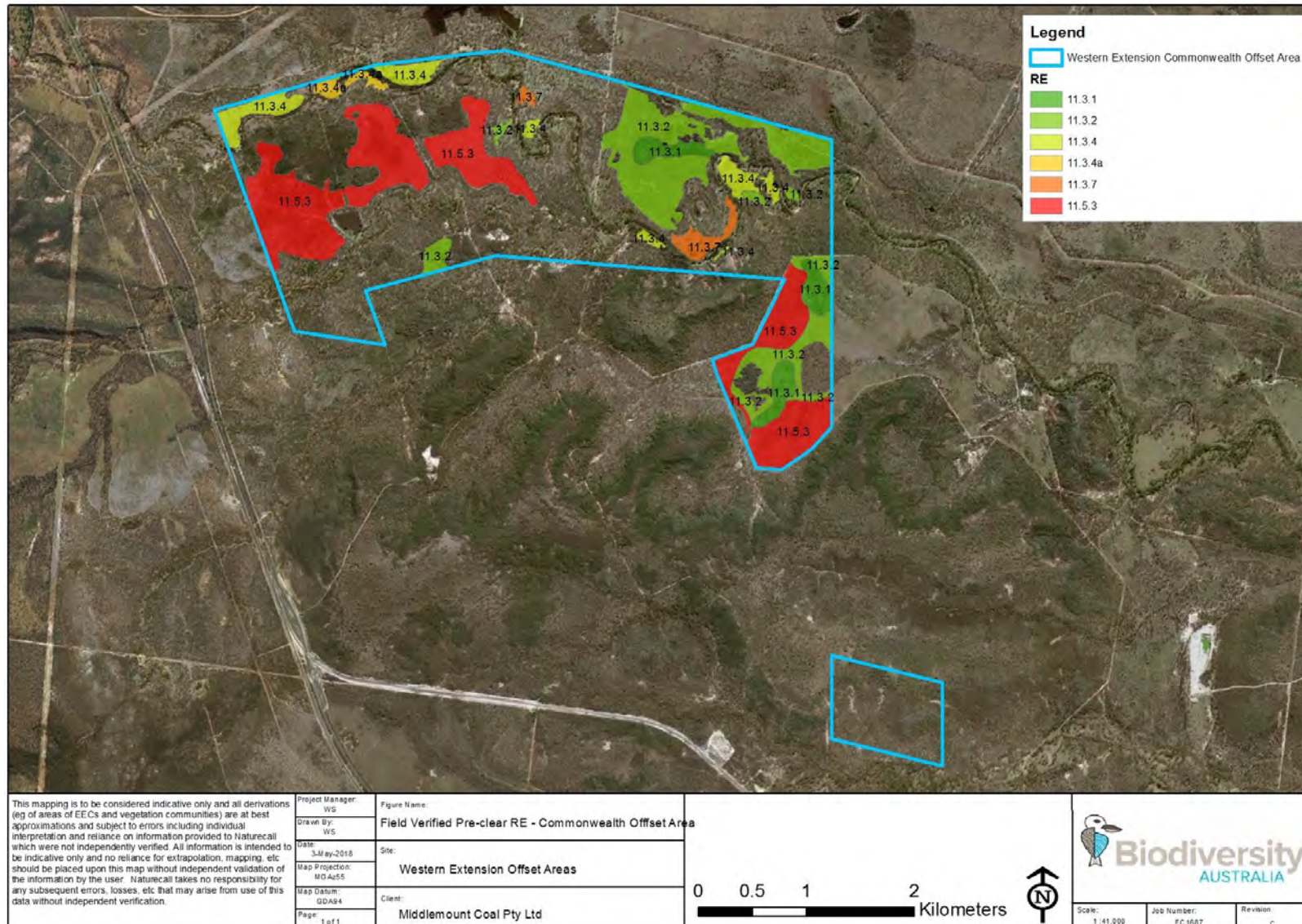


Table 8: Western Extension Commonwealth Offset Area Pre-clearing Regional Ecosystems

Regional Ecosystem (non-remnant)	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	32	E	E
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	144	OC	-
11.3.4/11.3.4a	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains; <i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles . Floodplain (other than floodplain wetlands)	46	OC	-
11.3.7	<i>Corymbia spp.</i> woodland on alluvial plains	13	LC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	209	LC	-



Figure 11: Field-verified Pre-clearing RE – Western Extension Commonwealth Offset Area





Western Extension State Offset Area

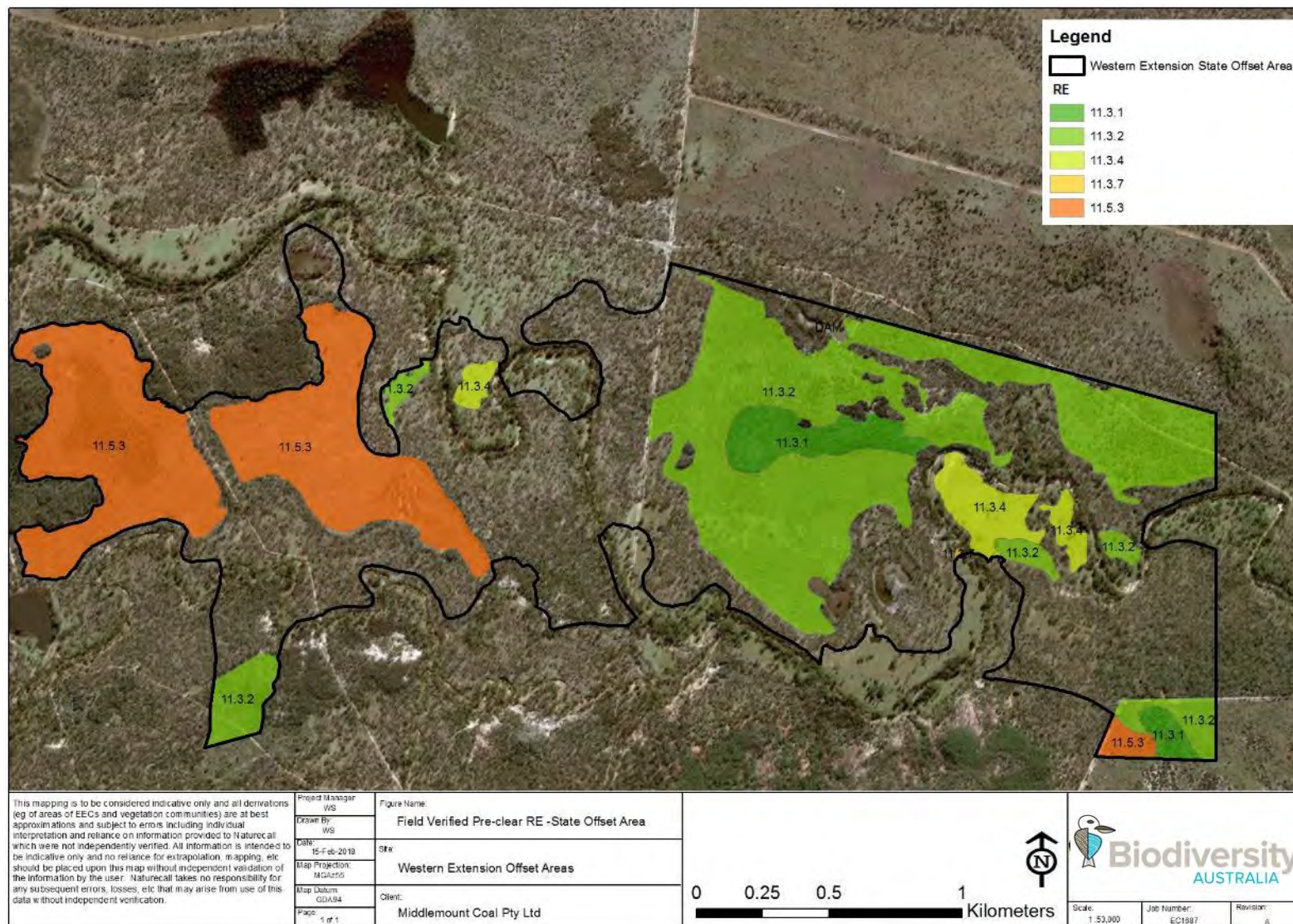
The following table (Table 9) details the Pre-clearing RE's present within non-remnant areas of the Western Extension State Offset Area along with the area (in ha) and conservation status. A map of the field verified Pre-clearing RE's in the Western Extension State Offset Area is provided in Figure 12.

Table 9: Western Extension State Offset Area Pre-clearing Regional Ecosystems

Regional Ecosystem (non-remnant)	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	13.5	E	E
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	105	OC	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains	12	OC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	83	LC	-



Figure 12: Field verified Pre-clearing RE – Western Extension State Offset Area





Modified Rail Loop and Spur Offset Area

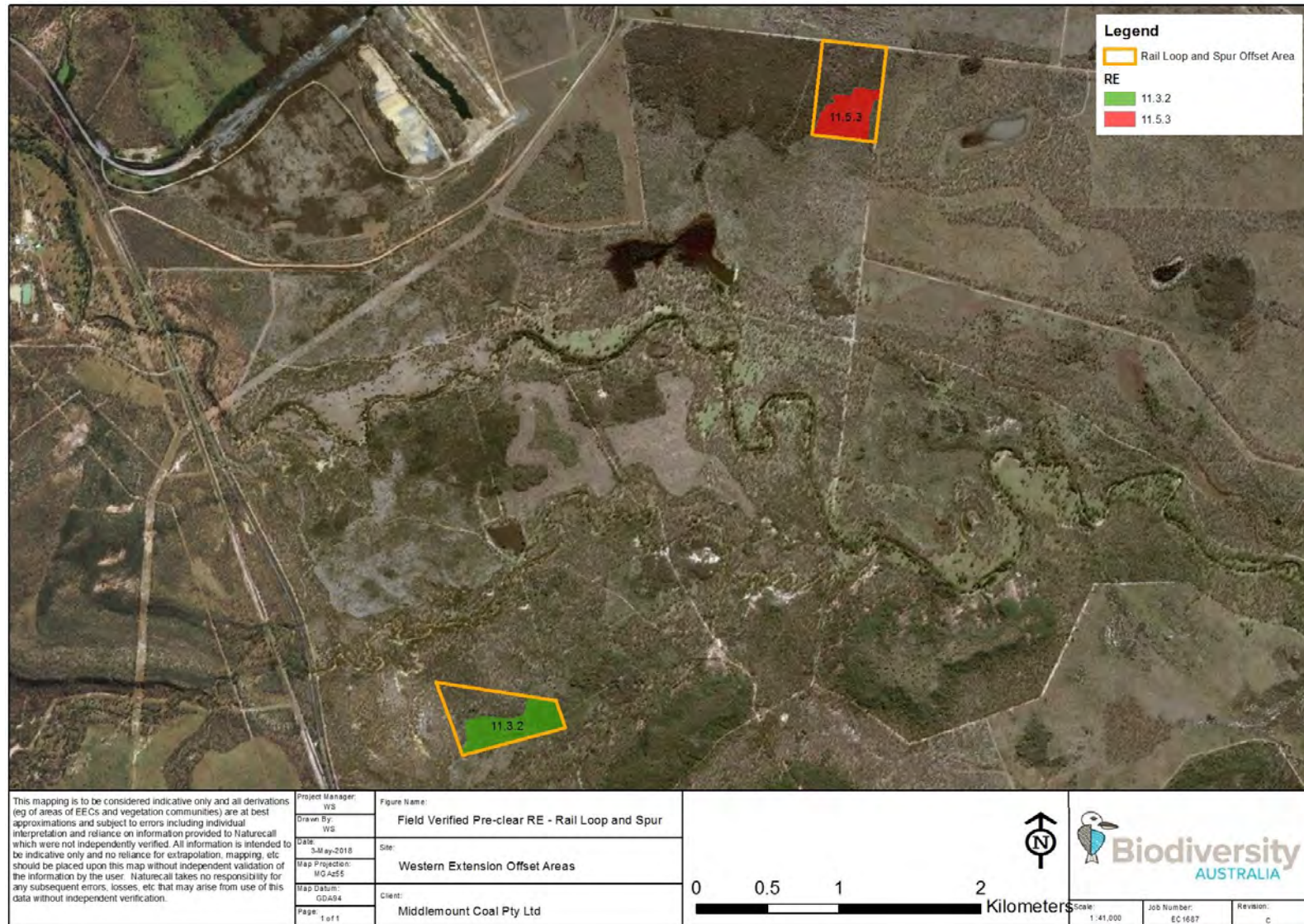
The following table (Table 10) details the Pre-clearing RE's present within non-remnant areas of the Modified Rail Loop and Spur Offset Area (3a and 3b) along with the area (in ha) and conservation status. A map of the field verified Pre-clearing RE's in the Modified Rail Loop and Spur Offset Area is provided in Figure 13.

Table 10: Rail Loop and Spur Offset Area Pre-clearing Regional Ecosystems

Regional Ecosystem (non-remnant)	Short Description	Field Verified Area (ha)	VMA Status	EPBC Status
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	13	OC	-
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	11.5	LC	-



Figure 13: Field-verified Pre-clearing RE – Modified Rail Loop and Spur Offset Area





5.1.4. Threatened Flora

The southern portions of the study sites comprising the Modified Stage 2 Commonwealth Offset Area (2) and Western Extension Commonwealth (2) Offset Areas contained potential habitat for *Cerbera dumicola*, however none were recorded during the surveys.

5.1.5. Endangered and Of Concern Regional Ecosystems

Queensland Vegetation Management Act Status

Under the VM Act, the following Endangered and Of Concern REs were identified and ground-truthed within the study sites:

Endangered Regional Ecosystems:

- RE 11.3.1 - *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.
- RE 11.4.8 - *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.
- RE 11.4.9 - *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.
- RE 11.4.9a - *Acacia harpophylla*, *Lysiphyllum carronii* +/- *Casuarina cristata* open forest to woodland.

Of Concern Regional Ecosystems:

- RE 11.3.2 - *Eucalyptus populnea* woodland on alluvial plains.
- RE 11.3.4 - *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains.
- RE 11.5.18 - *Micromyrtus capricornia* shrubland on Cainozoic sand plains and/or remnant surfaces.

The area (in ha), of each of these communities is presented in Table 11 and their extent and location within the study sites is illustrated in Figure 14.

Environmental Protection and Biodiversity Conservation Act Status

Four Regional Ecosystems conforming to *Acacia harpophylla* dominant and co-dominant' listed as Endangered under the EPBC Act (Brigalow EEC) were identified and accurately ground-truthed during the survey. The type and area of these communities is shown in Table 11 and illustrated in Figure 15.

All of these RE types would qualify as the Brigalow EEC. There were a few small isolated patches of remnant vegetation that would not meet the minimum size threshold (<0.5ha) to qualify as the Brigalow EEC.

There are also some areas of non-remnant vegetation that have the potential to qualify as the Brigalow EEC, however these have not been mapped at this stage.



Table 11: Type and area of Brigalow EEC communities in the study sites

Revised RE	BD Status	VMA Status	EPBC Status	Area (ha)
Commonwealth				
11.3.1	Endangered	Endangered	Endangered	16.5
11.4.8	Endangered	Endangered	Endangered	17
11.4.9	Endangered	Endangered	Endangered	29
11.4.9a	Endangered	Endangered	Endangered	13.5
State				
11.3.1	Endangered	Endangered	Endangered	8
Modified Stage 2 Commonwealth (3)				
11.4.8	Endangered	Endangered	Endangered	15.5
11.4.9	Endangered	Endangered	Endangered	14
Rail Loop & Spur (3a)				
11.4.8	Endangered	Endangered	Endangered	7
11.4.9	Endangered	Endangered	Endangered	9



Figure 14: Endangered and Of Concern Regional Ecosystems Listed Under the VM Act

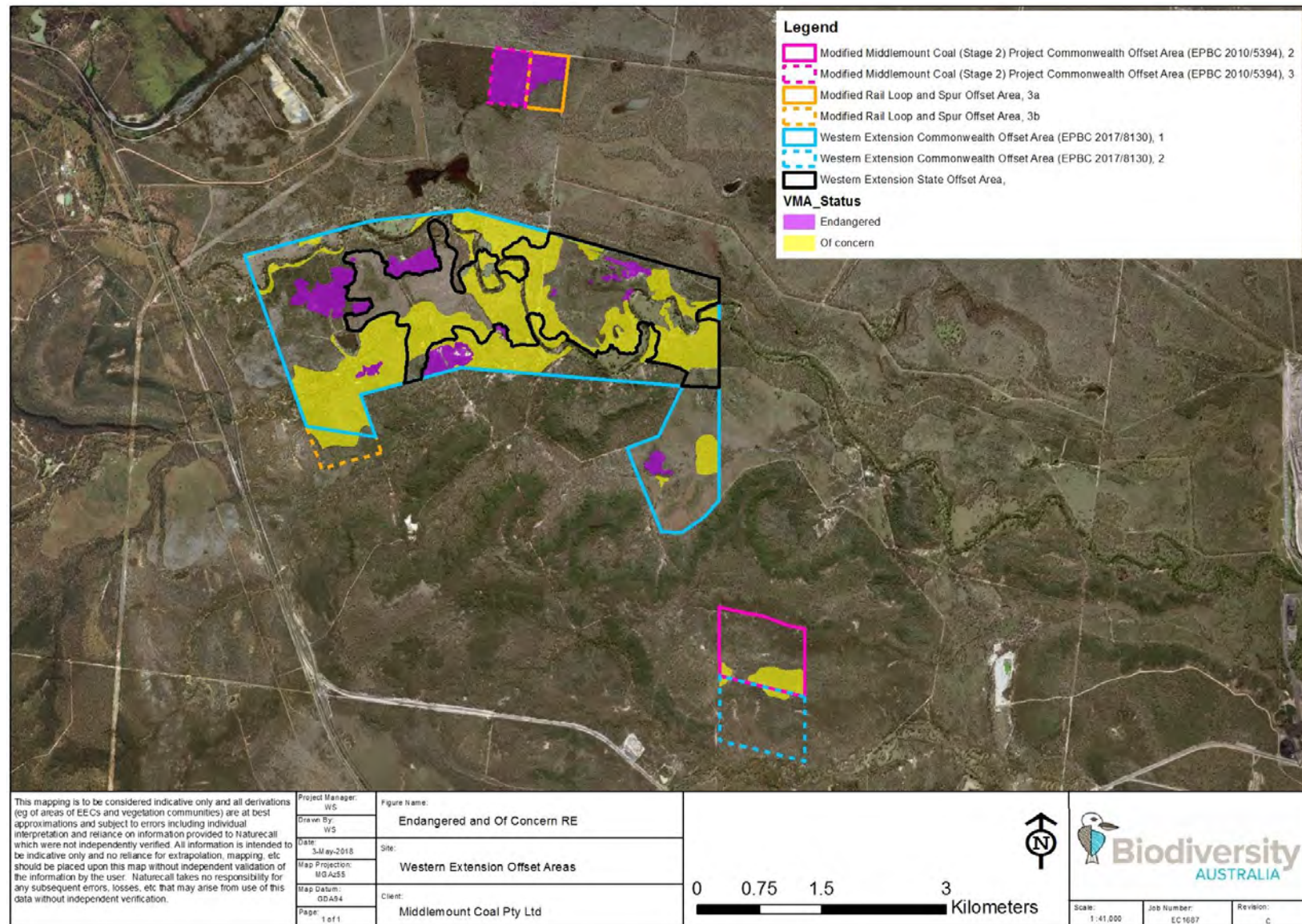
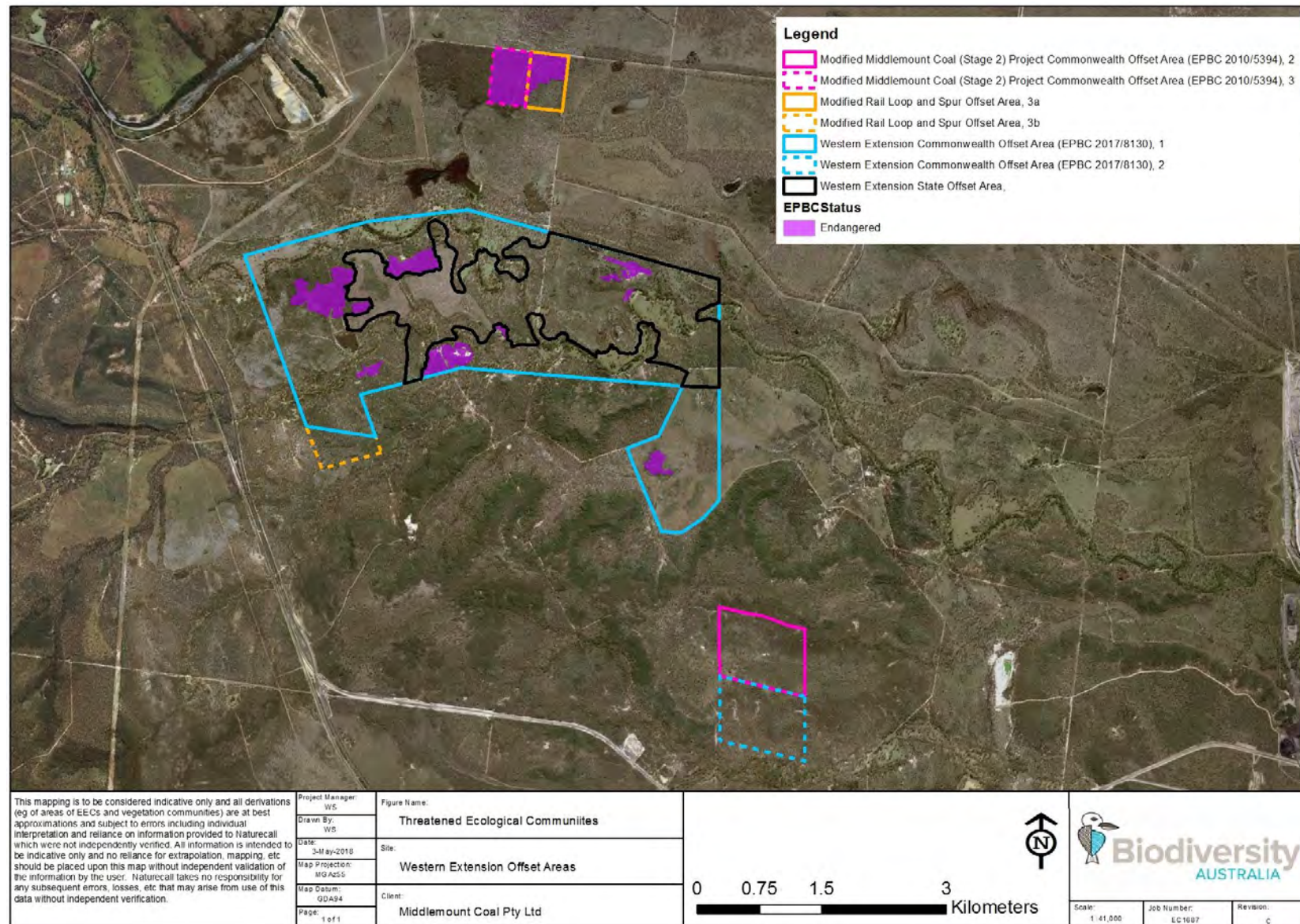




Figure 15: Threatened Ecological Communities Listed Under the EPBC Act





5.1.6. Exotic Flora Species

A total of 15 exotic flora species were recorded within the study sites. Weed invasion is common throughout, especially in disturbed areas, however it is largely limited to the groundcover stratum. Naturalised introduced pasture species such as Buffel Grass (*Cenchrus ciliaris*), Sabi Grass (*Urochloa mosambicensis*) and Red Natal Grass (*Melinis repens*) along with herbs including *Sida* spp., Cobblers Pegs (*Bidens pilosa*), Gomphrena Weed (*Gomphrena celosioides*) and Stylo (*Stylosanthes scabra*) were the main weeds encountered. These species dominated the ground layer in the derived grassland habitats, and incursion of these species into adjacent eucalypt woodlands was common.

Table 12 lists the noxious weeds declared under the *Biosecurity Act 2014* recorded within the study sites. Occasional Prickly Pear (*Opuntia elata*), Harrisia Cactus (*Harissa martinii*) and Velvety Tree Pear (*Opuntia tomentosa*) were recorded. The noxious weed distribution of these species was patchy and these species are unlikely to pose a significant risk to the ecological integrity of the study sites due to their low density.

Table 12: Noxious Weeds Recorded Within the Study Sites

Scientific Name	Common name	Biosecurity Act Category	Weed of National Significance	Abundance
<i>Opuntia elata</i>	Prickly Pear	Class 2,3,4 and 5	Yes	Low
<i>Opuntia tomentosa</i>	Velvety Tree Pear	Class 3	Yes	Low
<i>Harrisia martinii</i>	Harrisia Cactus	Class 3	No	Low

5.1.7. Baseline Condition of Regional Ecosystems (Western Extension Commonwealth Offset Area (1 and 2) and Western Extension State Offset Area)

RE 11.3.1 – *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains

RE 11.3.1 within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area was dominated by *Acacia harpophylla*. Native forb species richness and number of large trees scored lower when compared to the benchmark values for this RE. Weed cover was also slightly higher than the benchmark value. However, overall the baseline health and quality of remnant RE 11.3.1 was high.

RE 11.3.2 – *Eucalyptus populnea* woodland on alluvial plains

RE 11.3.2 within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area was dominated by *Eucalyptus populnea*. Recruitment of woody perennial species, native grass and native forb species richness, native perennial grass cover and number of large trees all scored lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.3.2 was average.



RE 11.3.25 - *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

Within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area *Eucalyptus tereticornis*, and *Casuarina cunninghamiana* dominated this RE. Roper Creek runs through part of the RE. Weed cover was high, particularly along drainage lines and this was reflected in the score for this attribute. Recruitment of woody perennial species, native shrub, grass and forb species richness, tree canopy cover, native perennial grass cover, organic litter and coarse woody debris scored lower than the benchmark values. Overall the baseline health and quality of RE 11.3.25 was average.

RE 11.3.27d - *Eucalyptus camaldulensis* and/or *E. tereticornis* woodland.

This RE comprises low lying land on a floodplain that would hold water for extended periods after rain. Tree and shrub cover is sparse and the groundcover composition is variable depending on the time of year.

A range of sedges and grasses occur in the ground layer including *Fimbristylis vagans*, *Cyperus gracilis*, *Juncus usitatus*, *Eragrostis* spp. and Swamp Ricegrass (*Leersia hexandra*). The ground layer was dry and grassy at the time of survey, however standing water and a variety of aquatic and semi-aquatic species would be present in the wet season. Weed cover was low and the main disturbance noted was trampling from cattle.

RE 11.3.4 and 11.3.4a - *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains and *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

RE 11.3.4 and 11.3.4a within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area was characterised by *Eucalyptus tereticornis* open woodlands on alluvial formations associated with Roper Creek. Previous clearing and thinning for grazing was evident in some areas. Recruitment of woody perennial species, native grass and forb species richness, tree canopy height, shrub canopy cover, native perennial grass cover and number of large trees scored lower than the benchmark values. Overall the baseline health and quality of RE 11.3.4/11.3.4a was average.

RE 11.3.7 – *Corymbia* spp. woodland on alluvial plains

RE 11.3.7 within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area was dominated by *Corymbia clarksoniana* and *Corymbia tessellaris*. The majority of attribute values scored slightly lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.3.7 was average.

RE 11.4.8 – *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains

Within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area *Acacia harpophylla* dominated this RE habitat. Weed cover was low throughout. Native forb species richness, shrub canopy cover and native perennial grass cover scored lower when compared to the benchmark values for this RE. However, overall the baseline health and quality of RE 11.4.8 was high.



RE 11.4.9 and 11.4.9a – *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains; and *Acacia harpophylla*, *Lysiphyllum carronii* +/- *Casuarina cristata* open forest to woodland

RE 11.4.9 and 11.4.9a within the Western Extension Commonwealth Offset Area (1) and Western Extension State Offset Area was dominated by *Acacia harpophylla* and *Casuarina cristata*. Native shrub and forb species richness, tree canopy cover, shrub canopy cover and native perennial grass cover scored lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.4.9 and 11.4.9a was average.

RE 11.5.18 – *Micromyrtus capricornia* shrubland on Cainozoic sand plains and/or remnant surfaces

The shrub *Micromyrtus capricornia* was the dominant species in this RE. The groundcover comprises an intact layer of native grasses. Weed cover was very low throughout. The majority of attribute values scored slightly lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.5.18 was average.

RE 11.5.2a – *Allocasuarina luehmannii* low tree layer with or without emergent woodland

Allocasuarina luehmannii (Bull Oak) was the dominant species throughout this RE. The RE featured very low weed cover. Recruitment of woody perennial species, native tree and grass species richness, tree canopy cover, shrub canopy cover, native perennial grass cover and coarse woody debris scored lower than the benchmark values. Overall the baseline health and quality of RE 11.5.2a was average.

RE 11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces

RE 11.5.3 within the Western Extension Commonwealth Offset Area (1 and 2) and Western Extension State Offset Area was dominated by *Eucalyptus populnea*. The remnant Poplar Box woodland was in good condition. Recruitment of woody perennial species, native shrub and forbs species richness, shrub canopy cover, native perennial grass cover and organic litter scored lower than the benchmark values in some areas. Overall the baseline health and quality of RE 11.5.3 was average when compared to the benchmark.

RE 11.5.9 - *Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces

Few weeds were present and a high number of tree species were recorded within RE 11.5.9. *Eucalyptus crebra* was the dominant canopy species within this RE. Recruitment of woody perennial species was significantly lower than the benchmark value. Overall the baseline health and quality of RE 11.5.9 was average which was reflected in the habitat quality scoring.



RE 11.7.2 - *Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone

Within the Western Extension Commonwealth Offset Area (1), *Acacia shirleyi* (Lancewood) characterised this RE, with mono specific stands present throughout. Native shrub, grass and forbs species richness, tree canopy cover, shrub canopy cover, organic litter and coarse woody debris scored lower than the benchmark values. Overall the baseline health and quality of RE 11.7.2 was average.

RE 11.7.4 - *Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust

The remnant woodland within RE 11.7.4 was dominated by *Eucalyptus crebra*. Native tree species were diverse with 18 species recorded. Ground cover was dominated by grasses with low levels of coarse woody debris present. Overall the baseline health and quality of RE 11.7.4 was average.

Non-remnant Vegetation

According to Neldner et al. (2017):

“Woody vegetation is vegetation for which the predominant stratum is composed mainly of woody vegetation such as trees or shrubs. The Herbarium assesses and maps woody dominated vegetation as remnant if it meets the definition used in the Vegetation Management Act 1999, which is:

vegetation, part of which forms the predominant canopy of the vegetation—

(a) covering more than 50% of the undisturbed predominant canopy; and

(b) averaging more than 70% of the vegetation’s undisturbed height; and

(c) composed of species characteristic of the vegetation’s undisturbed predominant canopy.”

The field surveys indicated that approximately 444 ha of the Western Extension Commonwealth Offset Area (1) and approximately 213.5 ha of the Western Extension State Offset Area did not meet this definition and as such is mapped as non-remnant vegetation. These areas have been previously cleared, are grazed by cattle and displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses.

Overall, regrowth Eucalypts and Acacias were the most common of these trees recorded in non-remnant area while *Corymbia* species were only occasionally present.

Despite this, it was noted that these areas displayed positive signs of natural regeneration.



5.1.8. Baseline Condition of Regional Ecosystems (Modified Stage 2 Commonwealth Offset Area 2 and 3)

RE 11.4.8 – *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains

Within the Modified Stage 2 Commonwealth Offset Area (3) *Acacia harpophylla* dominated RE 11.4.8. The majority of attributes for RE 11.4.8 scored lower when compared to the benchmark value. The overall baseline health and quality of RE 11.4.8 was average.

RE 11.4.9– *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains

RE 11.4.9 within the Modified Stage 2 Commonwealth Offset Area (3) was dominated by *Acacia harpophylla* and *Casuarina cristata*. The majority of attributes for RE 11.4.9 scored lower when compared to the benchmark value. Overall the baseline health and quality of RE 11.4.9 was average.

RE 11.5.18 – *Micromyrtus capricornia* shrubland on Cainozoic sand plains and/or remnant surfaces

Within the Modified Stage 2 Commonwealth Offset Area (2) *Micromyrtus capricornia* dominated RE 11.5.18. Weed cover was very low throughout. The majority of attribute values scored slightly lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.5.18 was average.

RE 11.5.2a –*Allocasuarina luehmannii* low tree layer with or without emergent woodland

Allocasuarina luehmannii (Bull Oak) was the dominant species throughout RE 11.5.2a. The RE featured very low weed cover. Recruitment of woody perennial species, native tree and grass species richness, tree canopy cover, shrub canopy cover, native perennial grass cover and coarse woody debris scored lower than the benchmark values. Overall the baseline health and quality of RE 11.5.2a was average.

RE 11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces

Few weeds were present and a high number of tree species were recorded within RE 11.5.3, with *Eucalyptus populnea* being the dominant species recorded. Recruitment of woody perennial species, native shrub, grass and forbs species richness, tree and shrub canopy cover and organic litter scored lower than the benchmark values. Overall the baseline health and quality of RE 11.5.3 was average when compared to the benchmark.

RE 11.5.9 - *Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces

Eucalyptus crebra was the dominant canopy species within RE 11.5.9. The majority of attribute values scored slightly lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.5.9 was average which was reflected in the habitat quality scoring.



5.1.9. Baseline Condition of Regional Ecosystems (Modified Rail Loop and Spur Offset Area 3a and 3b)

RE 11.3.2 – *Eucalyptus populnea* woodland on alluvial plains

RE 11.3.2 within the Modified Rail Loop and Spur Offset Area (3b) was dominated by *Eucalyptus populnea*. Recruitment of woody perennial species, native grass and native forb species richness, shrub canopy cover and native perennial grass cover all scored lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.3.2 was average.

RE 11.4.8 – *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains

Within the Modified Rail Loop and Spur Offset Area (3a), *Acacia harpophylla* dominated RE 11.4.8. Weed cover was low throughout. The majority of attribute values scored slightly lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.4.8 was average.

RE 11.4.9– *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains

RE 11.4.9 within the Modified Rail Loop and Spur Offset Area (3a) was dominated by *Acacia harpophylla* and *Casuarina cristata*. Recruitment of woody perennial species, native shrub and forb species richness, tree and shrub canopy cover, native perennial grass cover and coarse woody debris all scored lower when compared to the benchmark values for this RE. Overall the baseline health and quality of RE 11.4.9 was average.

RE 11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces

RE 11.5.3 within this study site was dominated by *Eucalyptus populnea*. Recruitment of woody perennial species, native shrub, grass and forbs species richness, tree and shrub canopy cover and native perennial grass cover scored lower than the benchmark values. Overall the baseline health and quality of RE 11.5.3 was average when compared to the benchmark.

Non-remnant Vegetation

According to Neldner et al. (2017):

“Woody vegetation is vegetation for which the predominant stratum is composed mainly of woody vegetation such as trees or shrubs. The Herbarium assesses and maps woody dominated vegetation as remnant if it meets the definition used in the Vegetation Management Act 1999, which is:

vegetation, part of which forms the predominant canopy of the vegetation—

(a) covering more than 50% of the undisturbed predominant canopy; and

(b) averaging more than 70% of the vegetation’s undisturbed height; and

(c) composed of species characteristic of the vegetation’s undisturbed predominant canopy.”



The field surveys indicated that approximately 25 ha of the Rail Loop and Spur Offset Area (3a and 3b) did not meet this definition and as such is mapped as non-remnant vegetation. These areas have been previously cleared, are grazed by cattle and displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses.

Overall, regrowth Eucalypts and Acacias were the most common of these trees recorded in non-remnant area while *Corymbia* species were only occasionally present.

Despite this, it was noted that these areas displayed positive signs of natural regeneration.

5.2. Habitat Quality Assessment (Western Extension Commonwealth Offset Area 1 and 2)

The habitat quality assessment results for the Western Extension Commonwealth Offset Area are provided in the *Middlemount Coal Mine Western Extension Project (EPBC 2017/8130) EPBC Act Preliminary Assessment Documentation Terrestrial Habitat Quality Data* (Biodiversity Australia, 2019).



5.3. Habitat Quality Assessment (Western Extension State Offset Area)

Site condition

The vegetation throughout the Western Extension State Offset Area is in a good condition overall.

Remnant vegetation communities covered approximately 240.5 ha (53%) of the Western Extension State Offset Area while non-remnant vegetation communities covered approximately 213.5 ha (47%).

The less disturbed remnant areas displayed attributes with similar values to the published benchmarks (DSITI 2017). Vegetation condition throughout the non-remnant REs varied but overall showed positive signs of natural regeneration. There are several areas of the Western Extension State Offset Area that have been previously cleared and are grazed by cattle. These areas all displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses. Many of these non-remnant areas recorded positive signs of native tree recruitment and natural regeneration.

Across the Western Extension State Offset Area, assessment units (within remnant vegetation) scored between 47 and 61 (out of a possible 80) for overall site condition (Table 13). Within remnant vegetation Assessment Unit 1 (RE 11.3.1) scored the highest and Assessment Unit 6 (RE 11.5.3) scored the lowest for overall site condition (Table 13).

Across the Western Extension State Offset Area, assessment units (within non-remnant vegetation) scored between 33 and 45 (out of a possible 80) for overall site condition (Table 13). Assessment Unit 9 (RE 11.3.4) scored the highest and Assessment Unit 7 (RE 11.3.1) scored the lowest for overall site condition (Table 13).

Site context

Across the Western Extension State Offset Area, assessment units scored between 18 and 25 (out of a possible 26) for site context (Table 13). Assessment Units 3, 5 and 10 scored the highest for site context (Table 13).

Assessment Unit Habitat Quality Scores

Table 13 summarises the site condition and site context scores for each assessment unit.


Table 13: Habitat Quality Scores for Western Extension State Offset Area

Assessment Unit	RE	Site Condition Score	Site Context Score	Assessment Unit Habitat Quality Score
1	11.3.1	61	20	7.64
2	11.3.2	55	24	7.45
3	11.3.25	52.5	25	7.31
4	11.3.27d	-	-	-
5	11.3.4/11.3.4a	53	25	7.36
6	11.5.3	47	24	6.70
7 (non rem)	11.3.1	33	18	5.60
8 (non rem)	11.3.2	43.5	24	6.68
9 (non rem)	11.3.4	45	24	6.51
10 (non rem)	11.5.3	41	25	6.53

Final Habitat Quality Scores

The following table summarises the final habitat quality scores for each assessment unit. The overall Habitat Quality Score for the Western Extension State Offset Area is 6.94.

Table 14: Final Habitat Quality Score for Western Extension State Offset Area

Assessment Unit	1	2	3	4	5	6	7 (NR)	8 (NR)	9 (NR)	10 (NR)
RE	11.3.1	11.3.2	11.3.25	11.3.27d	11.3.4	11.5.3	11.3.1	11.3.2	11.3.4	11.5.3
Habitat Quality Score (measured)	81	79	77.5	N/A	78	71	51	67.5	69	66
Habitat Quality Score (max)	106	106	106	N/A	106	106	91	101	106	101
Assessment Unit Area (ha)	8.04	185.27	17.65	4.03	17.32	8.81	13.44	105.39	12.27	83.03
Assessment Unit Habitat Quality Score	7.64	7.45	7.31	N/A	7.36	6.70	5.60	6.68	6.51	6.53
Size weighting	0.02	0.41	0.04	N/A	0.04	0.02	0.03	0.23	0.03	0.18
Weighted Assessment Unit Habitat Quality Score	0.14	3.06	0.29	N/A	0.28	0.13	0.17	1.55	0.18	1.19
FINAL TOTAL HABITAT QUALITY SCORE	6.94									



5.4. Habitat Quality Assessment (Modified Stage 2 Commonwealth Offset Area 2 and 3)

The habitat quality assessment results for the Modified Stage 2 Commonwealth Offset Area are provided in the *Middlemount Coal Mine Western Extension Project (EPBC 2017/8130) EPBC Act Preliminary Assessment Documentation Terrestrial Habitat Quality Data* (Biodiversity Australia, 2019).

5.5. Habitat Quality Assessment (Modified Rail Loop and Spur Offset Area 3a and 3b)

Site condition

The vegetation throughout the Modified Rail Loop and Spur Offset Area is in good condition overall. The Modified Rail Loop and Spur Offset Area was approximately 56.5 ha and made up of remnant and non-remnant vegetation communities. Remnant vegetation communities covered 32 ha (57%) while non-remnant vegetation communities covered 24.5 ha (43%) of the Modified Rail Loop and Spur Offset Area.

The less disturbed remnant areas displayed attributes with similar values to the published benchmarks (DSITI, 2017). Vegetation condition throughout the non-remnant REs varied but overall showed positive signs of natural regeneration. There are several areas within the Modified Rail Loop and Spur Offset Area that have been previously cleared and are grazed by cattle. These areas all displayed high levels of weed invasion, however the majority of weeds were naturalized pasture grasses. Many of these non-remnant areas recorded positive signs of native tree recruitment and natural regeneration.

Across the Modified Rail Loop and Spur Offset Area, assessment units (within remnant vegetation) scored between 40 and 56 (out of a possible 80) for overall site condition (Table 15). Within remnant vegetation, Assessment Unit 3 (RE 11.4.9) scored the highest and Assessment Unit 2 (RE 11.4.8) scored the lowest for overall site condition (Table 15).

Across the Modified Rail Loop and Spur Offset Area, assessment units (within non-remnant vegetation) scored between 37 and 43.5 (out of a possible 80) for overall site condition (Table 15). Assessment Unit 5 (11.3.2) scored the highest and Assessment Unit 6 (RE 11.5.3) scored the lowest for overall site condition (Table 15).

Site context

Across the Modified Rail Loop and Spur Offset Area, assessment units scored between 13 and 25 (out of a possible 26) for site context (Table 15). Assessment Units 1 and 5 scored the highest for site context (Table 15).

Species habitat index

Species habitat index scores were calculated for the Squatter Pigeon (southern) across the Modified Rail Loop and Spur Offset Area.



- Squatter Pigeon (southern): the species habitat index scored 28 for both remnant and non-remnant AU's (out of a possible 50).

Assessment Unit Habitat Quality Scores

Table 15 summarises the site condition, site context and species habitat index scores for each assessment unit using the Squatter Pigeon (southern) species habitat index data.

Final Habitat Quality Scores

Table 16 below summarises the final habitat quality scores for each assessment unit and for the Modified Rail Loop and Spur Offset Area overall, using the Squatter Pigeon (southern) species habitat index data.

The final Total Habitat Quality Score for the Approved Commonwealth Offset Area is 5.90.

Table 15: Habitat Quality Scores for Modified Rail Loop and Spur Offset Area

Assessment Unit	RE Type	Site Condition Score	Site Context Score	Species Habitat Index Score (Squatter Pigeon [southern])	Assessment Unit Habitat Quality Score (Squatter Pigeon [southern])
1	11.3.2	53	25	28	6.79
2	11.4.8	40	15	28	5.32
3	11.4.9	56	13	28	6.22
4	11.5.3	55	14	28	6.22
5 (non rem)	11.3.2	43.5	25	28	6.39
6 (non rem)	11.5.3	37	18	28	5.32

Table 16: Final Habitat Quality Score for Modified Rail Loop and Spur Offset Area (Squatter Pigeon [southern])

(Squatter Pigeon (southern) Species Index Data)

Assessment Unit	1	2	3	4	5	6
RE	11.3.2	11.4.8	11.4.9	11.5.3	11.3.2	11.5.3
Habitat Quality Score (measured)	106.00	83.00	97.00	97.00	96.50	83.00
Habitat Quality Score (max)	156.00	156.00	156.00	156.00	151.00	156.00
Assessment Unit Area (ha)	0.58	7.31	9.00	2.59	13.44	11.59
Assessment Unit Habitat Quality Score	6.79	5.32	6.22	6.22	6.39	5.32
Size weighting	0.01	0.16	0.20	0.06	0.30	0.26



Weighted Assessment Unit Habitat Quality Score	0.09	0.87	1.26	0.36	1.93	1.39
FINAL TOTAL HABITAT QUALITY SCORE	5.90					



5.6. Fauna Survey Results

5.6.1. Fauna Habitat Types

Broad fauna habitats within the study sites were categorized and mapped into seven broad habitat types using the same classifications as PB (2010) (Figure 16). The broad fauna habitat types include:

- Eucalypt woodland/forest.
- Micromyrtus shrubland.
- Riparian habitat.
- Wetlands (natural/artificial).
- *Acacia shirleyi* forest.
- *Acacia harpophylla* woodland/forest.
- Regrowth/derived grassland.

Table 17 details the regional ecosystems which make up each broad fauna habitat type along with the area (in ha) of each.

Table 17: Broad Fauna Habitat Types

Broad Fauna Habitat Type	Regional Ecosystem	Field Verified Area (ha)
Eucalypt Woodland	11.3.2	291
	11.3.4/11.3.4a	117.5
	11.3.7	29
	11.5.2a	59.5
	11.5.3	105
	11.5.9	65.5
	11.7.4	13.5
Subtotal (Eucalypt Woodland)		681
<i>Acacia harpophylla</i> woodland/forest	11.3.1	16.5
	11.4.8	39.5
	11.4.9/11.4.9a	65.5
Subtotal (<i>Acacia harpophylla</i>)		121.5
Riparian habitat	11.3.25	57
Wetlands	11.3.27d	4
<i>Acacia shirleyi</i> forest	11.7.2	3
Micromyrtus shrubland	11.5.18	22
Regrowth	-	469
TOTAL		1357.5

Table 18 describes the habitat values per category, with focus on habitat value and suitability for foraging, nesting, roosting, and breeding requirements for potentially occurring threatened species listed under the NC Act and EPBC Act.


Table 18: Fauna Habitat Assessment

Habitat Attribute / Category	Site Values					
	1. Eucalypt woodland/forest	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Groundcover	Variable density and composition depending on disturbance history e.g. rotational grazing regime. Some areas feature a moderately dense cover of exotic grasses while some are more open and dominated by native grasses and shrubs. A number of native grass species provide a potential food resource for the Squatter Pigeon (southern). Some areas also have a mosaic of open sandy areas and native grasses which is preferred habitat for this species.	Comprises open grassy groundcover (mostly native grasses) and areas of bare ground. A number of native grass species provide potential food resources for the Squatter Pigeon (southern).	Generally, a good cover of native grasses, sedges and herbs. Some areas dominated by Buffel Grass.	Sparse to open ground cover of native grasses, with areas of bare ground.	Sparse to open ground cover of mostly native grasses, with areas of bare ground. Provides potential shelter and prey habitat for threatened reptiles.	Dominant ground cover composition of exotic grasses with native grasses and herbs being less common. Areas with a higher percentage of native grass species would provide food resources for the Squatter Pigeon (southern).
Leaf Litter	High under canopy trees, and scattered throughout the mixed grass undergrowth.	Overall low density of leaf litter present due to the lack of canopy trees.	Generally thin leaf litter throughout due to open canopy.	Density of leaf litter was low overall with some small accumulations noted.	Mature Brigalow habitats contained dense accumulations of leaf litter which would provide shelter and prey habitat for a range of small reptiles.	Sparse leaf litter.
Logs and Debris	Reasonable abundance of hollow logs and debris present due to the nature of Eucalyptus shedding limbs. Larger logs provide shelter and prey habitat for ground dwelling reptiles.	Low density of coarse woody debris in the form of small fallen timber at the base of scattered canopy eucalypts. Marginal potential habitat values for threatened fauna overall.	Some accumulations of coarse woody debris and logs under canopy trees. Marginal potential habitat values for threatened fauna overall.	High density of coarse woody debris, which is typical of this habitat type.	High density of coarse woody debris, which is typical of this habitat type.	Very few logs observed. Some log and debris piles as a result of past clearing occur.
Rocky outcrops	Only some small to medium surface rock present.	Some small surface rock present.	Absent	Rocky outcrops are very common in this habitat type. Provide potential shelter, basking sites and prey habitat for a range of common reptiles and small mammals.	Absent	Absent



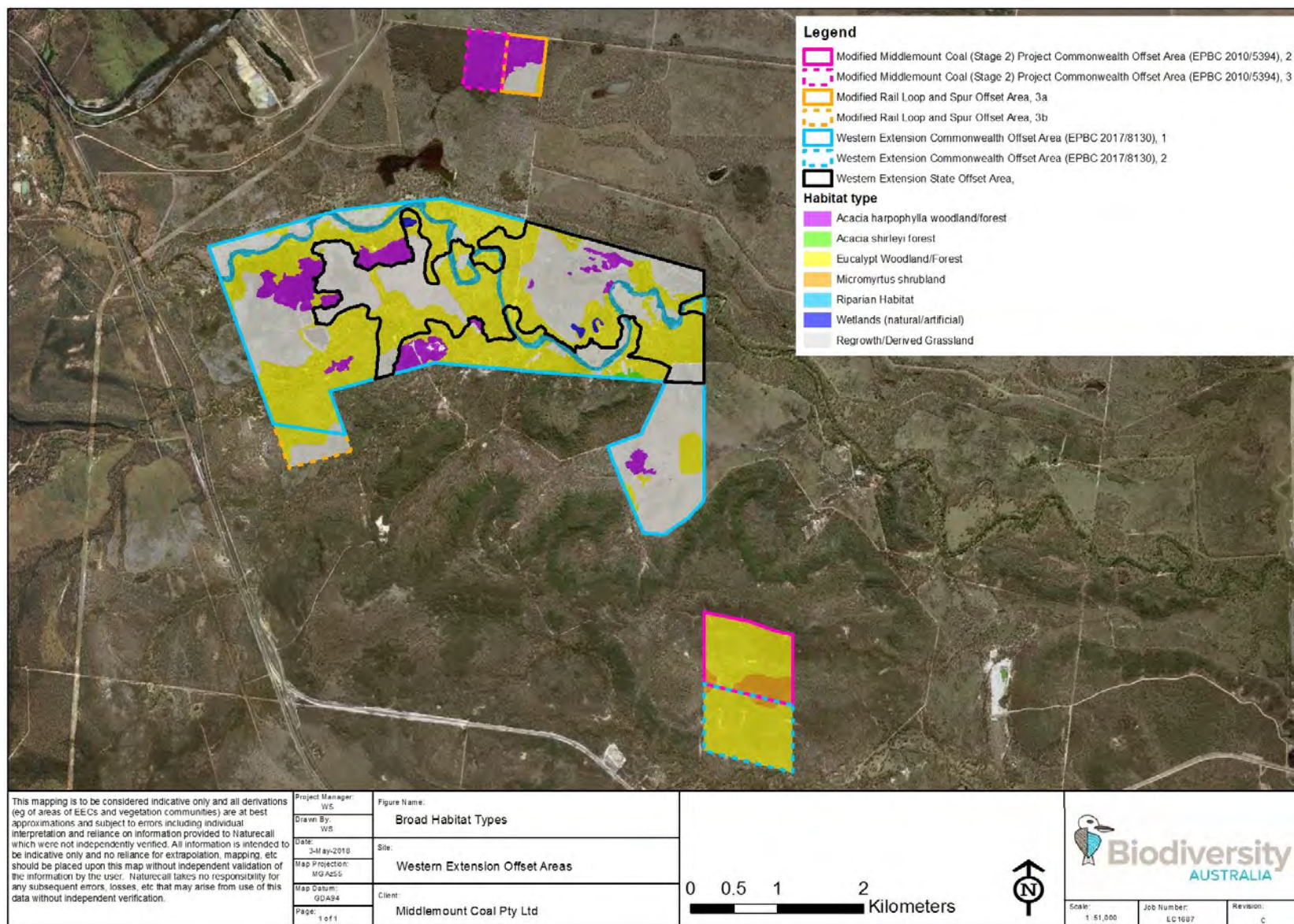
Habitat Attribute / Category	Site Values					
	1. Eucalypt woodland/forest	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Aquatic habitat	Aquatic habitats in this habitat type were largely limited to small ephemeral creeks and soaks that would only hold water for short periods.	Absent	The ephemeral creeks and drainage lines were largely dry during the survey, however some had small pools of water remaining. Semi-permanent billabongs and pools in the creek bed would provide water sources for the Squatter Pigeon (southern).	Absent	Brigalow habitats contain small depressions and melon holes that would hold water during the wet season.	A few large dams were located within non-remnant areas. One large dam in the south of the site contained established aquatic vegetation. Dams on site attracted a range of wetland birds and provided permanent water sources for a range of fauna including the Squatter Pigeon (southern).
Hollows	Hollow-bearing trees and stags were common within this habitat type. A range of hollow-sizes are present i.e. <5cm to >20cm diameter cavities. Hollows provide nesting/denning/roosting habitat for a number of threatened fauna species such as the Greater Glider.	Scattered eucalyptus and corymbias in this habitat type contained hollows. Hollows that are present would provide potential roosting habitat for threatened fauna species.	Hollow-bearing trees were generally uncommon in this habitat type and would largely be occupied by common birds such as Galahs and Lorikeets.	Absent.	Low occurrence of tree hollows in occasional eucalyptus species present.	No hollow bearing trees present due to previous clearing history.
Nectar sources	Woodland habitats contain a range of nectar producing species e.g. eucalypts, acacias and grevilleas.	Low nectar source overall. Flowering <i>Micromyrtus</i> shrubs would be an insect attractant for Microbats.	Nectar sources in riparian habitats include eucalypts and Melaleucas, some of which were flowering during the survey.	<i>Acacia shirleyi</i> is the primary nectar source and would provide foraging resources for fauna when in flower.	<i>Acacia harpophylla</i> is the primary nectar source and would provide foraging resources for fauna when in flower.	This habitat type does not provide a significant nectar source due to the lack of mature trees.
Koala food trees	Moreton Bay Ash, Poplar Box and Narrow-leaved Ironbark are the main Koala browse species in this community (Department of the Environment [DotE] 2014). A Koala was recorded in this habitat type near Roper Creek (Photo 3).	Absent aside from a few Narrow-leaved Ironbark.	This community is dominated by Queensland Blue Gum which is a preferred browse species for Koalas.	Absent	<i>Eucalyptus cambageana</i> is located within this habitat type and, although a less common food source for the Koala, meets the definition of a Koala food tree (DotE 2014).	Absent aside from occasional areas of regrowth <i>Eucalypts</i> and <i>Corymbia spp.</i>



Habitat Attribute / Category	Site Values					
	1. Eucalypt woodland/forest	2. Micromyrtus shrubland	3. Riparian habitat	4. <i>Acacia shirleyi</i> forest	5. <i>Acacia harpophylla</i> woodland/forest	6. Regrowth/derived grassland
Connectivity values	Provides strong habitat links and connectivity values across the site, especially north-south connections with adjacent habitat in the east and west of the site. Some areas of woodland are fragmented by roads and cleared areas. This habitat type would benefit the local movements of a range of fauna species, including arboreal species such as the Koala.	The shrubland habitats would complement the connectivity values of other habitat types and provide shelter and cover for small terrestrial species and passerine birds.	Riparian habitats provide connectivity along Roper Creek. Due to the open nature of this habitat type, it is only likely to be used by mobile species capable of crossing open ground. Important connectivity values for the Koala.	This habitat type is generally surrounded by woodland habitats and would provide similar connectivity values. Rocky scarp habitats are likely to assist local movements of reptiles and small mammals.	The Brigalow habitats would contribute to the connectivity values of the other site habitats. Patches provide good 'stepping stone' habitats for birds.	Continued regeneration of non-remnant areas over time would help re-establish linkages for flora and fauna across the site and broader landscape.



Figure 16: Broad Fauna Habitat Types Present on the Study Site





5.6.2. Fauna Species Detected

A total of 87 fauna species were detected during the survey either opportunistically or during targeted surveys. A complete list of fauna species detected is provided in Appendix 2. Birds were the most common fauna group observed with a total of 72 species detected. Eleven mammals (including three introduced species) and four reptiles were also detected (Appendix 2).

The species assemblage on the study sites is considered typical for the area based on results of previous surveys on adjacent and nearby lands (e.g. PB 2010; EHP, 2012; Naturecall 2013, 2014b, 2015, 2016).

5.6.3. Threatened Fauna Species

The Koala (*Phascolarctos cinereus*), which is listed as Vulnerable under the NC Act and EPBC Act was observed at one location within the Western Extension Commonwealth Offset Area (1) during spotlighting surveys.

The Greater Glider (*Petauroides volans*) which is listed as Vulnerable under the NC Act and EPBC Act was observed during spotlighting surveys at five locations within the study sites, of which three records occur within the Western Extension Commonwealth Offset Area (1).

The Squatter Pigeon (southern) (*Geophaps scripta scripta*), which is listed as Vulnerable under the NC Act and EPBC Act was not observed within the study sites, but was observed on the Dysart Road to the southwest of the site.

Opportunistic surveys for the threatened Ornamental Snake (*Denisonia maculata*), which is listed as Vulnerable under the NC Act and EPBC Act, were carried out over the survey period, however it was not detected.

Further information on each of these species is provided below.

Koala (*Phascolarctos cinereus*)

An adult Koala was recorded just to the south of Roper Creek within the Western Extension Commonwealth Offset Area (1) during a spotlighting survey on 22 November 2018 (Photo 3, Figure 18). The Koala was recorded within a Queensland Blue Gum within vegetation equivalent to RE 11.3.4.

Koalas have also been recorded on adjacent land to the north by Ecology and Heritage Partners (2012) and adjacent to Parrot Quarry Road by Naturecall (2014b) (Figure 17).

Koala food trees (as defined in the *EPBC Act Referral Guidelines for the Vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* [DotE 2014] and *Nature Conservation [Koala] Conservation Plan 2006 and Management Program 2006-2016* [EPA 2006]) are present within the study sites, in particular Queensland Blue Gum (identified as an important food species for the Koala [Van Dyck and Strahan 2008; Land for Wildlife 2014]), Moreton Bay Ash, Queensland Peppermint, Poplar Box and Narrow-leaved Ironbark.



A large portion of the Regional Ecosystems mapped within the offset areas would provide known and potential habitat for the Koala based on the occurrence of preferred Koala food trees (Figure 18). This includes RE 11.3.2, RE 11.3.4, RE 11.3.4a, RE 11.3.7, RE 11.3.25, RE 11.3.27d, RE 11.5.2a, RE 11.5.3, RE 11.5.9 and RE 11.7.4.

In addition, these areas would provide beneficial movement corridors (i.e. connectivity) for the Koala throughout the landscape, particularly along Parrot creek.

Photo 3: Koala recorded in the Offset Area

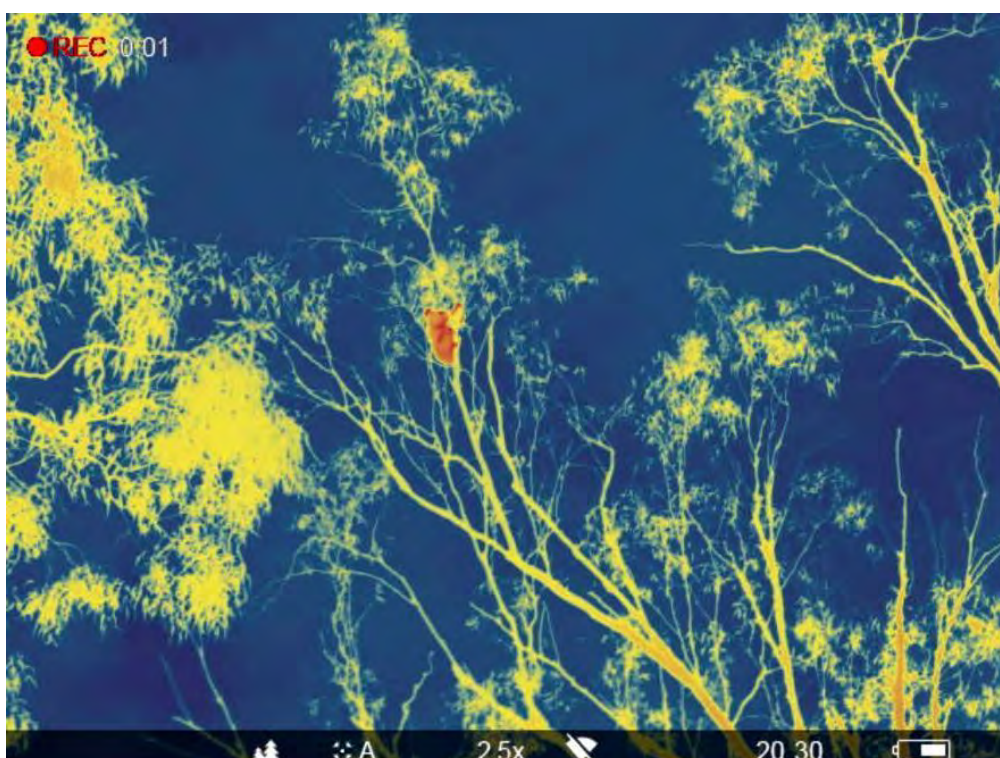
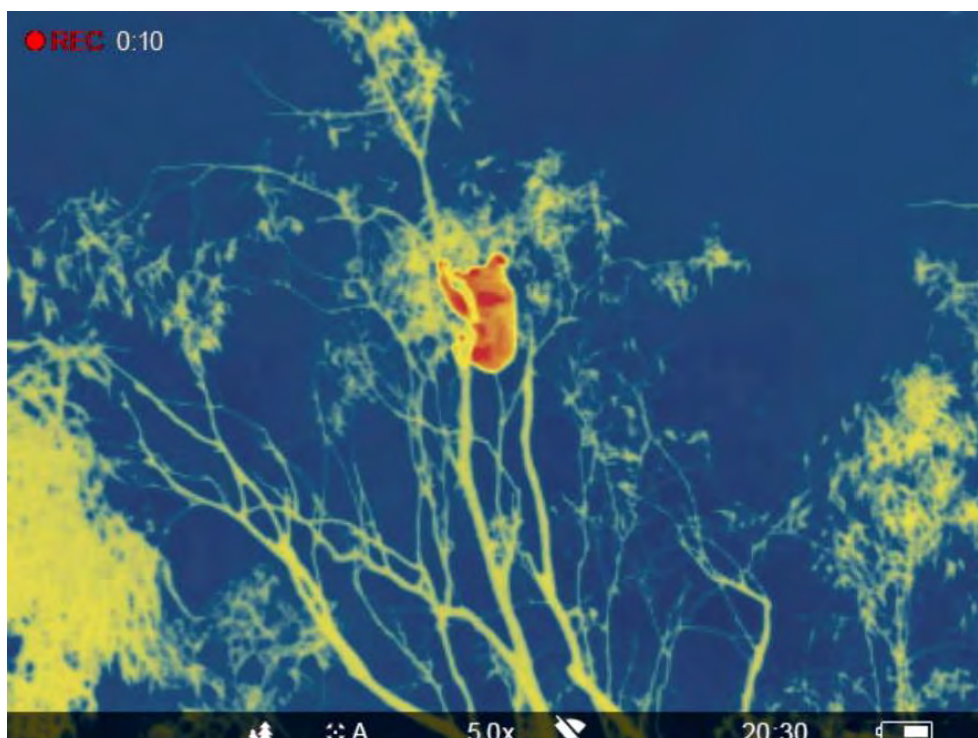




Figure 17: Previously recorded threatened species in the surrounding area

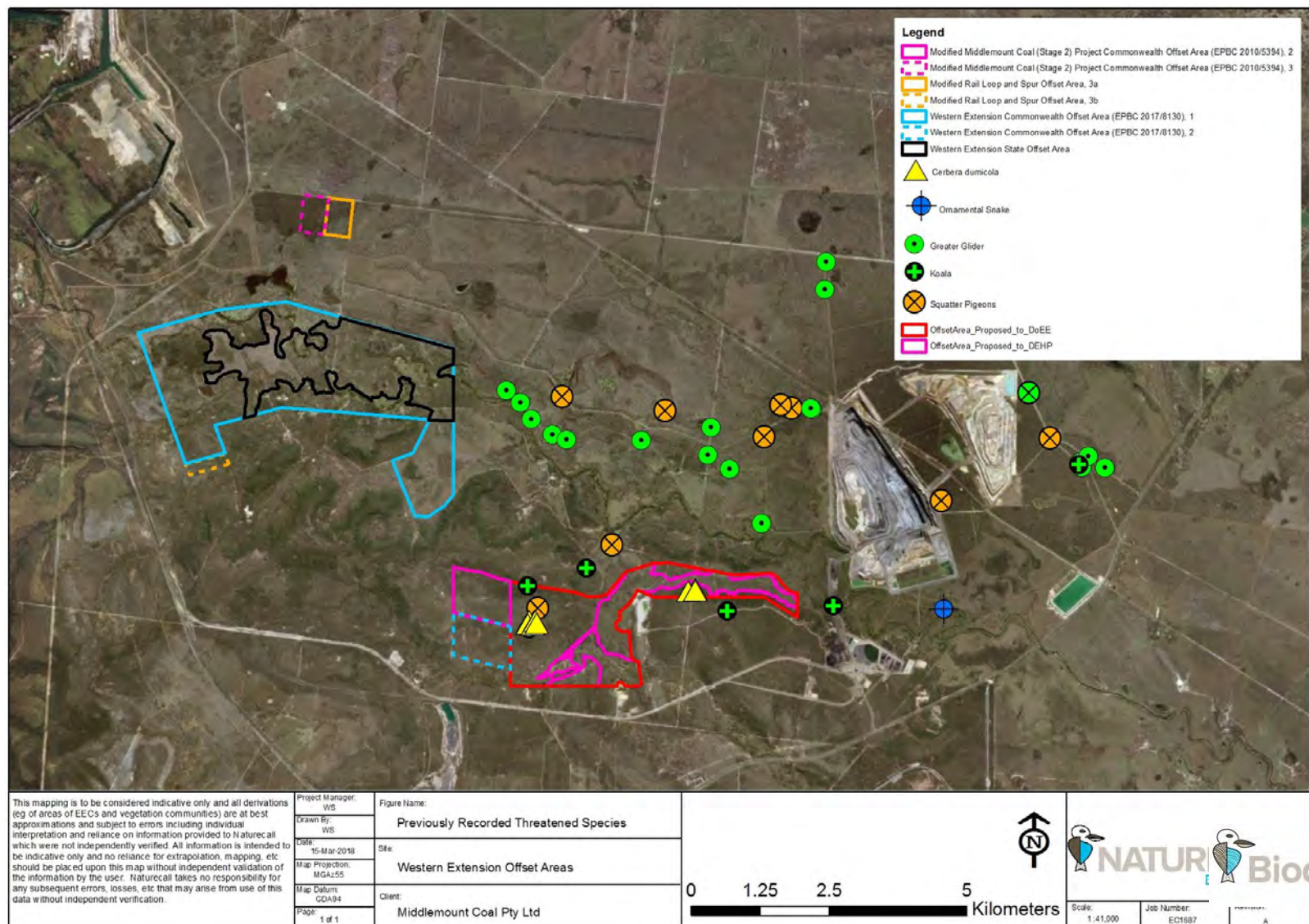
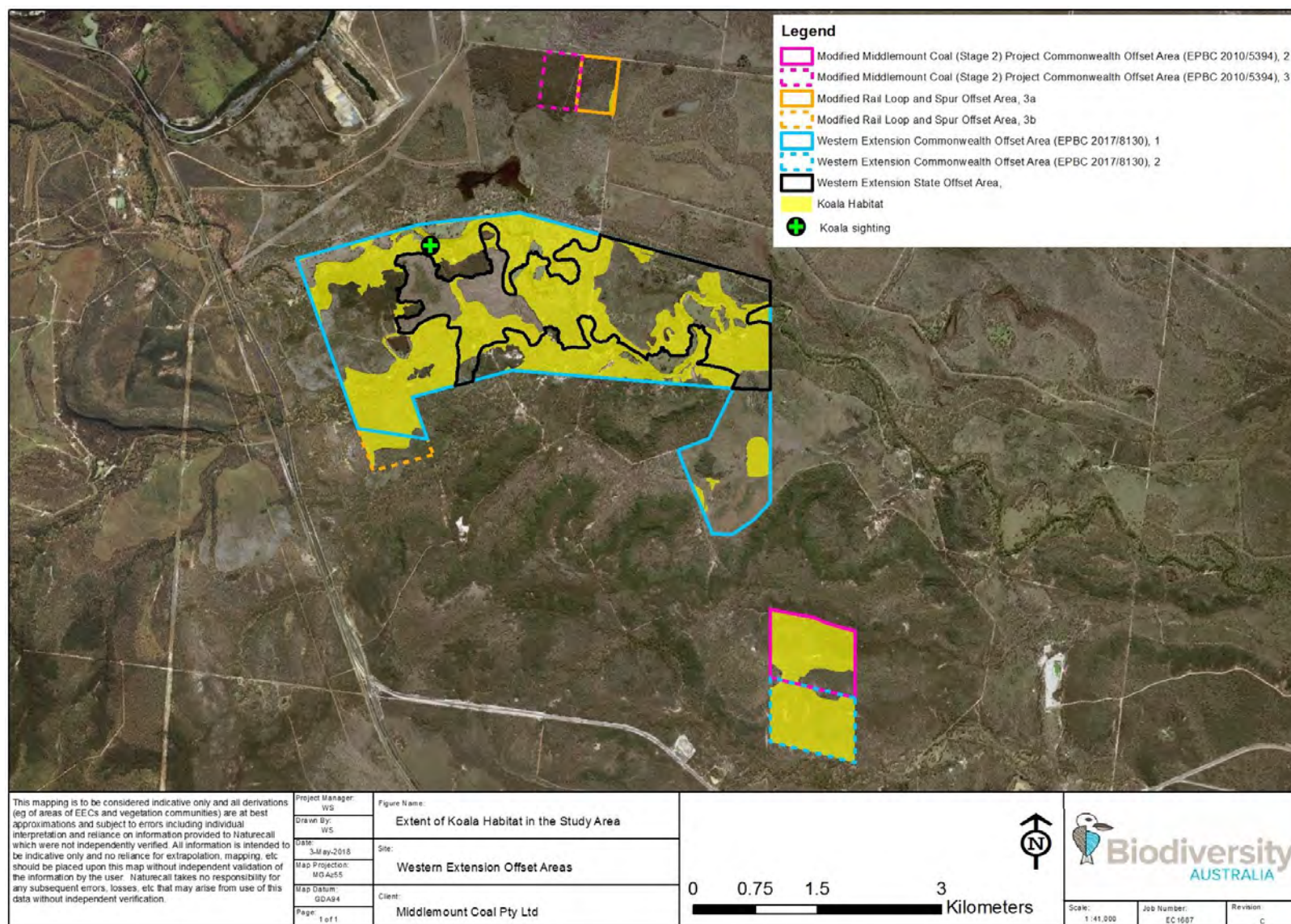




Figure 18: Koala habitat within each Offset Area





Greater Glider (*Petauroides volans*)

Four Greater Gliders were observed during a spotlighting survey on 22 November (Photo 4). Three were recorded within the north of the Western Extension Commonwealth Offset area (1) and one was recorded near the Dysart Road to the west. They were all recorded in open woodland habitats near Roper Creek equivalent to RE 11.5.3 and 11.3.7.

A fifth deceased Greater Glider was observed on 25th November to the south of the Western Extension Commonwealth Offset area (1) when en-route to vegetation survey plots. It was found entangled on a barbed wire fence, and was likely to have become entangled several weeks prior (Photo 5).

The Greater Glider occurs in forests and woodlands across eastern Australia where it forages on eucalypt leaves and occasionally flowers (Threatened Species Scientific Committee [TSSC] 2016). It requires large tracks of remnant forests which contain old growth trees containing hollows which it uses for denning (TSSC 2016).

Previous observations of this species on MCPL land (see Figure 17 above) have noted that it prefers woodland an open forest associated with major creeks and drainage lines, equivalent to RE types 11.3.25, 11.3.2, 11.3.4, 11.3.4a, 11.3.27d, 11.5.3 and 11.3.7. It has also been occasionally noted in Poplar Box woodland equivalent to RE 11.5.3. Preferred forage species appear to be Moreton Bay Ash, Silver-leaved Ironbark and Poplar Box.

The Western Extension Commonwealth Offset Area (1) contains extensive suitable habitat for the Greater Glider, and it has been demonstrated to occur here during the field surveys (Photos 4 & 5; Figure 19). Habitats that are known to support this species include woodland dominated by Blue Gum, Clarkson's Bloodwood, Silver-leaved Ironbark, Poplar Box and Moreton Bay Ash in riparian zones and creek flats associated with Roper Creek.

Approximately 575 ha of known and potential habitat for the Greater Glider occurs in the Western Extension Commonwealth Offset Area represented by all Eucalypt forests and woodlands present as these contain trees with hollows suitable for denning. Hollow-bearing trees and stags are common and a range of hollow-sizes are present i.e. <5 cm to >20 cm diameter cavities.

The Western Extension Commonwealth Offset Area also contains approximately 400 ha of cleared land likely to have been formerly potential habitat (i.e. Eucalypt forests and woodlands).

Note that RE 11.5.2a and 11.5.9 were excluded as potential habitat for this species as the tree canopy was generally sparse, the community was exposed and very dry and hollow-bearing trees were rare.



Photo 4: Greater Glider recorded

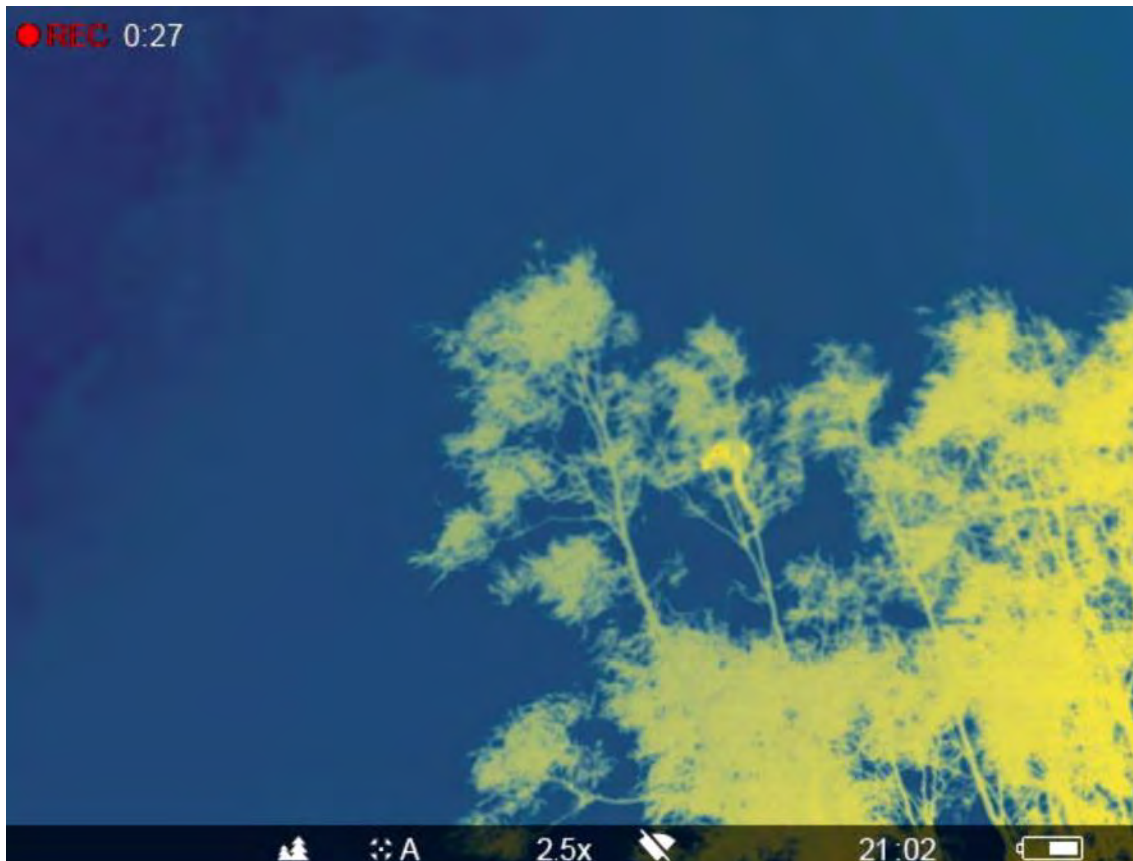
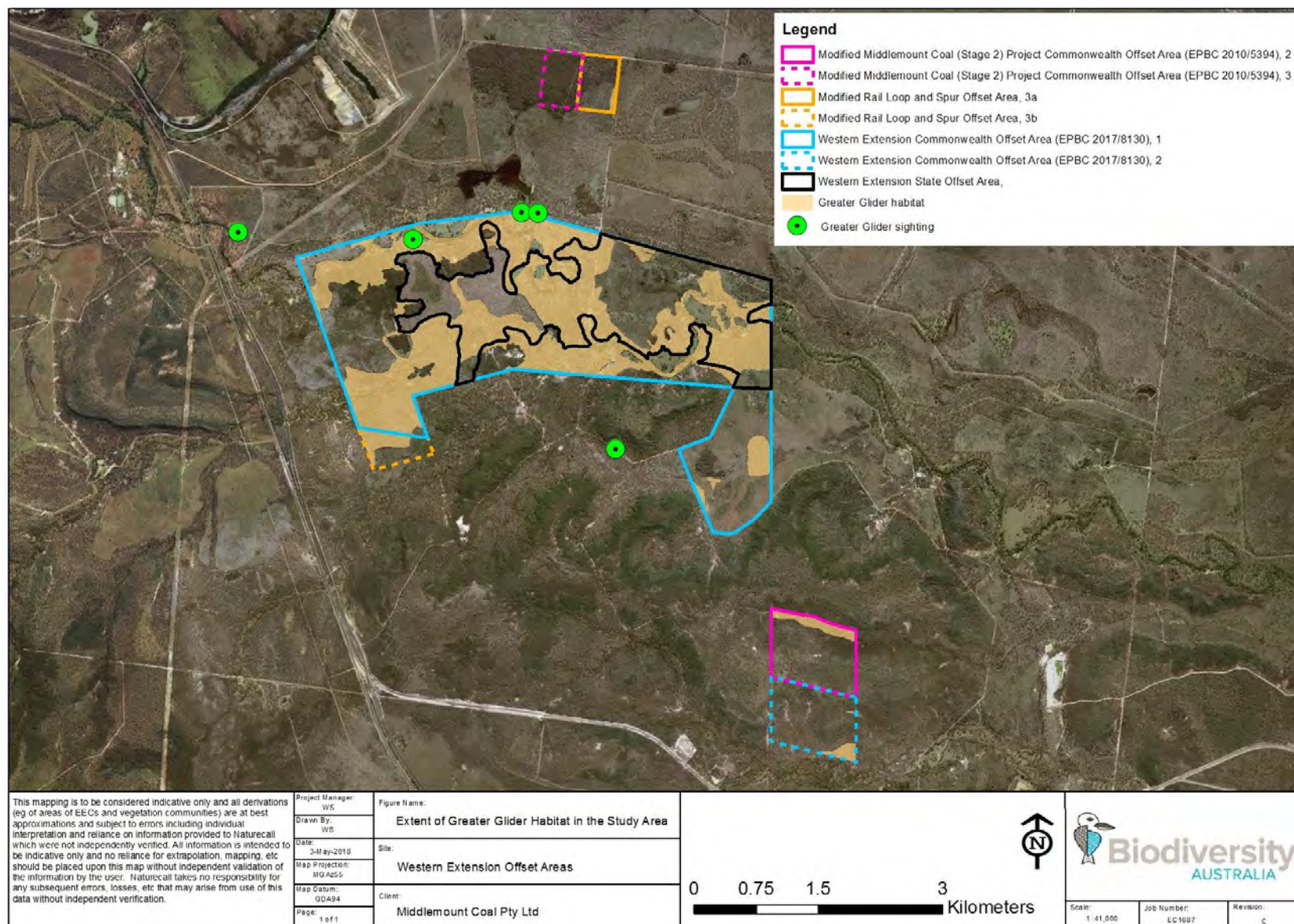


Photo 5: Greater Glider on barbed wire fence





Figure 19: Greater Glider habitat within the study sites





Squatter Pigeon (southern) (Geophaps scripta scripta)

The Squatter Pigeon (southern) has been recorded adjacent to the proposed offset areas (Figure 22) in habitat which is contiguous with the proposed offset areas. Given the nearby records, the presence of potential habitat and nature of the species, it is highly likely that the Squatter Pigeon (southern) would use habitat in the proposed offset area.

Habitat for the Squatter Pigeon (southern) in the Action area is considered to comprise of all remnant and regrowth habitat with a suitable groundcover.

Western Extension Commonwealth Offset Area contains approximately 1,155 ha of potential habitat for the Squatter Pigeon (southern), comprising approximately 749.5 ha of woodland and 405.5 ha of vegetation in the early stage of regrowing from past clearance.

The offset area is suitably located (on the same property) to benefit the same local population of this species that would use habitat within the Action area.

Roper Creek and Two Mile Gully traverse the Western Extension Commonwealth Offset Area such that most of the potential habitat for this species is within 1 km of these watercourses and therefore potential breeding habitat.

Similar to the Action area, some vegetation in the early stage of regrowing from past clearance (approximately 400 ha) is not considered potential habitat for this species because the dominant ground cover composition is exotic grasses, with native grasses and herbs being less common.

The Western Extension Commonwealth Offset Area is providing the equivalent type of habitat to that within the Action area.

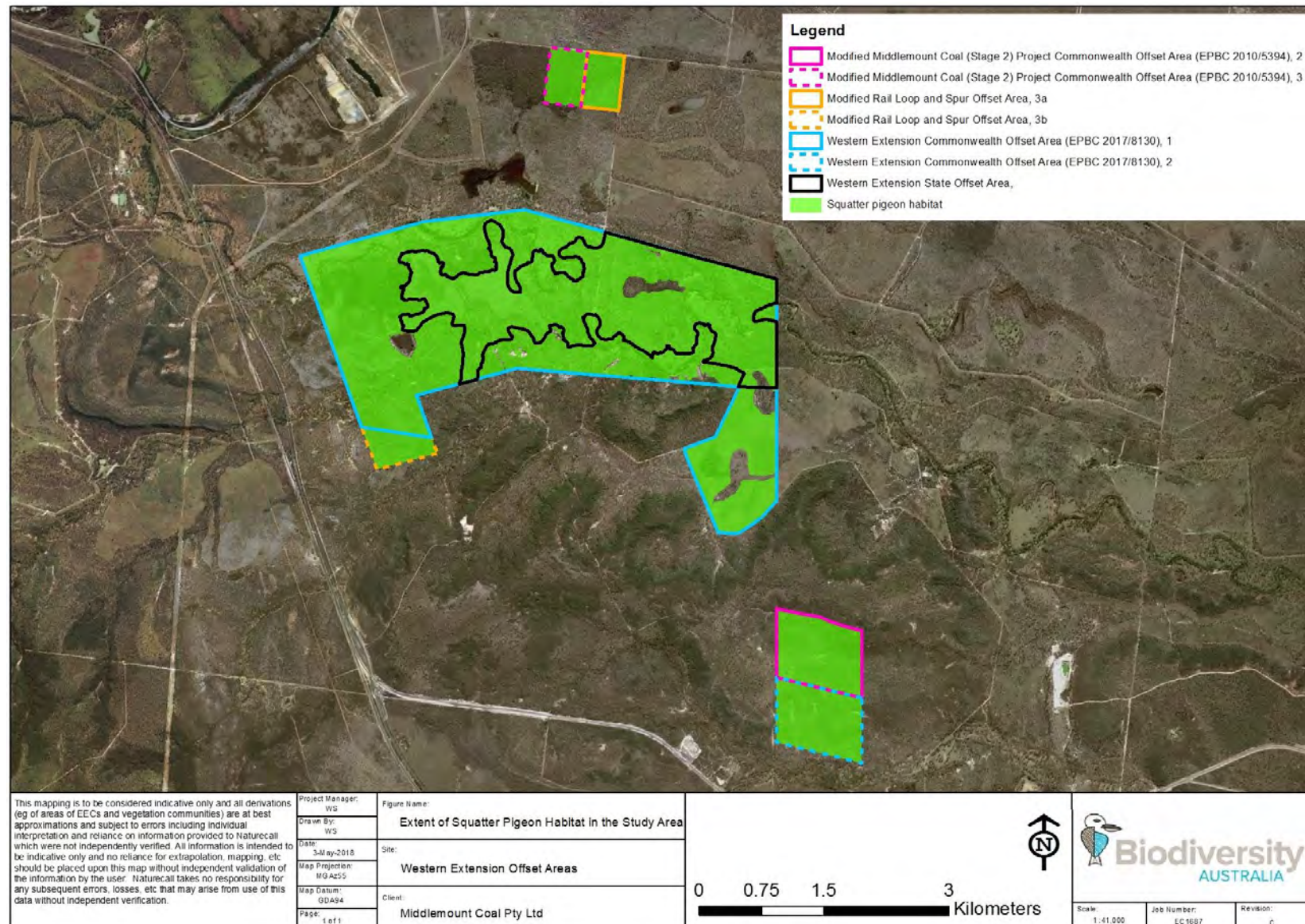
Note that RE 11.7.2 was excluded as potential habitat for this species due to very rocky or bare ground with low native grass cover.

The breeding habitat described above would also provide foraging resources for this species. The breeding habitat would also provide dispersal habitat for this species.

There are no additional areas of forest or woodland which would specifically aid the dispersal of the Squatter Pigeon (southern). There are very small areas of cleared land between patches of habitat (less than 100 m apart). These are not considered 'dispersal habitat' for the species.



Figure 20: Squatter Pigeon (southern) habitat within the study sites





Ornamental Snake (*Denisonia maculata*)

The Western Extension Commonwealth Offset Area contains approximately 76 ha of potential suitable habitat for the Ornamental Snake (represented by RE 11.3.1, RE 11.4.8, RE 11.4.9 and RE 11.4.9a).

Consistent with the proposed clearance area, given the Ornamental Snake was previously recorded in RE 11.3.1 (Brigalow) (Parsons Brinkerhoff, 2010a) and it provides suitable microhabitat for the species (e.g. woody debris, ground litter, cracking clay soils and gilgai), this RE is considered to provide potential habitat.

Roper Creek and Two Mile Gully traverse the Western Extension Commonwealth Offset Area providing habitat that is favoured by its prey – frogs (DEE, 2019).

The offset area contains 30 ha of cleared land likely to have been formerly potential habitat (i.e. Brigalow RE 11.3.1). These areas currently do not have sufficient microhabitat requirements (e.g. fallen timber) for shelter and prey species. These cleared areas are currently not considered habitat for the species.

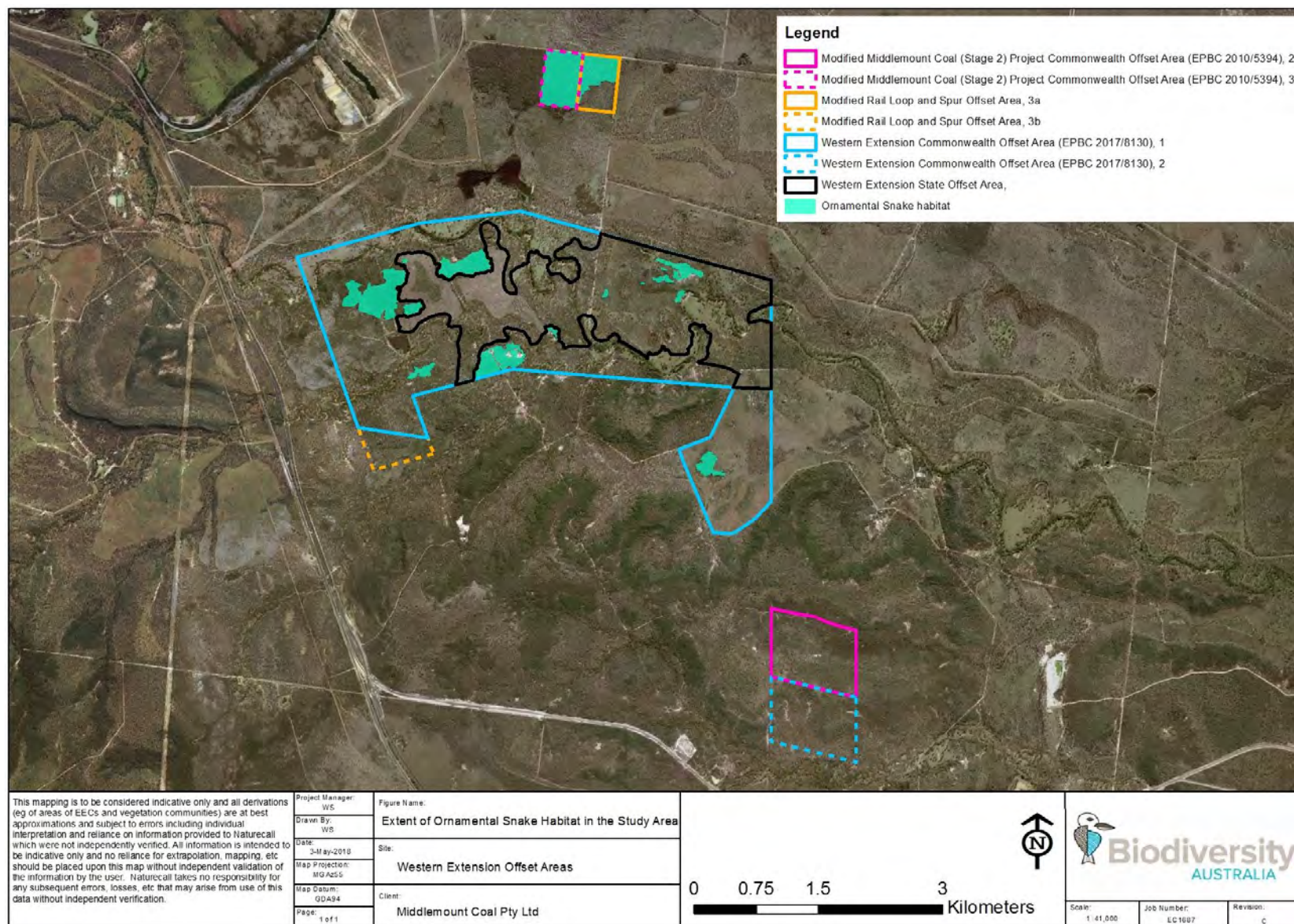
RE 11.4.8, RE 11.4.9 and RE 11.4.9a within the Western Extension Commonwealth Offset Area are preferred habitat (approximately 59.5 ha).

All of the potential habitat in the Western Extension Commonwealth Offset Area (described above) is suitable habitat for this species. No suitable habitat in the Action area is known to be important as defined by the EPBC Act Draft Referral Guidelines for the Nationally listed Brigalow Belt Reptiles (DSEWPaC 2011c) as:

- the species has not been recorded in the habitat in the Western Extension Commonwealth Offset Area;
- the Western Extension Commonwealth Offset Area is not near the limit of the species' known range (after DSEWPaC 2011c);
- the Western Extension Commonwealth Offset Area does not contain large patches of contiguous, suitable habitat and viable landscape corridors, as the habitat is instead small and fragmented (Figure 2 - Attachment E); and
- the Western Extension Commonwealth Offset Area does not contain a unique habitat type containing known records of the species.



Figure 21: Ornamental Snake habitat within the study sites





Summary

Table 27 provides a summary of the extent of potential habitat for each of the above threatened species within each relevant offset area. Figure 22 also shows the location of threatened fauna species detected during the recent fauna surveys.

Table 19: Area of potential habitat for threatened species within the Offset Areas

Species	Potential Habitat			
	Western Extension Commonwealth Offset Area	Western Extension State Offset Area	Modified Stage 2 Commonwealth Offset Area (a) and (b)	Modified Rail Loop and Spur Offset Area (a) and (b)
Ornamental Snake	76	N/A	29.5	N/A
Squatter Pigeon (southern)	1,155	N/A	114.5	N/A
Koala	664.5	N/A	N/A	N/A
Greater Glider	575	N/A	12.4	N/A

5.6.4. Migratory Fauna Species

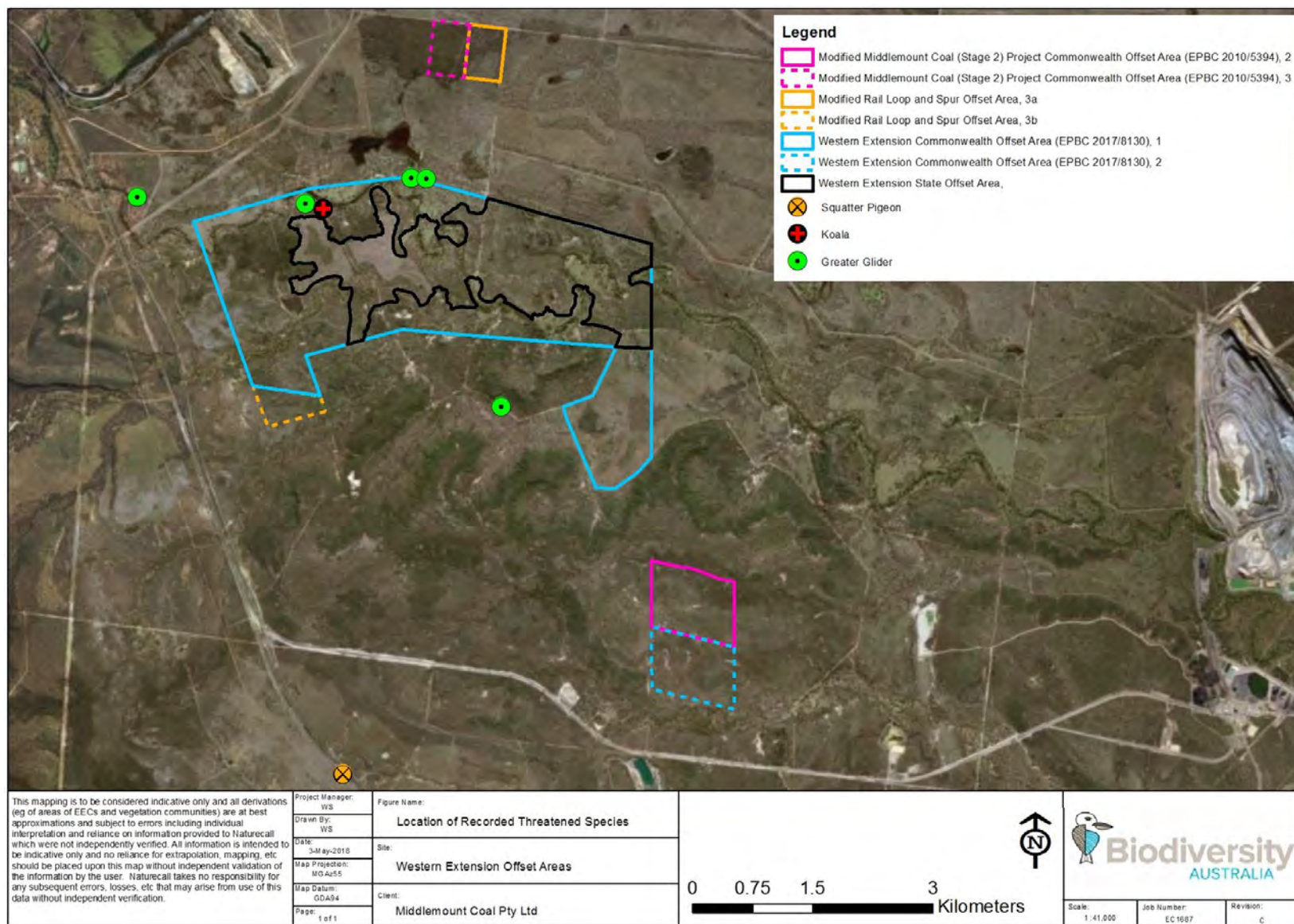
No migratory species were recorded during the field surveys.

5.6.5. Exotic Fauna Species

A feral cat was directly observed in the Western Extension Commonwealth Offset Area (1) during the spotlighting survey. Cat tracks were also occasionally observed on the surrounding roads and access tracks. No wild dogs were observed within the study sites, however dog tracks were recorded on access tracks and in dry creek beds. The only other exotic fauna species detected within the study sites was the European Rabbit.



Figure 22: Threatened fauna species detected during recent surveys





6.0 Summary and Conclusion

The study sites are located approximately 270 km north-west of Rockhampton and 3 km south-west of the Middlemount Township. The study sites comprise freehold land owned by MCPL and total approximately 1,843 ha in area. This includes a combination of forested/woodland areas along with cleared grazing land.

A desktop study (including comprehensive literature review) was carried out prior to the field survey to gather relevant information and data. Existing DSITI RE mapping of the study sites, as well as previous mapping on adjoining land was obtained and used in conjunction with satellite imagery to identify the broad vegetation types present within the study sites.

Flora and fauna surveys were undertaken throughout the study sites from 18-21 July 2017 and 20-26 November 2017. Terrestrial habitat quality assessments were completed at 44 locations spread across the four offset areas. The fauna surveys comprised habitat suitability assessment, opportunistic surveys for threatened species, track, scat and secondary evidence searches as well as opportunistic fauna observations.

The study sites was categorised into seven broad fauna habitat types (i.e. eucalypt woodland/forest, micromyrtus shrubland, riparian habitat, *acacia shirleyi* forest, wetlands, *acacia harpophylla* woodland/forest, and regrowth/derived grassland). Eucalypt woodland was the most common habitat type on the study sites. A number of habitat features were well represented in eucalypt woodlands such as hollow-bearing trees, coarse woody debris, nectar sources and native groundcover. It is considered that the various habitat types present on site would provide suitable habitat for a range of conservation significant fauna species including the Squatter Pigeon (southern), Greater Glider, Koala and Ornamental Snake.

No threatened flora species were detected during the survey. The less disturbed remnant areas displayed attributes with similar values to the published benchmarks. While non-remnant areas generally contained more weed species they showed positive signs of natural regeneration.

Three threatened fauna species were recorded during the field surveys, namely the Koala, Greater Glider and Squatter Pigeon (southern). These species are listed as Vulnerable under the NC Act and EPBC Act. A fourth threatened species, the Ornamental Snake, was also considered a potential occurrence in the study sites based on local records identified in the literature and database searches and presence of suitable habitat.

Species habitat index scores were calculated for the Squatter Pigeon (southern), Greater Glider, Koala and Ornamental Snake for each assessment unit within the Western Extension Commonwealth Offset Area.



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Appendix 1: Site Flora Species List

Common name	Scientific name	NC Act Status
Canopy Trees		
Ironwood	<i>Acacia excelsa</i>	LC
Brigalow	<i>Acacia harpophylla</i>	LC
Inland Rosewood	<i>Acacia rhodoxylon</i>	LC
Lancewood	<i>Acacia shirleyi</i>	LC
Smooth-barked Apple	<i>Angophora leiocarpa</i>	LC
Clarkson's Bloodwood	<i>Corymbia clarksoniana</i>	LC
Dallachy's Gum	<i>Corymbia dallachiana</i>	LC
Moreton Bay Ash	<i>Corymbia tessellaris</i>	LC
Reid River Box	<i>Eucalyptus brownii</i>	LC
Dawson's Gum	<i>Eucalyptus cambageana</i>	LC
Narrow-leaved Ironbark	<i>Eucalyptus crebra</i>	LC
Peppermint	<i>Eucalyptus exserta</i>	LC
Silver-leaved Ironbark	<i>Eucalyptus melanophloia</i>	LC
Poplar Box	<i>Eucalyptus populnea</i>	LC
Queensland Blue Gum	<i>Eucalyptus tereticornis</i>	LC
Swamp Box	<i>Lophostemon suaveolens</i>	LC
Understorey Trees and Shrubs		
Bendee	<i>Acacia catenulata</i>	LC
-	<i>Acacia cretata</i>	LC
Black Wattle	<i>Acacia leiocalyx</i>	LC
Native Willow	<i>Acacia salicina</i>	LC
Bull Oak	<i>Allocasuarina luehmannii</i>	LC
Red Ash	<i>Alphitonia excelsa</i>	LC
Bitter bark	<i>Alstonia constricta</i>	LC
Whitewood	<i>Atalaya hemiglauca</i>	LC
Coffee Bush	<i>Breynia oblongifolia</i>	LC
Prickly Pine	<i>Bursaria incana</i>	LC
Wild Orange	<i>Capparis canescens</i>	LC
Narrowleaf bumbe-tree	<i>Capparis loranthifolia</i>	LC
-	<i>Capparis mitchelli</i>	LC
Currant Bush	<i>Carissa ovata</i>	LC
Leichhardt Bean	<i>Cassia brewsteri</i>	LC
Belah	<i>Casuarina cristata</i>	LC
River Oak	<i>Casuarina cunninghamiana</i>	LC
Limebush	<i>Citrus glauca</i>	LC
-	<i>Denhamia cunninghamii</i>	LC
Native Ebony	<i>Diospyros humilis</i>	LC
Hop Bush	<i>Dodonaea viscosa</i>	LC



Common name	Scientific name	NC Act Status
Turkey Bush	<i>Eremophila deserti</i>	LC
Harrisia Cactus	<i>Harrisia martinii</i> *	LC
Batswing Coral Tree	<i>Erythrina vespertilio</i>	LC
False Sandalwood	<i>Eremophila mitchellii</i>	LC
Emu Bush	<i>Eremophila nivea</i>	LC
Cocaine Tree	<i>Erythroxylum australe</i>	LC
Native Guava	<i>Eupomatia laurina</i>	LC
Sandpaper Fig	<i>Ficus opposita</i>	LC
Scrub Leopardwood	<i>Flindersia dissosperma</i>	LC
Wilga	<i>Geijera parviflora</i>	LC
Beefwood	<i>Grevillea striata</i>	LC
Dysentery Bush	<i>Grewia latifolia</i>	LC
Bootlace Oak	<i>Hakea lorea</i>	LC
Red Bauhinia	<i>Lysiphyllum carronii</i> *	LC
Black Teatree	<i>Melaleuca bracteata</i>	LC
Fibre bark	<i>Melaleuca nervosa</i>	LC
-	<i>Micromyrtus capricornia</i>	LC
Boobialla	<i>Myoporum montanum</i>	LC
Native Olive	<i>Notelaea microcarpa</i>	LC
Prickly Pear	<i>Opuntia elata</i> *	LC
Velvety Tree Pear	<i>Opuntia tomentosa</i> *	
Gooya	<i>Owenia acidula</i>	LC
-	<i>Pittosporum sp.</i>	LC
Quinine Tree	<i>Petalostigma pubescens</i>	LC
-	<i>Psydrax attenuata</i>	LC
-	<i>Solanum parvifolium</i>	LC
Yellow-wood	<i>Terminalia oblongata</i>	LC
Vine Tree	<i>Ventilago viminalis</i>	LC
Grasses		
Kerosene Grass	<i>Aristida holathera</i>	LC
Feathertop Wiregrass	<i>Aristida latifolia</i>	LC
Buffel Grass	<i>Cenchrus ciliaris</i> *	LC
-	<i>Chloris sp.</i>	LC
Windmill Grass	<i>Chloris truncata</i>	LC
Cotton Panic Grass	<i>Digitaria brownii</i>	LC
-	<i>Eragrostis sp.</i>	LC
Black Speargrass	<i>Heteropogon contortus</i>	LC
Golden Weather-grass	<i>Hypoxis hygrometrica</i>	LC
Blady Grass	<i>Imperata cylindrica</i>	LC
Red Natal Grass	<i>Melinis repens</i> *	LC
Brigalow Grass	<i>Paspalidium caespitosum</i>	LC



Common name	Scientific name	NC Act Status
-	<i>Setaria sp.*</i>	LC
Fairy Grass	<i>Sporobolus caroli</i>	LC
Kangaroo Grass	<i>Themeda triandra</i>	LC
Sabi Grass	<i>Urochloa mosambicensis*</i>	LC
Groundcovers		
Chaff Flower	<i>Achyranthes aspera*</i>	LC
Mexican Poppy	<i>Argemone ochroleuca*</i>	LC
Creeping Saltbush	<i>Atriplex semibaccata</i>	LC
Cobbler's Pegs	<i>Bidens pilosa*</i>	LC
-	<i>Cassytha sp.</i>	LC
Rock Fern	<i>Cheilanthes sieberi</i>	LC
Lambs Quarter's	<i>Chenopodium album*</i>	LC
Yellow Buttons	<i>Chrysocephalum apiculatum</i>	LC
Flaxleaf Fleabane	<i>Conyza bonariensis*</i>	LC
Darling Lily	<i>Crinum flaccidum</i>	LC
Lance-leaved Rattlepod	<i>Crotalaria lanceolata*</i>	LC
Yellow Rattlepod	<i>Crotalaria mitchellii</i>	LC
Slender Flat-sedge	<i>Cyperus gracilis</i>	LC
Ruby Saltbush	<i>Enchylaena tomentosa</i>	LC
Winter Apple	<i>Eremophila debilis</i>	LC
Gomphrena Weed	<i>Gomphrena celsioides*</i>	LC
Parthenium	<i>Parthenium hysterophorus*</i>	LC
Pigweed	<i>Portulaca oleracea*</i>	LC
White root	<i>Pratia purpurascens*</i>	LC
Soft Roly-poly	<i>Salsola kali</i>	LC
Flannel Weed	<i>Sida hackettiana*</i>	LC
Spiked Sida	<i>Sida subspicata</i>	
Stylo	<i>Stylosanthes scabra*</i>	LC
Purple top	<i>Verbena bonariensis*</i>	LC
Bluebell	<i>Wahlenbergia gracilis</i>	LC
Spiny-headed Matrush	<i>Lomandra longifolia</i>	LC
Lianas, Scramblers and Twiners		
Nepine	<i>Capparis lasiantha</i>	LC
-	<i>Desmodium macrocarpum</i>	LC
-	<i>Glycine clandestina</i>	LC
Bush Banana	<i>Marsdenia viridiflora</i>	LC
Rough Silkpod	<i>Parsonsia lanceolata</i>	LC
Orchids and Epiphytes		
Tiger Orchid	<i>Cymbidium canaliculatum</i>	LC

* Denotes an introduced species



Appendix 2: Site Fauna Species List

Common Name	Scientific Name	Detection Method ¹
Birds		
Grey Teal	<i>Anas gracilis</i>	OBS
Pacific Black Duck	<i>Anas superciliosa</i>	OBS, HC
Australasian Darter	<i>Anhinga novaehollandiae</i>	OBS
Richards Pipit	<i>Anthus novaeseelandiae</i>	OBS
Red-winged Parrot	<i>Aprosmictus erythropterus</i>	OBS
Great Egret	<i>Ardea alba</i>	OBS
Cattle Egret	<i>Ardea ibis</i>	OBS
Australian Bustard	<i>Ardeotis australis</i>	OBS
Hardhead	<i>Aythya australis</i>	OBS
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	OBS, HC
Pheasant Coucal	<i>Centropus phasianinus</i>	OBS
Azure Kingfisher	<i>Ceyx azureus</i>	OBS
Red-capped Plover	<i>Charadrius ruficapillus</i>	OBS
Australian Wood Duck	<i>Chenonetta jubata</i>	OBS
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	OBS, HC
Australian Raven	<i>Corvus coronoides</i>	HC
Torresian Crow	<i>Corvus orru</i>	OBS, HC
Cicadabird	<i>Coracina tenuirostris</i>	OBS, HC
Pied Butcherbird	<i>Cracticus nigrogularis</i>	HC
Grey Butcherbird	<i>Cracticus torquatus</i>	OBS
Black Swan	<i>Cygnus atratus</i>	OBS
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	OBS, HC
Blue-winged Kookaburra	<i>Dacelo leachii</i>	OBS
Emu	<i>Dromaius novaehollandiae</i>	OBS
White-faced Heron	<i>Egretta novaehollandiae</i>	OBS
Black-fronted Dotterel	<i>Elseynornis melanops</i>	OBS
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	OBS
Galah	<i>Eolophus roseicapilla</i>	OBS
Eastern Koel	<i>Eudynamys orientalis</i>	OBS
Dollarbird	<i>Eurystomus orientalis</i>	OBS
Australian Hobby	<i>Falco longipennis</i>	OBS
Eurasian Coot	<i>Fulica atra</i>	OBS
Bar-shouldered Dove	<i>Geopelia humeralis</i>	OBS
Peaceful Dove	<i>Geopelia placida</i>	OBS, HC
White-throated Gerygone	<i>Gerygone albogularis</i>	OBS, HC
Magpie-lark	<i>Grallina cyanoleuca</i>	OBS



Common Name	Scientific Name	Detection Method ¹
Brolga	<i>Grus rubicunda</i>	OBS
Australian Magpie	<i>Gymnorhina tibicen</i>	OBS, HC
Whistling Kite	<i>Haliastur sphenurus</i>	OBS, HC
Black-winged Stilt	<i>Himantopus himantopus</i>	OBS
Welcome Swallow	<i>Hirundo neoxena</i>	OBS
Red-backed Fairy-wren	<i>Malurus melanocephalus</i>	OBS
Noisy Miner	<i>Manorina melanocephala</i>	OBS, HC
Rainbow Bee-eater	<i>Merops ornatus</i>	HC
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	OBS
Black Kite	<i>Milvus migrans</i>	OBS
Cotton Pygmy-Goose	<i>Nettapus coromandelianus</i>	OBS
Crested Pigeon	<i>Ocyphaps lophotes</i>	OBS
Olive-backed Oriole	<i>Oriolus sagittatus</i>	OBS
Striated Pardalote	<i>Pardalotus striatus</i>	OBS, HC
Australian Pelican	<i>Pelecanus conspicillatus</i>	OBS
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	OBS
Pied Cormorant	<i>Phalacrocorax varius</i>	OBS
Common Bronzewing	<i>Phaps chalcoptera</i>	OBS
Little Friarbird	<i>Philemon citreogularis</i>	OBS,HC
Noisy Friarbird	<i>Philemon corniculatus</i>	OBS, HC
Pale-headed Rosella	<i>Platycercus adscitus</i>	OBS, HC
Glossy Ibis	<i>Plegadis falcinellus</i>	OBS
Tawny Frogmouth	<i>Podargus strigoides</i>	OBS
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	OBS
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	OBS, HC
Willie Wagtail	<i>Rhipidura leucophrys</i>	OBS
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	OBS
Apostlebird	<i>Struthidea cinerea</i>	OBS
Australian Grebe	<i>Tachybaptus novaehollandiae</i>	OBS
Double-barred Finch	<i>Taeniopygia bichenovii</i>	OBS
Australian White Ibis	<i>Threskiornis molucca</i>	OBS
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	OBS
Forest Kingfisher	<i>Todiramphus macleayi</i>	OBS
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	HC
Masked Lapwing	<i>Vanellus miles</i>	OBS
Singing Honeyeater	<i>Lichenostomus virescens</i>	OBS,HC
Mammals		
Dog	<i>Canis lupus familiaris</i> *	TRA
Feral Cat	<i>Felis catus</i> *	OBS



Common Name	Scientific Name	Detection Method ¹
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	OBS, SC, TRA
Common Wallaroo	<i>Macropus robustus</i>	OBS
Swamp Wallaby	<i>Wallabia bicolor</i>	OBS
Red-necked Wallaby	<i>Macropus rufogriseus</i>	OBS
Rufous Bettong	<i>Aepyprymnus rufescens</i>	OBS
European Rabbit	<i>Oryctolagus cuniculus</i> *	SC
Greater Glider ⁺ [^]	<i>Petauroides volans</i>	OBS
Koala ⁺ [^]	<i>Phascolarctos cinereus</i>	OBS
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	OBS
Reptiles		
Open Litter Rainbow Skink	<i>Carlia pectoralis</i>	OBS
Wall Skink	<i>Cryptoblepharus virgatus</i>	OBS
Copper-tailed Skink	<i>Ctenotus taeniolatus</i>	OBS
Bynoe's Gecko	<i>Heteronotia binoei</i>	OBS
¹ Codes: Direct Observation (OBS), Heard Call (HC), Tracks (TRA), Scat (SC) * Denotes exotic species ^ Vulnerable EPBC Act + Vulnerable NC Act # Migratory EPBC Act		

APPENDIX E

QUEENSLAND HERBARIUM (2016) REGIONAL ECOSYSTEM FIRE GUIDELINES

Table E1
Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines

Regional Ecosystem	Description Label	Fire Guidelines
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	<i>INTERVAL:</i> n/a. b, d: Occasional fires 5 - 10 years. <i>STRATEGY:</i> Maintain fire management of surrounding country so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary. <i>ISSUES:</i> <i>Casuarina cristata</i> is fire sensitive, although germination can be good in bare areas. <i>Brigalow</i> is soft-seeded, so germination is not promoted by fire. <i>Buffel</i> grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as <i>buffel</i> have invaded.
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	<i>SEASON:</i> Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. <i>INTENSITY:</i> Low to moderate. <i>INTERVAL:</i> 6-10 years (shorter in north of bioregion: 2-7 years). <i>STRATEGY:</i> Restrict to less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. <i>ISSUES:</i> Burn interval for conservation purposes will differ from that for grazing purposes; the latter being much shorter. Management of this vegetation type should be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Fire can control shrub invasives (e.g., <i>Eremophila</i> spp. and <i>A. stenophylla</i> in the red soil country in particular). Fire will also control cypress. Low to moderate intensity burns with good soil moisture are necessary to minimise loss of hollow trees. Avoid burning riparian communities as these can be critical habitat for some species. Culturally significant (scar) trees may need protection, such as rake removal of ground fuels. Planned burns have traditionally been carried out in the winter dry season; further research required.
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	<i>SEASON:</i> Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. <i>INTENSITY:</i> Low to moderate. <i>INTERVAL:</i> 6-10 years (shorter in north of bioregion: 2 - 7 years). <i>STRATEGY:</i> Restrict to less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. <i>ISSUES:</i> Burn interval for conservation purposes will differ from that for grazing purposes; the latter being much shorter. Management of this vegetation type should be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Fire can control shrub invasives (e.g., <i>Eremophila</i> spp. and <i>A. stenophylla</i> in the red soil country in particular). Fire will also control cypress. Low to moderate intensity burns with good soil moisture are necessary to minimise loss of hollow trees. Avoid burning riparian communities as these can be critical habitat for some species. Culturally significant (scar) trees may need protection, such as rake removal of ground fuels. Planned burns have traditionally been carried out in the winter dry season; further research required.

Table E1 (Continued)
Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines

Regional Ecosystem	Description Label	Fire Guidelines
11.3.7	<i>Corymbia</i> spp. woodland on alluvial plains	SEASON: Early dry season when there is good soil moisture, with some later fires in the early storm season or after good spring rains. INTENSITY: Primarily low to moderate, with occasional high intensity fires. INTERVAL: Typically 2 - 7 years, with some areas longer unburnt. STRATEGY: A predominance of early dry season fires is recommended, although there is value in occasional late dry season fires, or storm burns, over small areas. Burning should begin very soon after the wet season, to secure boundaries and adjacent fire-sensitive vegetation. Subsequent repeat ignitions can be used within the same section of land weeks or months after the boundaries have been secured by early burning, to produce a mixture of burnt areas with multiple ignition dates. Use topographical features to ignite areas as soon as they dry out. This will create a mosaic of areas that were burnt at different dates and unburnt sections within the same area of woodland. Burn away from riparian communities, which can be critical habitat for some species. Approximately 25% of the grassy woodlands within a landscape should receive patchy fires in most years. ISSUES: These woodlands have a diverse native grass and herb layer that is maintained and promoted by regular fire. Burning that starts immediately after the wet season, with follow up small fires ignited progressively over multiple dates can increase the availability of grass and herb seed, which is a critical food source for many birds and small mammals. Recently burnt grass clumps tend to produce more seed than unburnt clumps and the earlier burnt grass usually seeds earlier than later burnt grass. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Low to moderate intensity burns with good soil moisture minimise the risk of losing hollow trees. An occasional late season burn will promote grasses and legumes. Ensure a diverse grass layer; maintenance of hollow-bearing trees and vegetation structure.
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	SEASON: Primarily early dry season. INTENSITY: Low. INTERVAL: 3 - 5 years. STRATEGY: Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. c-g: Depending on position in the landscape, protection depends on broad-scale management of surrounding country, with numerous small fires throughout the year so that wildfires will be very limited in extent. ISSUES: Fringing communities are critical habitat. In some situations it may be best not to burn. Intense and extensive fires degrade vegetation structure and destroy fauna habitats. Restrict the extent and intensity of fires. Hollow trees are critical habitat. Green panic may be an issue and an intensive grazing regime for very short periods, may be necessary to limit potential of wildfire. c-g: If burning is to occur then implement when water level is deep enough to protect the bases of aquatic plants. Sedges are disadvantaged by repeated fires. Impact of fire on rare and threatened plants associated with mound springs that include <i>Arthraxon hispidus</i> and <i>Dimeria</i> sp. (<i>Salvator Rosa</i> R.J.Fensham RJF3643) should be considered. Boggomosses/springs can bounce back following fire but care should be taken where a dry peat layer has developed (particularly in degraded situations). Fire is an option for control of weeds (possibly in ungrazed situations). If riparian areas need to be burnt to reduce fuel loads then burning should occur when there is good soil moisture and active growth.
11.3.27	Freshwater wetlands	STRATEGY: Depending on position in the landscape, protection depends on broad-scale management of surrounding country, with numerous small fires throughout the year so that wildfires will be very limited in extent. ISSUES: If burning is to occur then implement when water level is deep enough to protect the bases of aquatic plants. Sedges are disadvantaged by repeated fires. Impact of fire on rare and threatened plants associated with mound springs that include <i>Arthraxon hispidus</i> and <i>Dimeria</i> sp. (<i>Salvator Rosa</i> R.J.Fensham RJF3643) should be considered. Boggomosses/springs can bounce back following fire but care should be taken where a dry peat layer has developed (particularly in degraded situations). Fire is an option for control of weeds (possibly in ungrazed situations). If riparian areas need to be burnt to reduce fuel loads then burning should occur when there is good soil moisture and active growth.

Table E1 (Continued)
Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines

Regional Ecosystem	Description Label	Fire Guidelines
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	STRATEGY: Maintain fire management of surrounding country so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary. ISSUES: <i>Casuarina cristata</i> is fire sensitive, although germination can be good in bare areas. <i>Brigalow</i> is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	STRATEGY: Maintain fire management of surrounding country so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary. ISSUES: <i>Casuarina cristata</i> is fire sensitive, although germination can be good in bare areas. <i>Brigalow</i> is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.
11.4.9	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	STRATEGY: Maintain fire management of surrounding country so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary. ISSUES: <i>Casuarina cristata</i> is fire sensitive, although germination can be good in bare areas. <i>Brigalow</i> is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces	SEASON: Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. INTENSITY: Low to moderate. INTERVAL: 6-10 years. STRATEGY: Restrict to less than 30% in any year. Burn under conditions of good soil moisture and when plants are actively growing. Sometimes a small amount of wind may move the fire front quickly so that burn intensity is not too severe to destroy habitat trees. a: Restrict to less than 30-60% in any year. Rotate burns in mosaic patches. Maintain fire management of surrounding country so that wildfires will be very limited in extent. Burn under conditions of good soil moisture and when plants are actively growing. ISSUES: Burn interval for conservation purposes will differ from that for grazing purposes; the latter being much shorter. Management of this vegetation type should be based on maintaining vegetation composition, structural diversity, fauna habitats (in particular hollow-bearing trees and logs) and preventing extensive wildfire. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Fire can control shrub invasives (e.g., <i>Eremophila</i> spp. and <i>A. stenophylla</i> in the red soil country in particular). Fire will also control cypress. Low to moderate intensity burns with good soil moisture are necessary to minimise loss of hollow trees. Avoid burning riparian communities as these can be critical habitat for some species. Culturally significant (scar) trees may need protection, such as rake removal of ground fuels. Planned burns have traditionally been carried out in the winter dry season; further research required. a: Maintaining a fire mosaic will ensure protection of fauna habitats (such as dense stands of <i>A. luehmannii</i>) and mitigate against wildfires. <i>Allocasuarina luehmannii</i> (bull oak) can be both killed by fire and regenerate from seed following fire. Bull oak thickening/creation of whipstick communities may be controlled with planned low intensity burns. Drought index will help deliver required guideline. Jewel butterfly is significant in this community, but the jewel butterfly needs thick leaf litter/mature bull oak; so high intensity fire (or fire that removes the litter layer) could be detrimental to survival. <i>Allocasuarina</i> is also an important food source for glossy-black cockatoo.

Table E1 (Continued)
Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines

Regional Ecosystem	Description Label	Fire Guidelines
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	SEASON: Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. INTENSITY: Various. INTERVAL: 6-15 years (shorter intervals in north of bioregion: 5 - 10 years). No shrubby woodlands should receive two consecutive burns at intervals of < 6 years. STRATEGY: Once boundaries of the planned burning area are secure, ignite across the landscape in a patchwork, rather than continuous ignition strips. Use topographical features to help create a patchily burnt landscape. Where shrubby woodlands occur within a broader grassy landscape, attempt to burn the shrubby woodland during every second fire rotation in the grassy woodland, by burning early breaks around the shrubby areas. In sites with a history of wildfires recurring within 5 years, patchy burning in a few small strategic locations at 3 or 4 year intervals may reduce the incidence of extensive wildfires, while ensuring most shrubby woodland areas remain unburnt for > 5 years. b: Burn under mild conditions and primarily away from the edge into surrounding vegetation. Low intensity burning may be of benefit within the forests with native grasses and where Para grass density requires management. ISSUES: Shrubby woodlands require longer fire intervals than grassy woodlands, because of the presence of fire-killed shrubs and the time required for post-fire regrowth to return to a mature structure. The seedlings of many fire-killed shrubs (such as some wattles) require 5 years or more before they mature. The creation of a fine-scale patchy mosaic can be more difficult to achieve in shrubby compared to grassy woodlands. Ensure seedlings of fire-killed shrubs mature and persist in the woodland; ensure several years of mature shrubby woodland structure before the subsequent fire. b: Care is needed to ensure a low intensity fire, as high intensity fires can damage trees, e.g. <i>Melaleuca</i> spp. and <i>Brigalow</i>. Native grasses (e.g. <i>Imperata cylindrica</i>, <i>Sporobolus virginicus</i>) and sedges (e.g. <i>Fimbristylis</i> spp) will benefit from occasional burning. Fire, coupled with herbicide spraying, is important for managing exotic wetland plants, such as <i>Olive Hymenachne</i> and <i>Para grass</i>. Burning temporarily opens gaps within exotic grass patches, allowing native flora to establish. Ensure native grass diversity is maintained and native trees are not damaged by fires.
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces	SEASON: Late wet to early dry season when there is good soil moisture. Early storm season or after good spring rains. INTENSITY: Various. INTERVAL: 6-15 years (shorter intervals in north of bioregion: 5 - 10 years). No shrubby woodlands should receive two consecutive burns at intervals of < 6 years. STRATEGY: Once boundaries of the planned burning area are secure, ignite across the landscape in a patchwork, rather than continuous ignition strips. Use topographical features to help create a patchily burnt landscape. Where shrubby woodlands occur within a broader grassy landscape, attempt to burn the shrubby woodland during every second fire rotation in the grassy woodland, by burning early breaks around the shrubby areas. In sites with a history of wildfires recurring within 5 years, patchy burning in a few small strategic locations at 3 or 4 year intervals may reduce the incidence of extensive wildfires, while ensuring most shrubby woodland areas remain unburnt for > 5 years. ISSUES: Shrubby woodlands require longer fire intervals than grassy woodlands, because of the presence of fire-killed shrubs and the time required for post-fire regrowth to return to a mature structure. The seedlings of many fire-killed shrubs (such as some wattles) require 5 years or more before they mature. The creation of a fine-scale patchy mosaic can be more difficult to achieve in shrubby compared to grassy woodlands. Ensure seedlings of fire-killed shrubs mature and persist in the woodland. Ensure several years of mature shrubby woodland structure before the subsequent fire.
11.5.18	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains and/or remnant surfaces	SEASON: Spring to summer after rain, with good soil moisture. INTENSITY: Moderate to high. INTERVAL: 6-15 years. STRATEGY: This RE will burn when ready with adjacent vegetation. Burn small patches where possible (most are naturally small). Burn when sufficient soil moisture and according to seasonal condition. ISSUES: This heathland requires long enough fire intervals to allow regrowth to a mature structure. Ensure mature shrubland structure persists for many years in between fire events.

Table E1 (Continued)
Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines

Regional Ecosystem	Description Label	Fire Guidelines
11.7.2	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	STRATEGY: Maintain fire management of surrounding country so that wildfires will be very limited in extent and do not penetrate Lancewood forests. ISSUES: Although fire promotes the germination of Lancewood seedlings, trees are killed by all but the lowest intensity fires. Lancewood trees require approximately 20 years before seedlings mature. Often the lack of grass layer inhibits fire spread into these forests, and they will regenerate after occasional wildfires. Damaged by repeated fires < 20 years. Manage surrounding woodlands so that wildfires do not burn large areas of Lancewood forest in a single event. Ensure no damage to Lancewood trees from fires; extra protection required to ensure no two fires penetrate Lancewood forests within 20 years.
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> woodland on Cainozoic lateritic duricrust	STRATEGY: Manage surrounding country. Burn surrounding country only under conditions of good soil moisture and when plants are actively growing. Will be difficult to burn owing to a lack of ground fuel that normally occurs in this RE.
11.9.1	<i>Acacia harpophylla</i> - <i>Eucalyptus cambageana</i> woodland to open forest on fine-grained sedimentary rocks	STRATEGY: Maintain fire management of surrounding country so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary. ISSUES: <i>Casuarina cristata</i> is fire sensitive, although germination can be good in bare areas. <i>Brigalow</i> is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.

Source: Queensland Herbarium (2016) Regional Ecosystem Fire Guidelines (December 2016) (Queensland Department Of Science, Information Technology And Innovation: Brisbane). <https://publications.qld.gov.au/dataset/redd/resource/c77196df-7af9-4c09-ac88-256867c39806> . Last updated: 23 December 2016.

APPENDIX F

RISK ANALYSIS

Table F1
Likelihood of Risk Occurring

Category	Likelihood	Qualitative description	Quantitative description
A	Almost Certain	The event is expected to occur in most circumstances	May occur once a month or more frequently
B	Likely	The event will probably occur in many circumstances	May occur once every year
C	Possible	Identified factors indicate the event could occur at some time	May occur once every 2 or 3 years
D	Unlikely	The event could occur at some time but is not expected	May occur once every 5 years
E	Rare	The event may occur only in exceptional circumstances	May occur once every 10 years

Source: Qld Government Offset Delivery Plan Template.

Table F2
Qualitative Risk Analysis Matrix

RATING	CONSEQUENCES	LIKELIHOOD				
		Rare – E	Unlikely – D	Possible – C	Likely – B	Almost certain – A
5	Severe - Permanent and/or very long term damage to areas of significant value, e.g. permanent loss of vegetation through pest invasion.	H	H	E	E	E
4	Major - Significant and/or long term damage to areas of high value, e.g. significant loss of vegetation through pest invasion.	M	M	H	H	E
3	Moderate - Moderate or medium term damage to areas of value, e.g. moderate loss of vegetation through pest invasion.	M	M	M	H	H
2	Minor - Minor and/or short term damage to areas of low value, e.g. minor loss of vegetation through pest invasion.	L	M	M	M	H
1	Insignificant - Insignificant or very short term damage to areas of very low or negligible value, e.g. insignificant loss of vegetation through pest invasion.	L	L	L	M	M

Low Risk (L)	Moderate Risk (M)	High Risk (H)	Extreme Risk (H)
Requires routine action	Requires moderate action < 1 Month	Requires priority action < 2 Weeks	Requires immediate action < 1 Week

Source: Qld Government Offset Delivery Plan Template.

Table F3
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Clearing	Illegal access and potential vandalism	D	3	M	- On-ground set up including fencing, installing locked gates, signage and access tracks. - Inspect and remedy issues.	E	2	L
Livestock	Grazing by cattle – ground disturbance, remove or destroy seeds, seedlings or plantings	D	2	M	- Modify fencing. - Incorporate electric fencing. - Inspect and remedy issues. - Modify rotational grazing regime.	E	2	L
Introduced flora species (environmental weeds/restricted invasive plants)	Weed invasion	C	2	M	- Ongoing monitoring. - Weed management strategy. - Restricting vehicles to designated access tracks. - Implementation of measures that favour the restoration of healthy native vegetation. - Physical removal and chemical application are the main weed control methods available.	E	2	L
Impacts from Animals (exotics and grazing native animals)	Grazing by pest animals (e.g. pigs, goats , rabbits and hares)	C	2	M	- Pest Animal Management Strategy. - Ongoing monitoring. - Removing available feed. - Implement trapping and/or baiting.	E	2	L
	Grazing native fauna species (e.g. kangaroos)	D	2	M	- Strategic grazing in the offset areas to control biomass and reduce fuel load. - Inspect and remedy issues with fences, gates or access.	E	2	L

Table F3 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Fire	Uncontrolled bushfire	C	4	H	- The Qld Rural Fire Service will be called for assistance if a significant bushfire was to occur within or move towards the offset areas. - Inspect and remedy issues with fences, gates or access. - MCPL also has firefighting capabilities (e.g. trained personnel and mobile equipment) that can assist the Qld Rural Fire Service.	E	2	L
Floristics	Poor diversity in the seed mix or tube stock	D	2	M	- Favour natural regeneration within the offset area in the first instance. - Further active revegetation.	E	2	L
	Poor understorey diversity	D	2	M	Further active revegetation.	E	2	L
	Over-collection of seed for revegetation purposes	D	2	M	All seed collection is to be conducted under the framework of the 'Florabank Guidelines'. This includes best practice in collection activities, cleaning, data collection, germination testing and storage.	E	2	L
Native plant growth	Poor native plant growth/germination	C	3	M	- Site preparation including stabilising and preparing the surface of the rehabilitation area so that it can absorb water and nutrients. - Further active revegetation.	D	1	L
	Dense overstorey and midstorey revegetation	C	2	M	Ongoing monitoring and implementation of remedial actions.	D	1	L
	Dense grass cover	C	2	M	Strategic grazing in the offset areas to control biomass.	D	1	L
Fauna habitat	Lack of structural diversity (including lack of tree hollows)	C	2	M	- Re-use of habitat features salvaged during vegetation clearance. - Further active revegetation.	D	1	L
	Lack of suitable vegetation for foraging and/or roosting	C	2	M	- Re-use of habitat features salvaged during vegetation clearance. - Further active revegetation.	D	1	L

Table F3 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Natural Disaster	Drought	D	4	M	- The Qld Rural Fire Service will be called for assistance if a significant bushfire was to occur within or move towards the offset areas. - Inspect and remedy issues with fences, gates or access. - MCPL also has firefighting capabilities (e.g. trained personnel and mobile equipment) that can assist the Qld Rural Fire Service.	E	2	L

APPENDIX G
PEER REVIEW LETTER

Monday 16th July 2018

Mr Shane Flint
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Dear Shane,

Re: Peer Review of Revised Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan

As requested, we carried out a peer review of the Revised Middlemount Coal Mine Offset Management Plan/Vegetation Management Plan.

1.0 Background Information

The plan has been revised to cover the additional Middlemount Coal Offset Areas that have been setup as part of recent project approvals and applications and now includes the following Offset Areas:

- a modified Middlemount Coal (Stage 2) Project Commonwealth Offset Area;
- a modified Rail Loop and Spur Offset Area;
- the North-eastern Extension Commonwealth Offset Area;
- the North-eastern Extension State Offset Area;
- the Western Extension Commonwealth Offset Area; and
- the Western Extension State Offset Area.

Biodiversity Australia have worked at Middlemount Coal Mine since 2013. Work carried has included annual monitoring of offset areas, flora and fauna surveys and impact assessments for mine expansion projects, ground-truthing vegetation and conducting baseline ecological surveys of new offset areas now included in the plan.

2.0 Reviewer's Qualifications

The peer review of the revised plan was undertaken by Principal Ecologist Will Steggall and Vegetation/Fauna Unit Manager Stephen Lyngcoln.

Will and Stephen have tertiary qualifications in Environmental Sciences and a combined 31 years' experience in environmental management and ecological surveys in Queensland and NSW. Both ecologists easily meet the requirements of a "suitably trained ecologist" as per the following definition on the North-eastern Extension EPBC Act approval:

"Suitably trained ecologists: means a natural person/s with the requisite training and/or experience in the ecological field relevant to the ecological work to be undertaken. The requisite training and experience must include, at minimum:

(a) one year of experience conducting ecological surveys in Queensland, Australia; and

(b) tertiary qualification in a suitable area of study (such as natural resources, environmental sciences, zoology or botany) and 5 years of ecological field work experience (alternatively a minimum of 3 years of ecological field work experience with supervision by a senior suitably qualified ecologist); or

(c) 5 years of ecological field work experience unless the person is engaged in a specialist field in which case half the number of years of field experience in that specialisation would be sufficient experience for work in regard to that specialisation."

3.0 Review Outcomes

Biodiversity Australia carried out a detailed review of the plan and provided minor technical corrections to background information of the offset areas as well as input and advice for management of the offset areas (e.g. fire management, weed management) and the annual monitoring requirements.

We are satisfied with the content of the revised plan and have found it to adequately address the setup, environmental management and monitoring requirements of the offset areas.

Yours faithfully,



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