



INVINCIBLE COLLIERY BIODIVERSITY MANAGEMENT PLAN

Shoalhaven Coal Pty Limited (Castlereagh Coal)



INVINCIBLE COLLIERY

(Southern Extension)

Biodiversity Management Plan

Document Status Register

Section/Page	Revision Number	Amendment/Addition	Distribution	DPE Approval Date
All	INV-BMP-R0	Original	DPIE, OEH	-
	INV-BMP-R1	R1	DPE, BCD	July 2023

Table of Contents

1.0	INTRODUCTION	6
1.1	Background	6
1.2	Location and Description of the Southern Extension Area	9
1.3	Document Purpose and Objectives	9
1.4	Document Structure and Regulatory Compliance	9
1.5	Guidelines and Policies	16
1.6	Regulatory Consultation	16
1.7	Biodiversity Credit Obligation	17
2.0	EXISTING BIODIVERSITY VALUES	19
2.1	Southern Extension Project Area	19
2.1.1	Native Vegetation	19
2.1.2	Threatened Species	20
2.1.3	Weed and Pest Species	21
2.2	Biodiversity Offset Areas	22
2.2.1	Existing Biodiversity Offset Areas	22
2.2.2	Hillcroft Offset Site	24
3.0	BIODIVERSITY MANAGEMENT MEASURES	29
3.1	Land Disturbance Management Controls	30
3.1.1	Defining Limits of Clearing	31
3.1.2	Pre-clearance Surveys	31
3.1.3	Tree Felling Procedure	31
3.1.4	Seed Collection and Propagation	32
3.1.5	Salvage of Habitat Features	32
3.1.6	Topsoil Management	33
3.2	Operational Controls	33
3.2.1	Controlling Access and Traffic	33
3.2.2	Weed Management	34
3.2.3	Pest Management	34
3.2.4	Sediment and Erosion Control	35
3.2.5	Salinity Control	35
3.2.6	Fire Management	36
3.2.7	Training and Awareness	36
3.2.8	Aboriginal Heritage Values	36
3.2.9	Mine Rehabilitation Strategies	36
4.0	BIODIVERSITY OFFSET AREAS MANAGEMENT MEASURES	39
4.1	Management Objectives	39

4.2	Integration of Biodiversity Offset Areas with Mine Rehabilitation	39
4.2.1	Lot 112, DP 877190	40
4.2.2	Lot 1, DP 180294 (Renown Farm)	40
4.2.3	Lot 113, DP 877190	40
4.3	Management Actions	41
4.3.1	Natural and Active Regeneration	41
4.3.2	Re-use of Salvaged Habitat Features	43
4.3.3	Access Control	43
4.3.4	Weed Management	43
4.3.5	Pest Animal Management	47
4.3.6	Fire Management	47
4.4	Long-term Security Mechanism	48
4.5	Conservation Bond	48
5.0	BIODIVERSITY OFFSET AREAS MONITORING PROGRAM	49
5.1	Purpose of Biodiversity Monitoring Program	49
5.2	Objectives	49
5.3	Timing	50
5.4	Vegetation Integrity and Condition Monitoring Methodology	50
5.4.1	Site Selection	50
5.4.2	Plot based Surveys	50
5.4.3	Overall Site Condition	51
5.5	Fauna Monitoring	51
5.5.1	Birds	51
5.5.2	Bats	52
5.5.3	Terrestrial Mammals	52
5.5.4	Reptiles	52
5.6	Monitoring of Re-use of Salvaged Habitat Features	52
5.7	Access Control Monitoring	52
5.8	Weed Monitoring	52
5.9	Pest Animal Monitoring	53
5.10	Fire Monitoring	53
5.11	Performance and Completion Criteria	53
6.0	COMMUNICATION AND REPORTING	57
6.1	Reporting	57
6.1.1	Annual Biodiversity Monitoring Report	57
6.1.2	Annual Review	57
6.1.3	Incident Reporting	57
6.2	Adaptive Management	57
6.3	Auditing	58
6.4	Review and Improvement	58

6.5	Threats and Corrective Action	58
6.6	Roles and Responsibilities	60
7.0	REFERENCES	62
8.0	ABBREVIATIONS	63
A.	TRANSLOCATION PLAN FOR BURSARIA SPINOSA	1
A.1.	Introduction	1
A.2.	Biology of the Bathurst Copper Butterfly and Bursaria spinosa	1
A.3.	Identification of Specimens to be Translocated	1
A.4.	Identification of Recipient Sites	2
A.5.	Site Preparation	3
A.6.	Translocation Procedure	4
A.7.	Timing of Translocation	4
A.8.	Expertise Required	5
A.9.	Monitoring and Maintenance of Translocated Populations	8
A.10.	Risk Mitigation and Contingency Measures	8
A.11.	Performance and Completion Criteria	10
A.12.	Adaptive Management	11
B.	PERFORMANCE MEASURES AND COMPLETION CRITERIA FOR THE SOUTHERN EXTENSION AREA	1
C.	SOUTHERN EXTENSION AREA FLORA AND FAUNA SPECIES LISTS	2

Figures

Figure 1	Locality Plan	7
Figure 2	Invincible Southern Extension Project	8
Figure 3	Location of Biodiversity Offset Areas and Project Areas	25
Figure 4	Biometric Vegetation Type Communities and Threatened Species Records	26
Figure 5	Existing Offset Areas Vegetation Communities and Threatened Species	27
Figure 6	Hillcrest Offset Site Vegetation Communities and Threatened Species	28
Figure 7	Integration of Existing Biodiversity Offset Areas	38
Figure 8	Conceptual Location of Monitoring Sites within the Biodiversity Offset Area	55
Figure 9	Conceptual Location of Monitoring Sites within the Hillcroft Offset Site	56
Figure 10	Preferred Areas for the Translocation of <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>	6
Figure 11	<i>Bursaria spinosa</i> areas in the SEA	7

Tables

Table 1	Relevant Conditions of PA 07_0127 (Mod 5)	10
Table 2	Relevant Environmental Assessment Biodiversity and Rehabilitation Commitments	15
Table 3	<i>Bursaria</i> Translocation Plan Performance and Completion Criteria	10
Table 4	Performance Indicators and Completion Criteria for the SEA	1
Table 5	Flora Species List	2
Table 6	Fauna Species List	7

Appendices

Appendix A	Translocation Plan for <i>Bursaria spinosa</i>
Appendix B	Performance Measures and Completion Criteria
Appendix C	Southern Extension Flora and Fauna Species Lists
Appendix D	Stakeholder Engagement

1.0 INTRODUCTION

1.1 Background

Shoalhaven Coal Pty Limited, trading as Castlereagh Coal Pty Ltd (Castlereagh Coal), owns the Invincible Colliery (Invincible), a coal mine located approximately 25 kilometres (km) north-west of Lithgow in New South Wales (NSW) (refer to **Figure 1**). The town of Cullen Bullen is located approximately 3 km north-west of Invincible.

In 2015, the Manildra Group's Shoalhaven Coal purchased Invincible, and the nearby Cullen Valley Mine, to secure continued supply of a speciality coal product, known as 'nut' coal, for the Shoalhaven Starches Plant located at Bomaderry on the NSW South Coast (refer to **Figure 1**). More recently, Shoalhaven Coal was purchased in November 2021 via a 100% share transaction by an all-Australian locally based ownership team which is primarily focussing on supply of coal to the power stations and domestic markets in NSW. The Invincible Colliery has a long history of mining, with operations dating back to 1901. Open cut mining has been carried out at Invincible at various times ranging from the 1940s through to the mine being placed into care and maintenance in 2013 when the available coal within the approved mining area was exhausted. The existing operations are shown in **Figure 2**.

During 2016, Shoalhaven Coal sought to modify the Invincible Project Approval (PA) 07_0127 (Mod 5) to extend open cut mining operations to the south of the existing approved mining area (the Project). The modification was approved by the Planning Assessment Commission (PAC) on 2 February 2018. The Project Approval permits mining operations to be carried out until 31 December 2025. Castlereagh Coal intends to recommence open cut coal mining operations at Invincible in Q2 / Q3 2023. The Project Approval (Mod 5) for the Project includes:

- Extending the period in which mining can continue for a period of 8 years from approval of the modification application;
- Extending the open cut mining area to mine down to, and including, the Lithgow Seam to the south of the existing mine in the SEA;
- Up to 1.2 Million tonnes per annum (Mtpa) of product coal to be extracted or transported from the site;
- Hours of operation for mining operations in daytime (i.e. 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sunday and public holidays) with coal transport and processing operations undertaken to 10.00 pm and maintenance activities any time;
- Product coal transport arrangements (with coal to be transported from the site by road truck to either Mount Piper Power Station or other domestic destinations);
- Use of existing open cut voids and former underground workings for temporary water storage;
- Continued use of existing Invincible infrastructure (including maintenance work, and minor upgrades and operation of the existing Coal Preparation Plant); and
- Rehabilitation of the proposed Southern Extension Area (SEA) and all existing disturbance areas at Invincible by reshaping mining areas to remove voids and revegetating the reshaped landform with locally endemic woodland and forest communities.



Legend

- | | | | |
|---|---|---|---------------|
|  | Existing Approved Mining Disturbance Area |  | State Forests |
|  | Invincible Project Approval Boundary |  | NPWS Estates |
|  | Southern Extension Area | | |
|  | Mining Restriction Area | | |

Coordinate System: MGA Zone 56 (GDA 94)

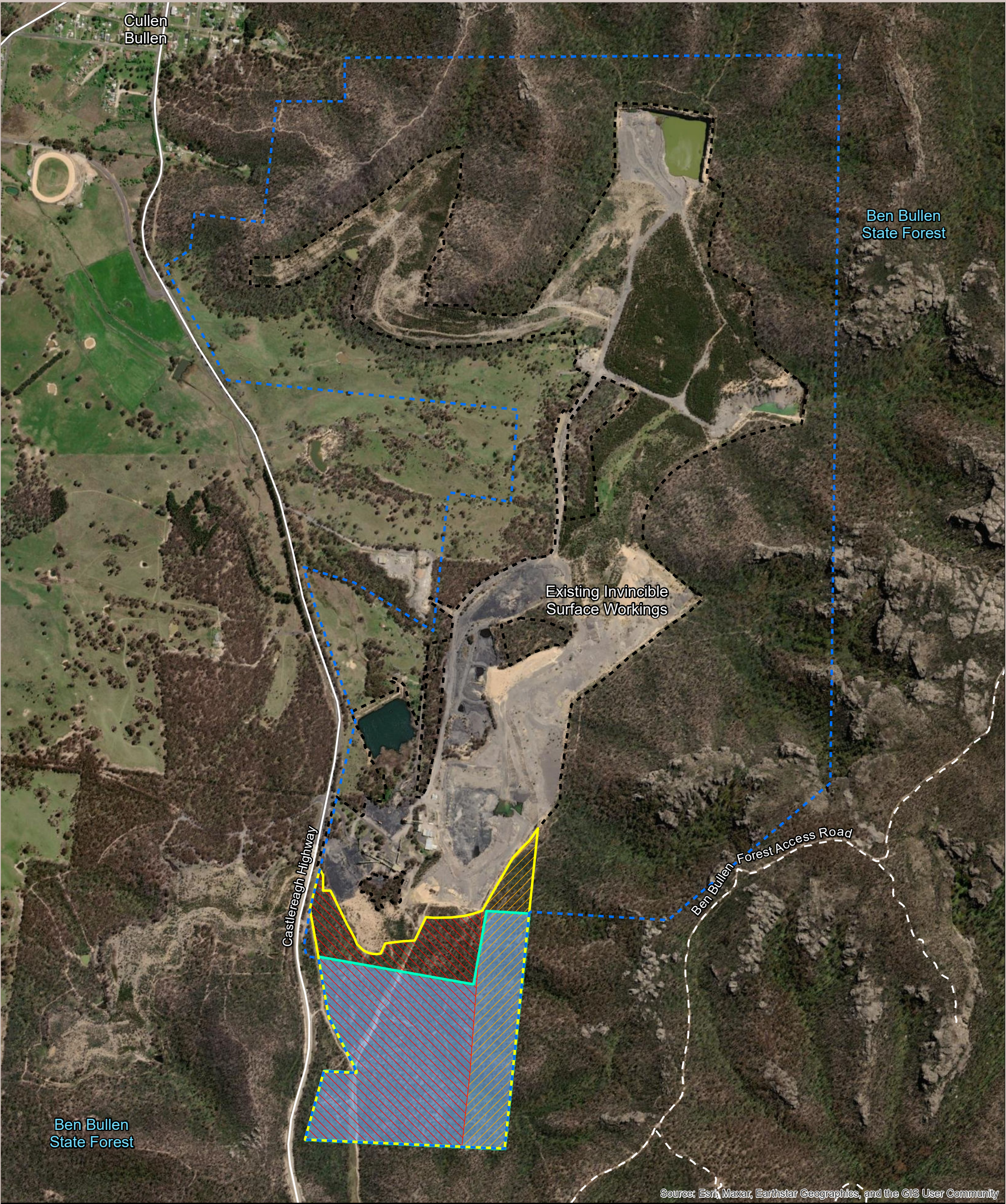


Data Source:
Umwelt 2018



Figure 1. Locality Plan





- Legend**
- Existing Approved Mining Disturbance Area
 - Approved Southern Extension Area
 - Southern Extension Area
 - Mining Restriction Area
 - Invincible Project Approval Boundary
 - MLA 1844

Coordinate System: MGA Zone 56 (GDA 94)

Data Source:
Umwelt 2018



Figure 2. Invincible Southern Extension Project

0 0.5 km

1.2 Location and Description of the Southern Extension Area

The SEA is located within the South-Eastern Highlands Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Capertee IBRA subregion, approximately 20 km north-west of Lithgow, NSW. The SEA is located directly to the south of the existing Invincible Colliery (see **Figure 2**). The approved Invincible disturbance footprint is approximately 165 ha in area and the SEA covers an additional approximately 50 ha. Both the existing Invincible Disturbance Area and the approved SEA are shown on **Figure 2**.

The topography surrounding the SEA is generally characterised by steep forested slopes and escarpments within the Ben Bullen State Forest to the north, east and south and the Castlereagh Highway to the west. Elevations within the SEA range from approximately 912 m AHD in the south to 997 m AHD in the east.

The SEA lies entirely within the upper catchment of Cullen Creek. Cullen Creek is an ephemeral stream that rises in the steep hills of the Ben Bullen Range. It flows in a north-westerly direction before joining Dulhuntys Creek approximately 4 km downstream of Invincible Colliery, which in turn joins Williwa Creek before discharging into the Turon River. The confluence with the Turon River is approximately 25 km downstream of the SEA.

A range of mitigation and offset measures have been developed to mitigate the potential impacts of the Project on biodiversity, most significant of those being the establishment of three Biodiversity Offset Areas; Lot 112 DP 877190, Renown Farm (Lot 1 DP 180294) and Lot 113 DP 877190 (referred to as the existing Biodiversity Offset Areas), as well as a property known as Hillcroft (hereafter referred to as the Hillcroft Offset Site). All four of these proposed offset areas are collectively referred to as the Biodiversity Offset Areas in this Biodiversity Management Plan (BMP). Castlereagh Coal will also secure biodiversity credits to meet residual offset requirements of PA 07_0127 (Mod 5).

Other mitigation measures include the development of a Translocation Plan for *Bursaria spinosa*, and ongoing monitoring and management of the Biodiversity Offset Areas to further enhance their biodiversity value in the long term.

1.3 Document Purpose and Objectives

The purpose of this BMP is to describe the biodiversity management strategies, procedures, controls and monitoring programs to be implemented to manage the potential biodiversity impacts associated with the operation of Invincible, with particular focus on the SEA and the Biodiversity Offset Areas. This includes the identification of land disturbance management controls to minimise impacts to biodiversity in the Existing Approved Mining Disturbance Area as well as monitoring and management of the Biodiversity Offset Areas and the provision of a Translocation Plan for *Bursaria spinosa*.

This BMP addresses the relevant requirements of the Project Approval (Mod 5) and relevant Environmental Assessment commitments, and comments from OEH on the draft BMP prepared by Umwelt (2018), from Department of Planning and Environment (DPE) in 2022, and from Biodiversity and Conservation Division, DPE (BCD) in 2023.

1.4 Document Structure and Regulatory Compliance

This BMP contains the following chapters and Appendices:

- **Chapter 2.0** – Existing Biodiversity Values;
- **Chapter 3.0** – Invincible Colliery Biodiversity Management Measures;
- **Chapter 4.0** – Biodiversity Offset Areas Management Measures;
- **Chapter 4.0**–Biodiversity Offset Areas Monitoring Program
- **Chapter 5.0** –Communication and Reporting;

- **Chapter 5.11** – References;
- **Chapter 7.0** – Abbreviations;
- **Appendix A** – Translocation Plan for *Bursaria spinosa*;
- **Appendix B** – Performance Measures and Completion Criteria;
- **Appendix C** – Southern Extension Area Flora and Fauna Species Lists;
- **Appendix D** – Records of Correspondence with DPE and the BCD; and
- **Appendix E** – Biobanking Report.

Table 1 below outlines the relevant Project Approval conditions and where they have been addressed within this BMP.

Table 1 Relevant Conditions of PA 07_0127 (Mod 5)

Condition	Description	Section/s Addressed													
Schedule 3 – Specific Environmental Conditions															
Biodiversity Offset Strategy															
29	The Proponent must implement the biodiversity offset strategy for the project, as summarised in Table 8 and shown in Appendix 5: <i>Table 8: Biodiversity Offset Strategy</i> <table> <tr> <th>ID</th><th>Offset Area</th><th>Minimum Size(ha)</th></tr> <tr> <td>1</td><td>Lot 112, DP 877190</td><td rowspan="3">114.5</td></tr> <tr> <td>2</td><td>"Renown Farm" (Lot 1, DP 180294)</td></tr> <tr> <td>3</td><td>Lot 113, DP 877190</td></tr> <tr> <td>4</td><td>Hillcroft Offset Site</td><td>NA</td></tr> </table>	ID	Offset Area	Minimum Size(ha)	1	Lot 112, DP 877190	114.5	2	"Renown Farm" (Lot 1, DP 180294)	3	Lot 113, DP 877190	4	Hillcroft Offset Site	NA	Section 4.0
ID	Offset Area	Minimum Size(ha)													
1	Lot 112, DP 877190	114.5													
2	"Renown Farm" (Lot 1, DP 180294)														
3	Lot 113, DP 877190														
4	Hillcroft Offset Site	NA													
30	Within 2 years of the recommencement of mining operations, unless the Secretary agrees otherwise, the Proponent must make suitable arrangements to provide appropriate long-term security for Offset Areas 1 – 3 as identified in Table 8, to the satisfaction of the Secretary. Note: the long-term security of Offset Areas 1 – 3 may be achieved through one or a combination of the following: Deed of agreement with the Minister, rezoning the land under the Lithgow Environment Plan, caveats on the title under the Conveyancing Act 1919, or another mechanism as agreed by the Secretary.	Section 4.0													
Retirement of Credits															
31	Prior to the recommencement of mining operations, the Proponent must review and update the ecosystem and species credit requirements in Table 9 and 10 to reflect the final mine plan, in consultation with OEH and to the satisfaction of the Secretary.	Section 1.7													

Condition	Description	Section/s Addressed																						
	<i>Table 9: Ecosystem Credit Requirements</i> <table><tr><th>Biometric Vegetation Type</th><th>Code (BVT)</th><th>Code (PCT)</th><th>Credits Required</th></tr><tr><td>Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion</td><td>CW117</td><td>PCT351</td><td>542</td></tr><tr><td>Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes</td><td>CW263</td><td>PCT324</td><td>2893</td></tr></table> <i>Table 10: Species Credit Requirements</i> <table><tr><th>Species</th><th>Credits Required</th></tr><tr><td><i>Eucalyptus Cannonii</i> (Capertee Stringybark)</td><td>468</td></tr><tr><td><i>Petaurus norfolcensis</i> (Squirrel Glider)</td><td>1047</td></tr><tr><td><i>Hoplocephalus bungaroides</i> (Broad-headed Snake)</td><td>388</td></tr><tr><td><i>Paralucia spinifera</i> (Bathurst Copper Butterfly)</td><td>15</td></tr></table> Notes: 1. The review and update of ecosystem and species credits is to be undertaken in accordance with the NSW Offsets Policy for Major Projects. 2. The Ecosystem and Species Credits identified in Table 9 and 10 were calculated using the Framework for Biodiversity Assessment.	Biometric Vegetation Type	Code (BVT)	Code (PCT)	Credits Required	Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	CW117	PCT351	542	Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	CW263	PCT324	2893	Species	Credits Required	<i>Eucalyptus Cannonii</i> (Capertee Stringybark)	468	<i>Petaurus norfolcensis</i> (Squirrel Glider)	1047	<i>Hoplocephalus bungaroides</i> (Broad-headed Snake)	388	<i>Paralucia spinifera</i> (Bathurst Copper Butterfly)	15	
Biometric Vegetation Type	Code (BVT)	Code (PCT)	Credits Required																					
Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	CW117	PCT351	542																					
Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	CW263	PCT324	2893																					
Species	Credits Required																							
<i>Eucalyptus Cannonii</i> (Capertee Stringybark)	468																							
<i>Petaurus norfolcensis</i> (Squirrel Glider)	1047																							
<i>Hoplocephalus bungaroides</i> (Broad-headed Snake)	388																							
<i>Paralucia spinifera</i> (Bathurst Copper Butterfly)	15																							
32	Within 2 years of the recommencement of mining operations, unless otherwise agreed by the Secretary, the Proponent must retire the biodiversity credits of a number and class identified in the review carried out under condition 31 above. The retirement of these credits must be carried out using the Hillcroft Biobanking Site, as shown in Appendix 5. Any residual offset requirements not achieved by the retirement of Hillcroft Biobanking Site must be retired in accordance with <i>NSW Offset Policy for Major Projects</i> and can be achieved by: (a) Acquiring or retiring credits under an offset scheme developed by the NSW Government; (b) Making payments into an offset fund that has been developed by the NSW Government; or (c) Providing supplementary measures.	Section 4.4																						
Biodiversity Management Plan																								
33	Prior to recommencing mining operations, unless the Secretary agrees otherwise, the Proponent must prepare a Biodiversity Management Plan for the project to the satisfaction of the Secretary. This plan must: (a) Be prepared in consultation with OEH;	This document, Appendix D																						
	(b) Describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site;	Section 4.2																						

Condition	Description	Section/s Addressed
	(c) Establish baseline data for the existing habitat in the offset area and on the site;	Section 2.0
	(d) Describe the short, medium, and long term measures that would be implemented to: • Manage the remnant vegetation and habitat on the site; • Translocate the <i>Bursaria spinosa</i> located within the Southern Extension Area; and • Implement the biodiversity offset strategy.	Sections 3.1 Appendix A Section 4.0
	(e) Include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy, and triggering remedial action (if necessary);	Sections 5.11 and Appendix B
	(f) Include a detailed description of the measures that would be implemented to: • Enhance the quality of existing vegetation and fauna habitat in the Biodiversity Offset Areas; • Maximising salvage of resources within the approved disturbance area; • Collecting and propagating seed to be used for rehabilitation; • Minimising the impacts on fauna on site, including undertaking pre-clearance surveys; • Managing any potential conflicts between the proposed restoration works in the biodiversity areas and any Aboriginal heritage values (both cultural and archaeological); • Manage salinity; • Control weeds and feral pests; • Control erosion; • Control access; and • Manage bush fire risk.	Sections 3.0 and 4.0
	(g) Include a seasonally – based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;	Section 5.0
	(h) Include a translocation plan for the <i>Bursaria spinosa</i> that includes: • an investigation into translocation options, including rehabilitated areas of the site, and areas off site; • describes the measure that would be undertaken to translocate the species; • a detailed description of a monitoring and maintenance program.	Appendix A
	(i) Identify the potential risks to the successful implementation of the biodiversity offset strategy, and include a description of contingency measures that would be implemented to mitigate these risks;	Section 6.5
	(j) Include details of who would be responsible for monitoring, reviewing and implementing the plan.	Section 6.6
	Notes: • With the approval of the Secretary, the Biodiversity Management Plan may exclude offset areas secured under a Biobanking Agreement	

Condition	Description	Section/s Addressed
	The Biodiversity Management Plan and rehabilitation Management Plan need to be substantially integrated for achieving biodiversity objectives for the rehabilitated mine site	
34	The Biodiversity Management Plan approved by the Secretary must be implemented.	Section 6.6
Conservation Bond		
35	Within 6 months of the approval the Biodiversity and Rehabilitation Management Plan, the Proponent must lodge a conservation bond with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria described in the Biodiversity Management Plan. The sum of the bond shall be determined by: (a) Calculating the full cost of implementing the biodiversity offset strategy (other than land acquisition costs); and (b) Employing a suitably qualified quantity surveyor, whose appointment has been endorsed by the Secretary, to verify the calculated costs. If the biodiversity offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Secretary will release the bond. If the offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Secretary will call in all, or part of, the conservation bond, and arrange for the satisfactory completion of the relevant works.	Section 4.5
	Note: - Alternative funding arrangements for long term management of biodiversity offset strategy, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate can be used to reduce the liability of the conservation and biodiversity bond. - The sum of the bond may be reviewed in conjunction with any revision to the biodiversity offset strategy.	
Schedule 5 – Environmental Management, Reporting and Auditing		
Management Plan Requirements		
3	The proponent must ensure that the management plans under this approval are prepared in accordance with any relevant guidelines, and include: a) detailed baseline data; b) a description of: - the relevant statutory requirements (including and relevant approval, licence or lease conditions); - any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; c) a description of the measures that would be implemented to comply with	Section 2.0 Section 1.0 Section 5.11 Section 5.11 Sections 4 &

Condition	Description	Section/s Addressed
	the relevant statutory requirements, limits, or performance measures/criteria; d) a program to monitor and report on the: - impacts of environmental performance of the project; - effectiveness of any management measures (see c above); e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; f) a program to investigate and implement ways to improve the environmental performance of the project over time; g) a protocol for managing and reporting any: - Incidents; - Complaints; - Non-compliances with statutory requirements; and - Exceedances of the impact assessment criteria and/or performance criteria; and a protocol for periodic review of the plan.	5.0 Sections 5.0 and 6.0 Section 6.5 Sections 6.4 Section 5.11 Section 5.11 Section 5.11
5	Within 3 months of: - The submission of an annual review under condition 4 above; - The submission of an incident report under condition 7 below; - The submission of an audit report under condition 9 below; or - Any modification to the conditions of this approval, (unless the conditions require otherwise), the Proponent must review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review, unless the Secretary agrees otherwise, the revised document must be submitted to the Secretary for approval. Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.	Section 5.11
6	To ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project, the Proponent may submit revised strategies, plans or programs required under this approval at any time. With the agreement of the Secretary, the Proponent may also submit any strategy, plan or program required by this consent on a staged basis.	Section 5.11
7	The Secretary may approve a revised strategy, plan or program required under this consent, or the staged submission of any of these documents, at any time. With the agreement of the Secretary, the Proponent may prepare the revised or staged strategy, plan or program without undertaking consultation with all parties nominated under the applicable condition in this consent.	Section 5.11
9	The Proponent must immediately notify the Secretary and any other relevant agencies of any incident. Within 7 days of the date of the incident, the Proponent must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	Section 6.1

Condition	Description	Section/s Addressed
10	The Proponent must provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval.	Section 6.1

In accordance with Condition 2 Schedule 2 of the Project Approval (Mod 5), the mine must be developed and operated generally in accordance with the environmental impact assessment reports prepared for the development and subsequent modifications. Table 2 summarises the safeguards and management controls relating to biodiversity and rehabilitation management that have been identified in the Environmental Assessment reports prepared for Project Approval (Mod 5).

Table 2 Relevant Environmental Assessment Biodiversity and Rehabilitation Commitments

Reference	Description	Section/s Addressed
Environmental Assessment (Umwelt 2016)	Section 7.3 Biodiversity Castlereagh Coal will implement the following measures to minimise the potential impacts on the biodiversity of the Modification area and the locality: (a) Update the existing Landscape Management Plan in accordance with the requirements of the modified Invincible Project Approval (Mod 5) to minimise impacts on biodiversity values;	This Plan
	(b) Surveying and marking the boundaries of the areas of disturbance on the ground prior to any vegetation clearing;	Section 3.1.1
	(c) A robust tree felling procedure will be implemented to minimise the potential for impacts on native fauna species (focusing on threatened species) as a result of the clearing of hollow-bearing trees. The tree felling procedure is designed to minimise impacts to hollow-dependent fauna, particularly the squirrel glider and hollow-dependent micro-bats;	Section 3.1.3
	(d) Tree hollows felled during clearing will either be stockpiled for use as habitat in rehabilitation areas or relocated to areas within the Biodiversity Offset Areas which will not be disturbed by the project;	Sections 3.1.5
	(e) Felled trees and branches will be stockpiled for use in stabilising slopes and for habitat in the rehabilitated landform. Some trees and branches may be mulched for use in soil amelioration and stabilisation; and	Section 3.1.5
	(f) Targeted weed management measures including regular weed inspections and weed control and eradication techniques such as herbicides, physical removal and prompt revegetation of bare areas	Section 3.2.2
	(g) erosion and sedimentation control in accordance with management procedures for the Southern Extension Project as defined in Invincible Colliery Water Management Plan (WMP) (Shoalhaven Coal, 2018b)	Section 3.2.4
	(h) employee education and training including inductions for staff, contractors and visitors to the site will be conducted to inform personnel of the biodiversity issues present at the site and so they know their role and responsibilities in relation to the protection and/or minimisation of impacts to native biodiversity	Section 3.2.7

Reference	Description	Section/s Addressed
	(i) areas of biodiversity value outside the Southern Extension Area will be fenced or signposted, where appropriate, to prevent any unnecessary disturbance during mining.	Section 3.1.1
	Castlereagh Coal will undertake the following management measures to minimise the potential impacts and spread of weeds during the Southern Extension Project: (a) the limits of ground disturbance will be clearly demarcated and no unnecessary disturbance will be undertaken outside of these areas (b) rehabilitation will be undertaken on disturbed areas as soon as practical following disturbance. This may include resspreading of topsoil, seeding and/or planting of natives (c) regular inspections will be undertaken in the Southern Extension Area and adjacent areas to monitor the spread of weed species (d) training of environmental personnel on the identification of target weed species.	Section 3.1 Section 3.2.9 Section 3.2.2 Section 3.2.2
	Castlereagh Coal will control and eradicate any outbreak of noxious weeds as required under the Biosecurity Act 2015, and as required by the Local Land Services and other relevant authorities. Weed control and eradication techniques may include: (a) spraying with herbicides (b) physical removal e.g. chipping (c) minimisation of area available for weed infestation, through prompt revegetation of bare areas.	Section 3.2.2
	Castlereagh Coal will monitor the presence of pest species and additional pest control measures will be implemented in consultation with the appropriate government agency or controlling authority as required.	Section 5.8 and 5.9

1.5 Guidelines and Policies

This BMP has been prepared in accordance with the Draft DPE Environmental Management Plan Guidelines (DPE, 2017).

Guidelines relevant to the management of bushfire hazard on site include:

- *Bush Fire Environmental Assessment Code for New South Wales* (NSW Rural Fire Service, 2006a);
- *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* (NSW Rural Fire Service, 2006b); and
- *Guidelines for Ecologically Sustainable Fire Management* (NPWS, 2004).

Guidelines relevant to the translocation of *Bursaria spinosa* include:

- *Australian Network for Plant Conservation Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al, 2004).

1.6 Regulatory Consultation

In accordance with Condition 33 Schedule 3 of the Project Approval, this BMP has been prepared in consultation with the BCD and with DPE. Records of consultation with regulatory agencies are included as **Appendix D**.

1.7 Biodiversity Credit Obligation

The Invincible Colliery Southern Extension Project requires the implementation of a Biodiversity Offset Strategy to retire ecosystem credits and species credits (Condition 29 of Schedule 3, PA 07_0127 (Mod 5)). The number of ecosystem and species credits required were identified in Table 9 and Table 10 of the Consent.

Condition 31 PA 07_0127 (Mod 5) provided for the identified credit requirements to be updated based on the final mine plan and is reproduced verbatim in italics below:

Prior to the recommencement of mining operations, the Proponent must review and update the ecosystem and species credit requirements in Table 9 and 10 to reflect the final mine plan in consultation with OEH and to the satisfaction of the Secretary.

The originally EIS proposed mine plan has been amended (reduced in area) to exclude an area known as the Mining Restriction Area from the development area (see **Figure 2**), resulting in a reduced credit liability to that identified in the conditions of PA 07_0127 (Mod 5). A comparison of the original and revised development footprint and updated credit liability based on the reduction in area of the development footprint is shown in **Table 3** below.

Table 3 Comparison of Original and Revised Development Footprint and Credit Liability

	Original Development Footprint		Revised Development Footprint	
	Area of habitat/Number individuals	Credits required	Area of habitat/Number individuals	Credits required
Vegetation Communities				
CW117	8.24	542	1.18	78
CW263	41.02	2893	35.08	2483.00
Threatened Species				
Capertee Stringybark	24	468	24	468
Squirrel Glider	47.61	1047	35.02	770
Broad-headed Snake	11.76	388	5.06	167
Bathurst copper butterfly		15	0.2	15

An earlier version of this BMP was prepared by Umwelt and submitted to the (then) OEH in November 2018, which identified the development footprint and the number of ecosystem credits and species credits required to be retired as identified by the BioBanking Calculator. These correspond to the credits identified for the 'revised development footprint' in **Table 3**.

The OEH provided comments on the draft BMP prepared by Umwelt and requested that justification be provided for the amended ecosystem and species credit requirements, and this has been provided in **Table 3**. The OEH further requested that the amended development footprint shapefile and species polygons be provided and that the Southern Extension Project be submitted in the BioBanking Calculator in order to allow OEH to review the information.

The original data prepared by Umwelt for the draft BMP is not available, and therefore in order to provide the amended development footprint and species polygon shapefiles to the current DPE, Cumberland Ecology has digitised the species polygons previously prepared by Umwelt. The digitising process is not 100% accurate as it relies on manual tracing of existing images, however these are broadly comparable to the Umwelt 2018 data. Therefore, as a conservative measure, the original species polygon areas previously provided by Umwelt have been used in the BioBanking Calculator to calculate the final credit liability for the project. As requested by the former OEH, the digitised shapefiles for the species credit polygons for the Capertee Stringybark, the Squirrel Glider, the Broad-headed Snake and the Bathurst copper butterfly have been submitted to the DPE to enable them to assess the project.

Note that the EIS and approved credit obligation for Capertee Stringybark accounts for 24 individuals of the species. A map in the EIS shows the location of 5 discrete areas in which the species was recorded, however it does not specify how many individuals were present in each area. A map in the previous draft BMP shows the location of 3 discrete areas in the revised development footprint where the species was recorded, however it does not specify how many individuals were present in each area. New records of 13 individuals of Capertee Stringybark have been identified based on surveys by Umwelt (see **Figure 4**), however it is unclear if the 13 new records are a sub-set of the original 24 individuals or are additional records. Due to the uncertainty regarding the numbers of Capertee Stringybark individuals in the development footprint, the credit obligation has not been revised and the original 24 individuals (as defined in the EIS and consent conditions) have been used to determine the credit liability for this species.

The area of the species polygons created by Umwelt and by Cumberland Ecology and the final credit requirement for the project is presented below in **Table 4**. As discussed above, the final credit liability for the project has been calculated using the original, larger species polygons created by Umwelt, including the original number of reported Capertee Stringybark individuals. The Southern Extension Project has been submitted in the Biobanking Calculator.

Table 4 Revised Southern Extension Biodiversity Offset Strategy as identified in Project Approval (Mod 5)

Credit Type	Species Polygon Area/Count (Cumberland Ecology)	Species Polygon Area/Count (Umwelt)	Final Credit Liability
CW117	0.90 ha	1.18 ha	78
CW263	34.58 ha	35.08 ha	2483.00
<i>Eucalyptus cannonii</i> (Capertee Stringybark)	24	24	468
<i>Petaurus norfolcensis</i> (Squirrel Glider)	33.85	35.02	770
<i>Hoplocephalus bungaroides</i> (Broad-headed Snake)	4.58	5.06	167
<i>Paralucia spinifera</i> (Bathurst Copper Butterfly)	15.00	0.2	15

Condition 32 of Schedule 3 of the Project Approval requires the following:

Within two years of the recommencement of mining operations, unless otherwise agreed upon by the Secretary, the Proponent must retire the biodiversity credits of a number and class identified in the review carried out under Condition 31. The retirement of these credits must be carried out using the Hillcroft Biobanking (Stewardship) Site, as shown in Appendix 5. Any residual offset requirements not achieved by the retirement of Hillcroft Biobanking Site must be retired in accordance with the NSW Offset Policy for Major Projects.

Residual biodiversity credits required for PA 07_0127 Mod 5 will be retired by Castlereagh Coal through establishing the Hillcroft Offset Site and payment to the Biodiversity Conservation Trust (BCT) in lieu of a land-based offsets for the Broad-headed snake. A Biodiversity Offset Strategy for the retirement of the required credits will be prepared and submitted to the BCD and DPE for approval within three months of recommencing of mining operations at Invincible. Records of consultation with BCD and DPE on this matter are included in **Appendix D**.

2.0 EXISTING BIODIVERSITY VALUES

This chapter provides details of the key ecological values in the SEA and Biodiversity Offset Areas that will be managed under the BMP. Further detail regarding the biodiversity features and values of Invincible Colliery and the Biodiversity Offset Areas (see **Figure 2**) can be found in Section 3 of the EA Biodiversity Assessment Report (BAR) (Umwelt, 2016), Part A Response to Submissions (Umwelt, 2017), and the 2017 Invincible Colliery Biodiversity Monitoring Report (Shoalhaven Coal, 2018a). A summary of the ecological features of the SEA and Biodiversity Offset Areas is included below.

2.1 Southern Extension Project Area

2.1.1 Native Vegetation

The SEA is generally covered in moderate to good condition native vegetation regenerating after the summer 2019/2020 bushfires which directly impacted this area. It joins with much larger area of moderate to good condition native vegetation to the east and south associated with Ben Bullen State Forest and the Newnes Plateau State Forest similarly impacted by the 2019/2020 bushfires.

A list of all the flora species that have been recorded from the SEA by is presented in **Appendix C** (see Appendix 6 of the Environmental Assessment (Umwelt, 2016)).

Surveys of the SEA identified two Biometric Vegetation Types (BVTs) (excluding disturbed land) (refer to **Figure 4**) being:

- CW263 – Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes; and
- CW117 – Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion.

Within these communities, different zones have been identified based on the condition of the vegetation (see Appendix 6 of the Environmental Assessment (Umwelt, 2016)). CW117 occurs in one zone, while CW263 has been mapped as occurring in four zones. These communities are discussed in more detail in subsequent subsections.

No threatened ecological communities (TEC) have been recorded within the SEA.

A description of the two BVTs in the SEA is provided below.

2.1.1.1 CW263 – Inland Scribbly Gum grassy open forest

This is the dominant vegetation community within the SEA, occurring on the flats, low rises and along the small ephemeral drainage lines. A sparse canopy of mature eucalypt trees occurs throughout between 13 – 25 metres in height. Dominant canopy species include mountain gum (*Eucalyptus dalrympleana*) and inland scribbly gum (*Eucalyptus rossii*) with apple box (*Eucalyptus bridgesiana*), red stringybark (*Eucalyptus cannonii*) and narrow-leaved stringybark (*Eucalyptus sparsifolia*) also occurring. A very sparse emergent layer of tall, mature trees was also recorded in the north of the site, including narrow-leaved stringybark, inland scribbly gum and mountain gum. A very sparse to sparse midstorey of recruiting canopy species occurs between 2 to 9 metres in height. In addition, blunt leaf wattle (*Acacia obtusifolia*) and silver wattle (*Acacia dealbata*) also occur in the upper midstorey. A sparse shrub layer of low shrubs also occurs in the midstorey, ranging between 0.4 to 2 metres in height. Dominant species include box-leaf wattle (*Acacia buxifolia*), peach heath (*Lissanthe strigosa*), blunt beard-heath (*Leucopogon muticus*), prickly tea-tree (*Leucopogon juniperinum*), prickly shaggy pea (*Podolobium ilicifolium*) and hoary guinea flower (*Hibbertia obtusifolia*). The groundlayer of this community comprised two layers, an upper and lower. The upper was sparse, between 0.5 and 0.7 metres in height and comprised sub-shrubs, grasses and forbs. Dominant species included peach heath (*Lissanthe strigosa*), spinyheaded mat-rush (*Lomandra longifolia*), tussock (*Poa labillardierei*) and gorse bitter pea (*Daviesia ulicifolia*). The very sparse to mid-dense lower sub-stratum of the groundlayer was less than 0.5 metres in height and was dominated by native grasses and forbs. Namely, mat-rush (*Lomandra confertifolia*), *Poa sieberiana*, silvertop wallaby grass (*Rytidosperma pallidum*), wattle mat-rush (*Lomandra filiformis*), smooth-flower wallaby grass (*Rytidosperma pilosum*), *Austrostipa rudis* and threeawn speargrass (*Aristida vagans*). The introduced species St. John's

wort (*Hypericum perforatum*) and common centaury (*Centaureum erythraea*) were also common throughout this community.

Four zones of this community have been identified in the SEA. Floristically, these zones are all similar, however the zones have been separated as different condition classes in order to adequately depict the condition variations within the CW263 community across the site, including a small area that has been cleared for an easement.

2.1.1.2 CW117 – Brittle Gum – Broad-leaved Peppermint – Red Stringybark open forest

CW117 occupies the moderate slopes (6-9 degrees) along the eastern boundary of the SEA, occurring on shallow (almost skeletal) sandy loams. The community comprises a mature, sparse canopy between 10 and 20 metres in height. The variation in height is likely to be linked with the depth and quality of the soil. Dominant species include narrow-leaved stringybark (*Eucalyptus sparsifolia*), brittle gum (*Eucalyptus mannifera*), Sydney peppermint (*Eucalyptus piperita*) and apple box (*Eucalyptus bridgesiana*). Another species, Blaxland's stringybark (*Eucalyptus blaxlandii*) also occurs scattered through this community. The midstorey of this community comprised two distinct layers, an upper and lower. The very sparse to sparse upper sub-stratum was characterised by recruiting canopy species and ranged from 2 to 6 metres in height. In addition to the canopy species listed above, narrow-leaved geebung (*Persoonia linearis*) also occurred. The lower midstorey included a sparse layer of low shrubs, between 0.5 and 2 metres high. Dominant species included prickly shaggy pea (*Podolobium ilicifolium*), sunshine wattle (*Acacia terminalis*), narrow-leaved geebung (*Persoonia linearis*) and box-leaf wattle (*Acacia buxifolia*). A sparse groundlayer occurred throughout this community, typically less than 0.5 metres in height and comprising a mixture of grasses and forbs. Dominant species include *Poa sieberiana*, mat-rush (*Lomandra confertifolia*), silvertop wallaby grass (*Rytidosperma pallidum*), ivy goodeneia (*Goodenia hederacea* subsp. *hederacea*), silky purple-flag (*Patersonia sericea*), *Leucopogon lanceolatus* and hoary guinea flower (*Hibbertia obtusifolia*).

2.1.2 Threatened Species

The Framework for Biodiversity Assessment (FBA) methodology categorises threatened fauna species as either ecosystem-credit species or species-credit species, which are defined as:

- Ecosystem-credit species – species that can be reliably predicted to occur in Plant Community Types (PCTs) and have a high likelihood of occurring on the site; and
- Species-credit species – species that cannot be reliably predicted based on a PCT, distribution or habitat criteria. These species require targeted survey effort to determine their presence or otherwise on the site.

A total of 10 threatened species have been recorded in the SEA (see **Figure 4**). These were:

- Brown treecreeper (eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*) – listed as vulnerable under the BC Act;
- Gang-gang cockatoo (*Callocephalon fimbriatum*) – listed as vulnerable under the BC Act; and
- Scarlet robin (*Petroica boodang*) – listed as vulnerable under the BC Act;
- Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) (foraging habitat only) – listed as vulnerable under the BC Act;
- Yellow-bellied sheath-tail-bat (*Saccolaimus flaviventris*) – listed as vulnerable under the BC Act.
- Capertee stringybark (*Eucalyptus cannonii*) – listed as vulnerable under the BC Act;
- Large-eared pied bat (*Chalinolobus dwyeri*) – listed as vulnerable under the BC and EPBC Acts;
- Squirrel glider (*Petaurus norfolcensis*) – listed as vulnerable under the BC Act; and
- Bathurst copper butterfly (*Paralucia spinifera*) – listed as endangered under the BC Act and vulnerable under the EPBC Act.

Note that the location of the Bathurst copper butterfly and Eastern Bentwing-bat records from the SEA are unavailable and are not shown on **Figure 4**. The SEA contains 0.2 ha of *Bursaria spinosa* subsp. *lasiophylla*, a host plant for Bathurst copper butterfly (*Paralucia spinifera*). Due to the dependence of the Bathurst copper butterfly on *Bursaria spinosa*, it is

confidently assumed that this species would have been recorded from within the Bursaria areas, shown on **Figure 11** (refer to **Appendix A** for further information). Further discussion on these threatened species and a full fauna species list from the surveys undertaken in 2015/2016 is included in Appendix 6 of the Environmental Assessment (Umwelt, 2016).

The Broad-headed snake is a species-creditspecies that has a habitat qualifier. Although this species was not recorded during the targeted surveys within the SEA, there is a recent (2010) record of this species 1.5 km to the north-east of the SEA. In accordance with the FBA, the SEA is considered to contain appropriate summer habitat for this species. This is land within 500 m of sandstone escarpments with hollow-bearing trees, rock crevices or flat sandstone rocks on exposed cliff edges and sandstone outcroppings. The portion of the SEA within 500 m of sandstone escarpment and containing tree hollows has been mapped as potential habitat for this species and included in the FBA calculator assessment.

A list of all the fauna species that have been recorded from the SEA is presented in **Appendix C** (see Appendix 6 of the Environmental Assessment (Umwelt, 2016)).

2.1.3 Weed and Pest Species

Relatively low numbers of weed and pest species have been recorded from the SEA. The weed species identified as occurring in the SEA by the BAR are listed below:

- *Aira cupaniana* (Silvery Hairgrass);
- *Echium plantagineum* (Patterson's Curse);
- *Galenia pubescens* (Galenia);
- *Hypochaeris radicata* (Catsear);
- *Tolpis barbata* (Yellow Hawkweed);
- *Hypericum perforatum* (St. John's Wort); and
- *Plantago debilis* (Plantain).

A Weed Control Program will be developed and implemented prior to the commencement of the Project to limit the spread and colonisation of noxious and environmental weeds at Invincible Colliery, with a particular focus on rehabilitation areas. Further information regarding weed management in the SEA is provided in **Section 3.2.2** and **Section 5.8**.

The pest animal species recorded from the SEA are typical for those occurring in disturbed agricultural environments in NSW and included the following species:

- *Vulpes vulpes* (European Red Fox);
- *Felis catus* (Domestic Cat);
- *Lepus capensis* (Brown Hare);
- *Oryctolagus cuniculus* (European Rabbit); and
- *Mus musculus* (House Mouse)

A Pest Animal Control Plan will be developed by Shoalhaven Coal within one year of commencement of the Project operations and this will include provisions to monitor feral animal populations in the SEA and to initiate control measures if required. Further information regarding pest animal management in the SEA is provided in **Section 3.2.3** and **Section 5.9**.

2.2 Biodiversity Offset Areas

This section provides a summary of the biodiversity values present in the Biodiversity Offset Areas, comprising the existing Biodiversity Offset Areas (Lot 1 DP 180294 (“Renown Farm”), Lot 112 DP 87719 and Lot 113DP 877190 (see **Section 2.2.1**) and the Hillcroft Offset Site (see **Section 2.2.2**).

2.2.1 Existing Biodiversity Offset Areas

The three existing Invinible Colliery Biodiversity Offset Areas were established under the Invinible Project Approval (Mod 5). These are comprised of Lot 1 DP 180294 (“Renown Farm”), Lot 112 DP 87719, and Lot 113DP 877190 (see **Figure 3**). Although some fauna surveys and some high-level vegetation mapping has been completed, detailed surveys have not been completed within the Biodiversity Offset Areas. Detailed baseline surveys will be conducted in all the Biodiversity Offset Areas as the first stage of the Biodiversity Monitoring Program which will include detailed vegetation mapping and fixed floristic and vegetation integrity plot data in accordance with the BAM (see **Section 5.0**). A summary of the currently known biodiversity values of the Biodiversity Offset Areas is presented below.

The native vegetation found within the existing Biodiversity Offset Areas comprises a mix of intact woodland along slopes and hill crests, open forest in sheltered valleys and derived native grassland on open flats historically used for agriculture. The historical land use in the existing Biodiversity Offset Areas is cattle grazing, and large areas of native woodland has been historically cleared for this use. This has resulted in the creation of large areas of derived native grassland that have been used for grazing cattle for decades. No pasture improvement has taken place and the understorey is dominated by native species, but also with some exotic pasture species. Although some areas of native canopy vegetation remain, these have all also been subject to cattle grazing and subsequent degradation through selective browsing and grazing, nutrient enrichment, trampling and subsequent localised erosion. Some bare areas are evident, comprising access tracks and also bare patches of exposed soil in the paddocks, potentially due to cattle trampling.

Despite the degradation due to historical land use, the habitats present in the existing Biodiversity Offset Areas are known to support a variety of fauna groups including woodland birds, arboreal and terrestrial mammals, hollow dependant fauna, reptiles and amphibians. Several threatened fauna species have been recorded across the Biodiversity Offset Areas, and these are presented in **Table 5**. Some aquatic habitat is present in the Biodiversity Offset Areas, in the form of farm dams. The largest of these occurs in Lot 1 DP 180294 (“Renown Farm”). Another, smaller farm dam is present in Lot 112 DP 87719, and several first and second order streams according to the Strahler system of ordering streams are present in all the existing Biodiversity Offset Areas. These are ephemeral streams and would be dry for the majority of the year, flowing only following sufficient rainfall. The aquatic habitats in the farm dams are likely to support a range of amphibians, native fish and crustaceans, as well as water birds.

Based on the environments present in the Biodiversity Offset Areas, the pest animal species likely to occur would be those typical for disturbed agricultural environments in NSW and would likely include species recorded from the SEA such as the European Red Fox, European Rabbit and the Domestic Cat. Similarly, the weed species likely to occur in the Biodiversity Offset Areas would likely include exotic pasture grasses and generalist weeds typically occurring in agricultural environments such as Patterson’s Curse.

More detailed surveys will be conducted during the baseline surveys for the Biodiversity Monitoring Program, which will quantify the biodiversity values and threats such as weeds and pest animals present in these areas.

Table 5 lists the threatened species recorded and the vegetation communities that are present in each of the existing Biodiversity Offset Areas and their area of occupancy. The location of each threatened species record is shown in **Figure 5** as is the distribution of the vegetation communities.

Table 5 Vegetation Communities and Threatened Species Recorded from the Biodiversity Offset Areas

Biodiversity Offset Area	Vegetation Communities	Threatened Fauna Species
Lot 1 DP 180294 ("Renown Farm")	Tableland Scribbly Gum – Narrow-leafed Shrubby Open Forest (MU32) Grassland	Gang-gang cockatoo (<i>Acrocephalus australis</i>)
Lot 112 DP 87719	Tableland Gully Snow Gum – Ribbon Gum Grassy Forest (MU11) Cox's Permian red Stringy Bark – Brittle Gum Woodlands (MU37) Tableland Gully Mountain Gum – Broad leaved Peppermint Grassy Forest (MU35) Grassland	Gang-gang cockatoo (<i>Acrocephalus australis</i>) Dusky wood swallow (<i>Artamus cyanopterus</i>) Varied sittella (<i>Daphoenositta chrysoptera</i>) Greater glider (<i>Petauroides volans</i>) Squirrel glider (<i>Petaurus norfolcensis</i>) Large-eared pied bat (<i>Chalinolobus dwyeri</i>) Eastern bentwing-bat (<i>Miniopterus orianae oceanensis</i>) Greater broad-nosed bat (<i>Scoteanax rueppellii</i>)
Lot 113 DP 877190	Tableland Gully Mountain Gum – Broad leaved Peppermint Grassy Forest (MU35) Cox's Permian red Stringy Bark – Brittle Gum Woodlands (MU37) Tableland Scribbly Gum – Narrow-leafed Shrubby Open Forest (MU32) Grassland	Gang-gang cockatoo (<i>Acrocephalus australis</i>) Squirrel glider (<i>Petaurus norfolcensis</i>)

2.2.2 Hillcroft Offset Site

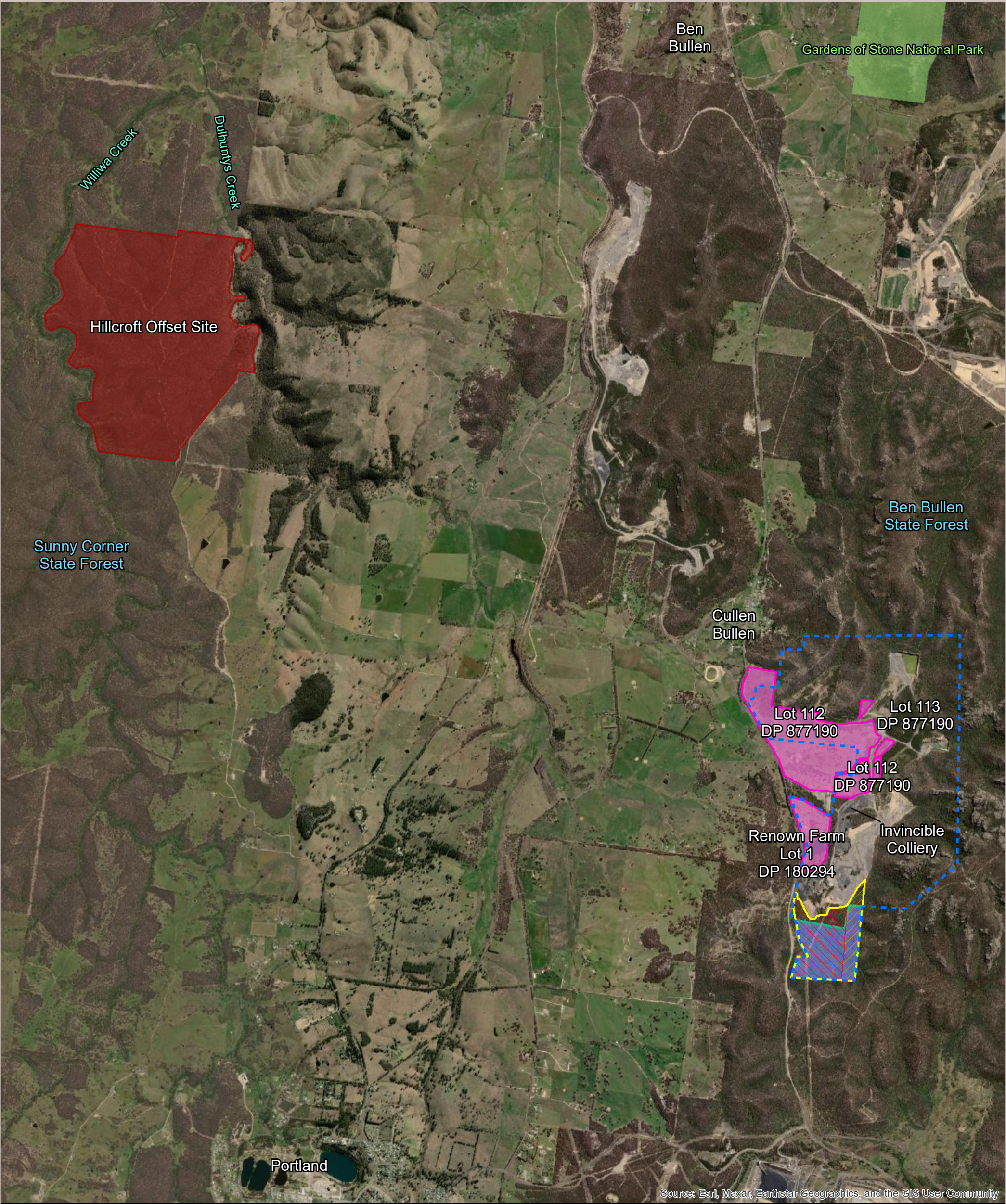
The Hillcroft Offset Site is approximately 372 ha in area and located approximately 5 km north west of the SEA (see **Figure 3**). The native vegetation of the Hillcroft Offset Site consists entirely of intact open forest communities occurring on undulating hills, sheltered gullies and occasional steep slopes. The Hillcroft Offset Site is located directly adjacent to Sunny Corner State Forest (see **Figure 3**), and together forms a large contiguous area of habitat for native species. The habitats present are known to support a variety of fauna groups including woodland birds, arboreal and terrestrial mammals, hollow dependant fauna, reptiles and amphibians. One sixth order stream is present in the Hillcroft Offset Site, Williwa Creek.

Two threatened species have been recorded in the Hillcroft Offset Site, being the Squirrel glider *Petaurus norfolcensis* listed as vulnerable under the EPBC Act and Capertee stringybark (*Eucalyptus cannonii*) listed as vulnerable under the BC Act (see **Figure 6**).

The biometric vegetation types recorded in the Hillcroft Offset Site and their areas are listed below in **Table 6** (refer to **Figure 3**). A strategy for the retirement of credits associated with the Hillcroft Offset Site will be provided to DPE within three months from the recommencement of mining operations at Invincible, as described in **Section 4.4**.

Table 6 Vegetation Communities in the Hillcroft Offset Site

Veg community	Area (ha)
CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	128.10
CW196 - Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	2.26
CW206 - Wet tussock grasslands of cold air drainage areas of the tablelands	1.89
CW263 - Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	239.90
Total	372.19



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

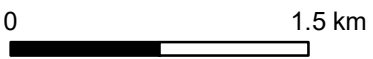
- | | | | |
|--|--------------------------------------|---|---------------------------|
|  | Invincible Project Approval Boundary |  | Existing Offsets |
|  | Approved Southern Extension Area |  | Biodiversity Offset Areas |
|  | Southern Extension Area |  | NPWS Estates |
|  | Mining Restriction Area | | |
|  | MLA 1844 | | |

Coordinate System: MGA Zone 56 (GDA 94)

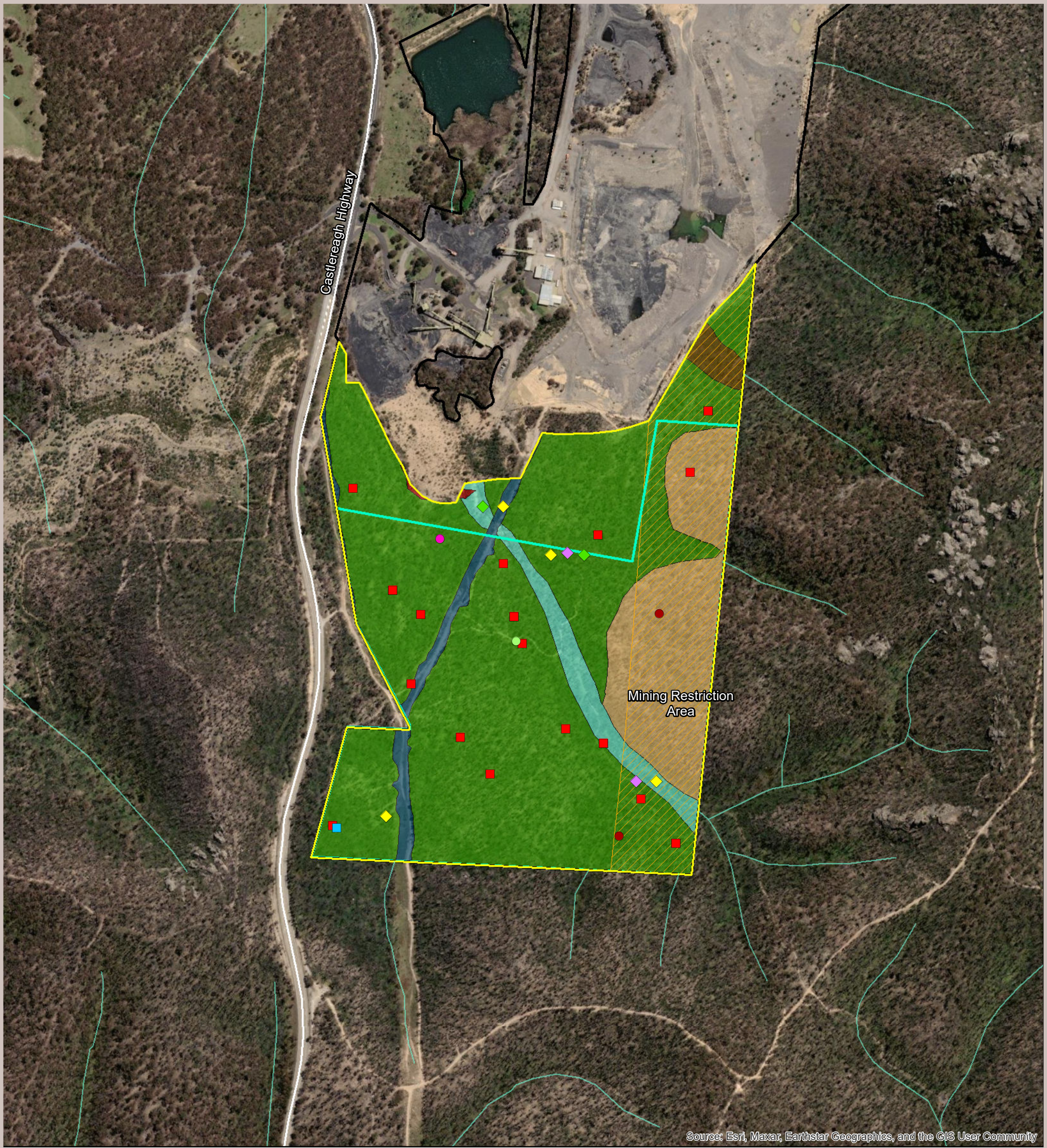
Data Source:
Umwelt 2018



Figure 3. Location of Biodiversity Offset Areas and Project Areas



I:\... \22129\Figures\RP1\20230609\Figure 3. Location of Offset Sites and Project Areas



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Figure 4. Biometric Vegetation Type Communities and Threatened Species Records in the Southern Extension Area

0 0.25 km

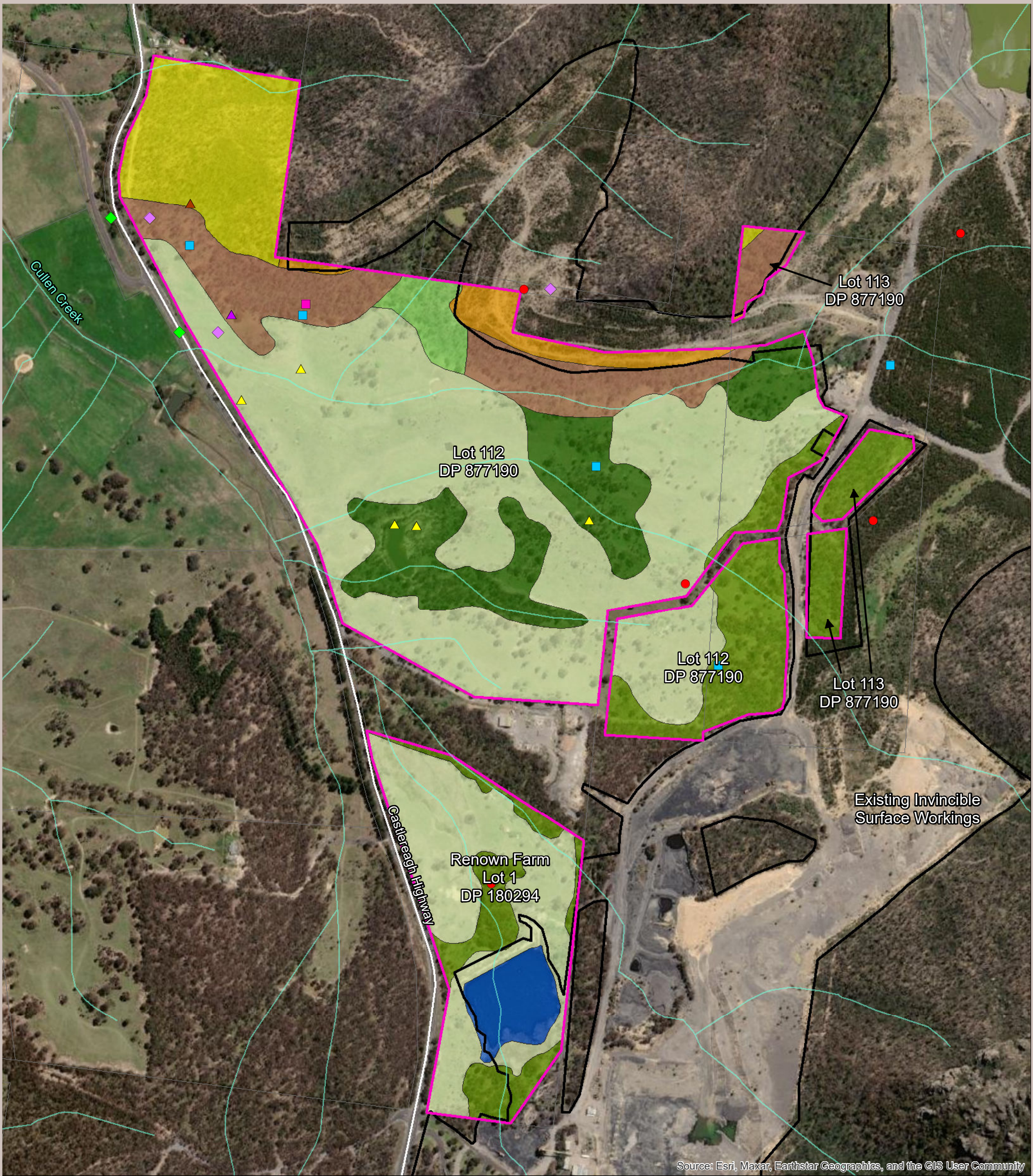
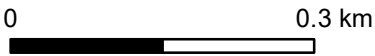
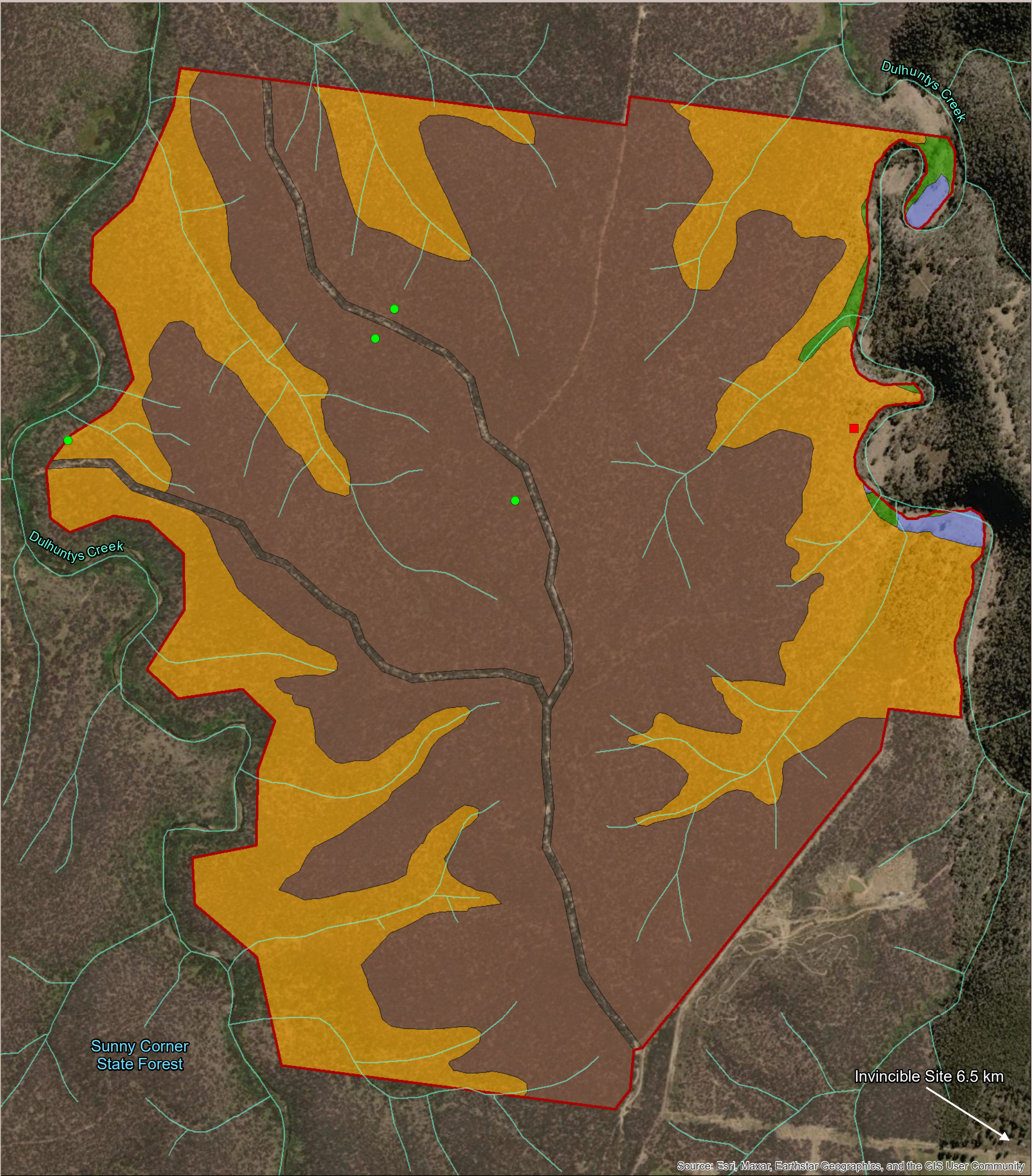


Figure 5. Existing Offset Areas Vegetation Communities and Threatened Species



I:\...122129\Figures\RP1\20220929\Figure 5. Existing Offset Vegetation Communities and Threatened Species



Legend

Hillcroft Offset Site

CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion - Mod-Good_High

CW196 - Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion - Mod-Good

CW206 - Wet tussock grasslands of cold air drainage areas of the tablelands - Mod - Good

CW263 - Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes - Mod-Good_High

Threatened Species

Squirrel Glider

Eucalyptus cannonii

Coordinate System: MGA Zone 56 (GDA 94)

Data Source: Umwelt 2018

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

cumberland ecology

0 0.35 km

Figure 6. Hillcroft Offset Site Vegetation Communities and Threatened Species

I:\... \22129\Figures\RP1\20230614\Figure 6. Hillcroft Offset Site Vegetation Communities and Threatened Species

3.0 BIODIVERSITY MANAGEMENT MEASURES

The objective of the biodiversity management strategy to be implemented at Invincible Colliery including the SEA (excluding the offset areas) will be to:

- Undertake pre-disturbance activities that minimise ecological impacts; and
- Commence rehabilitation as soon as practical behind mining activities so as to minimise the extent of disturbance on site.

Key ecological management strategies that will be implemented to limit any degradation or loss of biodiversity over the short and long term are outlined in **Table 7**. The performance and completion criteria relating to the key ecological management strategies are outlined in **Section 5.11**. Key management strategies relating to the rehabilitation of the site after mining are outlined in the Rehabilitation Management Plan (Shoalhaven Coal, 2018d).

Short term measures involve immediate actions to conserve remnant vegetation and habitat outside the approved disturbance area in their natural state to limit the loss of biodiversity or habitats within the Invincible Colliery. Short term measures will commence at the start of the Project and will be implemented for the first five years. Long term measures are those that will be undertaken after the first five and involve maintenance of remnant vegetation and habitat at Invincible Colliery and the SEA including managing weeds and pests, erosion, salinity and ongoing reporting.

Table 7 Key Short and Long Term Biodiversity Management Measures

Management or Mitigation Measure	Actions	Section(s)
Short Term Measures (0- 5 years)		
Protecting vegetation and fauna habitat outside the approved disturbance area	Demarcation of clearing limits (to be maintained for the life of the mining operations)	Section 3.1.1
Minimising the impacts on native fauna, including undertaking pre-clearance surveys and avoiding clearing activities during sensitive hibernation and breeding periods	Implementation of pre-clearance surveys and tree felling procedure prior to clearing	Section 3.1.2
	Where possible, timing clearing works outside sensitive periods for local threatened fauna	Sections 3.1.2 and 3.1.3
Ensuring minimal environmental consequences for threatened flora species, populations and habitats	Defining clearing limits	Section 3.1.1
	Pre-clearance surveys and tree felling procedures	Sections 3.1.2 and 3.1.3
	Seed collection and propagation of local flora species	Section 3.1.4
	Assisted regeneration and targeted vegetation establishment in rehabilitation areas	Section 4.3.1
Maximising the salvage of environmental resources within the approved disturbance area, including tree hollows, vegetative and soil resources, for beneficial reuse in the enhancement of site rehabilitation	Salvage of habitat features and placement within rehabilitation areas	Section 3.1.5
	Direct transfer of topsoil and associated seedbank from cleared areas	Section 3.1.6
Restoring native vegetation and fauna habitat in the rehabilitation areas through targeted vegetation	Rehabilitation of former mine areas	Section 3.2.9

Management or Mitigation Measure	Actions	Section(s)
establishment and the introduction of fauna habitat features		
	Salvage and placement of habitat features in rehabilitated areas	Section 3.1.5
Collecting and propagating seed	Direct transfer of topsoil and brush matting	Section 3.1.6
	Seed collection and propagation of local native and threatened species	Section 3.1.4
Controlling weeds and feral pests	Annual inspections with implementation of control programs as required	Sections 3.2.2 and 3.2.3
	Targeted weed control activities within rehabilitation areas	Sections 3.2.2
	Weed and feral pest control (if necessary)	Sections 3.2.2 and 3.2.3
Controlling erosion	Continued erosion and sediment control in accordance with the Invincible Water Management Plan (Shoalhaven Coal, 2018b)	Section 3.2.4
Long Term Measures (5 years until end of mine life)		
Protecting vegetation and fauna habitat outside the approved disturbance area (where required)	Demarcation of clearing limits to be maintained for the mine life	Section 3.1.1
	Fencing of revegetation areas to be installed and maintained for the mine life	Section 3.1.1
Controlling weeds and feral pests	Annual inspections with implementation of control programs as required	Section 3.2.2
	Targeted weed control activities within rehabilitation areas	Section 3.2.2
	Weed and feral pest control (if necessary)	Section 3.2.3
Controlling erosion	Inspection and maintenance of erosion and sediment controls in accordance with the Invincible Water Management Plan	Section 3.2.4
Controlling salinity	Inspection and maintenance of surface water management structures and drainage lines in accordance with the Invincible Colliery Water Management Plan (Shoalhaven Coal, 2018b)	Section 3.2.5
Reporting	Biodiversity Management Plan Annual Report	Section 5.11

3.1 Land Disturbance Management Controls

The following measures apply to works associated with land clearing and ground-disturbance at Invincible Colliery.

3.1.1 Defining Limits of Clearing

The limits of clearing for each stage of clearing works will be marked by high visibility tape that will be installed prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal, disturbance must be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

The person/s responsible for the clearing activities will be responsible for ensuring that the boundary markers, barriers and signs are installed to enable the suitable environmental and technical inspections of the proposed disturbance to be undertaken. Site inductions are to be given to ensure all site workers and visitors are aware of any sensitive vegetation. A ground disturbance permit must be completed prior to any clearing being undertaken.

3.1.2 Pre-clearance Surveys

Pre-clearing surveys will be undertaken by a suitably qualified and experienced person, no more than 2 weeks prior to felling. This will include marking of hollow-bearing trees, as well as any other notable features such as fallen timber, hollow logs or boulders suitable for salvage; active nests, dreys or dens requiring consideration; and seed-bearing trees for salvage.

3.1.3 Tree Felling Procedure

A tree felling procedure will be implemented at Invincible Colliery to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees. A suitably experienced person must be present during the clearance and is to direct the clearing (following any recommendations from pre-clearance surveys (**Section 3.1.2**)) to allow fauna to safely vacate the area. Any captured fauna species will be relocated to fauna release sites, taken to the vet clinic or wires representative if injured.

The tree felling will be undertaken no longer than two weeks following the pre-clearance survey and in accordance with the following 'two-stage' clearing procedure:

Stage One:

- Clearing of non-habitat trees and understorey vegetation within two weeks of the pre-clearance survey. Removal of non-habitat vegetation encourages hollow-dependent fauna to vacate clearing areas prior to the clearing of habitat trees, reducing the likelihood of fauna mortality during clearing.
- Habitat trees must be left standing for at least one night after clearing non-habitat vegetation to allow any fauna the opportunity to remove themselves following site disturbance.
- Felled trees and branches will be stockpiled for use in stabilising slopes and for habitat in the rehabilitated landform. Some trees and branches may be mulched for use in soil amelioration and stabilisation.

Stage Two:

- Visual canopy inspection of all trees to be removed on the day of clearing by suitably experienced and licensed person, to ensure that fauna is not injured during tree felling operations on the day of clearing.
- Detailed hollow-bearing tree felling procedures, including (but not limited to):
 - Supervision of all hollow-bearing tree felling works by a suitably experienced and licensed person, such as an ecologist. If an ecological issue (e.g. injured fauna, threatened species) is encountered, this person is to assess the circumstances and advise on the most appropriate measures to ensure minimal impact on fauna species. This will be assessed on a case by case basis and the advice of this person will be implemented by Invincible Colliery.
 - visual canopy inspection on the day of the felling of hollow-bearing trees for fauna species and active nests.

- shaking of hollow-bearing tree (with heavy machinery) for at least 30 seconds to encourage resident fauna to abandon tree, prior to felling.
- lowering of hollow-bearing trees as gently as possible with heavy machinery.
- inspection of all hollows in felled trees.
- capture of any displaced/injured fauna. Any injured fauna will be taken to a wildlife carer or vet.
- release of unharmed fauna into nearby secure habitats.
- felled trees to be rolled so that the number of hollows blocked against the ground are minimised.
- all felled trees to remain in place overnight to allow any unidentified fauna to escape.
- salvage of suitable hollows (i.e. hollows of appropriate size and structural integrity and that can be salvaged safely) for treatment and installation within rehabilitation and revegetation areas as compensatory habitat.

In the event that fauna are located within habitat trees during pre-clearance surveys or tree felling, no works will be undertaken within 5 m of the identified tree until alternative felling strategies are explored under direction of the supervising ecologist.

3.1.4 Seed Collection and Propagation

The primary seed source utilised for mine rehabilitation will be the direct transfer of topsoil and brush-matting. Propagation of locally sourced seed and plant material will also be used for supplementing revegetation. To this end, Castlereagh Coal will implement a seed collection and propagation procedure in order to use local provenance species in rehabilitation. Seed from the site will be collected prior to or during clearing, or from within adjacent Biodiversity Offset Areas, in consultation with an ecologist to ensure that the values of the offset areas are protected.

Locally sourced seed will be used in rehabilitation on site where possible using brush-matting techniques. When local seed cannot be sourced due to prevailing environmental conditions, other seed sources will be utilised to ensure that degraded areas are rehabilitated following final landform shaping.

3.1.5 Salvage of Habitat Features

Where feasible, the salvage and relocation of hollow logs, fallen timber and boulders will be undertaken to augment habitat complexity within areas to be rehabilitated. The purpose of this will be to increase habitat complexity in these areas, to make them more habitable for native species, particularly threatened fauna species.

Habitat features suitable for salvage will be identified and marked in the field as part of pre-clearance surveys, and the number and type of each item will be recorded in the pre-clearance survey report. It is intended that any salvaged hollow bearing trees will either be incorporated in the final landform as ground level habitat or will have suitable hollow sections removed and attached to trees. The procedure for salvaging and reinstating habitat features is as follows:

- Hollow bearing trees will be considered for salvage based on structural integrity, number and size of hollows. Hollows to be salvaged will include a range of diameter sizes. Ideally, hollows should be in trunks or solid living branches to maximise the chance that they would survive the felling process;
- Woody ground debris will be selected based on size, structural integrity and presence of good hollows. Larger logs (in both length and girth) will be typically selected with large hollows (i.e. large diameter hollows through the length of the stem or at least a significant portion) through the stems; and
- Bush rock and boulders will be selected based on size, structural integrity and provision of habitat. Larger rocks and boulders will typically be selected to provide habitat for fauna species.

The salvaged habitat features will be moved to a rehabilitation area or Biodiversity Offset Area as soon as possible after clearing to maintain habitat connectivity between cleared areas and remnant bushland. This will provide for the continuation of runways and refuge sites for native fauna for the duration of clearing works.

3.1.6 Topsoil Management

A key method for rehabilitation works involves the transfer of topsoil and brush material obtained directly from cleared strips prior to their excavation onto rehabilitation areas. This material will be utilised as a seed source, mulch, erosion control, and will provide some habitat for fauna. The direct return of topsoil and brush matting is the primary method employed for revegetation of native vegetation.

Topsoil extracted during the clearing process will be managed in accordance with the topsoil management measures outlined below in order to preserve topsoil quality and enhance rehabilitation outcomes:

- Where possible, topsoil will be stripped when moist to help maintain viability and to reduce dust generation;
- Where practical, topsoil will be direct-returned to reshaped areas within Invincible Colliery which are available for revegetation;
- Topsoil stockpiles are to be located away from mining, traffic areas and watercourses and positioned within the perimeter of the closed water management system;
- Topsoil stockpiles will be located within the Invincible Colliery disturbance area and not within offset areas adjacent to the mine;
- Level or gently sloping areas will be selected as stockpiles sites to minimise erosion and potential soil loss;
- Silt fences will be established clear of drainage lines and will be installed at the base of stockpiles to prevent soil loss to the surrounding area;
- Stockpiles will be generally less than 3 metres high and will be set out in windrows to maximise surface exposure and biological activity;
- Stockpiles to be kept longer than 3 months (i.e. approximately how long it will take to establish a stable vegetative cover) will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species;
- Weed growth in topsoil stockpiles will be inspected on a monthly basis and controlled either by removing by hand or spraying if large areas (i.e. >40 m²) are observed; and
- Prior to re-spreading, weed growth will be scalped from the top of the stockpiles to minimise the transport of weeds into rehabilitated areas.

3.2 Operational Controls

3.2.1 Controlling Access and Traffic

Measures to be implemented to minimise unauthorised access to the site will include the following:

- The extraction area will be fenced where appropriate and vehicular access to the extraction area will be restricted to authorised vehicles only;
- Existing mine site boundary fencing will be maintained; and

- The entrance gate to the site will be locked at night to prevent access during non-operational periods. Onsite vehicular movements will be speed limited and will be indicated through the presence of signage installed on haul roads and access roads to minimise fauna injury/road kills.

3.2.2 Weed Management

Consistent with the Project Approval (Mod 5), an effective Weed Control Program will be developed and implemented prior to the commencement of the Project to limit the spread and colonisation of environmental weeds at Invincible Colliery, with a particular focus on rehabilitation areas. The Weed Control Program will identify what weeds are currently present, what controls will be put in place if an infestation is identified, and will identify appropriate targets for weed cover (e.g. weed species do not comprise more than a specified percentage of any strata, or certain weed species will be eradicated). **Section 4.3.4** provides details of the Weed Control Program that will be developed for the Biodiversity Offset Areas.

In general, the weed control program at Invincible Colliery will include:

- Annual inspections with a focus on mine rehabilitation areas to:
 - identify and map density and extent of weed infestations including noting areas where weeds contiguously cover an area of greater than 5 m by 5 m (25 m²); and
 - conduct general observations of the presence of weeds including drainage lines and closed water management system; and
 - assess the effectiveness of the control programs and in response make any necessary modifications to drive effective management intervention when required.
- Undertake appropriate, targeted weed control activities (including minimum disturbance techniques such as hand removal where feasible), specific to the weed species identified; and
- Annual reporting of the results of the annual inspections to assess the effectiveness of weed control programs.

The Weed Control Program will include the development and implementation of a weed eradication plan applicable to the circumstances, which may include manual removal, spot spraying or biological control. The specific method selected will consider the known locations of threatened flora and fauna species. Low impact weed management techniques such as manual removal will be used within 40 m of known threatened species records. Where required, herbicide types and application rates should be informed by the control specifications from the NSW WeedWise recommendations (DPI, 2018). To assist in reducing the requirements of weed control activities, exposed areas will be revegetated as soon as practical.

The weed control works will also consider:

- Regular contact (annual) with neighbouring property owners to attempt to eradicate weed species from the surrounding area;
- Minimisation of vegetation disturbance by reducing the number of tracks and using the same access routes;
- Minimisation of clearing and other disturbance of vegetation associated with civil works; and
- Maintenance of topsoil stockpiles to eradicate weed infestation.

3.2.3 Pest Management

A Pest Animal Control Plan will be developed by Shoalhaven Coal within one year of commencement of the Project. This will include specifications for annual pest animal monitoring, identification of pest animal species present in the SEA

and Biodiversity Offset Areas, target pest animal densities, trigger levels for management actions and appropriate control methods. The results of the annual monitoring program and any control activities conducted will be documented in the Annual Review (see **Section 6.1**) and will include recommendations for subsequent monitoring and control. Further details of the Pest Animal Control Plan to be implemented in the Biodiversity Offset Areas are provided in **Section 4.3.5**.

Feral pest management will be conducted as required based on the results of the annual pest animal monitoring results or reports from neighbours or other authorities. Experienced pest control contractors will be engaged to perform any control programs required, including baiting, trapping, warren ripping and open range shooting. Where possible, Shoalhaven Coal will work in collaboration with neighbouring land-owners to develop a strategic approach to pest management.

Monitoring of pest species populations and the effectiveness of the control program will be undertaken and reported annually as part of general biodiversity monitoring. This will include information regarding the timing of works, techniques used, data on kills or bait uptake, issues encountered, maps and data relating to the areas of impact and population estimates per species. The Biodiversity Management Plan Annual Report will include details of progress relative to identified target animal densities and recommendations and the proposed control program for subsequent years.

3.2.4 Sediment and Erosion Control

Erosion and migration of sediment from within the site into adjacent vegetation has the potential to facilitate weed invasion through the introduction of weed seeds and nutrients that favour the establishment and growth of weed species.

This potential impact will be avoided through the implementation of appropriate erosion and sediment control measures including the following:

- Stabilisation of areas of bare soil using mulch or suitable cover crop;
- Stabilisation of areas of bare soil by re-vegetating immediately with appropriate local native plants; and
- Control of sediment by installation of erosion fences around prior to commencement of earthworks to avoid potentially nutrient rich run-off entering neighbouring areas of vegetation.

Erosion control and sedimentation will be managed in accordance with the Invincible Colliery Water Management Plan (Shoalhaven Coal, 2018b).

3.2.5 Salinity Control

The transport of soils from the Southern Extension Project Area for use in rehabilitation areas has the potential to facilitate the development of soil salinity levels that are not suitable for supporting vegetation growth.

Three soil units have been mapped within the SEA, being deep orange clay loam, shallow brown sandy loam and skeletal sandy loam (Umwelt, 2016). The topsoil of deep orange clay loam (approximately 20 cm in depth) and shallow brown sandy loam (approximately 15 cm in depth) is suitable for stripping and reuse as top dressing in rehabilitation as both soil units are non-saline, slightly dispersive and slightly acidic (Umwelt, 2016). The subsoil of both soil units should not be retained for topsoil respreading due to salinity and acidity levels which are not suitable for supporting vegetation growth (Umwelt, 2016).

The topsoil of skeletal sandy loam is extremely shallow (approximately 2 cm in depth) and the subsoil contains high density of parent rock material, the soil is texturally and structurally unsuitable for stripping and neither the topsoil nor subsoil should be retained for respreading (Umwelt, 2016).

The remaining soil material (i.e. subsoil) may be reused in the land formation phase of rehabilitation to reduce the potential for salinity to affect vegetation growth.

3.2.6 Fire Management

Bushfire prevention is required under the *Rural Fires Act 1997*. The absence of fire will lead to a build-up of fire fuel and risk of high intensity bushfire. Shoalhaven Coal as the owner and lessee of the land is required to take practicable steps to prevent the occurrence of bushfires on the land and minimise the spread of bushfire. The primary management objective in relation to fire management is to protect lives, long-term biodiversity values and infrastructure assets from the impacts of bushfires.

Key control measures will focus on:

- Use of cool burns when deemed necessary (with any required approvals and/or permits from the Rural Fire Service) to reduce fuel build-up to protect biodiversity and conservation values. Cool burns will only be undertaken following prior assessment by and under the direction of a suitably qualified fire management contractor;
- Appropriate investment in fire suppression assets; and
- Communication of bushfire control measures and response procedures for provision to key stakeholders, including employees and contractors, neighbours and the RFS.

Any fuel hazard reduction burns will be planned in accordance with the *Bush Fire Environmental Assessment Code for New South Wales* (NSW Rural Fire Service, 2006a) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* (NSW Rural Fire Service, 2006b).

3.2.7 Training and Awareness

All site personnel working at Invincible Colliery will undergo a site induction which includes information on managing the ecological values of the site, the requirements of the land disturbance management controls and operational controls set out in this BMP. The role and responsibility of all workers in relation to protection and/or minimisation of impacts to native biodiversity will be outlined in accordance with **Section 6.6**. After completing the induction, workers will sign a statement of attendance and records of this will be retained by Shoalhaven Coal.

Training of environmental personnel will be undertaken on the identification of target weed species.

Tool-box meetings are held to discuss whole-of-site production, management, safety and environmental issues. Matters relating to rehabilitation and biodiversity management are raised during these meetings when necessary.

3.2.8 Aboriginal Heritage Values

The Invincible Colliery Aboriginal Cultural Heritage Management Plan (Shoalhaven Coal, 2022) outlines management measures for any potential conflicts with Aboriginal heritage values present in the Biodiversity Offset Areas.

3.2.9 Mine Rehabilitation Strategies

Rehabilitation of disturbed areas of the SEA will target three key vegetation communities:

- Tableland Gully Ribbon Gum- Blackwood – Apple Box Forest (Northern Gullies) (36 ha);
- Tableland Gully Mountain Gum, Broadleaved Peppermint Grassy Forest (Southern Gullies) (99 ha); and
- Exposed Blue Mountains Sydney Peppermint- Silvertop Ash Shrubby Woodland (Exposed Slopes) (0.8 ha).

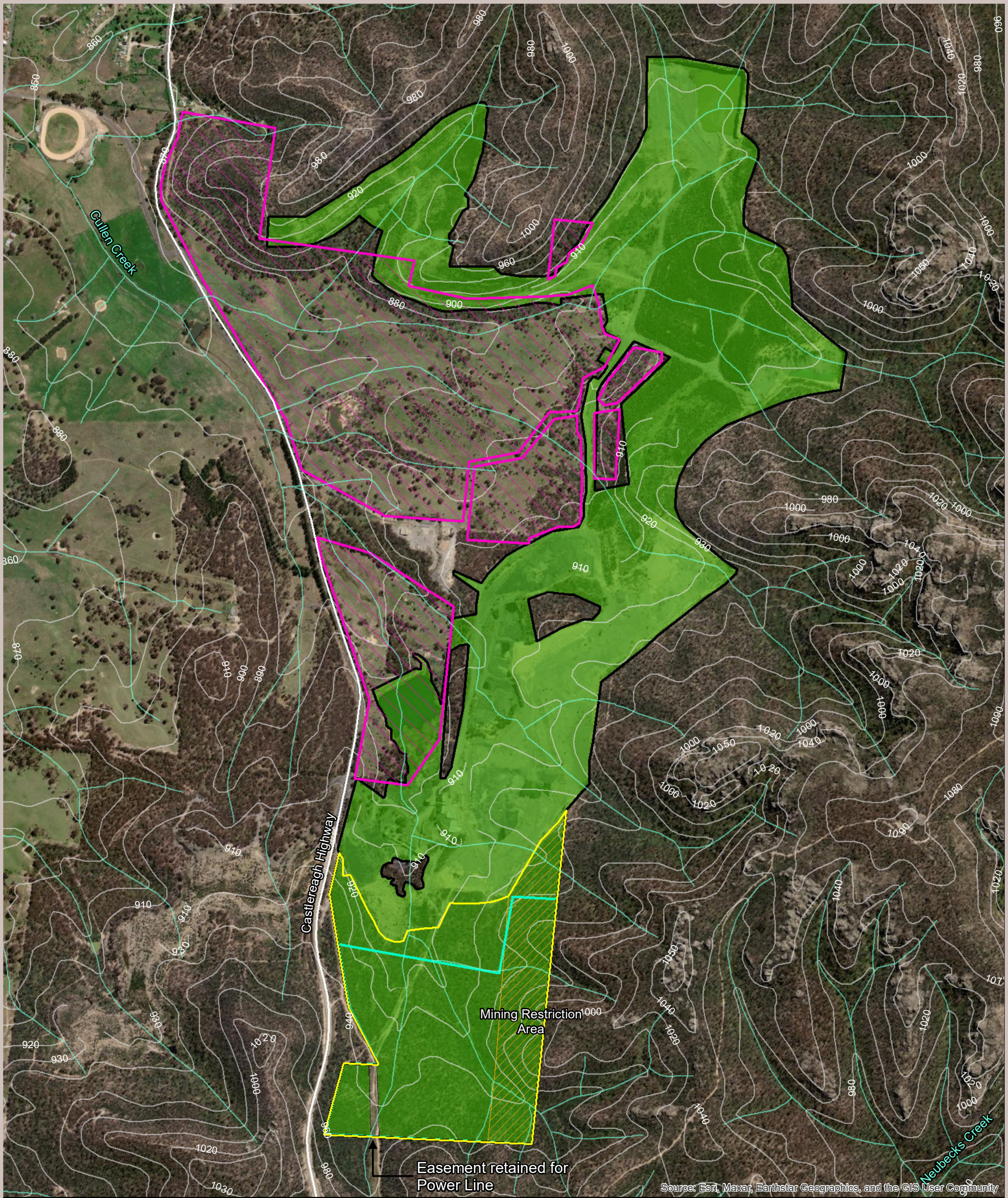
The areas of rehabilitation in the disturbed areas of the SEA are shown on **Figure 7**

The objectives of the mine rehabilitation are outlined in Condition 47 of Schedule 3 of the Project Approval (Mod 5). **Table 8** details the rehabilitation and revegetation objectives specific to managing biodiversity in rehabilitation areas and other vegetated land. The Invincible Colliery Rehabilitation Management Plan (Shoalhaven Coal, 2022) details a number of revegetation and rehabilitation management measures required for the progressive rehabilitation of the site.

Table 8 Biodiversity Objectives of Rehabilitation/Revegetation

Feature	Objective
Rehabilitation areas and other vegetated land	Restore self-sustaining woodland ecosystems on the sites that comprise flora species from locally occurring vegetation communities.
	Establish areas of self-sustaining habitat for threatened flora and fauna species.

The strategies for regeneration and revegetation are outlined in the Invincible Colliery Rehabilitation Management Plan (Umwelt, 2018d).



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Existing Approved Mining Disturbance Area
- Approved Southern Extension Area
- Rehabilitation - Vegetated
- Biodiversity Offset Area
- Mining Restriction Area
- MLA 1844

Coordinate System: MGA Zone 56 (GDA 94)

Data Source: Umwelt 2018

cumberland ecology

Figure 7. Integration of Existing Biodiversity Offset Areas



4.0 BIODIVERSITY OFFSET AREAS MANAGEMENT MEASURES

Three Biodiversity Offset Areas being Renown Farm (Lot 1, DP 180294), Lot 112 DP 877190 and Lot 113 DP 877190, were established under the Invincible Colliery Project Approval (PA 07_0127). A description of the biodiversity values of the Biodiversity Offset Areas is provided in **Section 2.2**. This section provides details of the management measures that will be implemented in the Biodiversity Offset Areas to control threats such as weeds and pests, and strategies to rehabilitate these areas to increase their biodiversity value in the long term.

4.1 Management Objectives

Specific objectives for the management of remnant vegetation and habitat within the existing Biodiversity Offset Areas include the following:

- Integration of existing Biodiversity Offset Areas with mine rehabilitation areas;
- Maintenance and improvement of the condition of existing vegetation; and
- Maintenance and improvement of habitat for threatened flora and fauna.

Management actions that will be implemented to achieve these objectives are presented within this chapter and include:

- Natural and active regeneration;
- Re-use of salvaged habitat features;
- Access control;
- Weed management;
- Pest Animal Management; and
- Fire Management.

These measures are detailed in subsections below, as well as details of the long term security mechanism to be implemented to secure the Biodiversity Offset Areas and the conservation bond to be lodged with the DPE.

4.2 Integration of Biodiversity Offset Areas with Mine Rehabilitation

The integration of the Biodiversity Offset Areas and mine rehabilitation areas will be achieved through the re-establishment of self-sustaining vegetation communities in the proposed mine rehabilitation areas and improvement of existing vegetation condition in the Biodiversity Offset Areas where necessary and as evidenced by biodiversity monitoring.

Figure 7 shows the proximate location of the proposed mine rehabilitation (refer to Rehabilitation Management Plan) in relation to the Invincible Biodiversity Offset Areas. The long-term rehabilitation of the SEA will result in the establishment and integration of self-sustaining vegetation communities with the surrounding remnant vegetation that is managed in the existing Biodiversity Offset Areas.

Further details on the work that has been undertaken in the three Biodiversity Offset Areas is presented below.

4.2.1 Lot 112, DP 877190

The management objective of this Biodiversity Offset Area was to re-establish and conserve native vegetation. This Biodiversity Offset Area is approximately 82 ha which includes approximately 46 ha of retained woodland/forest habitat and approximately 36 ha of grassland habitat. The retained woodland/forest habitat predominantly consists of the Tableland Gully Snow Gum Ribbon Gum Grassy Forest vegetation community, Cox's Permian Red Stringybark Brittle Gum Woodland, and Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest.

Revegetation work on Lot 112, DP 877190 was primarily focused on conserving and re-establishing adjacent native vegetation communities in grassland areas once occupied by agriculture. This was undertaken primarily through the removal of exotic pasture and weed species and re-introducing native trees, shrubs and grass species. Progressive planting and seeding of native species targeted areas of degraded grassland.

4.2.2 Lot 1, DP 180294 (Renown Farm)

This Biodiversity Offset Area is approximately 18 ha, of which 5 ha is of woodland vegetation and 13 ha is of degraded grassland and water storage (known as the Main Colliery Dam). Revegetation efforts were primarily focused on removing the exotic pasture and weed species, encouraging natural regeneration of native species, and reintroducing native grass species.

4.2.3 Lot 113, DP 877190

Revegetation work on Lot 113, DP 877190 was primarily focused on re-establishing and conserving adjacent native vegetation communities, of which the most predominant is the Tableland Gully Snow Gum Ribbon Gum Grassy Forest vegetation community.

The area of Lot 113, DP 877190 that was incorporated into the Biodiversity Offset Area comprises three separate parcels of land, with each generally linked to established vegetation in Ben Bullen State Forest. Specific details of these parcels are as follows:

- A 7.75 ha area to the immediate west of the current internal haulage road which borders remnant areas of the Tableland Gully Snow Gum Ribbon Gum Grassy Forest vegetation community. Castlereagh Coal fenced and adequately sign posted this area and manage the re-establishment of natural vegetation communities as follows:
 - Noxious weeds are identified, sprayed and monitored on a yearly basis;
 - Native grasses were introduced through ripping and sowing of the degraded pasture areas of the property; and
 - Tube stock of native tree and shrub species was planted. The planting of Capertee Stringybark was the focus of previous planting activities in this area, with tree species including *Eucalyptus rossii*, *Eucalyptus sparsifolia*, *Eucalyptus mannifera* and *Eucalyptus punctata*, and a variety of shrubs and grasses typical of the Tableland Gully Snow Gum – Ribbon Gum Grassy Forest.
- A 5.2 ha area to the immediate east of the current internal haulage road. This area comprises Tableland Gully Snow Gum – Ribbon Gum Grassy Forest, and importantly includes approximately 2.5 ha of Capertee Stringybark habitat. This area is fenced and monitored with remedial measures undertaken as required. Monitoring of this area includes the compilation and annual updating of an inventory of the number and health of the Capertee Stringybark population;
- A 1.5 ha area in the northwest corner of Lot 113, DP 877190 and to the immediate northwest of the previously rehabilitated section of the open cut mining. This area comprises Cox's Permian Red Stringybark Brittle Gum Woodland. This area was fenced and monitored with remedial measures undertaken as required; and

- On completion of open cut mining at Invincible Colliery, Castlereagh Coal will facilitate that the existing Biodiversity Offset Areas are integrated with rehabilitated areas within the open cut, and with vegetation within Ben Bullen State Forest through the completion of rehabilitation of the previously mined open cut areas as detailed within the Invincible Colliery Rehabilitation Management Plan (Shoalhaven Coal, 2018d).

4.3 Management Actions

In accordance with the conditions of consent, appropriate management actions will be implemented for the Biodiversity Offset Areas (including the existing Biodiversity Offset Areas and the Hillcroft Offset Site) to reduce the risk of not achieving management objectives identified in **Section 4.1**. Management actions include natural and active regeneration, habitat augmentation and where necessary, access control, weed and pest animal control, fuel load management, and ecological burns (where necessary/appropriate) and are detailed in subsequent sections.

4.3.1 Natural and Active Regeneration

Both natural and active regeneration will take place in the Biodiversity Offset Areas to enhance and improve the biodiversity values of these areas.

Natural regeneration will take place where the biodiversity values are relatively high and will comprise removing the threats to these areas such as grazing or weeds, and allowing the native bushland to regenerate naturally from the existing vegetation that is present.

Active regeneration or revegetation will take place in parts of the Biodiversity Offset Areas that are degraded and which do not contain sufficient existing native vegetation to allow natural regeneration to take place. Methods to be employed in these areas will include weed control and then planting additional ground, midstorey and canopy species in order to create native plant communities. Revegetation will be undertaken in conjunction with weed control and feral animal management, to minimise threats to seedlings. Further details on the measures to be undertaken in the parts of the Biodiversity Offset Areas requiring revegetation are provided below in subsequent subsections.

4.3.1.1 Site Preparation

Prior to commencing initial weed management in parts of the Biodiversity Areas requiring revegetation, the ground layer will be searched for native shrubs, herbs and grasses present within the area. Where practical these plants should have a plastic tree guard installed around them to protect them from herbicide drift.

After installation of tree guards initial weed treatment will commence. This will consist of spraying all weeds with Glyphosate 360g/L at a concentration of 10 mL herbicide to 1L of water. This strength is commonly used in bushland regeneration works as it will effectively kill most herbaceous weed species. A marker dye should be used in the herbicide solution to ensure areas of exotic grasses and herbs are not missed. Knapsack sprayers with a spray cone to direct the spray towards the ground to prevent herbicide drift into adjacent vegetated areas are to be used.

Following the initial spraying of weeds, revegetation areas should be left for three weeks to allow time for treated weeds to die. After this period the entire area should be resprayed with Glyphosate, with a focus made on treating any weeds that still have green colouring left in foliage, and any juvenile, newly germinated weeds. Due to the resilience of exotic pasture grasses such as *Eragrostis curvula* present, respraying should occur for a period of six months resulting in the area being sprayed a total of six times (one initial and five re-sprays).

If required following completion of the initial weed treatment, a thin layer of weed free native mulch, hydromulch, jute matting or a similar product, may be placed over the soil to assist with soil stabilisation until native plantings are able to establish. The layer of mulch or similar product will reduce soil runoff during periods of rain and also reduce the amount of sand lost to high winds. It is important that mulch is not spread too thickly so as to prevent the germination of native species from the soil seed bank, if present.

4.3.1.2 Revegetation Works

Following site preparation, revegetation works will take place where required using the planting of native species. Only species characteristic of the appropriate vegetation community will be planted in each area.

i. Species Selection

It is recommended that a mix of local small trees, shrubs, and ground layer plants are replanted at the specified densities outlined below.

All plants should be disease and pest-free, hardened off and well-watered at the time of planting. All plants are to be provided in a healthy condition. They must have good root development and a sturdy shoot system.

Final species selection will be based upon:

- Availability of seed material;
- Exclusion of plants likely to naturally regenerate on the site; and
- Previous experience with species re-vegetation performance.

ii. Planting Densities

The recommended planting specifications for native species are as follows:

- Small trees/ shrubs @ 4 unit / 10 m²; and
- Groundcovers @ 4 unit / 1m² planted in clumps/thickets.

Planting densities should be modified as required (reduced) with regard to existing native vegetation and/or regrowth vegetation within specific structural layers within a specific patch identified for reconstruction. Additionally, any plants that die should be replaced by new plantings in order to maintain the densities provided above.

iii. Characteristic Planting Units

It is advised that species should be planted in characteristic planting units to correspond with the topology, aspect, soil type and proximity to water.

Grasses may be planted in clumps of 3+ (spaced 15–20 cm apart within clumps) to generate physical / structural support for each other and microclimates. Wind pollinated grasses such as *Eragrostis brownii* may be planted in clumps to create a natural grassy understorey.

iv. Plant Supply

All plants will be sourced from local provenance sources. Where possible, these should come from seed collections or cuttings from within the patches of native vegetation proposed to be removed.

Prior to the initiation of planting procedures it is recommended to collect suitable quantities of local native seed from the areas of native vegetation proposed to be removed. If suitable quantities are not attained from these areas, additional seed should be sourced from nearby nurseries to ensure suitable volumes of seed are available for the propagation phase of the proposed bushland reconstruction works programme.

Local native plant species should be collected using principles prescribed in 'Bringing the Bush back to Western Sydney' (DIPNR, 2003). Seeds and vegetative propagules to be collected and propagated in a local commercial or community nursery should be of local provenance and sourced not more than 10 km from the Biodiversity Offset Areas.

4.3.2 Re-use of Salvaged Habitat Features

As outlined in **Section 3.1.5**, a selection of habitat features will be salvaged from clearing sites within the Disturbance Boundary for re-use within the rehabilitation areas and Biodiversity Offset Areas in order to augment the habitat availability for native species. Habitat features to be re-used include:

- Hollow limbs extracted using chainsaw;
- Fallen timber, including hollow limbs; and
- Bush rocks.

The number and type of each feature in the clearing areas will be recorded during the pre-clearance survey. These will be placed in appropriate locations in the Biodiversity Offset Areas under the supervision of an ecologist in order to provide additional habitat for native fauna species, and their location will be recorded using a GPS. Annual monitoring surveys will verify the placement of these habitat features in the rehabilitation areas or Biodiversity Offset Areas.

4.3.3 Access Control

Measures will be implemented to control access to the Biodiversity Offset Areas to minimise disturbance to biodiversity values, including:

- Maintaining existing boundary fencing;
- Installing and maintaining secure (locked) gates at all access points;
- Installing signage indicating access restrictions;
- Removal of unnecessary internal fencing;
- Maintenance of existing internal access tracks to facilitate ongoing management, including biodiversity and bush fire management; and
- Managing access during implementation of management activities (e.g. bush fire management, weed control).

Access control measures are to be implemented as required for the life of the Biodiversity Offset Areas.

4.3.4 Weed Management

This section provides details of the weed management that will be undertaken in the Biodiversity Offset Areas, including an indicative Weed Control Program, weed control measures and best management practice measures that will be implemented. The Weed Control Program presented below is indicative only and will be finalised for implementation within one year of the recommencement of Invincible mining operations (also see **Appendix B**).

4.3.4.1 Weed Control Program

i. Initial Inspection

An initial inspection of the Biodiversity Offset Areas will be conducted by a suitably qualified person with experience in weed management and control to conduct a baseline weed survey and develop a site-specific weeding plan for each offset area for the primary weeding phase. This baseline weed survey will be completed within three months of approval of the BMP.

These site-specific weeding plans are to be prepared as soon as practical and prior to the commencement of weed control works. This will include identification of weeding areas and weed species to target, identification of sensitive areas to avoid, as well as recommendations regarding appropriate weeding techniques to implement. These site-specific plans including all relevant details and maps will be incorporated into the BMP within six months of the approval of the BMP.

ii. Primary Weeding

Primary weeding will take place following the initial inspection and preparation of the site-specific weeding plan and will target Priority Weeds and Weeds of National Significance (WoNS), as well as any other environmental weeds present. Primary weeding may involve techniques such as but not limited to:

- Selective spraying of weeds, with selective and non-selective herbicide;
- Cutting or scraping deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters, and painting cut stumps with herbicides containing Glyphosate or Picloram;
- Target drilling and injecting large tree weeds (such as large prickly pear) with herbicides such as Glyphosate and a Garlon/diesel mix or use of biological control (e.g. cactoblastis moth – *Cactoblastis cactorum* – for prickly pear); and
- selective hand removal of weeds; and wicker wiping with herbicide of tall weeds in situations where damage to proximate, low growing native plants can be avoided.

Recommended techniques for removal of Priority Weeds that have been published by agencies/organisations such as the NSW Department of Primary Industries (DPI) such as the *NSW Weed Control Handbook* (DPI, 2018) are publicly available and will be consulted prior to weed control.

After physical removal of any plant material, the plant material should be stockpiled well away from sensitive areas and disposed of in an environmentally sensitive manner to prevent the spread of propagules or further seed production on the cut plant material. For species with the potential to spread vegetatively from plant fragments such as prickly pears (*Opuntia* species) it may be practical to collect material from site stockpiles and bury this material in a mine pit before ensuring it is completely buried under mine spoil or subsoil. Note that some removal guidelines are available for highly invasive weed species such as African Boxthorn.

iii. Follow-Up Weeding

Follow-up or secondary weeding will be undertaken in areas that have received past primary weeding treatments and eradication is not complete. Areas for follow-up weeding will be identified during annual weed monitoring. Follow-up weeding involves the selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds will be targeted during the follow-up weeding phase. Follow-up weeding is likely to be required at least bi-annually/seasonal for a period of 2 years or until weeds are at negligible levels, after which a review will be conducted to determine the on-going maintenance requirements.

iv. Maintenance Weeding

Maintenance weeding will be undertaken annually for the life of the Mine. It is expected that the Biodiversity Offset Areas will always require a certain level of maintenance weeding, as weed seeds and vegetative propagules make their way on site from the soil stored seedbank, via wind and bird droppings. It is expected that the amount of weeding required will decrease once initial infestations are controlled and the Biodiversity Offset Areas become more resistant to disturbance and weed colonisation.

Adaptive management/restoration practices will be adopted if weed species increase counter to these expectations.

4.3.4.2 Weed Control Measures

For sensitive areas of native vegetation, weeds should be controlled by hand weeding or manual removal in preference to herbicide application. No high disturbance manual removal of woody weeds should be undertaken near native trees. In areas of exotic vegetation however, then large scale herbicide spraying is likely to be appropriate. In other areas, herbicide application should be limited to backpack sprayers or hand application.

Weed control will be undertaken following the procedures outlined in the *NSW Weed Control Handbook* (DPI, 2018). The following sections provide specific guidelines for the use of the most common weed control measures.

i. Foliar Spray Application

- Suitable for shrubs, grasses and dense vines less than 6 m tall and perennial weeds with a small root system and simple stem;
- Herbicide is diluted with water or diesel at a specific rate and sprayed over the foliage to point of runoff (until every leaf is wetted, but not dripping); and
- Techniques differ depending on size of weed plant or infestation.

ii. Stem Injection

- Suitable for woody weeds and trees;
- Drill or cut through bark into live sapwood;
- Where low branches are encountered place a cut immediately below the branch;
- Immediately apply herbicide (within 15 seconds) for active uptake by plant; and
- Do not treat trees with poor sap flow that occurs when plants are stressed.

iii. Cut Stump Application

- Suitable for woody weeds, saplings and trees;
- Put plant off completely at base (no higher than 15cm from ground);
- Use a chainsaw, axe, brush cutter or machete depending on the thickness of the stem/trunk;
- Apply herbicide using knapsack, paint brush, drench gun or a hand-spray bottle;
- Spray or paint herbicide immediately onto the exposed surface of the cut stump (within 15 seconds for water-based herbicides and 1 minute for diesel-soluble herbicides); and
- For trees with large circumferences, it is only necessary to place the solution around the edge of the stump in the living tissue. The stump circumference should be bruised with the back of an axe and each successive blow treated with herbicide.

iv. Cut and Swab

- Suitable for vines and multi-stemmed shrubs;
- Similar to cut stump method;

- Herbicide applied via spray or brush; and
- In the case of vines with aerial tubers, both ends of the cut stems must be treated with herbicide. Hold both 'bunches' of cut stems in a container of herbicide for 15 seconds after cutting, so that maximum translocation occurs to both ground and aerial tubers.

v. Stem Scrape

- Suitable for plants and vines with aerial tubers;
- Sharp knife used to scrape a very thin layer of bark from a 10 cm section of stem; and
- Herbicide immediately applied to the exposed soft underlying green tissue.

vi. Basal Bark Application

- suitable for thin-barked woody weeds, saplings, regrowth and multi-stemmed shrubs and trees;
- Mix an oil soluble herbicide with diesel;
- Spray (saturate) the full circumference of the trunk or stem of the plant from ground level to 30cm height; and
- Best undertaken by contractors.

vii. Pellet or Granular Soil Application

- Suitable for woody weeds with extensive fine stems and root-suckering plants to 3m in height; and
- Apply herbicide pellets evenly to root area (soil under canopy from root crown or stems to 30cm beyond drip line) prior to spring or summer rains.

4.3.4.3 Best Management Practice

Weed removal will have regard to the following, to minimise impacts upon existing vegetation and habitats:

- Avoid over-clearing and remove only targeted species;
- Limit spread of weeds from disturbance areas or off-site areas to weed control areas by washing down vehicles and machinery prior to moving them out of designated disturbance / clearance areas;
- Employ minimal disturbance techniques to avoid soil and surrounding vegetation disturbance and replacement of disturbed mulch/leaf-litter;
- Remove of fruiting/seeding parts of weeds carefully, to minimise spread of plant propagules;
- Use of chemicals and sprays only during suitable weather conditions (i.e. Not during wet or windy conditions) and only during appropriate seasons;
- Avoid disturbance of native fauna or nesting/breeding sites; and
- Minimise and suppress the spread of plant pathogens by the utilisation of appropriate hygiene protocols.

4.3.5 Pest Animal Management

Pest animals are a potential threat to the integrity of forest and woodland habitats within the Biodiversity Offset Areas. Feral animals may change in distribution and abundance seasonally and there is potential for pest animal species to become prevalent. Accordingly, a Pest Animal Control Plan will be developed and implemented for the Project prior to commencement, and if required pest animal management will be undertaken to minimise the impacts to native fauna within the Biodiversity Offset Areas. In addition, a vertebrate pest control register will be developed to document when and where each control method is implemented.

Feral animal management will focus on the main feral animals recorded within the SEA and which have potential to occur in the Biodiversity Offset Areas, including the European Red Fox and the European Rabbit as well as any others that are identified during the course of management or monitoring. The appropriate management of these feral fauna species will require close coordination between monitoring and control activities. Since different feral species can respond differently to control measures, monitoring is required to respond appropriately to each species (see **Section 5.9**). Prior to the implementation of control measures, a population survey will be conducted to ascertain the severity and primary areas of infestation and to determine which species need to be controlled. Control measures will be implemented if required and post-control monitoring will be conducted to determine whether the controls were effective. The management of feral fauna is intended to be adaptive and will be informed/reviewed based on the key findings and recommendations of monitoring and control will be informed by the results of the monitoring surveys (see **Section 5.9**).

4.3.6 Fire Management

Fire management in the Biodiversity Offset Areas will be conducted in accordance with the measures outlined previously for the SEA in **Section 3.2.6**. Key control measures will focus on:

- Use of cool burns when deemed necessary (with any required approvals and/or permits from the Rural Fire Service) to reduce fuel build-up to protect biodiversity and conservation values;
- Appropriate investment in fire suppression assets; and
- Communication of bushfire control measures and response procedures for provision to key stakeholders, including employees and contractors, neighbours and the RFS.

Any fuel hazard reduction burns will be planned in accordance with the *Bush Fire Environmental Assessment Code for New South Wales* (NSW Rural Fire Service, 2006a) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* (NSW Rural Fire Service, 2006b).

In order to maintain existing values across the Biodiversity Offset Areas, it may be necessary to undertake occasional ecological burns. Monitoring will identify if fuel loads are at a level where low intensity ecological burning can be undertaken. Burn intervals will consider the guidelines contained within the *Threatened Species Hazard Reduction Lists* as well as the OEH (BCD) recommendations in the *Guidelines for Ecologically Sustainable Fire Management* (NPWS, 2004).

Current recommendations under the code and guidelines are:

In woodland vegetation or grassland derived from woodland, fire should not occur within 5 years of a previous fire and consideration should be given to burning within 30 years of any previous fire, with occasional intervals greater than 25 years being desirable.

4.4 Long-term Security Mechanism

Castlereagh Coal will secure the long-term security of the Biodiversity Offset Areas and residual offset credits within two years of the recommencement of mining operations at Invincible. As part of this process, Shoalhaven Coal will provide a strategy for the retirement of credits associated with the Hillcroft Offset Site to DPE within three months from the recommencement of mining operations to DPE.

Long-term security mechanisms will include one or a combination of the following, as identified in Condition 30, Schedule 3 of the Project Approval:

- Deed of agreement with the Minister;
- Rezoning the land under the *Lithgow Local Environment Plan 2014*;
- Caveats on the title under the *Conveyancing Act 1919*; and
- Or another mechanism as agreed by the Secretary.

4.5 Conservation Bond

In accordance with the requirements of Schedule 3, Condition 36 of the Project Approval (Mod 5), Shoalhaven Coal will lodge a conservation bond with DPE to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria as detailed in **Appendix B**.

5.0 BIODIVERSITY OFFSET AREAS MONITORING PROGRAM

Biodiversity monitoring is required by Condition 33 (g) Schedule 3 of the Project Approval (Mod 5). The following sections outline the biodiversity monitoring to be undertaken within the Biodiversity Offset Areas. This includes vegetation integrity monitoring, re-use of salvaged habitat features, access control, weed management and fire management.

The following Biodiversity Offset Areas Monitoring Program considers the results of existing biodiversity monitoring undertaken at Invincible Colliery and has been developed to enable reliable and repeatable methods of data collection driven by evidence-based outcomes.

The monitoring methods outlined in the following section are consistent with the Biodiversity Assessment Method (BAM). The BAM is the preferred method under the BC Act for assessing the integrity of vegetation and condition of fauna habitat. Biodiversity monitoring using the BAM will provide clear outcomes to direct the course of effective management intervention, while maintaining relevance to previous biodiversity monitoring undertaken. In order to do this, a number of monitoring sites will be established throughout the Biodiversity Offset Areas during the first year of baseline data collection (refer to **Section 5.4.1**).

The results of the monitoring will be reported in the Annual Biodiversity Monitoring Report. A summary of this report is provided in the Annual Review. (see **Section 6.1**).

5.1 Purpose of Biodiversity Monitoring Program

The purpose of this monitoring program is to monitor the condition of vegetation and habitat (retained and revegetated) over time, within the existing Biodiversity Offset Areas (Lot 112, DP 877190; Lot 1, DP 180294; Lot 113, DP 877190) and the Hillcroft Offset Site. Monitoring will focus on the native vegetation communities and habitat for threatened fauna species identified in **Section 2.2**, to determine which management actions are required and when they should be implemented.

Progress of ecological restoration and management will be evaluated against Key Performance Indicators (KPIs) and completion criteria so as to provide feedback that can be used to guide and improve management of the Biodiversity Offset Areas (refer to **Section 5.11**). Data management procedures will be implemented to ensure that all data is collected using appropriate techniques and analysed to allow meaningful spatial and temporal comparisons to be made.

The monitoring program includes the following:

- Collection of baseline data within vegetation communities of the Biodiversity Offset Areas;
- Monitoring of native vegetation communities and habitats of the Biodiversity Offset Areas to evaluate the ecological integrity of remnant vegetation over time, as measured by the BAM;
- Monitoring of fauna species usage of the Biodiversity Offset Areas;
- Monitoring potential threats to biodiversity including weeds, feral animals; and
- Monitoring compliance with management measures such as access control, and re-use of salvaged material.

5.2 Objectives

The objectives of the biodiversity monitoring program are to:

- Assess remnant vegetation against short term and long-term performance indicators;
- Identify any potential loss of biodiversity values over the Biodiversity Offset Areas;
- Verify that management actions have been implemented;
- Assess the presence of threats such as impacts from pest fauna species or weed infestations; and
- Identify the need for additional or corrective management measures to achieve the performance indicators and completion criteria.

5.3 Timing

Site selection and baseline data collection will be undertaken during the first year of monitoring the Biodiversity Offset Areas under this BMP. Monitoring surveys will be undertaken on an annual basis during the spring/summer months to remain consistent with data collection undertaken in previous monitoring events.

5.4 Vegetation Integrity and Condition Monitoring Methodology

5.4.1 Site Selection

Monitoring of the Biodiversity Offset Areas will be undertaken through the analysis of fixed floristic and vegetation integrity plot data in accordance with the BAM. Existing vegetation mapping will be reviewed prior to confirming the location of monitoring sites.

Monitoring locations will be established during the first year of monitoring (baseline data collection) where one vegetation integrity plot is to be established per vegetation zone (as informed by the review of vegetation mapping). Based on existing vegetation mapping the resulting survey effort is predicted to include a minimum of 23 vegetation integrity plots to be established across the Existing Biodiversity Offset Areas and 10 in the Hillcroft Offset Site during the first year of baseline data collection. The indicative location of the plots has been identified to provide a monitoring plot in each discrete patch of each vegetation community in the Biodiversity Offset Areas, and where each patch of vegetation is large, then additional plots have been placed in order to appropriately capture the floristic variation in the Biodiversity Offset Areas. The number of plots has not been determined in accordance with the minimum plot requirements of the BAM, however they have been appropriately placed to capture of the biodiversity variation in the Biodiversity Offset Areas. Note that large areas of grassland are relatively homogenous and numerous monitoring plots in these locations are not considered to be required.

Figure 8 and **Figure 9** show the conceptual location of monitoring sites across the Biodiversity Offset Areas and the Hillcroft Offset Site, respectively.

5.4.2 Plot based Surveys

At each floristic and vegetation integrity plot, data is to be recorded in accordance with Section 5 of the BAM (OEH 2017a). This involves setting out 20 x 50 m, 20 x 20 m and 1 x 1m plots. The location of each plot is to be recorded using a hand-held GPS.

At each plot/transect, approximately 45 to 60 minutes will be spent searching for all vascular flora species present within a 20 x 20 m plot. Searches of each 20 x 20 m plot is generally undertaken through parallel transects from one side of the plot to another. Most effort will be spent on examining the groundcover, which usually supports well over half of the species present, however the composition of any shrub, mid-storey, canopy and emergent layers will also be thoroughly examined.

For each flora species recorded in the plot, the following data will be collected in accordance with Table 2 of the BAM (OEH 2017a):

- Stratum/layer in which the species occurs;
- Growth form;
- Scientific name and common name;
- Cover; and
- Abundance.

At each vegetation integrity plot the following attributes will be recorded in accordance with the BAM (OEH 2017a) to determine the condition of the vegetation zone:

- Composition – native plant species richness by growth form (within the 20 x 20 m plot);
- Structure – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot);
- Function (within the 20 x 50 m plot):

- Number of large trees;
- Presence or otherwise of tree stem size classes;
- Presence or otherwise of canopy species regeneration;
- Length of fallen logs;
- Percentage cover for litter as recorded from five 1 x 1 m plots;
- Number of trees with hollows; and
- High threat exotic cover.

5.4.3 Overall Site Condition

Surveys will be undertaken in conjunction with the plot surveys (refer to **Section 5.4.2**) to evaluate the overall site condition. This will consist of qualitative data collection methods to determine the condition of habitats across each vegetation zone. The results of the overall site condition surveys will be recorded on rapid assessment proformas.

5.5 Fauna Monitoring

Fauna monitoring will be undertaken within the Biodiversity Offset Areas to document the improvement in fauna usage over time in response to management actions. The fauna monitoring program will target the following fauna groups:

- Birds;
- Bats;
- Terrestrial mammals; and
- Reptiles.

The survey methods for each fauna group being targeted during fauna monitoring surveys is detailed below. In addition to these methods, any vertebrate fauna species that are observed, heard calling or otherwise detected will be recorded in the total species list for each Biodiversity Offset Area.

Indicative vegetation survey locations are provided in **Figure 9**

Conceptual Location of Monitoring Sites within the Hillcroft Offset Site

and the quantum and location of the final fauna monitoring locations will be determined as part of the first monitoring period and will be a subset of the vegetation monitoring sites within the Biodiversity Offset Areas. Once established, the locations of the fauna monitoring sites will be included within this BMP.

The results of the fauna monitoring will be included in the Annual Biodiversity Monitoring Report and summarised in the Annual Review (see **Section 6.1.1**).

5.5.1 Birds

The following survey methods will be undertaken for birds within the Biodiversity Offset Areas:

- Diurnal area search (October – February): A 2 ha area for 20 minutes, recording only species detected visually and/or aurally within this area (including fly-over species);
- Diurnal area search (June – August): A 2 ha area for 20 minutes, recording only species detected visually and/or aurally within this area (including fly-over species); and

- Nocturnal call playback/spotlighting: Call playback, and associated spotlighting undertaken for owls on two separate nights.

5.5.2 Bats

The following survey methods will be undertaken for bats in the Biodiversity Offset Areas:

- Ultrasonic bat detection survey: Ultrasonic bat detection units placed in suitable habitat, such as along tracks, creeks and near caves (if present), for a period of two nights. Units set to record data between dusk and dawn. The survey data collected will be used to record all the species of bat present and the relative number of calls for each species.

5.5.3 Terrestrial Mammals

The following survey methods will be undertaken for terrestrial mammals within the Biodiversity Offset Areas:

- Motion sensor camera survey: Cameras will be deployed between October - February and left in-situ until collected between June - August (minimum three months deployed). Cameras will be un-baited and set to capture images.

5.5.4 Reptiles

The following survey methods will be undertaken for reptiles within the Biodiversity Offset Areas:

- Diurnal active search: A 20 minute active search on two separate days; and
- Nocturnal active search, with spotlighting: A 20-minute active search will be undertaken at each monitoring site on two separate nights. Searches will involve lifting fallen logs, bush rock and leaf litter.

5.6 Monitoring of Re-use of Salvaged Habitat Features

Monitoring will be undertaken to ensure that all appropriate habitat features present in the clearing areas are relocated to the rehabilitation areas or the Biodiversity Offset Areas to provide ongoing habitat for native species. As outlined previously, the number and type of each feature in the clearing areas will be recorded during the pre-clearance survey. These will be placed in appropriate locations in the Biodiversity Offset Areas under the supervision of an ecologist and their location will be recorded.

Annual monitoring surveys will verify the placement of these habitat features in the rehabilitation areas or Biodiversity Offset Areas within one year of removal and details will be included in the Annual Biodiversity Monitoring Report and summarised in the Annual Review (see **Section 6.1.1**).

5.7 Access Control Monitoring

During the annual monitoring, a review will be undertaken of all the required access control measures and locations to ensure that all access control measures have been implemented within one year of commencement of the project. Details of the monitoring and either verification of the access control measure implementation or lack of implementation will be recorded for inclusion in the Annual Biodiversity Monitoring Report and summarised in the Annual Review.

5.8 Weed Monitoring

Weeds are a threat to the integrity of the vegetation within the Biodiversity Offset Areas as they can out-compete native seedlings and reduce the success of revegetation measures. Monitoring is critical to the success of weed control as it allows comparison of records from before control activities began with those collected during and after control to determine the effectiveness of the Weed Control Program and allow it to be adapted where needed. For these reasons, weed monitoring will be undertaken within the Biodiversity Offset Areas to provide the necessary information to trigger management action and to determine the efficacy of management actions undertaken aimed at reducing weed extent and abundance.

Initially, a baseline survey of weeds will be completed within the Biodiversity Offset Areas following the approval this BMP. Information collected during this baseline survey will determine the location of significant weed infestations (defined as those that are widespread with high densities). Once determined, the locations of significant infestations will be mapped and included within this BMP.

Subsequently, weeds within the Biodiversity Offset Areas will be monitored as part of the ongoing vegetation monitoring procedure outlined in **Section 5.4.2**. This includes collection of cover and abundance data within a 50 x 20 m plot. Monitoring will focus on Weeds of National Significance (WoNS), Priority Weeds and High Threat Exotics which have been recorded within the Biodiversity Offset Areas. Should any other WoNS, Priority Weeds and High Threat Exotics be recorded, this BMP will be updated to include monitoring measures for these species. Similarly, should new species, or additional infestations be detected within the Biodiversity Offset Areas, these locations will also be included within the BMP.

Where new significant weed infestations, or newly-occurring weeds are detected during monitoring, the location, density and size will be recorded and the occurrences mapped and included within the BMP. If required, the performance criteria and completion criteria will be updated to reflect these occurrences.

The goal of weed management is to achieve a cover of exotic weed species at, or less than benchmark value in the short term and less than 5% cover in the long-term.

The results of the weed monitoring will be included in the Annual Biodiversity Monitoring Report (see **Section 6.1.1**).

5.9 Pest Animal Monitoring

Monitoring is critical to the success of feral animal control as it allows comparison of records from before control activities began with those collected during and after control to determine the effectiveness of the control strategy and allow it to be adapted, where needed. A Pest Animal Control Plan will be developed by Shoalhaven Coal within one year of commencement of the Project within the Biodiversity Offset Areas to provide the necessary information to trigger management action and to determine the efficacy of management actions undertaken aimed at reducing feral animal abundance.

Feral animal monitoring will be undertaken as required within the Biodiversity Offset Areas using motion-sensor cameras. Cameras will be established at permanent monitoring locations and will be un-baited and will be set to record images for subsequent identification. Cameras will be left in-situ for a minimum of 3 months. Analysis of data collected from the motion-sensor cameras will include review detection frequencies of each feral animal. In addition to motion sensor camera surveys, data collected at vegetation monitoring sites within the Biodiversity Offset Areas will also include collection of data on evidence of feral animal disturbance (e.g. diggings, droppings).

Monitoring locations will be determined as part of the first monitoring period. Once established, the locations of monitoring sites will be included within this BMP. Feral animal monitoring utilising motion-sensor cameras will be undertaken twice annually for the first three years of implementation of this BMP. It is anticipated that the frequency of monitoring will reduce over time as feral animal control measures are implemented. After the initial three years of monitoring, the frequency of future monitoring will be reviewed and updated within this BMP.

The results of the pest animal monitoring will be included in the Annual Biodiversity Monitoring Report (see **Section 6.1.1**).

5.10 Fire Monitoring

During the monitoring surveys, fuel loads will be assessed and if required, recommendations will be made regarding the implementation of control burns in accordance with the *Bush Fire Environmental Assessment Code for New South Wales* (NSW Rural Fire Service, 2006a) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* (NSW Rural Fire Service, 2006b).

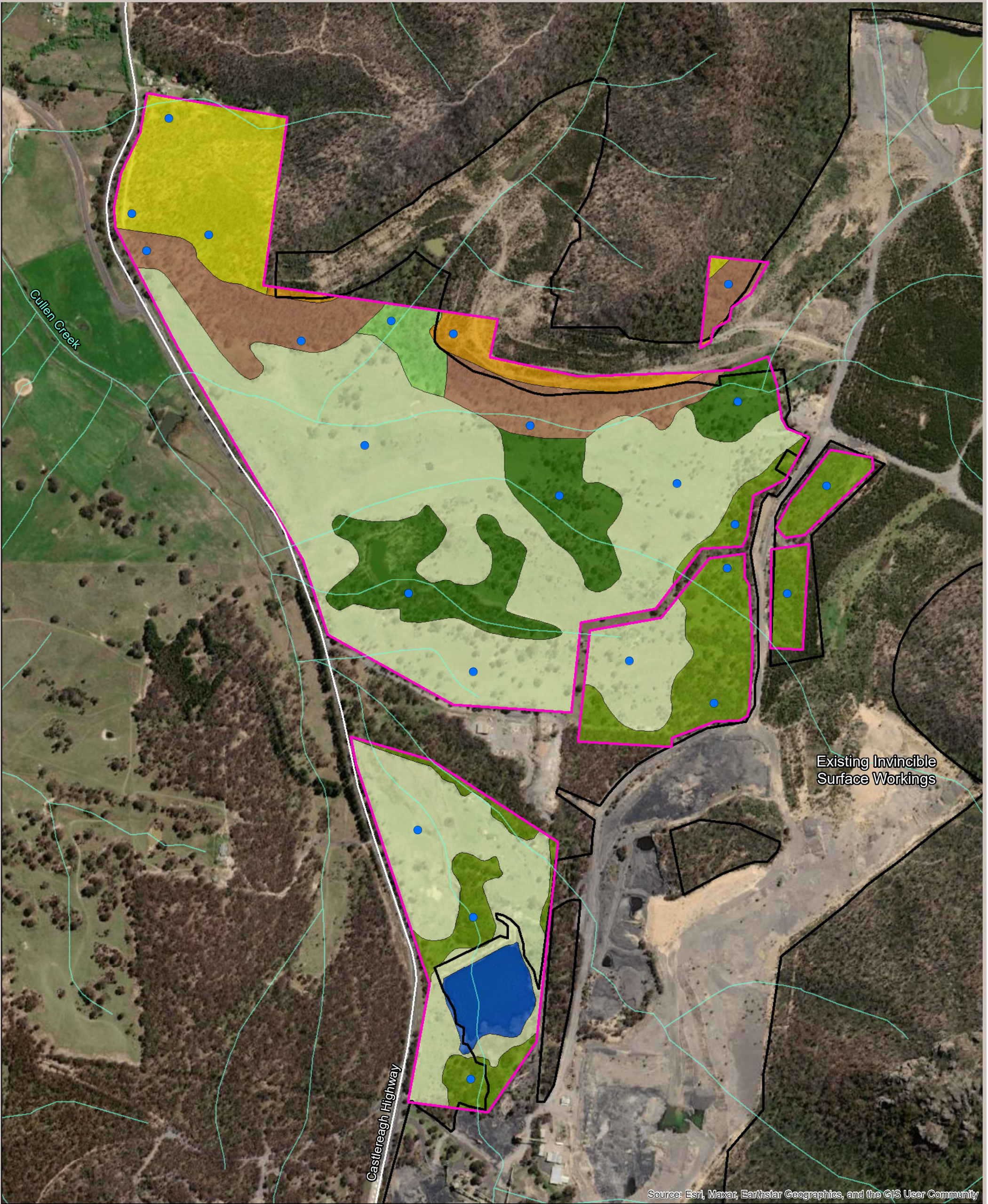
5.11 Performance and Completion Criteria

The goal for the Biodiversity Offset Areas is to maintain or improve the habitat value of the existing Biodiversity Offset Areas, utilising the methods outlined in **Chapter 5**. The performance and completion criteria for the management measures that will be implemented in the Biodiversity Offset Areas are outlined in **Table 9** and may be revised over time as a part of the adaptive management approach (**Section 6.2**).

Table 9 Performance and completion criteria for the Biodiversity Offset Areas

Action/Items	Performance Criteria	Completion Criteria
--------------	----------------------	---------------------

Natural and Active Regeneration	Biodiversity Offset Areas are managed for biodiversity using natural regeneration in areas with significant native vegetation remaining, and using active regeneration in areas lacking sufficient native vegetation.	The number of native plant species for each growth form group will be at or above benchmark value after 5 years. Structure of each growth form group will increase to at least local reference site benchmark after 10 years.
Increase in native fauna species	Increased in biodiversity is evidenced in the Biodiversity Offset Areas by an increase in native species abundance and diversity	Native fauna species diversity and abundance is higher than baseline levels after 10 years
Reuse of salvaged habitat features	Habitat features present in the disturbance footprint will be relocated into the rehabilitation areas or Biodiversity Offset Areas under supervision of an ecologist	All habitat features have been relocated in designated areas within one year of removal and details included in the Annual Biodiversity Monitoring Report..
Access control	Access control measures outlined in Section 4.3.3 will be implemented.	All access control measures have been implemented within one year of commencement of the project and documented in Annual Biodiversity Monitoring Report.
Weed Management	Weeds in the Biodiversity Offset Areas will be managed according to the measures outlined in Section 4.3.4	Cover of exotic weed species at, or less than benchmark value after 5 years and less than 5% cover after 10 years.
Fire Management	Fire risk managed as specified in Section 4.3.6	Fire management is consistent with Bush Fire Environmental Assessment Code for New South Wales (NSW Rural Fire Service, 2006a) and the guidelines contained in the Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code (NSW Rural Fire Service, 2006b).
Pest animal species	Pest animal species are managed in accordance with Section 4.3.5	Pest species are not affecting the quality of biodiversity offset areas as evidenced by monitoring, and there is no increase in pest species abundance or diversity relative to the baseline levels
Sediment and erosion	Sediment and erosion is managed appropriately and no increase is observed	Erosion is not affecting the quality of biodiversity offset areas as evidenced by monitoring and no additional erosion is recorded relative to baseline levels.



Legend

Biodiversity Offset Area

Existing Approved Mining Disturbance Area

Conceptual Monitoring Locations

Cox Permian Red Stringbark - MU37

Tableland Gully Mountain Gum - MU32

Tableland Gully Snow Gum - MU11

Tableland Gully Snow Gum - MU11xr

Tableland Scribbly Gum - MU35

Grassland

Rehabilitation

Dam

Coordinate System: MGA Zone 56 (GDA 94)

Data Source: Umwelt 2018

Figure 8. Conceptual Location of Monitoring Sites within the Biodiversity Offset Area

0

0.3 km

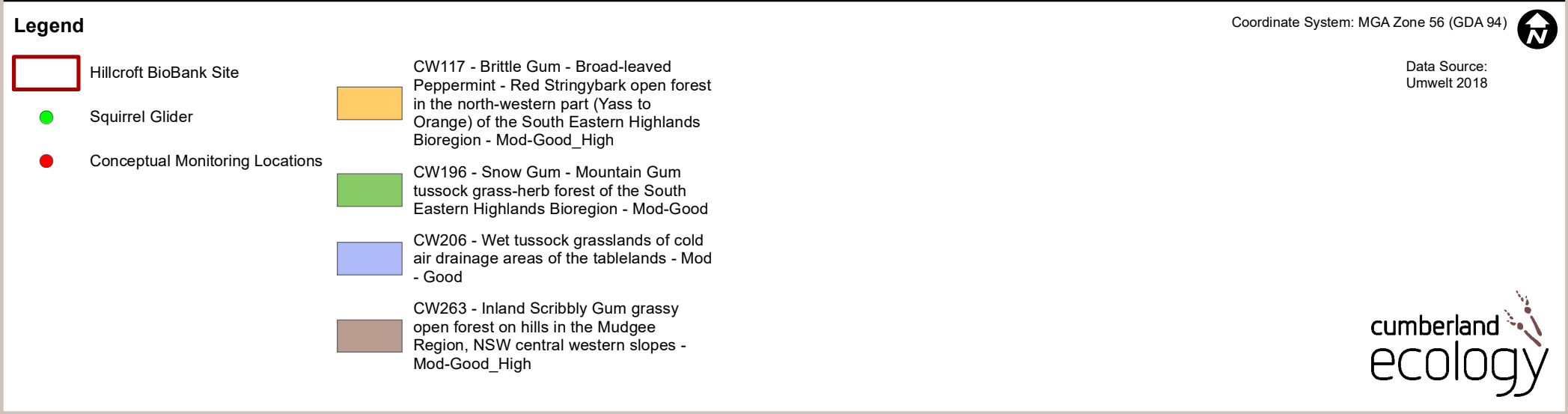
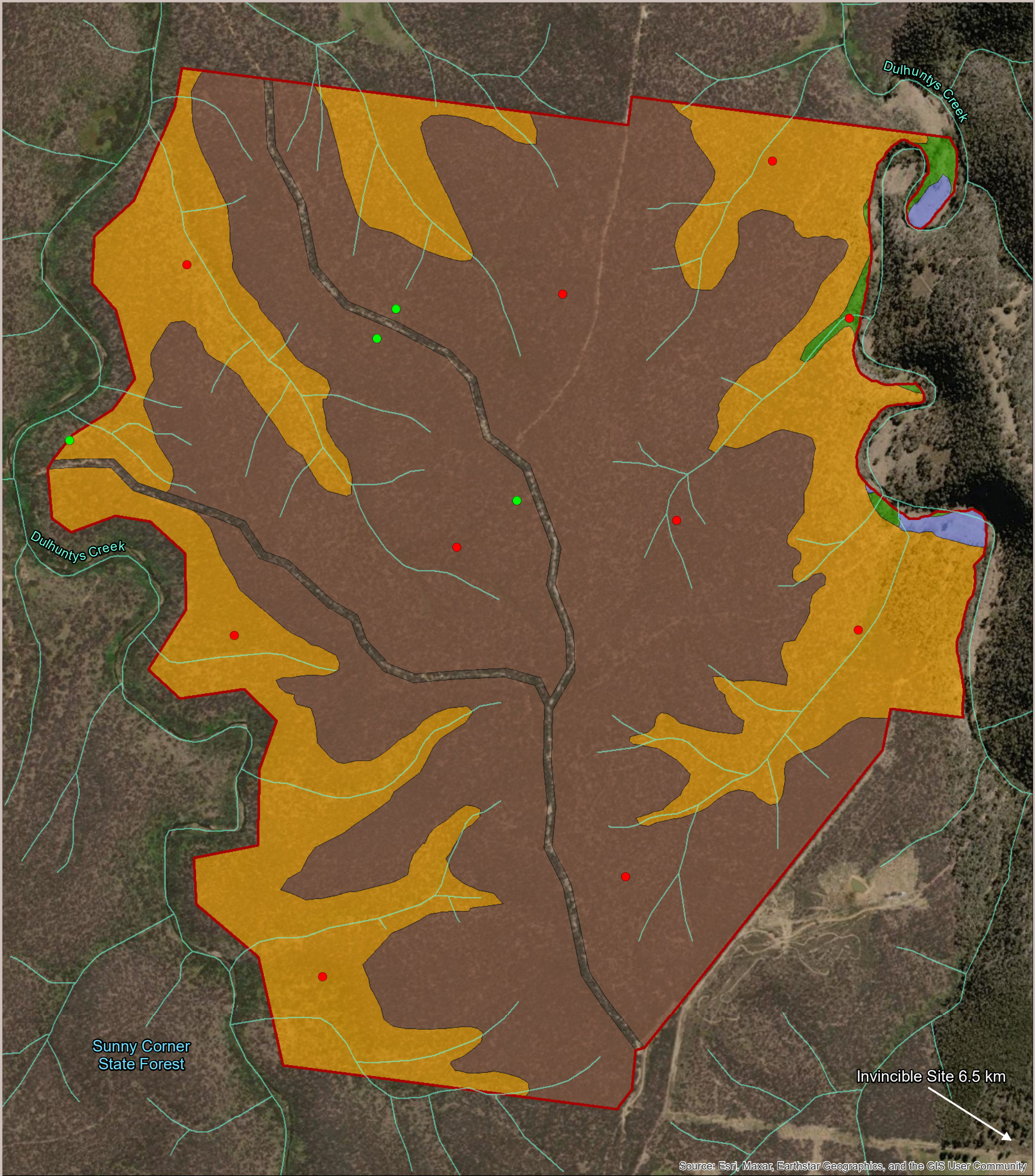


Figure 9. Conceptual Location of Monitoring sites in the Hillcroft Offset Site

0 0.35 km

I:\...129\Figures\RP1\20230614\Figure 9. Conceptual Location of Monitoring sites in the Hillcroft Offset Site

6.0 COMMUNICATION AND REPORTING

6.1 Reporting

6.1.1 Annual Biodiversity Monitoring Report

The Annual Biodiversity Monitoring Report forms a long-term record of the flora and fauna management within the SEA and Biodiversity Offset Areas and will help determine the efficacy of the mitigation measures implemented. A summary of the Annual Biodiversity Monitoring Report will be included in the Annual Review

6.1.2 Annual Review

A summary of biodiversity and rehabilitation monitoring results will be provided within the Annual Review. The Annual Review will be prepared and submitted to the Secretary, in accordance with Condition 4, Schedule 5 of the Project Approval (Mod 5). The Annual Review will be made available to the public through the Community Consultative Committee (CCC) and the Castlereagh Coal web site: (<http://www.castlereaghcoal.com.au/>).

A discussion of the effectiveness of the biodiversity and rehabilitation management controls utilised at Invincible Colliery will be reported to DPE in the Annual Review to be submitted to DPE by March each year. The Annual Review will also identify whether any change to existing or additional management controls are required to be implemented at Invincible Colliery in order to achieve the rehabilitation objectives or completion criteria.

In accordance with Schedule 5, Condition 13 of the Project Approval (Mod 5), Shoalhaven Coal will provide regular reporting on the environmental performance of the operations on its website. This will include outcomes of plans and programs as contained within this BMP.

6.1.3 Incident Reporting

In accordance with Schedule 5 Condition 9 of the Project Approval (Mod 5), Shoalhaven Coal must immediately notify the Secretary and other relevant agencies of any incident.

Within 7 days of the incident, Shoalhaven Coal will provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested. This report will include, but not be limited to:

- Time and date of the incident;
- Details of the incident;
- Measures implemented to prevent recurrence; and
- Any non-compliance with the consent conditions

6.2 Adaptive Management

In accordance with Schedule 5, Condition 2 of the Project Approval (Mod 5), Shoalhaven Coal will assess and manage biodiversity and rehabilitation related risks to achieve the objectives and completion criteria outlined in this plan.

Where a non-compliance relating to biodiversity and rehabilitation has occurred, Shoalhaven Coal, at the earliest opportunity will:

- Take all reasonable and feasible steps to ensure the exceedance ceases and does not reoccur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Secretary describing those options and any preferred remediation measures or other course of action; and

- Implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary.

Contingency measures that will be implemented while reasonable and feasible options are being explored include demarcating affected areas to prevent further access and minimise potential for further disturbance.

6.3 Auditing

In accordance with Schedule 5, Condition 11 and 12 of the Project Approval (Mod 5), Shoalhaven Coal will, within one year of recommencing operations, and every three years thereafter (unless otherwise directed by the Secretary), commission an Independent Environmental Audit of the project.

6.4 Review and Improvement

Ongoing monitoring and review on the performance and implementation of this BMP will be undertaken in accordance with Condition 5 of Schedule 5 of the Project Approval (Mod 5), which require review of the plan within 3 months of the submission of:

- An annual review under Schedule 5, Condition 4 of the Project Approval (Mod 5);
- An incident report under Schedule 5, Condition 9 of the Project Approval (Mod 5);
- An Independent Environmental Audit report under Schedule 5, Condition 11 and 12 of the Project Approval (Mod 5); and
- Any modifications to the conditions of the approval.

Updated versions of this BMP will be made publicly available on the Castlereagh Coal website in accordance with Condition 13 Schedule 5 of the Project Approval (Mod 5).

6.5 Threats and Corrective Action

There are risks associated with successful implementation of the BMP. In order to ensure delivery of the stated outcomes, and compliance with the approval conditions, a range of further actions are to be undertaken if monitoring identifies performance indicators/completion criteria are trending towards not being met.

The results of monitoring will feed into the adaptive management process (refer to **Section 6.2**). The Environmental Officer will utilise the results of the monitoring activities to identify any corrective actions required to meet the objectives and targets. The indicative triggers and corrective actions outlined in **Table 10** that have been identified will be subject to review based on the adaptive management process.

Table 10 Potential Threats and Recommended Corrective Actions

Threat	Potential Corrective Actions	Timing/Frequency
Inadequate resourcing	• Review and reallocate budget or resources to provide for the	• Within 2 weeks of identification
Weed species in the Biodiversity Offset Areas comprise more than 5% cover in any strata of native vegetation	• Modify weed management strategy and implement accordingly • Actively monitor the results of modifying strategy.	• Modified weed management strategy to be developed within 2 weeks of identification • Control works to be undertaken within • 1 month of identification • Monitoring to be undertaken 3 months following identification

Threat	Potential Corrective Actions	Timing/Frequency
Increase in weed species in the Biodiversity Offset Areas relative to baseline levels	• Modify weed management strategy and implement accordingly • Actively monitor the results of modifying strategy • Monitoring results to be included in the Annual Biodiversity Monitoring Report and results compared to previous monitoring results to determine if any change is evident	• Modified weed management strategy to be developed within 2 weeks of identification • Control works to be undertaken within 3 months of identification • Monitoring to be undertaken 3 months following identification
Weed species cover does not decrease in the Biodiversity Offset Areas following the implementation of control measures	• Adapt weed management strategy and modify accordingly • Actively monitor the results of modifying strategy. • Monitoring results to be included in the Annual Biodiversity Monitoring Report. and results compared to previous monitoring results to determine if any change is evident	• Weed management strategy to be updated and implemented prior to the next monitoring period
Increase in feral animal species abundance in the Biodiversity Offset Areas relative to baseline levels	• Modify feral animal control strategy and implement accordingly • Actively monitor the results of modifying strategy. • Monitoring results to be included in the Annual Biodiversity Monitoring Report and results compared to previous monitoring results to determine if any change is evident	• Modified feral animal strategy to be developed within 2 weeks of identification • Control works to be undertaken within 3 months of identification • Monitoring to be undertaken 3 months following identification
Increase in number of feral animal species in the Biodiversity Offset Areas	• Modify feral animal control strategy and implement accordingly • Actively monitor the results of modifying strategy. • Monitoring results to be included in Annual Biodiversity Monitoring Report and results compared to previous monitoring results to determine if any change is evident	• Modified feral animal strategy to be developed within 2 weeks of identification • Control works to be undertaken within 3 months of identification • Monitoring to be undertaken 3 months following identification

Threat	Potential Corrective Actions	Timing/Frequency
Feral animal abundance in the Biodiversity Offset Areas does not decrease following the implementation of control measures	- Adapt feral animal management strategy and modify accordingly - Actively monitor the results of modifying strategy. - Monitoring results to be included in the Annual Biodiversity Monitoring Report and results compared to previous monitoring results to determine if any change is evident	Feral animal management strategy to be updated and implemented prior to the next monitoring period
Unauthorised access resulting in damage	- Identify access points and repair as required - Rehabilitate any damaged areas - Review site security.	Within 1 week of identification during site operations or monitoring
Increase in erosion in the development site and Biodiversity Offset Areas relative to current documented levels	- Adapt erosion control strategy and modify accordingly - Supplementary planting of native plants - Actively monitor the results of modifying strategy	- Strategy to be developed within 2 weeks of identification of increase in erosion relative to baseline levels - Control works to be undertaken within 3 months of identification - Monitoring to be undertaken within 3 months following identification to verify no further increase in erosion

6.6 Roles and Responsibilities

Environmental management at Castlereagh Coal is the responsibility of all employees and contractors, with the Shoalhaven Coal Mining Engineering Manager having overall responsibility for environmental management of the operations. Environmental roles and responsibilities related to biodiversity and rehabilitation management for the project personnel are outlined in **Table 11**.

Table 11 Roles and Responsibilities

Role	Accountabilities for this document
Shoalhaven Coal Owner's Representative	Approve appropriate resources for the effective implementation of this plan.
Environmental Officer	- Coordinate and assist with the review of this plan in accordance with the requirements of the Project Approval (Mod 5). - Coordinate the implementation of biodiversity management controls and strategies in accordance with this Plan. - Coordinate the biodiversity monitoring requirements of this plan. - Facilitate the adequate maintenance of monitoring records. - Confirm that the personnel involved in carrying out and monitoring of the activities required under this plan are suitably qualified, licensed and experienced to undertake the task.

Role	Accountabilities for this document
	• Confirm all internal and external biodiversity reporting requirements are met. • Periodically review monitoring results and progress against targets and performance indicators in accordance with the requirements of this plan. • Assess the effectiveness of the management strategies and instigate the adaptive management process as required. • Identify any corrective actions required to meet the objectives and targets of this plan. • Coordinate biodiversity related incident investigations and reporting as required by the Project Approval (Mod 5). • Review of this plan as required by the Project Approval (Mod 5).
All employees and contractors	• Comply with all requirements in this Plan. • Report all potential environmental incidents to the Shoalhaven Coal Mining Engineering Manager immediately. • Seek approval from the Shoalhaven Coal Mining Engineering Manager prior to making changes to infrastructure/processes which may result in increased biodiversity risks.

7.0 REFERENCES

- Coalpac Pty Ltd (Coalpac), 2009. Landscape Management Plan – Invincible Open Cut Mine Extension.
- DLWC (Department of Land and Water Conservation), 2000. Rehabilitation and Revegetation Strategy prepared by Soil Service.
- NSW Department of Primary Industries (DPI), 2018. NSW WeedWise web page. <http://weeds.dpi.nsw.gov.au/>
- NSW National Parks and Wildlife Service (NPWS), 2001. Bathurst Copper Butterfly (*Paralucia spinifera*) Recovery Plan. NSW Rural Fire Service, 2006a. *Bush Fire Environmental Assessment Code for New South Wales*
- NSW Rural Fire Service, 2006b. Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code
- National Parks and Wildlife Services (NPWS) 2004. Guidelines for Ecologically Sustainable Fire Management
- Office of Environment and Heritage (OEH) 2017. *Biodiversity Assessment Method*. 59 Goulburn Street, Sydney NSW 2000 PO Box A290, Sydney South NSW 1232
- Office of Environment and Heritage (OEH) 2018. *BioNet – gateway to NSW Biodiversity Information* webpage. Accessed April 2018 from http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx
- PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney. <http://plantnet.rbgsyd.nsw.gov.au> [15/05/2018]
- Umwelt (Australia) Pty Ltd, 2016. Invincible Colliery Invincible Southern Extension Project Environmental Assessment: Section 75W Modification.
- Shoalhaven Coal Pty Ltd, 2017. 2016 Biodiversity Monitoring Report: Cullen Valley Mine and Invincible Colliery.
- Shoalhaven Coal Pty Ltd, 2018b. Invincible Colliery Water Management Plan.
- Shoalhaven Coal Pty Ltd, 2018c. Invincible Colliery Aboriginal Cultural Heritage Management Plan.
- Shoalhaven Coal Pty Ltd, 2018d. Invincible Colliery Mine Operations Plan.
- Shoalhaven Coal Pty Ltd, 2018d. Invincible Colliery Pollution Incident Response Management Plan.

8.0 ABBREVIATIONS

Term	Definition
AR	Annual Review
BAR	Biodiversity Assessment Report
BC Act	Biodiversity Conservation Act 2016
BCD	Biodiversity Conservation Division of the NSW Department of Planning and Environment
Biodiversity Offset Areas	Lot 112 DP 877190, Renown Farm (Lot 1 DP 180294); Lot 113 DP 877190 and the Hillcroft Offset Site
BMP	Biodiversity Management Plan
CCC	Community Consultative Committee
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Project Approval (Modification 5)	Project Approval PA 07_0127 (Modification 5)
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EIS	Environmental Impact Statement
DA	Development Application
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
Incident	A set of circumstances that: cause, or threatens to cause material harm to the environment; and/or breach or exceed the limits or performance measures / criteria in this approval.
OEH	Former NSW Office of Environment and Heritage (now DPE)
SEA	Southern Exclusion Area
Secretary	The Secretary of the NSW Department of Planning and Environment, or delegate

APPENDIX A

TRANSLOCATION PLAN FOR BURSARIA SPINOSA

A. TRANSLOCATION PLAN FOR BURSARIA SPINOSA

A.1. Introduction

The Bathurst Copper Butterfly (*Paralucia spinifera*) is a threatened species listed as endangered under the NSW BC Act and vulnerable under the Commonwealth EPBC Act that has been recorded within the SEA. This species has highly specific habitat requirements and only occurs where the food plant *Bursaria spinosa* subsp. *lasiophylla* and an attendant ant species is present. *Bursaria spinosa* was found at four locations in the SEA by Umwelt during surveys for the BAR. The largest patch of *Bursaria* recorded in the SEA is approximately 0.1 ha in area, and the area of the four patches combined is approximately 0.2 ha. The patches of *Bursaria spinosa* in the SEA are shown in **Figure 11**.

To avoid impacts to the Bathurst Copper Butterfly as a result of removing known habitat from the SEA, it is proposed to translocate the specimens of *Bursaria spinosa* recorded from the SEA to areas within the Biodiversity Offset Areas that will not be disturbed. This will be conducted in accordance with Condition 33(h) of Schedule 3 of the Project Approval (Mod 5), which states that Invincible must prepare a translocation plan for *Bursaria spinosa* that includes:

- An investigation into translocation options, including rehabilitated areas of the site, and areas off site;
- Describes the measures that would be undertaken to translocate the species; and
- A detailed description of a monitoring and maintenance program.

This Appendix provides a Translocation Plan for *Bursaria spinosa* that will be implemented under the direction of a qualified ecologist to meet the requirements of PA 07_0127. This Translocation Plan carefully considers methods and key learnings outlined in literature regarding translocation of the Bathurst Copper Butterfly during roadworks along the Castlereagh Highway in nearby Lidsdale, NSW (Mjadwesch and Nally, 2008). The management of the translocated *Bursaria spinosa* into recipient sites will be conducted in accordance with this document and with consideration of the Australian Network for Plant Conservation *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al, 2004).

A.2. Biology of the Bathurst Copper Butterfly and *Bursaria spinosa*

The Bathurst Copper Butterfly is known to occupy a restricted niche across its distribution, occurring along higher altitudes (greater than 900 m) in association with a host plant and an attendant ant (NPWS, 2001). The host plant, on which the caterpillars feed, is a subspecies of native blackthorn, *Bursaria spinosa* subsp. *lasiophylla*. This is a small, multi-stemmed shrub commonly occurring in eucalypt woodlands on heavy clays soils (Plantnet, 2018). The attendant ant species, *Anonychomyrma itinerans*, has a mutualistic relationship with the Bathurst Copper Butterfly. The ant nests at the base of the host plant, patrolling habitat areas when the Bathurst Copper Butterfly is active. The ant regularly tends to the eggs, found in the upper chambers of the ant nest, and caterpillars in exchange for honeydew secreted by a gland on the caterpillar. Due to the mutualistic relationship between the ant species and *Bursaria spinosa*, to maximise the likelihood of the Bathurst Copper Butterfly utilising the translocated *Bursaria* plants, the ant species must be translocated also. The translocation of the host plant including soil surrounding the root stock is considered to provide a suitable transport vessel for the Bathurst copper butterfly and attendant ant as well as any microhabitat requirements in the soil.

A.3. Identification of Specimens to be Translocated

The first stage of the translocation process will be the positive identification of all *Bursaria spinosa* plants in the SEA. This is required to avoid any inadvertent damage to these from mining operations and to positively determine the numbers to be translocated and enable them to be located when it is time to undertake the translocation.

Prior to any disturbance, field surveys will be undertaken to identify and mark the location of all *Bursaria spinosa* plants in the SEA. Indicative locations of the *Bursaria spinosa* plants previously identified from the SEA are provided in **Figure 11**, although any additional specimens recorded during clearing operations will be translocated according to the specifications in this plan. All *Bursaria spinosa* plants in the SEA disturbance footprint will be translocated.

Each *Bursaria spinosa* plant or clump of plants will be recorded with a GPS and marked with flagging tape to aid in location during translocation. The following details will be recorded at each location:

- GPS coordinates;
- Number of plants in the clump;
- Size of plants; and
- Approximate health of plants.

All *Bursaria spinosa* plants identified in the SEA will not be disturbed prior to translocation, and no disturbance will occur within a 10 m buffer of each plant or clump.

A.4. Identification of Recipient Sites

Prior to the translocation of *Bursaria spinosa* plants in the SEA, appropriate recipient sites for each specimen to be translocated will be identified and prepared in order to maximise the likelihood of successful translocation and subsequent colonisation by the Bathurst Copper Butterfly. In accordance with the PA 07_0127, a detailed investigation into recipient sites will be undertaken prior to translocation taking place. Potential recipient sites will be located in areas that won't be impacted by mining and rehabilitation works associated with Invincible Colliery, and may include already rehabilitated areas of the site, and the Biodiversity Offset Areas. Translocation will not occur unless a suitable recipient site has been identified and appropriately prepared (see **Section A.5**) (Vallee et al., 2004).

The selection process of a suitable recipient site will consider the environmental conditions of the recipient site with respect to the habitat requirements of the Bathurst Copper Butterfly. Where feasible, recipient sites should also be located within reasonable proximity to existing populations of *Bursaria spinosa*, thereby indicating that they are suitable for the establishment of the translocated specimens.

Locations of recipient sites are to preferentially contain the following conditions:

- Sites are to be located above 900 m elevation;
- Vegetation structure of the recipient site should be woodland or open forest;
- The translocated plants must be exposed to direct sunlight for a large portion of the day, due to orientation and / or canopy openness;
- Sites should aim to have a westerly to northerly aspect, whereas south facing slopes should generally be high enough and flat enough to ensure that they also receive full sun;
- Sites are to be subject to extremes of cold during winter months;
- Sites should also be in proximity to existing populations of *Bursaria spinosa* which will demonstrate the suitability of the recipient site and can act as control sites for future monitoring works; and
- Sites should be able to be safely accessed by machinery transporting the specimens to be translocated.

Figure 10 identifies areas within the Biodiversity Offset Areas that are potentially suitable for establishing a recipient translocation site.

Prior to translocation being undertaken, field surveys will be undertaken in areas that are potentially suitable, by a suitably qualified ecological practitioner, initially focussing on the areas identified in **Figure 10**, but including other areas of native vegetation in the Biodiversity Offset Areas or rehabilitated areas if they meet the initial selection criteria identified above. During the surveys, the land will be traversed and potentially suitable locations will be identified, marked with flagging tape and their locations recorded using a hand held GPS unit. After the field survey, the boundaries of each potential translocation site will be converted to high quality maps using GIS and mark up of aerial imagery.

At each potential translocation location, the following information as a minimum will be recorded to allow the most suitable sites to be identified:

- Altitude (m);
- Aspect (degrees);
- Soil type;
- Vegetation community present;
- Vegetation structure (e.g. woodland or open forest);
- Any anthropogenic disturbance;
- Evidence of weeds or other threats;
- Accessibility; and
- Photographs (one in each cardinal direction)

This information will be synthesised in a short translocation report and based on the information collected, a short list of the most appropriate recipient sites will be identified with sufficient detail to justify their selection. The short list of the most appropriate translocation sites will contain enough sites to allow for the translocation of all known specimens of *Bursaria spinosa* in the SEA. Should additional sites be required due to more specimens of *Bursaria spinosa* being recorded, then the short list will be updated with the next most suitable sites.

A.5. Site Preparation

Prior to the removal of the specimens to be translocated, the recipient site for each specimen will be prepared no more than seven (7) days in advance.

Site preparation will involve the following:

- Location of the site will be recorded using a GPS and marked with flagging tape;
- Any fallen timber or woody debris will be cleared by hand if possible to limit the potential for inadvertent damage to recipient sites; and
- A hole for emplacement of target plants and soils will be created using a small excavator. Depending on the size of the specimens to be translocated it is expected that the average dimensions of the hole will be approximately 2 m wide and 1 m deep. If required, this may be enlarged or filled in after the target specimen has arrived at the recipient site.

A.6. Translocation Procedure

This section provides details of the procedures to be implemented during translocation of *Bursaria spinosa* specimens from the SEA to previously identified and prepared recipient sites. The collection of specimens and their translocation is to be supervised by a suitably qualified and experienced ecologist.

During translocation, the following guidelines are to be adhered to:

- In order to maximise the opportunity to determine the effectiveness of the translocation, all plants should be surveyed for evidence of grazing by butterfly larvae prior to translocation;
- Excavation outlines are to be marked on the ground around the target plant to be collected, at least 1 m from the trunk;
- Each *Bursaria spinosa* plant should be wrapped with insect netting prior to translocation, to ensure that attendant insects are not dislodged and lost from the host plant whilst being moved;
- An excavator is to 'scoop' up specimens and soil, digging at least one metre below root stock and one metre surrounding target plants (to maximise the transport of soil and any host ants nest);
- 'Scoops' of target *Bursaria spinosa* are to be emplaced in the prepared recipient site on the same day they are extracted from the impact site along with the additional soil stockpile containing attendant ant species.
- Each individual plant of *Bursaria spinosa* will be translocated separately into an individually prepared hole, except where clumps of several plants occur growing in very close proximity, such that they cannot be separated without incurring root damage. In this circumstance, the entire clump will be removed and translocated intact;
- Treatment of soils within each plant hole with a plant establishment aid that contains a mix of materials such as slow and quick release fertilisers, water holding crystals, rooting hormones and wetting agents, (i.e. products such as Terra Cotten by TC Advantage Pty Ltd or Sure Start by Barmac). These agents assist in establishing newly installed plants and can reduce establishment watering resources by up to 50%;
- Soil should be backfilled around the translocated plants using a hand shovel, taking care to minimise damage to the roots and ensuring that the plant is upright, and the new soil level is the same as the previous soil level on the plant;
- The translocated plants should be pruned lightly to compensate for the likely removal of roots during the translocation process. Approximately 20% of the plant should be removed using secateurs;
- The translocated plants should be placed with the aim of forming clusters less than ten metres apart;
- Translocated specimens are to be thoroughly watered following the planting at the recipient site;
- All translocation specimens are to have their location recorded with a GPS, photographed and assigned a unique identification number for future monitoring purposes;
- Baseline information will be recorded from each translocated plant including, but not limited to, apparent health of the specimen, height, flowering status, any dieback; and
- Exclusion fencing is to be erected to protect translocated individuals from disturbance.

A.7. Timing of Translocation

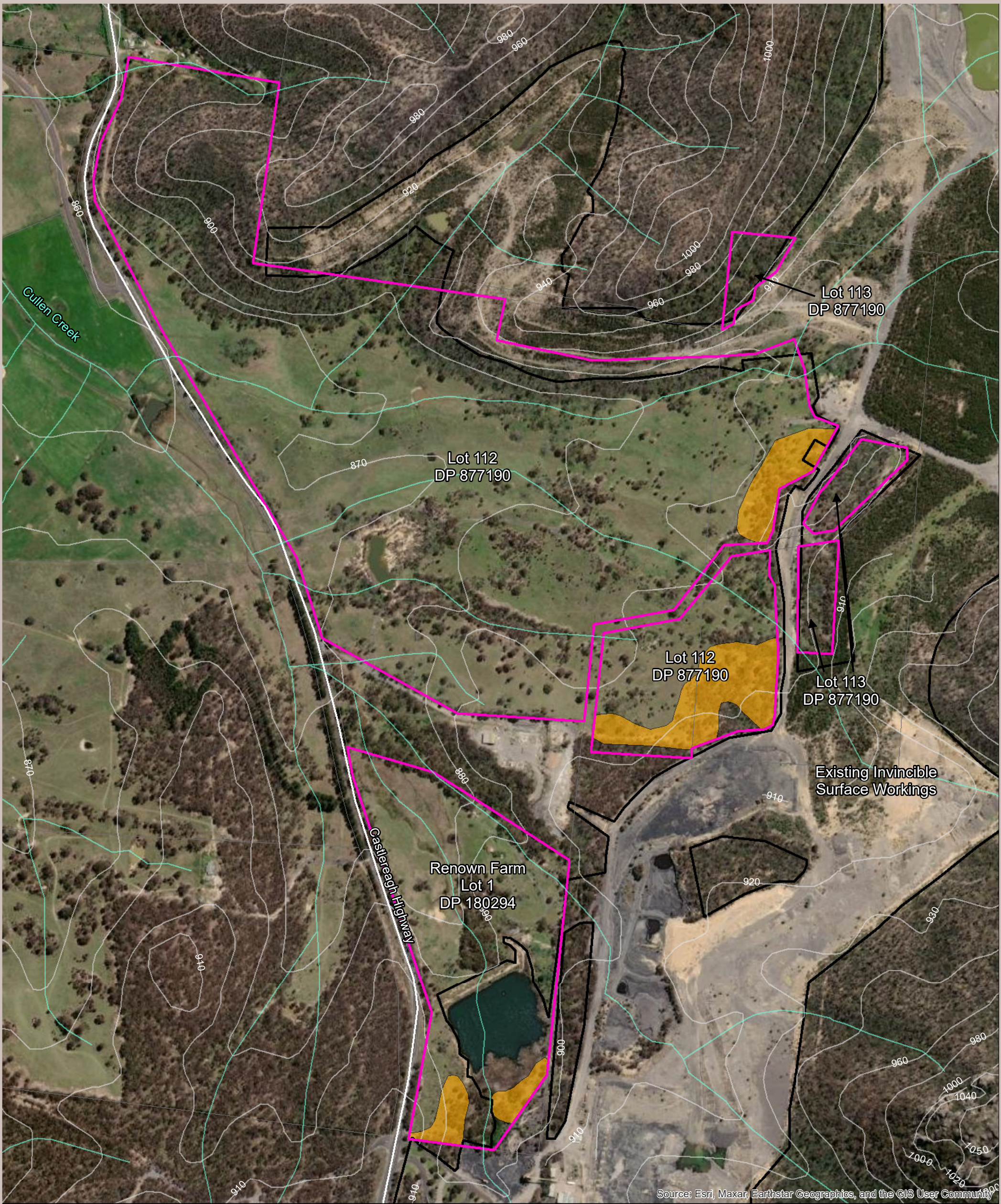
Translocation should be undertaken between autumn and spring. The purpose for this is to avoid establishing the plants in summer when high temperatures and lack of water are likely to hinder establishment efforts. If the plants are translocated in autumn, they will have the winter and spring period to establish while temperatures are moderate and

rainfall is relatively high. By summer, they will have a well-developed root system that will be better able to withstand dry and hot conditions.

A.8. Expertise Required

All threatened flora species identification, collection and translocation works must be supervised/ undertaken by appropriately qualified and experienced persons with experience in the translocation of Australian native flora species.

Personnel undertaking the translocation are required to be in possession of a Native Flora and Fauna Research Scientific Licence as issued by the DPE (NSW National Parks and Wildlife Service), specifically of a licence class for Translocation. This licence is for the collection and transport of protected flora for regeneration or propagation purposes (excluding commercial use).



- Legend**
- Biodiversity Offset Area
 - Existing Approved Mining Disturbance Area
 - Preferred Translocation Areas

Coordinate System: MGA Zone 56 (GDA 94)

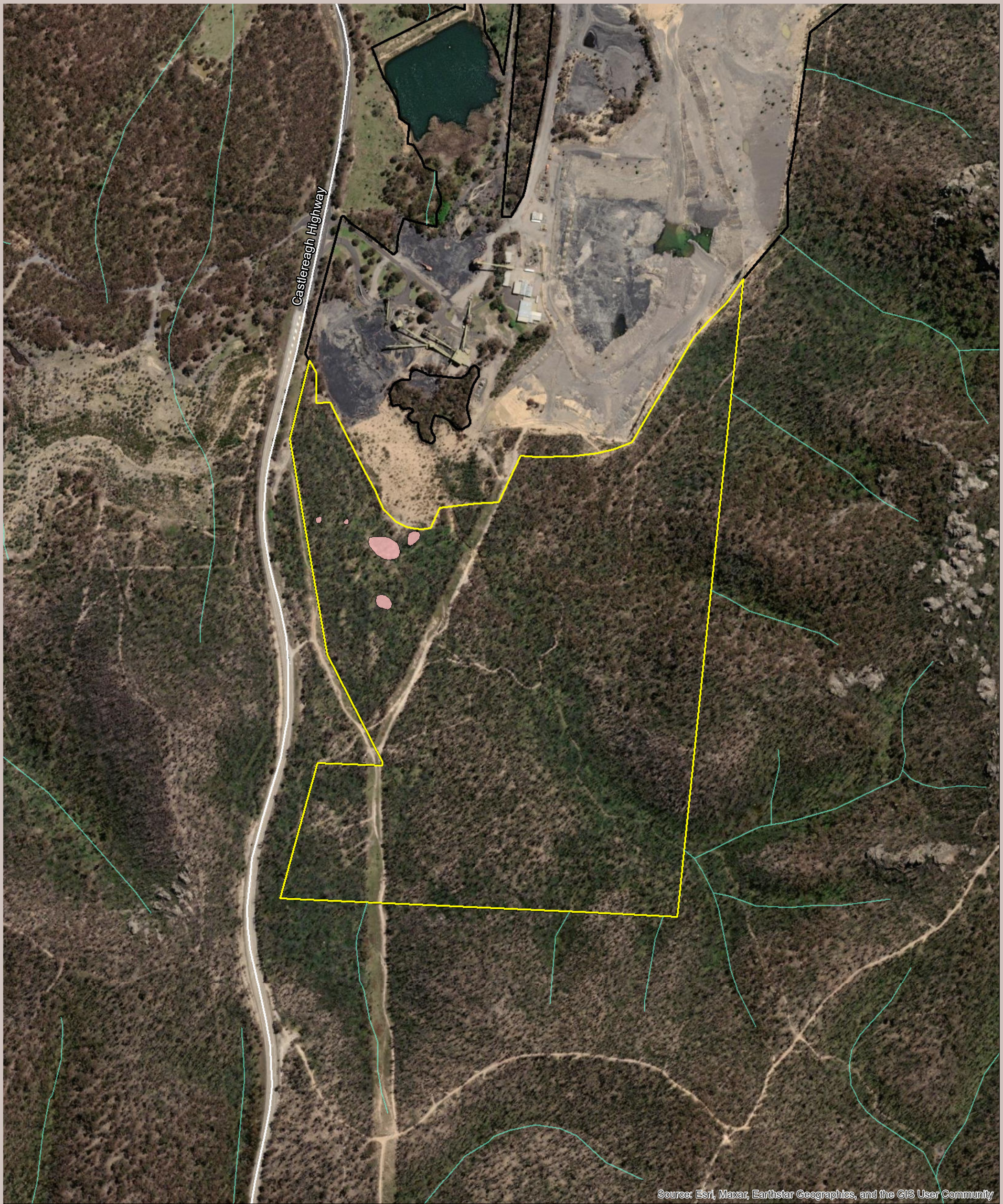
Data Source:
Umwelt 2018



Figure 10. Preferred Areas for Translocation of *Bursaria spinosa* subsp. *Lasiophylla*



I:\... \22129\Figures\RP1\20230614\Figure 10. Areas Potentially for Translocation of *Bursaria spinosa* subsp *lasiophylla*



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Coordinate System: MGA Zone 56 (GDA 94)



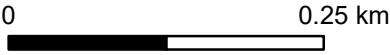
Data Source:
Umwelt 2018

Legend

-  Existing Approved Mining Disturbance Area
-  Approved Southern Extension Area
-  Bursaria Areas



Figure 11. Bursaria spinosa areas in the SEA



A.9. Monitoring and Maintenance of Translocated Populations

After planting works have been completed, monitoring will be undertaken to assess the health of the plants and determine the success of the *Bursaria spinosa* translocation. If indicated by the results of the monitoring, management measures will be implemented by appropriately qualified personnel to maximise the likelihood of successful establishment of *Bursaria spinosa* plants after translocation.

Monitoring will occur on a three-monthly basis for the first year following translocation, and annually thereafter for five years. Monitoring surveys will record the following qualitative data:

- Observations of individual plant health;
- Evidence of insect and/or insect herbivory;
- Presence of environmental weeds;
- Evidence of drought stress or need of supplementary watering;
- Recommendations to improve the condition of specimens to ensure the ongoing health and viability;
- Effectiveness of any previously recommended actions to protect/enhance the species; and
- Photo monitoring.

The results of the monitoring will be used to guide management and maintenance measures in the next monitoring period.

Ongoing maintenance measures will include watering plants as needed and weed control. Plants will be irrigated as required, in the first 3 months after installation, (on at least 4-5 occasions, depending on rainfall conditions). Note that a permit from the NSW Office of Water may be required for watering-in newly installed plants. If the monitoring indicates that environmental conditions are affecting establishment or growth of translocated *Bursaria spinosa*, then supplementary watering of translocated specimens will be undertaken more frequently if required.

Weed invasion is a threat to the establishment of native plant species and therefore the presence of environmental weeds such as vines, woody trees and shrubs, broadleaf annuals and naturalised grasses in the vicinity of the translocated *Bursaria spinosa* specimens will be closely monitored. If required, weed control will be undertaken using ecologically sensitive bushland regeneration techniques such as hand weeding and spot-spraying with herbicide, to ensure adequate weed control and establishment of *Bursaria spinosa*. Hand weeding around each plant by hand or selective herbicides may be required, as well as in an approximate 1 m radius around the outside of each plant.

Results of monitoring are to be detailed in the annual ecological monitoring report. If a poor survival rate of translocated *Bursaria spinosa* is identified during monitoring, the reason why translocation failed will be identified and the outcomes will be reported in the Annual Review and to DPE for key learnings to inform future translocation programs. Within one month of identification of failure of translocation (if applicable), the cause of failure of translocation will be identified and a report will be provided to DPE outlining the results of the translocation program within six months. If any plants fail to translocate successfully, contingency measures have been developed to ensure that a successful population of *Bursaria spinosa* is established to continue to provide habitat for the Bathurst Copper Butterfly (see **Section A.10**).

A.10. Risk Mitigation and Contingency Measures

This section identifies the potential risks to the translocation program and provides details of measures that will be implemented to minimise these risks, including contingency measures if the translocation fails.

The main risks to the translocation program are summarised below:

- Unsuccessful translocation, where some or all of the translocated individuals fail to establish;
- Threats such as weeds invade and out-compete the translocated individuals;
- Drought conditions cause unsuccessful establishment;
- *Bursaria spinosa* plants survive, but the attendant ant species does not successfully translocate; and
- *Bursaria spinosa* plants survive, but the Bathurst Copper Butterfly does not colonise the plants.

The main risk to the translocation program is that the translocated individuals fail to establish, which can occur for a number of reasons. Risks to establishment such as weeds or drought will be managed through previously identified management actions such as supplementary watering and weed control if required (see **Section A.9**). However, it is important to recognise that native Australian plant species are known to be intolerant of root disturbance and translocating mature specimens of *Bursaria spinosa* may result in some damage or disturbance occurring, leading to failure to establish, even in the absence of other factors. Therefore, contingency measures have been developed to address the possibility that the translocated plants fail to establish.

As all of the *Bursaria spinosa* individuals in the SEA will be translocated, there is no scope for additional translocations to take place in the event that the translocation is unsuccessful. Therefore, the key risk mitigation measure for this Translocation Plan is the supplementary planting of *Bursaria spinosa* tubestock if required. *Bursaria spinosa* is a well-known Australian native species that is often planted as part of bush regeneration activities as tubestock and it is likely to establish readily in the translocation locations.

As *Bursaria spinosa* is commonly used in bush regeneration there are likely to be existing stocks of the species available in native nurseries that can be utilised. Please note however that any tubestock must be purchased of local provenance. If the required quantities of local provenance tube stock are not available, then it may be necessary to collect or source suitable quantities of local native seed for propagation. If required for propagation, local *Bursaria spinosa* propagules should be collected using principles prescribed in 'Bringing the Bush back to Western Sydney' (DIPNR 2003). Seeds and vegetative propagules should be of local provenance, preferably from within 10 km of the site. Material should be propagated in a local commercial or community nursery, with well-established plants then used for planting in the site. It may be necessary to get the required amounts of seed and vegetative material contract-collected and grown-on by specialist nurseries. Local native plants should be grown in "Hiko" tube, maxi cell or viro-tube, or Forestry Tube-type containers.

The monitoring program that will be implemented following the translocation of *Bursaria spinosa* (see **Section A.10**) will be used to determine the requirement for any supplementary planting. Any translocated *Bursaria* plant that is recorded as dead or unlikely to survive during the monitoring program will be replaced by *Bursaria spinosa* tubestock at a ratio of 5:1. These will be planted in close proximity to the dead specimen and approximately 5 m apart from each other. A tree guard will be placed around each planted tubestock, and its location will be marked with a steel dropper and flagging tape. Relevant details of the replacement plantings will be recorded including:

- Number of tubestock;
- GPS location of each specimen; and
- Photographs of the plant.

If monitoring records indicate that some of the tubestock have also failed to establish, they will be replaced at the earliest opportunity in an appropriate season (between Autumn and Spring). Planted tubestock will not be considered to have reached completion criteria until they have survived for a minimum of five years after planting (see **Section A.11**).

The risk of the ant population not successfully translocating and the Bathurst Copper Butterfly not colonising are more difficult to manage, and it is not proposed to translocate any individuals of the Bathurst Copper Butterfly or its larvae. Therefore, the completion criteria for the Translocation Plan will be limited to the successful re-establishment of the translocated *Bursaria spinosa* plants. It is assumed that if a viable population of *Bursaria spinosa* is established in

appropriate locations outside the SEA, then it is likely that the Bathurst Copper Butterfly and the attendant ant species will colonise them over time as they become established.

A.11. Performance and Completion Criteria

This section provides the performance criteria of the actions that will be undertaken to translocate *Bursaria spinosa* specimens from the SEA to the Biodiversity Offset Areas to provide ongoing habitat for the Bathurst Copper Butterfly and thereby facilitate its persistence in the Biodiversity Offset Areas. The actions identified are those that have been specified previously in this Translocation Plan, and the performance and completion criteria for each of these actions is provided in **Table 3**.

Table 3 Bursaria Translocation Plan Performance and Completion Criteria

Action	Responsibility	Performance Criteria	Timing
Identification of specimens to be translocated	Ecologist	All <i>Bursaria</i> specimens in the SEA have been identified and information specified in Section A.3 has been collected	Prior to any disturbance in the SEA
Identify recipient sites	Ecologist	Surveys complete and a short list of appropriate translocation sites have been identified	Prior to translocation
Site preparation	Shoalhaven	Translocation sites have been prepared to receive specimens to be translocated according to the specifications in Section A.5	No earlier than 7 days prior to translocation
Translocation of <i>Bursaria spinosa</i> specimens	Shoalhaven/Ecologist	<i>Bursaria</i> specimens have been translocated according to the specifications in Section A.6	Between Autumn and Spring
Monitoring and maintenance	Shoalhaven/Ecologist		Inspections completed every 3 months for the first 12 months to determine success of translocation, followed by implementation of monitoring program annually for up to 5 years.
Risk mitigation and contingency measures	Shoalhaven	Contingency measures implemented If indicated by the results of the monitoring (see Section A.10) measures	As required following the monitoring reports

The completion criteria for this Translocation Plan is the successful translocation of *Bursaria spinosa* specimens from the SEA to a recipient site in mine rehabilitation or the Biodiversity Offset Areas. Success will be considered to have been achieved if the translocated plants (or tubestock plantings) have survived for a minimum of five years after translocation.

Depending on the success of the translocation plan, the completion criteria will also be considered to have been met if the translocated plants have died, but the tubestock planting that is proposed as a contingency measure has been successful, and a minimum of five (5) *Bursaria spinosa* tubestock have been successfully established for each translocated *Bursaria spinosa* specimen that failed to establish. Planted tubestock will not be considered to have reached completion criteria until they have survived for a minimum of five years after planting.

A.12. Adaptive Management

The translocation of *Bursaria spinosa* has not been practiced widely and the procedures developed are largely new and experimental. As such, it is imperative that the process remains flexible, allowing for new innovations to be incorporated as experience is developed over time. The methods of translocation in this Translocation Plan have been prepared in consideration of the previous attempts at translocating the Bathurst Copper Butterfly (Mjadwesch and Nally, 2008) and knowledge and experience of bush regeneration/revegetation. The results of the monitoring will be very important in determining the most successful techniques for future translocation events, and procedures, performance criteria and completion criteria will be adapted accordingly to reflect these outcomes. Strict documentation of information throughout the entire process is essential.

Documentation including methods and monitoring results of the translocation process will be provided to the DPE following completion of the initial five year monitoring period and results of annual ecological monitoring undertaken at Invincible Colliery, including the monitoring of the success of the translocation program will also be reported in the Annual Review.

APPENDIX B

PERFORMANCE MEASURES AND COMPLETION CRITERIA

B. PERFORMANCE MEASURES AND COMPLETION CRITERIA FOR THE SOUTHERN EXTENSION AREA

Table 4 provides details of the performance and completion criteria developed for monitoring the success of management action actions in the SEA using the SMART principles:

- **Specific** – specific outcomes relevant to biodiversity conservation objectives;
- **Measurable** –quantifiable performance measures that can be compared over time to demonstrate whether the outcomes are attained and/or maintained;
- **Achievable** – the performance measures are realistic;
- **Relevant** – outcomes are directly relevant to the biodiversity matter; and
- **Timely** – includes specific timeframes for the attainment of the outcome.

Please note that performance and completion criteria that have been developed for the Biodiversity Offset Areas are presented in **Section 5.11**.

Table 4 Performance Indicators and Completion Criteria for the SEA

Action/Items	Performance Criteria	Completion Criteria
Land Disturbance Management Controls		
Remnant vegetation is to be protected from accidental impact.	Areas to be disturbed will be clearly defined in the field prior to the commencement of the Project to prevent accidental impact to remnant vegetation.	All areas to be disturbed are clearly demarcated and surrounded by fencing. No areas of remnant vegetation are impacted unnecessarily
Remnant vegetation is protected from disturbance.	Remnant vegetation will be demarcated or sign-posted as necessary prior to the commencement of the Project to protect from disturbance such as accidental clearing and unauthorised access,	Remnant vegetation is clearly demarcated and protected from disturbance prior to the commencement of the Project. Annual monitoring is being undertaken and reported in the Annual Biodiversity Monitoring Report. as required. Management works have been verified to have been completed in the Annual Biodiversity Monitoring Report.
	Annual inspections will be completed to assess condition of fences and signs, and identify areas of erosion concern, weeds or feral animals requiring control.	
	Management works such as weed control are undertaken in remnant vegetation as necessary when they are identified.	
Salvage of habitat features such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged.	Appropriate habitat features have been salvaged prior to vegetation clearance and verified in the Annual Biodiversity Monitoring Report.
	Salvaged features are reinstated in rehabilitation areas	Appropriate habitat features have been re- instated in rehabilitation areas within one year of removal and verified in the Annual Biodiversity Monitoring Report.
Pre-clearing Surveys	All areas are subject to a pre-clearing	All areas that were cleared were assessed

Action/Items	Performance Criteria	Completion Criteria
	inspection by suitably qualified personnel prior to tree-felling occurring	for habitat value prior to tree-felling works occurring
Tree-felling Supervision	The felling of habitats features identified during pre-clearing surveys was supervised by suitably qualified personnel.	The felling of all habitat features were supervised by suitably qualified personnel and a clearance supervision report has been prepared within one month of clearing.
Seed Collection and Propagation	Pre-clearing surveys identify potential seed sources prior to clearing. Seeds are collected, stored and propagated according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	Rehabilitation/revegetation works use seeds collected onsite.
Soil Management	Where feasible excavated topsoils from clearing areas are immediately returned to rehabilitation areas.	All topsoils removed have been re-used in surface preparation of rehabilitation areas within one year of removal.
Operational Controls		
Controlling Access and Traffic	The extraction area is fenced to prevent vehicular access into non- necessary areas prior to the commencement of the project. Fencing of extraction areas is maintained.	Required fences are installed prior to the commencement of the project and regularly monitored and maintained in functional condition. This is verified in the Annual Biodiversity Monitoring Report.
	Signs indicating the on-site speed limits for vehicles are installed at appropriate points throughout site prior to the commencement of the project and maintained.	Speed limit signs were installed prior to the commencement of the project and maintained for the duration of operations.
Develop and implement a Weed Control Program for the Project	A Weed Control Program will be developed for the Project within one year of commencement. This plan will identify the weeds present, appropriate control methods and a program for weed management actions.	A Weed Control Program has been developed for the Project within one year of commencement of the Project and weed management actions taken in accordance with the plan and documented appropriately in the Annual Biodiversity
Operational Controls		
Weed inspections of remnant and rehabilitation areas	Annual inspections will be undertaken of rehabilitation areas and remnant vegetation in Biodiversity Offset Areas to identify areas of weed infestation.	Annual inspections are undertaken in rehabilitation and remnant vegetation areas for weed infestations and outcomes documented in the Annual Biodiversity Monitoring Report., including progress towards targets identified in the Weed Control Program.
Develop a weed control register to document when and where each control method is implemented.	Update and maintain weed control register. The weed control register will be prepared within one year of the commencement of the project and will be updated every time weed management is undertaken	Weed control register is maintained and up to date.

Develop and implement an effective Pest Animal Control Plan.	Develop an Annual Pest Animal Control Plan within one year of commencement of the Project. This will include specifications for an annual pest animal monitoring and reporting program, trigger levels for management actions and appropriate control methods. The results of the annual monitoring program and any control activities conducted will be documented in the Biodiversity Management Plan Annual Report	Strategies from control plans are implemented and targets are achieved. Stable or downward trend in population size based on initial monitoring results recorded in the Annual Biodiversity Monitoring Report. Report.
Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register. The vertebrate pest control register will be prepared within one year of the commencement of the project and will be updated every time vertebrate pest control is undertaken	Pest animal control register is maintained and up to date.
Sediment and Erosion Control	Sediment and erosion control will be undertaken prior to the commencement of the Project and ongoing in accordance with the Soil and Water Management Plan (Shoalhaven Coal, 2018b)	Undertaken in accordance with the Soil and Water Management Plan (Shoalhaven Coal, 2018b).
Training and Awareness		
Site induction	The site induction package will be updated prior to the commencement of the Project to include information on the ecological values of the site. Site induction package is updated if new significant ecological values are identified.	All new personnel were inducted to site in a manner that identifies key ecological values.
Toolbox Meetings	Where significant new ecological values are identified this will be shared during tool-box meetings.	Current site personnel were kept updated on site ecological values (as necessary).
Inspections and Monitoring		
Monthly rehabilitation inspections	Monthly inspections of rehabilitation will be completed following commencement of the Project and documentation maintained in a database for future comparison	Monthly inspections completed and documented.
Annual rehabilitation, general ecological and targeted threatened species monitoring.	Rehabilitation, general ecological and targeted threatened species monitoring will be conducted annually following commencement of the Project and an annual report will be prepared presenting the results of the monitoring and comparing them to previous years	Monitoring program completed and results included in the Annual Biodiversity Monitoring Report.
Communication and Reporting		
Collate data on actions implemented and results of inspections and monitoring into the Annual Review.	Annual Review completed and submitted before end of March each year	An AR has been reported on annually for the duration of operations.

External reporting	The Castlereagh Coal website (publicly available) will be updated regularly (at a minimum every quarter) in response to actions undertaken as required under this BMP	Actions undertaken in accordance with this BMP were documented on the Castlereagh Coal website and made publicly available.
Incident Reporting	Any Environmental Incidents will be reported to the Mine Manager, immediately after occurrence.	All Environmental Incidents were reported immediately to the Mine Manager.
	If an Environmental Incident was identified, an incident report will be prepared and provided to the Secretary within 7 days of the incidence occurring.	For all Environmental Incidents, an incident report was prepared and provided to the Secretary within 7 days.
Review and Improvement		
Review of BMP	A review of the BMP was undertaken and relevant modifications made (if required) within three (3) months of each of the following: • Incident report • Annual Review • Independent Environmental Audit outcomes • Modification to consent	A review of the BMP was undertaken and relevant modifications made (if required) within three (3) months of each of the following: • Incident report • AR • Independent Environmental Audit outcomes • Modification to consent

APPENDIX C

SOUTHERN EXTENSION FLORA AND FAUNA SPECIES LISTS

C. SOUTHERN EXTENSION AREA FLORA AND FAUNA SPECIES LISTS

Table 5 Flora Species List

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Opps
Filicopsida																
Adiantaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	poison rock fern		5	20			5	50	20		5				
Dennstaedtiaceae	<i>Pteridium esculentum</i>	bracken fern		10							1				50	
Magnoliopsida (Flowering Plants) - Lillidae																
Cyperaceae	<i>Lepidosperma laterale</i>													1		
Iridaceae	<i>Pattersonia sericea</i>	silky purple-flag				3										
Lomandraceae	<i>Lomandra confertifolia</i>			50	1000	50										
Lomandraceae	<i>Lomandra filiformis</i>						1000	500	500	500	500	100	2	1000	100	
Lomandraceae	<i>Lomandra longifolia</i>	spiny-headed mat-rush								100				500		
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	many-flowered mat- rush			20										2	
Lomandraceae	<i>Lomandra sp.</i>		50													
Orchidaceae	<i>Dipodium roseum</i>											1				
Orchidaceae	<i>Dipodium sp</i>		1													
Orchidaceae	<i>Diuris sulphurea</i>	tiger orchid														X
Phormiaceae	<i>Dianella revoluta</i> var. <i>revoluta</i>	a blue flax lily	5	10	10		10	5		5		5				
Phormiaceae	<i>Stypantra glauca</i>	nodding blue lily		2												
Poaceae	* <i>Aira cupaniana</i>	silvery hairgrass							10							
Poaceae	<i>Aristida vagans</i>	threeawn speargrass							50	10	20	20		100		
Poaceae	<i>Austrodanthonia laevis</i>	wallaby grass									50	20				
Poaceae	<i>Austrodanthonia pilosa</i>	smooth-flowered wallaby grass							50	50						
Poaceae	<i>Austrostipa bigeniculata</i>	yanganbil		100												
Poaceae	<i>Austrostipa rudis</i>	foxtail speargrass		50						10	5	10				
Poaceae	<i>Austrostipa scabra</i>	rough speargrass		50												
Poaceae	<i>Austrostipa sp.</i>	a speargrass													50	

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Opps
Poaceae	<i>Echinopogon ovatus</i>	forest hedgehog grass								5				100		
Poaceae	<i>Entolasia stricta</i>	wiry panic							3							
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>												1000	1000	500	
Poaceae	<i>Paspalidium distans</i>						20									
Poaceae	<i>Paspalidium</i> sp.		20													
Poaceae	<i>Poa labillardierei</i>	tussock grass							20	10					2	
Poaceae	<i>Poa sieberiana</i>	snowgrass		100	100	50	500		20			10	500	100	500	
Poaceae	<i>Rytidosperma pallidum</i>	silver-top wallaby grass		50												
Poaceae	<i>Rytidosperma</i> sp	silver-top wallaby grass	100		20	5	20	100	3	10		500	1000	100	500	
Poaceae	<i>Themeda triandra</i>	kangaroo grass											50			
Magnoliopsida (Flowering Plants) - Magnoliidae																
Acanthaceae	<i>Brunoniella australis</i>	Blue trumpet flower			10		1	5								
Aizoaceae	* <i>Galenia pubescens</i>	Galenia		1												
Apiaceae	<i>Hydrocotyle laxiflora</i>	stinking pennywort		20	20		20	10		20			100	100	100	
Apiaceae	<i>Platysace lanceolata</i>	shrubby Platysace	5													
Asteraceae	<i>brachyscome spathulata</i>													1		
Asteraceae	<i>Cassinia arcuata</i>	sifton bush							5		10				1	
Asteraceae	<i>Chrysocephalum apiculatum</i>	common everlasting							500							
Asteraceae	<i>Circium vulgare</i>	spear thistle											1			
Asteraceae	<i>Cymbonotus</i> sp.												1			
Asteraceae	<i>Euchiton involucratu</i> s	star cudweed			5											
Asteraceae	* <i>Hypochaeris radicata</i>	catsear			5					10	10			5		
Asteraceae	<i>Lagenophora stipitata</i>	common lagenophora	1													
Asteraceae	<i>Leucochrysum albicans</i> subsp. <i>albicans</i> c			5												
Asteraceae	<i>Senecio quadridentatus</i>	cotton fireweed							100			5				
Asteraceae	<i>Solenogyne gunnii</i>	Solenogyne					2									
Asteraceae	* <i>Tolpis barbata</i>	yellow hawkweed						2								
Asteraceae	<i>Vernonia cinerea</i>								5							
Asteraceae	<i>Vittadinia muelleri</i>	fuzzweed								5						
Asteraceae	<i>Vittadinia gracilis</i>	woolly New Holland daisy					2		10		20					

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Opps
Boraginaceae	<i>Cynoglossum suaveolens</i>	sweet hounds-tongue		5	5											
Boraginaceae	<i>Echium plantagineum</i>	Patterson's curse		10							2		1		5	
Campanulaceae	<i>Wahlenbergia</i> sp.	bluebell					2								1	
Clusiaceae	<i>Hypericum gramineum</i>	small St John's wort		50	20		20	10	20	50	10	5				
Clusiaceae	* <i>Hypericum perforatum</i>	St. John's wort		10	10		20		10		20		20		20	
Convolvulaceae	<i>Dichondra repens</i>	kidney weed			20		20			10			200	500	50	
Dilleniaceae	<i>Hibbertia obtusifolia</i>	hoary guinea flower	5	5		3										
Dilleniaceae	<i>Hibbertia</i> spp.							20				2				
Ericaceae	<i>Astroloma humifusum</i>	native cranberry	2													
Ericaceae	<i>Brachyloma daphnoides</i>	Daphne heath	2			10										
Ericaceae	<i>Leucopogon lanceolatus</i>		5													
Ericaceae	<i>Leucopogon muticus</i>	blunt beard-heath						10						2		
Ericaceae	<i>Lissanthe strigosa</i>	peach heath		20	100		25	10	20			50				
Ericaceae	<i>Melichrus urceolatus</i>	urn-heath													1	
Ericaceae	<i>Monotoca elliptica</i>	Tree broom-heath						20								
Fabaceae (Faboideae)	<i>Bossiaea buxifolia</i>						1									
Fabaceae (Faboideae)	<i>Bossiaea prostrata</i>			1												
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	gorse bitterpea								50	50					
Fabaceae (Faboideae)	<i>Desmodium gunnii</i>	tick-trefoil						10								
Fabaceae (Faboideae)	<i>Desmodium varians</i>	slender tick-trefoil		50			5		5							
Fabaceae (Faboideae)	<i>Dillwynia phyllicoides</i>	parrot-pea								3	1					
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	twining glycine								5				100		
Fabaceae (Faboideae)	<i>Glycine microphylla</i>	small-leaf glycine					3									
Fabaceae (Faboideae)	<i>Glycine tabacina</i>												100		500	
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	false sarsaparilla		2		1	3	5			2	10				
Fabaceae (Faboideae)	<i>Hovea</i> spp.							1								
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian indigo		5			5									
Fabaceae (Faboideae)	<i>Podolobium ilicifolium</i>	prickly shaggy pea	100	20		10		50								
Fabaceae (Mimosoideae)	<i>Acacia buxifolia</i>	box-leaved wattle	20		50	8		20	20	20	50	20				
Fabaceae (Mimosoideae)	<i>Acacia dealbata</i>	silver wattle			3		7	1		5	20		3		1	
Fabaceae (Mimosoideae)	<i>Acacia deanei</i>	green wattle		5												
Fabaceae (Mimosoideae)	<i>Acacia falcata</i>															
Fabaceae (Mimosoideae)	<i>Acacia gunnii</i>	ploughshare wattle	1	3			3	1								
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	Sydney golden wattle												1		

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Opps
Fabaceae (Mimosoideae)	<i>Acacia obtusifolia</i>			5				2		1		2				
Fabaceae (Mimosoideae)	<i>Acacia spp.</i>	wattle					1									
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>	sunshine wattle				20										
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	prickly moses							2			1				
Gentianaceae	<i>Centaurium erythraea</i>	common centaury		100				2	20		10			1	100	
Geraniaceae	<i>Geranium solanderi</i>	native geranium											2			
Goodeniaceae	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	ivy goodenia	20	10		10		50		5	5	10				
Haloragaceae	<i>Gonocarpus tetragynus</i>	poverty raspwort			10		20	10	2	20	5	20		100	100	
Lamiaceae	<i>Mentha diemenica</i>	slender mint											5		100	
Lauraceae	<i>Cassytha glabella</i>															
Loranthaceae	<i>Amyema miquelii</i>	box mistletoe					1	2		8		2				
Loranthaceae	<i>Amyema spp.</i>	mistletoe			1											
Myrtaceae	<i>Eucalyptus albens</i>	white box														
Myrtaceae	<i>Eucalyptus amplifolia</i>	cabbage gum												7		
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's red gum			2									1		
Myrtaceae	<i>Eucalyptus blaxlandii</i>	Blaxland's stringybark														
Myrtaceae	<i>Eucalyptus bridgesiana</i>	apple box		4	3	1										
Myrtaceae	<i>Eucalyptus cameronii</i>	diehard stringybark					5									
Myrtaceae	<i>Eucalyptus cannonii</i>	capertee stringybark		5	5								4			
Myrtaceae	<i>Eucalyptus dalrympleana</i>	mountain gum							20	6	20	5				
Myrtaceae	<i>Eucalyptus dives</i>	broad-leaved peppermint													8	
Myrtaceae	<i>Eucalyptus mannifera</i>	brittle gum	3	5												
Myrtaceae	<i>Eucalyptus melliodora</i>	yellow box											2	1		
Myrtaceae	<i>Eucalyptus piperita</i>	Sydney peppermint			1							2				
Myrtaceae	<i>Eucalyptus praecox</i>	brittle gum			8		10	2								
Myrtaceae	<i>Eucalyptus radiata</i>	narrow-leaved peppermint					2	2								
Myrtaceae	<i>Eucalyptus rossii</i>	inland scribbly gum	2	1	4	3		10				14				
Myrtaceae	<i>Eucalyptus sieberi</i>	silvertop ash	10													
Myrtaceae	<i>Eucalyptus sparsifolia</i>	narrow-leaved stringybark				20		20	1	7	10	7			2	
Myrtaceae	<i>Eucalyptus viminalis</i>	ribbon gum											20	1	8	
Myrtaceae	<i>Leptospermum juniperinum</i>	prickly tea-tree								50		1				
Myrtaceae	<i>Leptospermum polygalifolium</i>			1												

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Opps
Oxalidaceae	<i>Oxalis</i> sp.		3	20	50		5	5		3	20		100	50		
Phyllanthaceae	<i>Poranthera microphylla</i>	small poranthera			1			5								
Pittosporaceae	<i>Billardiera scandens</i>	hairy apple berry	1		10									1		
Pittosporaceae	<i>Bursaria spinosa</i>	native blackthorn			1		3									
Plantaginaceae	* <i>Plantago debilis</i>			20												
Plantaginaceae	<i>Plantago lanceolata</i>	lambs tongue													5	
Plantaginaceae	<i>Plantago</i> sp.	plantain					20								5	
Plantaginaceae	<i>Veronica calycina</i>	hairy speedwell											1			
Plantaginaceae	<i>Veronica plebeia</i>	trailing speedwell			1											
Proteaceae	<i>Persoonia laurina</i>	laurel geebung	10	10		8		5		2		1				
Proteaceae	<i>Persoonia linearis</i>	narrow-leaved geebung										1		1		
Proteaceae	<i>Persoonia rigida</i>			5							3					
Ranunculaceae	<i>Clematis aristata</i>	old man's beard											1			
Rhamnaceae	<i>Pomaderris andromedifolia</i>													1		
Rosaceae	<i>Acaena novae-zelandiae</i>	bidgee-widgee					10									
Rosaceae	<i>Rosa rubiginosa</i>	sweet briar											1			
Rubiaceae	<i>Galium</i> sp.						1						1000			
Santalaceae	<i>Exocarpos cupressiformis</i>	cherry ballart						3								
Stackhousiaceae	<i>Stackhousia muricata</i>		13			5										
Stackhousiaceae	<i>Stackhousia</i> sp.										1	1				
Stackhousiaceae	<i>Stackhousia viminea</i>		10	10		8		5		2		1				
Violaceae	<i>Viola hederaceae</i>	ivy-leaved violet													10	

Table 6 Fauna Species List

Scientific Name	Common Name	TSC Status	EPBC Status
AMPHIBIANS			
Myobatrachidae			
<i>Crinia signifera</i>	common froglet		
<i>Limnodynastes dumerilii dumerilii</i>	eastern banjo frog (dumerilii)		
Hylidae			
<i>Litoria dentata</i>	bleating tree frog		
<i>Litoria peronii</i>	Peron's tree frog		
REPTILES			
Scincidae			
<i>Lampropholis delicata</i>	dark-flecked garden sunskink		
<i>Lampropholis guichenoti</i>	pale-flecked garden sunskink		
<i>Saiphos equalis</i>	three-toed skink		
<i>Saproscincus mustelinus</i>	weasel skink		
Agamidae			
<i>Amphibolurus muricatus</i>	jacky lizard		
BIRDS			
Podargidae			
<i>Podargus strigoides</i>	tawny frogmouth		
Columbidae			
<i>Phaps chalcoptera</i>	common bronzewing		
Alcedinidae			
<i>Ceyx azureus</i>	azure kingfisher		
<i>Dacelo novaeguineae</i>	laughing kookaburra		
Cuculidae			
<i>Cacomantis variolosus</i>	brush cuckoo		
Cacatuidae			
<i>Callocephalon fimbriatum</i>	gang-gang cockatoo	V	
<i>Calyptorhynchus funereus</i>	yellow-tailed black-cockatoo		
Psittacidae			
<i>Platycercus elegans</i>	crimson rosella		
<i>Platycercus eximius</i>	eastern rosella		
Strigidae			
<i>Ninox novaeseelandiae</i>	southern boobook		
Accipitridae			
<i>Accipiter fasciatus</i>	brown goshawk		
<i>Aquila audax</i>	wedge-tailed eagle		
Climacteridae			
<i>Climacteris picumnus</i>	brown treecreeper	V	
<i>Cormobates leucophaea</i>	white-throated treecreeper		
Pardalotidae			
<i>Pardalotus punctatus</i>	spotted pardalote		
Meliphagidae			
<i>Acanthagenys rufogularis</i>	spiny-cheeked honeyeater		
<i>Anthochaera chrysoptera</i>	little wattlebird		
<i>Anthochaera carunculata</i>	red wattlebird		
<i>Lichenostomus chrysops</i>	yellow-faced honeyeater		
<i>Lichenostomus leucotis</i>	white-eared honeyeater		
<i>Manorina melanocephala</i>	noisy miner		
<i>Melithreptus brevirostris</i>	brown-headed honeyeater		

Scientific Name	Common Name	TSC Status	EPBC Status
<i>Melithreptus lunatus</i>	white-naped honeyeater		
<i>Philemon corniculatus</i>	noisy friarbird		
Petroicidae			
<i>Eopsaltria australis</i>	eastern yellow robin		
<i>Petroica boodang</i>	scarlet robin	V	
Acanthizidae			
<i>Acanthiza pusilla</i>	brown thornbill		
<i>Acanthiza chrysorrhoa</i>	yellow-rumped thornbill		
<i>Acanthiza lineata</i>	striated thornbill		
<i>Acanthiza nana</i>	yellow thornbill		
<i>Sericornis frontalis</i>	white-browed scrubwren		
Pachycephalidae			
<i>Pachycephala rufiventris</i>	rufous whistler		
<i>Pachycephala pectoralis</i>	golden whistler		
Artamidae			
<i>Cracticus tibicen</i>	Australian magpie		
<i>Cracticus torquatus</i>	grey butcherbird		
<i>Strepera graculina</i>	pie currawong		
Campephagidae			
<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		
Corcoracidae			
<i>Corcorax melanorhamphos</i>	white-winged cough		
Corvidae			
<i>Corvus coronoides</i>	Australian raven		
Rhipiduridae			
<i>Rhipidura albiscapa</i>	grey fantail		
<i>Rhipidura leucophrys</i>	willie wagtail		
Maluridae			
<i>Malurus lamberti</i>	variegated fairy-wren		
<i>Malurus cyaneus</i>	superb fairy-wren		
Hirundinidae			
<i>Hirundo neoxena</i>	welcome swallow		
Nectarinidae			
<i>Dicaeum hirundinaceum</i>	mistletoebird		
MAMMALS			
Macropodidae			
<i>Macropus giganteus</i>	eastern grey kangaroo		
<i>Macropus rufogriseus</i>	red-necked wallaby		
<i>Wallabia bicolor</i>	swamp wallaby		
Petauridae			
<i>Petaurus norfolcensis</i>	squirrel glider	V	
Phalangeridae			
<i>Trichosurus vulpecula</i>	common brushtail possum		
<i>Pseudocheirus peregrinus</i>	common ringtail possum		
Vombatidae			
<i>Vombatus ursinus</i>	common wombat		
Emballonuridae			
<i>Saccolaimus flaviventris</i>	yellow-bellied sheath-tail-bat	V	
Molossidae			
<i>Tadarida australis</i>	white-striped freetail-bat		

Scientific Name	Common Name	TSC Status	EPBC Status
Rhinolophidae			
<i>Rhinolophus megaphyllus</i>	eastern horseshoe-bat		
Vespertilionidae			
<i>Chalinolobus dwyeri</i>	large-eared pied bat	V	V
<i>Chalinolobus gouldii</i>	Goulds wattled bat		
<i>Chalinolobus morio</i>	chocolate wattled bat		
<i>Miniopterus schreibersii oceanensis</i>	eastern bentwing-bat	V	
<i>Scotorepens orion</i>	south -eastern broad-nosed bat		
<i>Vespadelus darlingtoni</i>	large forest bat		
<i>Vespadelus regulus</i>	southern forest bat		
<i>Vespadelus vulturnus</i>	little forest bat		
Canidae			
<i>Vulpes vulpes</i>	red fox		
Felidae			
<i>*Felis catus</i>	cat		
Leporidae			
<i>*Lepus capensis</i>	brown hare		
<i>*Oryctolagus cuniculus</i>	rabbit		
Muridae			
<i>*Mus musculus</i>	house mouse		
Bovidae			
<i>*Ovis aries</i>	sheep		

APPENDIX D

Stakeholder Engagement

Our ref: DOC23/591552
Your ref: INV-BMP-R1

Tim Playford
Senior Project Manager/Ecologist
Cumberland Ecology
tim.playford@cumberlandecology.com.au

Dear Tim

Invincible Colliery Southern Extension – Biodiversity Management Plan

Thank you for your email dated 22 June 2023 to the Biodiversity, Conservation and Science Directorate (BCS) inviting comments on the draft Biodiversity Management Plan (BMP) for the Invincible Colliery Southern Expansion. This draft BMP been prepared in response to our previous comments to NSW Planning (formerly Department of Planning and Environment), dated 21 December 2018.

BCS has reviewed the draft BMP and we can confirm that the majority of our previous issues have been addressed. Our residual issues include:

- The timeframe proposed for submitting the Biodiversity Offset Strategy;
- The lack of adequate evidence to justify and demonstrate the reduction of Capertee Stringybark credits; and
- Minor amendments and additions required for both Table 9 of the BMP and the Bursaria Translocation Plan.

The above listed residual issues should be addressed in the finalised BMP sent to NSW Planning for approval.

BCS's previous recommendations (dated 21 December 2018) are provided in **Attachment A**. Our detailed comments and recommendation on the draft BMP are provided in **Attachment B**.

If you require any further information regarding this matter, please do not hesitate to contact Ben Ellis, A/Principal Project Manager, via ben.ellis@environment.nsw.gov.au or (02) 8275 1838.

Yours sincerely



Sarah Carr
Director North West
Biodiversity, Conservation and Science Directorate

4 July 2023

Attachment A – BCS's previous recommendations

Attachment B - BCS's Detailed Comments and Recommendations

BCS's previous recommendations

Invincible Colliery Southern Extension - Biodiversity Management Plan

BCS Recommendation Reference	Summary of BCS Recommendation (21 December 2018)	Addressed in Revised BMP?	Report Reference	Comment and Recommendation (Recommendations in Bold)
1	Include a description of the baseline ecological data for the development site in section 3	Yes	Section 2.0	Additional detail of biodiversity values present has been added to Section 2.0. No further action required.
2	Update Figure 3.2 to ensure it displays all of the threatened species records from the development site, including additional Capertee stringybark and purple copper butterfly records.	Yes	NA	An updated Figure has been produced which contains the relevant biodiversity values. No further action required.
3	Amend Figure 3.4 to display the Capertee stringybark records at the Hillcroft offset site	Yes	Figure 6	An updated Figure has been produced which contains the relevant biodiversity values. No further action required.
4	Clarify in section 3.3 and Figure 3.4 which glider species has been recorded at the Hillcroft offset site.	Yes	Section 2.2.2	Clarified as Squirrel Glider. No further action required.
5	Clearly label the three polygons in Figure 3.3 that relate to Lot 113 DP 877190	Yes	Figure 5	An updated Figure has been produced which contains the relevant detail. No further action required.
6	Amend all relevant figures in the BMP to reflect the change in the development footprint	Yes	All Relevant Figures	All Figures containing the mine site disturbance area have been revised. No further action required.
7	Actual time periods (in years) should be used to define the short, medium and long-term management actions in Table 4.1	Yes	Table 7	Table 7 has been updated with actual time periods. No further action required.
8	Insert information into section 4.2.9 that outlines the vegetation communities to be established on the rehabilitation land, their area and a diagram displaying their location.	Yes	Section 4.2	Detail on the management and objectives for rehabilitation land have been provided. No further action required.
9	Provide justification for the amended ecosystem and species credit requirements listed in Table 5.1.	No	Table 4	Justification and a process for calculating the reduced impact area and associated credit obligation for the project has been provided. However, the proponent has proposed to include a reduced number of Capertee Stringybark credits based on inadequate justification and evidence.

				See Attachment B for further detail.
10	Provide OEH with the amended development footprint shapefile and species credit polygons.	Yes	Provided to BCS	Spatial files provided. No further action.
11	Submit the Invincible Southern Extension project in the BioBanking Calculator to allow OEH to review the information.	No	Provided to BCS	A finalised BioBanking Calculator report has been submitted with the revised BMP which contains updated credit calculations. This will require revision to conform with BCSs recommendations See Attachment B for further detail.
12	Amend the text in section 4.3 to accurately reproduce Schedule 3 Condition 33(h) regarding the investigation of translocation options for <i>Bursaria spinosa</i>	Yes	Appendix A	Amended. No further action necessary.
13	The proponent should contact OEH to receive advice on how to best implement the translocation project and amend the translocation plan to reflect this.	Yes	NA	See Attachment B for further detail.
14	The translocation plan should be endorsed by OEH and approved by DPE.	No	NA	BCS would be happy to endorse the translocation plan if minor amendments and recommendations are included in the final plan. See Attachment B for further detail.
15	The translocation plan should be removed from the body of the BMP and placed in an appendix.	Yes	Appendix A	Amended. No further action necessary.
16	Provide evidence that the Hillcroft property can legitimately be used as a biodiversity offset site. If Hillcroft has to be withdrawn from the BOS the proponent must advise how the biodiversity credit liability will be fulfilled, and the BOS and BMP must be updated accordingly.	No	NA	Further investigations into the Hillcroft Offset site have been deferred to a Biodiversity Offset Strategy proposed to be submitted to DPE within 12 months of the commencement of mining operations. However, BCS is concerned regarding the proposed timeframe for submitting the Biodiversity Offset Strategy. See Attachment B for further detail.
17	Amend the text throughout the BMP to ensure the term Hillcroft Offset Site (or similar) is consistently used.	Yes	All Section of BMP	Amended. No further action necessary.
18	All performance measures and completion criteria in Table A1 should be reviewed and amended to ensure they conform to the SMART principles	No	Table 9	Table 9 of the BMP does not contain any specific timeframes. To conform to SMART principles each performance measure and completion criteria in Table 9 should contain timeframes. See Attachment B for further detail

19	Provide more detailed ecological information in section 5.2 for each of the three existing biodiversity offset areas.	Yes	Table 5	Additional ecological information has been provided for each biodiversity offset areas. No further action needed.
20	Develop management actions for the biodiversity offset areas.	Yes	4.3	Detailed Management action have been included for offset sites. No further action needed.
21	Develop performance measures and completion criteria for the biodiversity offset areas that adhere to the SMART principles.	No	Table 9	As per Recommendation 18 above. To conform to SMART principles each performance measure and completion criteria in Table 9 should contain timeframes. See Attachment B for further detail
22	Where relevant, increase the number of monitoring sites or justify how the objectives of the monitoring program will be met for the vegetation zones where a minimum number of plots (according to Table 4 of the BAM) will not be achieved.	Yes	Section 5.4	Minimum plot have been justified. No further action needed.
23	Amend the monitoring plan to include a plot/s in the biodiversity offset area known as Lot 113 DP 877190, or alternatively section 6.4.1 should detail why it is appropriate that no monitoring plots need to be located in this area	Yes	Figure 8	Plots have been proposed in offset area Lot 113 DP 877190. No further action necessary.
24	Develop a comprehensive list of monitoring actions for the biodiversity offset areas and detail the frequency of monitoring for each action	Yes	Section 5.4	Detailed monitoring actions for biodiversity offset areas have been provided. No further action necessary.
25	Review and update the threats and corrective actions in Table 10.1 to ensure they adhere to the SMART principles.	Yes	Table 10	Threats and Corrective Actions have been improved to conform to SMART principals.
26	Update the threats in Table 10.1 to ensure they adequately describe all of the threats relevant to the implementation of the BMP.	Yes	Table 10	Threats and Corrective Actions have been improved to conform to SMART principals.
27	Where relevant clarify whether each threat relates to the development site or the biodiversity offset areas.	Yes	Table 10	Clarification provided. No further action needed.
28	Delete the threats in Table 10.1 relating to Bursaria spinosa and include them in the translocation plan for the purple copper butterfly.	Yes	Appendix A	Threats have been moved to Appendix A. No further action needed.

BCS's Detailed Comments and Recommendations

Invincible Colliery Southern Extension – Biodiversity Management Plan

1. Preparation of the Invincible Biodiversity Offset Strategy should be prioritised

Schedule 3, Condition 32 of the project approval for the Invincible Southern Extension (PA 07_0127 (Mod 5) requires the proponent to retire the biodiversity credit obligation for the project within 2 years of the recommencement of mining operations.

The BMP proposes that a strategy for the retirement of credits, including those associated with the Hillcroft Offset Site, will be provided to DPE within 12 months from the recommencement of mining operations. This will only provide the proponent a very limited amount of time to implement the finalised biodiversity offset strategy, when approved.

Implementation of an offset strategy, inclusive of establishing offset sites, can require significant lead-time to appropriately navigate complex land tenure agreements, prepare comprehensive and fully costed 20-year management regimes and/or seek relevant approvals. This is especially the case for projects which have complex and tailored offset approval conditions, such as the Invincible Southern Extension.

We strongly recommend that the proponent immediately commences preparation of the Biodiversity Offset Strategy to provide as much time as possible for its implementation, with the aim to submit it for approval within 3 months of the commencement of mining operations. This will provide the proponent with more appropriate lead time to comply with the credit retirement timeframe outlined in Schedule 3, Condition 32 of the project approval.

Recommendations:

- 1.1 Revise the BMP to include a more appropriate timeframe for submitting the Invincible Biodiversity Offset Strategy. For example, within 3 months of the commencement of mining operations.

2. In the absence of available evidence, the credits for Capertee Stringybark should not be reduced

Schedule 3, Condition 32 of the project approval allows the proponent to revise the ecosystem and species credit obligation to reflect the reduced mine layout.

BCS are supportive of the approach taken to reduce the credits associated with “area” species polygons, according to the revised Southern Extension layout. However, regarding Capertee Stringybark (which is a “count” species), there is uncertainty over the number of individuals present in the revised Southern Extension Layout.

BCS understands the following:

- The EIS and approved credit obligation for Capertee Stringybark accounts for 24 individuals of the species.
- A map in the EIS shows the location of 5 discrete areas in which the species was recorded, however it does not specify how many individuals were present in each area.

- A map in the previous draft BMP shows the location of 3 discrete areas in the revised mine layout where the species was recorded, however it does not specify how many individuals were present in each area.
- New records of 13 individuals of Capertee Stringybark have been identified, however it is unclear if the 13 new records are a sub-set of the original 24 individuals or are additional records.

The proposed credit calculation approach for Capertee Stringybark is to use the most recently recorded 13 individuals, rather than the original 24 individuals, to define the revised credit obligation.

We do not support this approach, credit calculations for “count” species must be informed by the exact number and location of each individual within an impact area. If there is uncertainty regarding this information and/or how it has been derived, then the credit obligation should not be revised and the original 24 individuals (as defined in the EIS and consent conditions) should be used.

If the proponent does wish to revise the credit obligation, based on the assumption that there will be less than 24 individuals of Capertee Stringybark in the reduced Southern Extension Layout, then a targeted survey can be undertaken to confirm this. It should be noted this targeted survey would need to occur prior to construction commencing.

Recommendation:

- 2.1 Given the uncertain nature of the exact number and location of each individual, the credit calculations for Capertee Stringybark should not be revised from the 24 individuals defined in the EIS and approved credit obligation.
- 2.2 If the proponent wishes to confirm the exact number and location of Capertee Stringybark, via targeted survey prior to construction commencing, we would be happy to review this.

3. Minor amendments are required for the *Bursaria* Translocation Plan

The following revisions and additions should be included in the final Translocation Plan for *Bursaria spinosa*.

- The Translocation Procedure in Section A6 states, “*Translocated specimens are to be treated thoroughly with a sugar/honey solution following the planting at the recipient site to support the attendant ant species*”. BCS consider this step unnecessary and may attract unwanted invertebrates, it should be removed from the procedure.
- We recommend that each *Bursaria* plant should be wrapped with insect netting prior to translocation, to ensure that attendant insects are not dislodged and lost from the host plant whilst being moved.
- The site preparation procedure in Section A5 states “*Site preparation will involve the following: Any fallen timber or woody debris will be cleared*”. This process should be done by hand, if possible, to limit the potential for inadvertent damage to recipient sites.

Recommendations:

- 3.1 Update the finalised translocation plan for *Bursaria spinosa* with the revisions and additions listed in this response.

4. Amend Table 9 to include specific timeframes

Section 5.11 of the BMP states:

*The performance and completion criteria for the management measures that will be implemented in the Biodiversity Offset Areas are outlined in Table **Error! Reference source not found.**9 and may be revised over time as a part of the adaptive management approach (Section 6.2). Timeframes utilised in this table include the following:*

- *Short term: 0-5 years.*
- *Medium term: >5-15 years; and*
- *Long term: >15-25 years.*

However, Table 9 of the BMP does not reference any specific time periods or metrics. To conform to SMART principles, each performance measure and completion criteria in Table 9 should contain specific timeframes.

Recommendation:

- 4.1 Revise Table 9 to contain specific timeframes