DURALIE COAL MINE
Biodiversity Management Plan

DURALIE COAL MINE

BIODIVERSITY MANAGEMENT PLAN

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Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	Approval Date
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All	Version F	Duralie Open Pit Modification (2014).	DP&E and DotE	-
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1 INTRODUCTION

1.1 DURALIE COAL MINE

Duralie Coal Pty Ltd (DCPL), a subsidiary of Yancoal Australia Ltd, is required to develop a Biodiversity Management Plan (BMP) for the Duralie Coal Mine (DCM). The BMP forms part of the conditions for the Project Approval (08_0203) relating to its mining operations and is intended to be a central management tool to assist in the management of ecological issues both within the mine site and in adjacent conservation areas (herein referred to as the 'Offset areas') owned and managed by the company.

The DCM, which was in operation from 2003 to 2021, is located in the Gloucester Valley, New South Wales (NSW), approximately 5 kilometres (km) north of the small village of Stroud Road and 20 km south of Stratford (Figure 1). The Offset areas described in this plan are located immediately to the north-west and south-east of the mine (Figures 2 and 3) and are to be managed for conservation purposes.

The Duralie Extension Project (DEP) involved the extension and continuation of mine operations at the DCM. DCPL was granted approval for the DEP under section 75J of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) on 26 November 2010 (NSW Project Approval [08_0203]) and under sections 130 and 133 of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 22 December 2010 (Commonwealth Approval [EPBC 2010/5396]). On 10 November 2011, the NSW Project Approval (08_0203) was amended by Order of The Land and Environment Court of NSW. On 1 November 2012, the NSW Project Approval (08_0203) was modified as a result of the Duralie Rail Hours Modification. On 5 December 2014, NSW Project Approval (08_0203) was modified to reflect approval of the Duralie Open Pit Modification. A copy of the consolidated NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396) is available on the Duralie Coal website (http://www.duraliecoal.com.au).

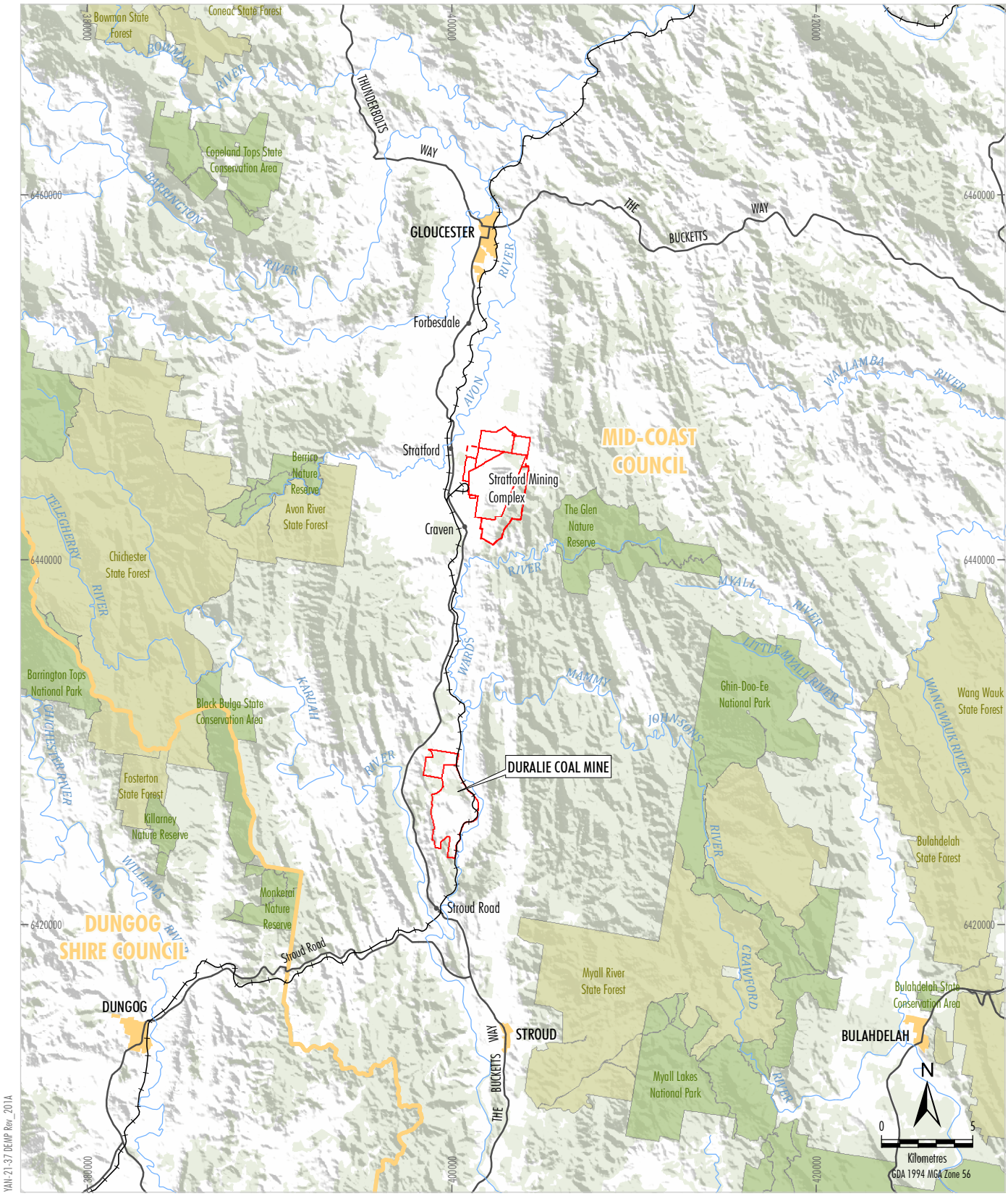
The activities associated with the approved Duralie Open Pit Modification included:

- an increase in the maximum depth of the Clareval open pit;
- a minor increase in the extent of surface development of the DCM of approximately 2.5 hectares (ha), resulting from:
  - a reduction in low wall angles of the Clareval open pit and the removal of a pillar between the Clareval and Weismantel open pits to improve geotechnical stability; and
  - associated relocation of the up-catchment diversion to the west of the Clareval open pit;
- revision of mining sequence (i.e. progression of mining in the Clareval and Weismantel open pits); and
- an increase in height of the waste rock emplacement (i.e. the backfilled open pit) from approximately 110 metres (m) Australian Height Datum (AHD) to approximately 135 m AHD.

The general arrangement of the DCM, showing modifications, is provided in Figure 2.

Current Status of the DCM

Condition 5, Schedule 2 of Project Approval (08_0203) authorised mining operations to be carried at the DCM to 31 December 2021. Mining operations at the DCM were suspended in October 2018 and were resumed in February 2021 with run of mine coal being extracted from the Weismantel Pit.



LEGEND

- Mining Lease Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Local Government Area Boundary

Source: Geoscience Australia (2006); NSW Department of Planning & Environment (2017)

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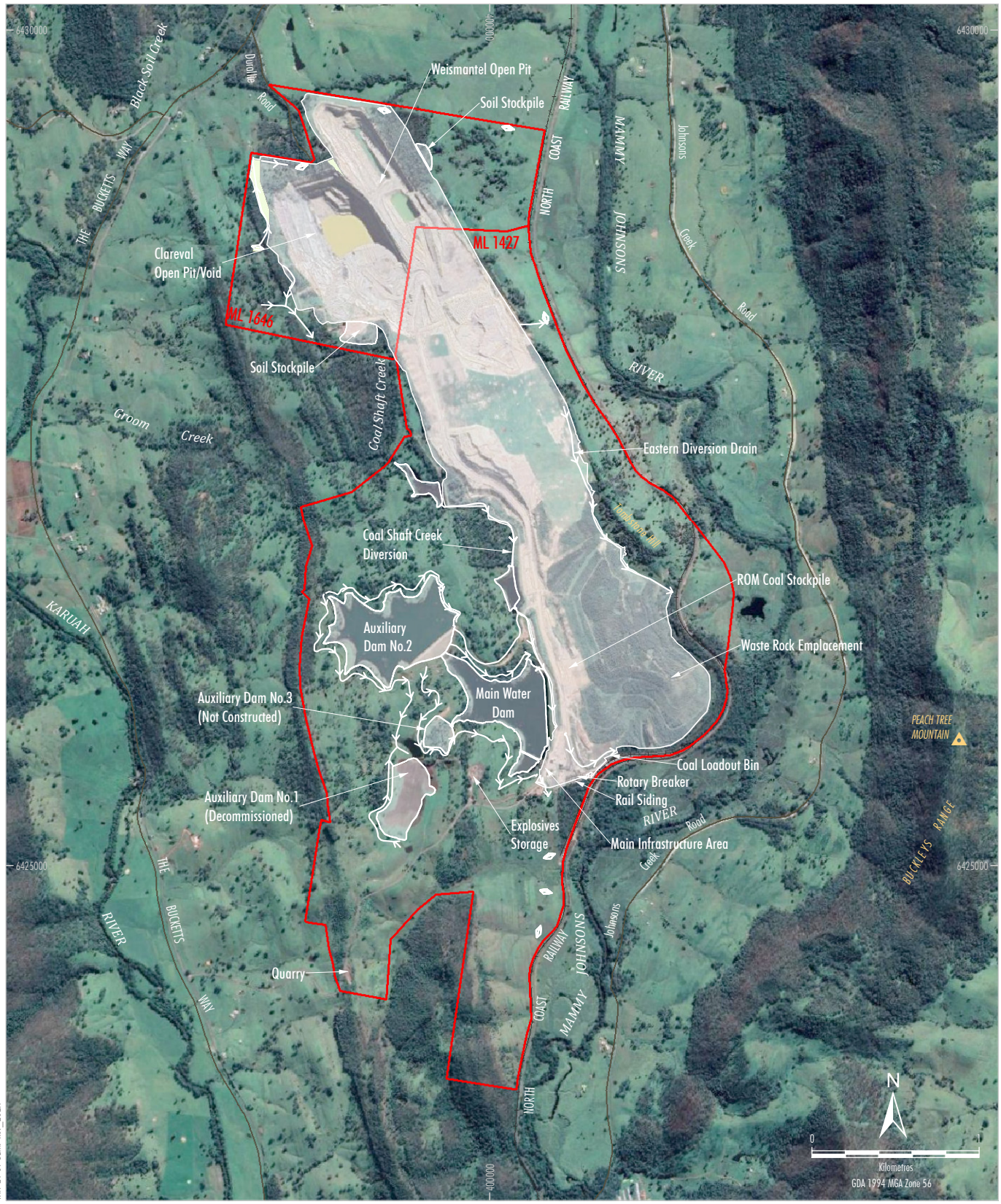
DURALIE COAL MINE

Regional Location

Figure 1

YAN-21-37 DEIAP Rev_201A



YAN-21-37 DEMP Rev_202A

LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

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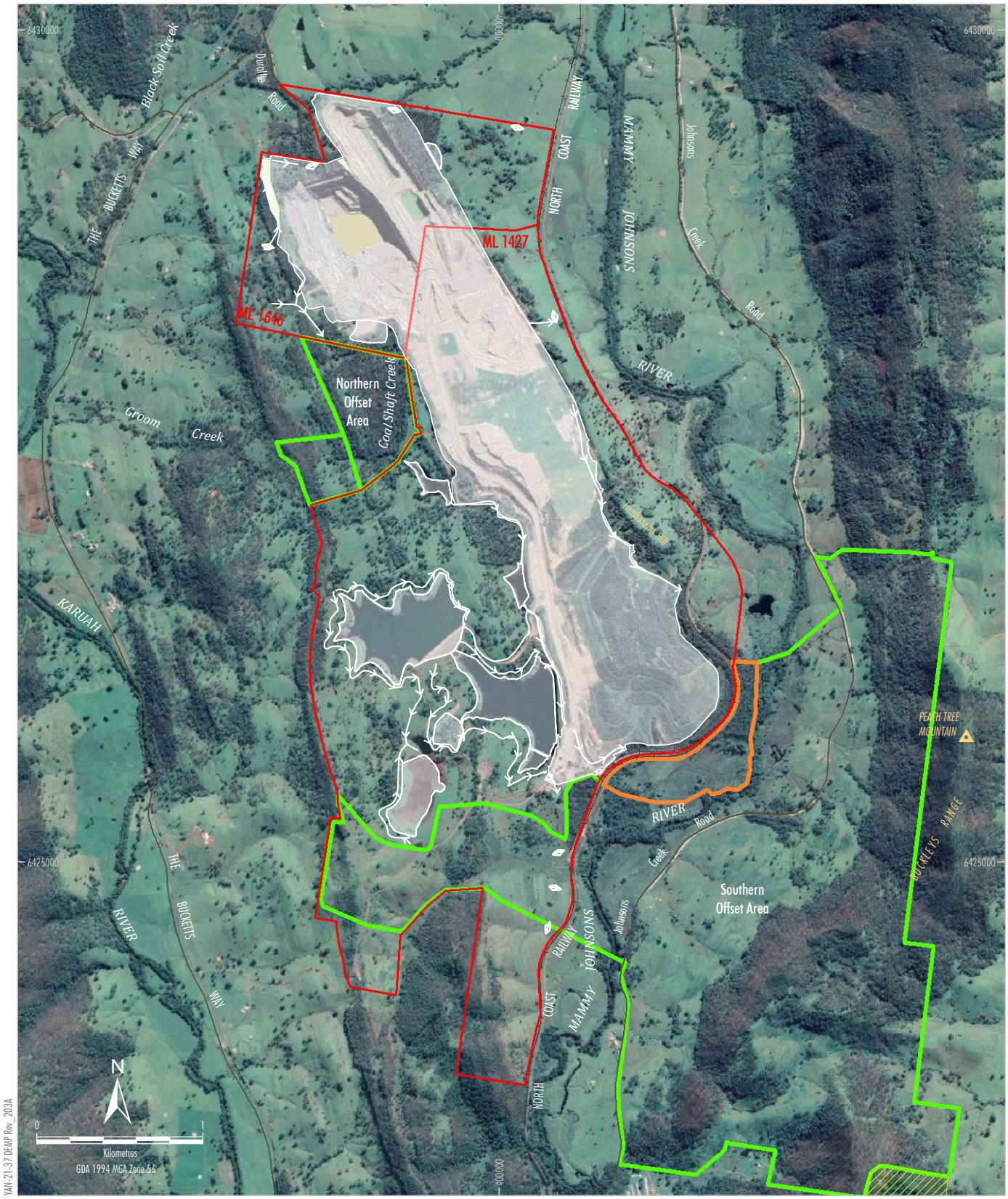
DURALIE COAL MINE

DCM General Arrangement

Figure 2



YAN-21-37 DEMP Rev_203A

LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System
- Private Land Under Conservation Agreement
- Offset Area
- Bowens Road North Offset Area

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

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DURALIE COAL MINE

Location of the Offset Areas

Figure 3

Accordingly, DCPL has commenced the mine closure phase (i.e. following the cessation of mining operations on 31 December 2021) and operations at the DCM now reflect the transition towards mine closure:

- **Clareval Open Pit:** Mining of the Clareval Open Pit has now been completed and dewatering of the pit has ceased. Partial backfilling with waste rock mined from the Weismantel Open Pit has commenced, along with shaping of the pit area to its final landform design. Mining of the Clareval Open Pit was finalised to a shallower depth than the maximum approved depth as modelled in the 2014 DCM Open Pit Modification.
- **Weismantel Open Pit:** Mining of the Weismantel Open Pit continued up until 31 December 2021, however, did not occur to the maximum approved depth as modelled in the 2014 DCM Open Pit Modification. Progressive backfilling of completed areas of the Weismantel Open Pit has been undertaken.
- **DCM Water Management System Changes:**
  - Following the cessation of mining of the Clareval Open Pit (now final void) and the Clareval void becoming available for water storage, Weismantel Open Pit dewatering is now preferentially transferred to the Clareval void and not stored within the Main Water Dam. As a result, all irrigation activities for the purpose of reducing the total site water inventory at the DCM have now ceased and the DCM's Irrigation Area irrigation system has been decommissioned and removed.
  - Decommissioning of other redundant water management structures has also commenced. Consistent with the approved DCM final landform design, Auxiliary Dam No. 1 has been dewatered, decommissioned and rehabilitated.
- **Vegetation Clearance**: No new disturbance areas (within approved surface disturbance areas) are proposed.
- **Closure Planning**: The DCM's Mine Closure Planning Program includes technical assessments and works that are being undertaken and implemented as the DCM progresses towards and commences the mine closure phase. DCPL is progressively completing components of the Mine Closure Planning Program, with the various technical assessments currently being completed based on the refined final landform design. The outcomes from the Mine Closure Planning Program technical assessments and works will be incorporated into the DCM Rehabilitation Management Plan.

DCM Activities after Cessation of Mining Operations

Since the completion of mining operations on 31 December 2021, DCPL has begun to undertake bulk rehabilitation earthworks to achieve the final landform design. Once bulk rehabilitation earthworks are complete, all major fleet will then be removed from site and the mine's workforce reduced to support post-closure activities.

DCPL will continue to implement this BMP to manage biodiversity at the rehabilitated site and within the offset areas during the mine closure phase. It is anticipated that this BMP will remain in effect until the BMP completion criteria have been met to the satisfaction of DPE and the Department of Agriculture, Water and the Environment (DAWE). Positive Covenants and Restriction on the Use of Land instruments for the Offset areas were registered by the NSW Land and Property Information (LPI) in September 2015 (reference number AIW 207001631). The public Positive Covenants in relation to the Offset areas shall remain in force in perpetuity.

1.2 PURPOSE AND SCOPE OF THIS PLAN

This BMP addresses the requirements for the DCM BMP outlined in Condition 43, Schedule 3 of the NSW Project Approval (08_0203), and Conditions 13 and 14 of the Commonwealth Approval (EPBC 2010/5396). It includes specific management measures for biodiversity at the mine site and the allocated DCM Offset areas. This BMP also addresses the Bowens Road North Offset, since the offset is managed as an extension of the DCM Offset areas in conjunction with Condition 41, Schedule 3 of the Stratford Extension Project Development Consent (SSD-4966). The statutory requirements for this BMP are outlined in Section 3. A detailed list of the relevant conditions of NSW Project Approval (08_0203) and Commonwealth Approval (EPBC 2010/5396) is provided in Sections 3.1 and 3.2 respectively.

This revision of the BMP has been prepared to describe the current status of operations at the DCM and the changes to DCM activities following the cessation of mining on 31 December 2021.

Updates have also been made to describe the status of management actions and the status of performance and completion criteria for the Offset areas and management actions that will continue to be undertaken during the mine closure phase. Other administrative updates have also been included to contemporise the plan.

1.3 RELATIONSHIP OF THIS PLAN TO OTHER DURALIE COAL MINE MANAGEMENT PLANS

As described above, the BMP covers management of biodiversity values at the DCM and DCM Offset areas in accordance with the DCM's approval conditions described in Section 3. Various other management plans also deal with biological aspects relevant to the mine site and Offset areas as described below.

Management of the Giant Barred Frog is prescribed within the DCM Giant Barred Frog Management Plan (GBFMP) in accordance with Condition 32, Schedule 3 of the NSW Project Approval (08_0203). The Giant Barred Frog is known to occur within the section of the Mammy Johnsons River covered by the Offset areas. The GBFMP provides hygiene protocols for amphibian surveys as well as a protocol for sick or dead frogs.

The DCM Rehabilitation Management Plan (RMP) describes management of the post-mine landforms in accordance with Condition 57, Schedule 3 of the NSW Project Approval (08_0203). It also covers rehabilitation of the Coal Shaft Creek Diversion. The BMP describes some aspects relevant to rehabilitation such as collection and propagation of seed from felled vegetation (Section 5.7) as well as salvaging and reusing material from the site for habitat enhancement (Section 5.8).

In accordance with Condition 29, Schedule 3 of the NSW Project Approval (08_0203), the DCM Water Management Plan (WAMP) covers:

- Performance criteria, including trigger levels for investigating any potentially adverse [water-related] impacts on the stream and vegetation health of the Unnamed Tributary, Coal Shaft Creek and Mammy Johnsons River.
- Performance criteria for surface water quality attributes relevant to water quality impacts on biological diversity and aquatic ecological integrity.
- A program to monitor the stream and riparian vegetation health of the Unnamed Tributary, Coal Shaft Creek and Mammy Johnsons River when the DCM's Additional Irrigation Areas are under irrigation.

- A program of ecotoxicity testing of water in water storages on-site and at selected water monitoring sites in the Mammy Johnsons River when the DCM's Additional Irrigation Areas are under irrigation.
- Macroinvertebrate sampling at selected monitoring sites in the Mammy Johnsons River when the DCM's Additional Irrigation Areas are under irrigation.

As described in Section 1.1 above, all irrigation activities for the purpose of reducing the total site water inventory at the DCM have now ceased and the DCM's Irrigation Area irrigation system has been decommissioned and removed.

The DCM's environmental management plans, including the WAMP, RMP and GBFMP, have been or are being revised to reflect the current status of operations and activities at the DCM and to describe activities (including relevant ongoing monitoring) during the mine closure phase.

1.4 SECURITY OF THE OFFSET AREAS

In accordance with Condition 42, Schedule 3 of the NSW Project Approval, Positive Covenants and Restriction on the Use of Land instruments for the Offset areas were registered by the NSW Land and Property Information (LPI) in September 2015 (reference number AIW 207001631). The public Positive Covenants in relation to the Offset areas, shall remain in force in perpetuity.

1.5 CONSULTATION

In accordance with Condition 43(a), Schedule 3, of NSW Project Approval (08_0203), the BMP is to be prepared in consultation with the NSW Biodiversity and Conservation Division (BCD) within the NSW Department of Planning and Environment (DPE) (formerly the Office of Environment and Heritage [OEH]).

A BMP was first submitted to the Director-General of the then DP&I (now DPE) for approval within 3 months of the grant of NSW Project Approval (08_0203) (on 10 February 2012). The BMP was updated in 2018 to describe the management actions and performance and completion criteria for the three-year period between August 2018 and July 2021 and to include broader concepts for the longer term (6+ years) since commencement of the BMP in 2012.

This revised BMP has been provided to the BCD for comment. BCD's correspondence is included in the Record of Consultation provided in Attachment 1.

This revised BMP has been submitted to both the DPE and DAWE for approval. On 22 February 2023, the DPE approved this revised BMP. The DPE's letter of approval is provided in Attachment 2. The revision and approval status of this BMP is provided on the cover page of this plan.

1.6 SUITABLY QUALIFIED AND EXPERIENCED PERSONS

Condition 43(a), Schedule 3, of NSW Project Approval (08_0203), requires the BMP to be prepared by a suitably qualified and experienced person whose appointment has been approved by the Secretary of the DPE. The former NSW Department of Planning & Environment's (DP&E's) Director of Resource Assessments, as delegate for the Secretary of DP&E, approved the appointment of Mr Jamie Gleeson (Resource Strategies Pty Ltd) as a suitably qualified and experienced person for the preparation of the DCM BMP on 9 April 2018.

This revised BMP has been reviewed by Mr Gleeson.

2 STRUCTURE OF THE BIODIVERSITY MANAGEMENT PLAN

The structure of this plan is as follows:

Section 1: Introduction of the DCM and this BMP.

Section 2 Structure of the Plan.

Section 3 Statutory Requirements.

Section 4 Description of DCM site and Offset areas (including notes relating to offset vegetation, flora and fauna and threats to offset values identified as part of field survey activities).

Section 5 Management of Existing Vegetation and Proposed Rehabilitation at the DCM.

Section 6 Management of the Offset areas.

Section 7 Performance and Completion Criteria (for the Offset areas).

Section 8 Monitoring and Reporting Program (for the Offset areas).

Section 9 Contingency Measures (relating to the Offset areas).

Section 10 Reporting, Auditing and Reviewing requirements.

Section 11 Responsibilities.

Section 12 Conservation Bond Requirements (relating to the Offset areas).

Section 13 Lists the references cited.

Appendices are:

Appendix A Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021

Appendix B Site Characteristics

Appendix C Offset Vegetation Management Unit Summaries for the Offset Areas

Appendix D Plant Palettes for Specified Offset Revegetation

Appendix E Reference Site Information

Appendix F Annual Biodiversity Report 2021

3 STATUTORY REQUIREMENTS

DCPL's statutory obligations are contained in:

(i) the conditions of the NSW Project Approval (08_0203);

(ii) the conditions of the Commonwealth Approval (EPBC 2010/5396);

(iii) relevant licences and permits, including conditions attached to mining leases; and

(iv) other relevant legislation.

Obligations relevant to this BMP are described below.

3.1 DURALIE COAL MINE - RELEVANT NSW APPROVAL CONDITIONS

The objectives of the BMP (Section 1.2) directly relate to conditions outlined in the DCM NSW Project Approval (08_0203). Table 1 provides the NSW Project Approval conditions relevant to the BMP and outlines where these conditions are addressed in this BMP.

Table 1
NSW Project Approval Conditions Relevant to this Biodiversity Management Plan

NSW Project Approval (08_0203) Condition	Relevant BMP Section
43. The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Secretary. This plan must:	This BMP
(a) be prepared in consultation with OEH by a suitably qualified and experienced persons whose appointment has been approved by the Secretary;	1.5 and 1.6
(b) be submitted to the Secretary for approval within 3 months of the date of this approval;	1.5
(b1) be approved by the Secretary prior to the commencement of clearing in EA (Mod 2);	
(c) describe how the Offset strategy and its implementation will be integrated with other strategies, plans and programs required under this approval, including the Giant Barred Frog Management Plan, Water Management Plan and Rehabilitation Management Plan, and their implementation;	1.3
(d) include:	
• *a description, based on field surveys, and in consultation with OEH, of the biodiversity values of the vegetation communities in the offset area, including remnant vegetation and derived grasslands, including as habitat for the threatened species that are recorded in the surface development area;*	4.2
• *a description of the biodiversity values to be lost through clearing of vegetation communities in the surface development area, including remnant vegetation and derived grasslands, including as habitat for the threatened species that are recorded in the surface development area;*	4.1
• *a description of the short, medium and long term measures that would be implemented to:*	
- *implement the Offset Strategy;*	6
- *maintain and enhance biodiversity values in the offset area to offset the loss of biodiversity values in the surface development area;*	6
- *provide and enhance suitable habitat in the offset area for the threatened species that are recorded in the surface development area;*	Refer to Table 3
- *manage the remnant vegetation and habitat on the site (including the offset area);*	5 and 6
• *detailed completion criteria, as well as performance criteria for the measuring the short, medium and long term success of the Offset Strategy;*	7

Table 1 (Continued)
NSW Project Approval Conditions Relevant to this Biodiversity Management Plan

NSW Project Approval (08_0203) Condition	Relevant BMP Section
• *the measures described in the EA and in the expert report of Dr Goldney dated 7 April 2011 in Land and Environment Court proceedings No 10090 of 2011 to avoid or mitigate impacts on biological diversity, native flora and fauna and threatened species;*	3.4
• *a detailed description of the measures that would be implemented in the short, medium and long term to implement the Offset Strategy, including the procedures to be implemented for:*	
- *implementing revegetation and regeneration within the offset area, including establishment of canopy, understorey and ground strategy;*	6.1 to 6.3
- *the introduction of hollow bearing habitat features;*	6.4
- *controlling weeds and feral pests, including the engagement of appropriately qualified contractors;*	6.5
- *managing grazing and agriculture, including provision to exclude livestock grazing from existing treed areas and Endangered Ecological Communities within the offset area;*	6.6
- *controlling vehicular access to minimise the potential for vehicle strike of native fauna; and*	6.7
- *bushfire management;*	6.9
• *a description of the measures that would be implemented in the short, medium and long term to manage the remnant vegetation and habitat on site, including the procedures to be implemented for:*	
- *protecting vegetation and soil outside the disturbance areas;*	5.1
- *rehabilitating creeks and drainage lines on the site (both inside and outside the disturbance areas), to ensure no net loss of stream length and aquatic habitat;*	5.2
- *managing salinity;*	5.3
- *undertaking pre-clearance surveys including for threatened species;*	5.4
- *if pre-clearance surveys identify any breeding pair of threatened species, including the Varied Sittella, deferral of clearing of their habitat until the breeding site is vacated;*	5.4
- *managing impacts on fauna;*	5.5
- *landscaping the site, and particularly the land adjoining public roads, to minimise visual and lighting impacts;*	5.6
- *collecting and propagating seed;*	5.7 and 6.10
- *salvaging and reusing material from the site for habitat enhancement;*	5.8
- *controlling weeds and feral pests, including the engagement of appropriately qualified contractors;*	5.9 and 5.10
- *controlling vehicular access to minimise the potential for vehicle strike of native fauna; and*	5.11
- *bushfire management;*	5.12
• *a Vegetation Clearing Plan (VCP) that must include the following:*	5.4
- *clear delineation of disturbance areas and restriction of clearing to the minimum area necessary to undertake the approved activities;*	
- *a methodology for recording the approximate size and number of hollow bearing trees to be removed and their replacement with the same number of nesting boxes of appropriate size within similar vegetation within the Project site or offset lands;*	
- *a methodology for the management of hollow bearing trees during vegetation clearing to minimize impacts on hollow dependent fauna which may be present;*	
- *provision for a suitably trained or qualified person to the satisfaction of the Director-General to be present during the felling of identified hollow bearing trees to provide assistance with the care of any injured fauna;*	

Table 1 (Continued)
NSW Project Approval Conditions Relevant to this Biodiversity Management Plan

NSW Project Approval (08_0203) Condition	Relevant BMP Section
- *provision for the checking of any animals found and recording of the species, number and condition (age class, pregnant or lactating females etc) and for details to be provided to the National Parks and Wildlife Service and Department within 3 months of the clearing event;* - *provision for the annual inspection of the nesting boxes for the life of the mine. An inspection report shall be prepared and include a review of the condition and use of the nesting boxes;* - *provision for the checking of vegetation to be cleared for threatened species and recording of the species, number and condition and for details to be provided to the National Parks and Wildlife Service and the Department within 3 months of the clearing event.*	5.4
• *a description of the contingency measures that would be implemented to improve the performance of the offset strategy and the detailed performance criteria that are not being met in any given year; and*	9
• *details of who would be responsible for monitoring, reviewing, and implementing the plan;*	8 and 10
• *a program to monitor and report on the effectiveness of the measures in the Biodiversity Management Plan and conditions 33-43 of this approval, and the performance of the Offset Strategy, with summary reporting to be carried out annually and comprehensive reporting every three years following the independent environmental audit (see condition 8 of Schedule 5).*	8
Operating Conditions *41. The Proponent must:* *(a) not destroy, damage, remove or harm any native flora or fauna in the offset area; or*	10
(b) not carry out in the offset area or the vicinity of the offset area any activity that may cause, or is likely to result in, or will or might threaten the viability of, native flora or fauna in the offset area, or threaten the success of the offset strategy; and	
(c) ensure that its agents, contractors, licensees and invitees (and use best endeavours to ensure that any other persons) also comply with condition 41(a) and (b).	
Long Term Security of Offset *42. Within 12 months of the date of this approval, unless otherwise agreed by the Secretary, the Proponent shall either:* *(a) enter into a conservation agreement pursuant to s 69B of the National Parks and Wildlife Act 1974 relating to the offset area, recording the obligations assumed by the Proponent under the conditions of this approval in relation to the offset area , and register that agreement pursuant to s 69F of the National Parks and Wildlife Act 1974; or*	1.4
(b) cause to be registered against the titles of the offset area a public positive covenant and/or restriction on the use of land, in favour of the Director-General, requiring the proponent to implement and observe the conditions of this approval in relation to the offset area.	
The conservation agreement or the public positive covenant and/or restriction on the use of the land in relation to the offset area, shall remain in force in perpetuity.	

OEH = NSW Office of Environment and Heritage (now the BCD within the DPE).

EA = Environmental Assessment.

EPL = Environmental Protection Licence.

Table 2 provides the completion criteria for the DCM Offset Strategy from Condition 33, Schedule 3 of the NSW Project Approval (08_0203) and how they would be complied with. The overall aim of the revegetation work planned in the Offset areas is to create self-sustaining ecosystems (i.e. mature assemblies of plants that are able to produce viable seed that can grow within the area).

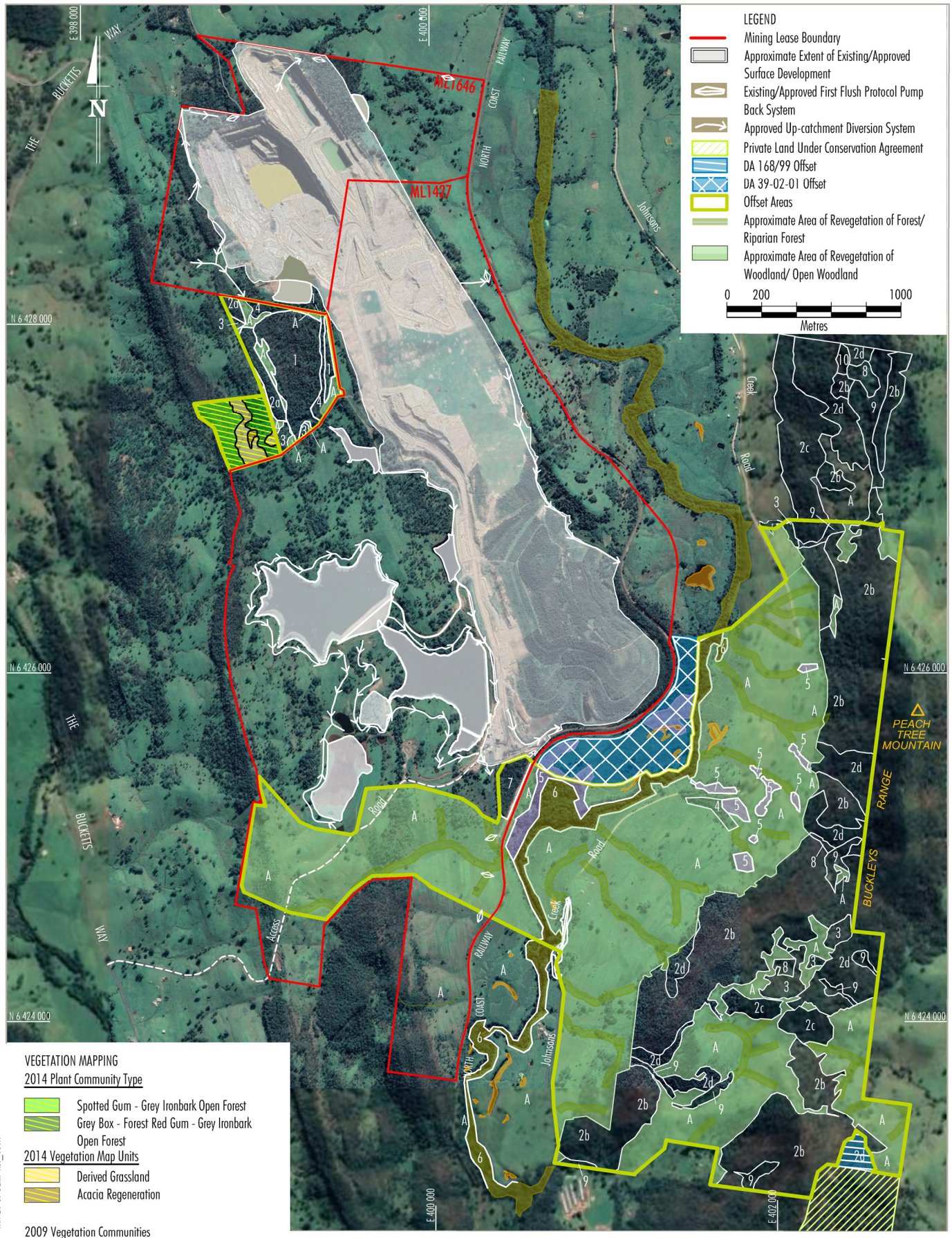
Table 2
Offset Strategy Completion Criteria

Domain	Offset Strategy Completion Criteria	DCM Offset Strategy Compliance
Enhancement Areas (i.e. existing remnant vegetation)	Areas of existing remnant vegetation within the Offset area (299 ha) have been conserved and enhanced.	299 ha will be conserved and enhanced.
Revegetation Areas	357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas as a self-sustaining ecosystem. The methodology for determining a self-sustaining ecosystem shall be to the satisfaction of the Secretary. Woodland/open woodland and forest revegetation areas that provide habitat resources for the threatened species by including the flora species referred to in approval conditions 35 to 38.	The DCM Offset areas will contain 357.5 ha of woodland density revegetation. Vegetation Management Unit “AF” (36 ha) is to be revegetated at forest density.
Direct links between the Offset Area and Rehabilitation Area	Native vegetation has been established which directly links vegetation areas of the offset area with the Rehabilitation area.	Refer to Section 7.2.

Greening Australia undertook an inspection of the Offset areas in late 2011 and early 2012 to provide a basis for the proposed management of the area. During this work it was noted that the climax communities in the local area are at forest density (refer to Appendix E for indicative coverage of reference communities). Greening Australia anticipates that, on a trajectory towards a self-sustaining ecosystem, the revegetation areas are likely to change in structure from a grassland to woodland/open woodland to forest. Similarly, to ensure more effective operational delivery and ecological outcomes, previous mapping of proposed forest areas (Figure 4) has been replaced by an equal amount of revegetation of forest habitat areas within revegetation area AF (Figure 6).

Section 7.2 describes the completion criteria for the Offset areas.

Conditions 34 to 40, Schedule 3 of the NSW Project Approval (08_0203) provide detailed conditions about the DCM Offset Strategy and habitat for threatened species (Figure 5). Table 3 shows that many of these conditions describe the current habitat present in the Offset areas, and therefore by conserving the Offset areas, these conditions have been met. Some of these conditions specify the species to be used in revegetation areas. These species are incorporated into the planting plan outlined in Section 6 (and specified in Appendix D).



VEGETATION MAPPING

2014 Plant Community Type

- Spotted Gum - Grey Ironbark Open Forest
- Grey Box - Forest Red Gum - Grey Ironbark Open Forest

2014 Vegetation Map Units

- Derived Grassland
- Acacia Regeneration

2009 Vegetation Communities

1 Spotted Gum - Red Ironbark - Thick-leaved Mahogany Forest

2a-2d Spotted Gum – Grey Ironbark – Thick-leaved Mahogany Forest

3 Red Gum Grassy Woodland

4 Grey Gum – Red Gum – Apple Riparian Forest

5 Cabbage Gum Floodplain Forest - River-flat Eucalypt Forest on Coastal Floodplains Endangered Ecological Community

6 Riparian Closed Forest - Lowland Forest on Floodplain Endangered Ecological Community

7 Stringybark – Paperbark Forest

8 Dry Gully Rainforest

9 Blue Gum Moist Forest

10 Perch Sedgeland

11 Freshwater Wetlands Endangered Ecological Community

Source: Orthophoto: Google Earth CENS/Airbus (2020); DCPL (2009); after Cenwest Environmental Services & Resource Strategies (2009) and FloraSearch (2014)

YAH-21-37 DEMP Rev_101A

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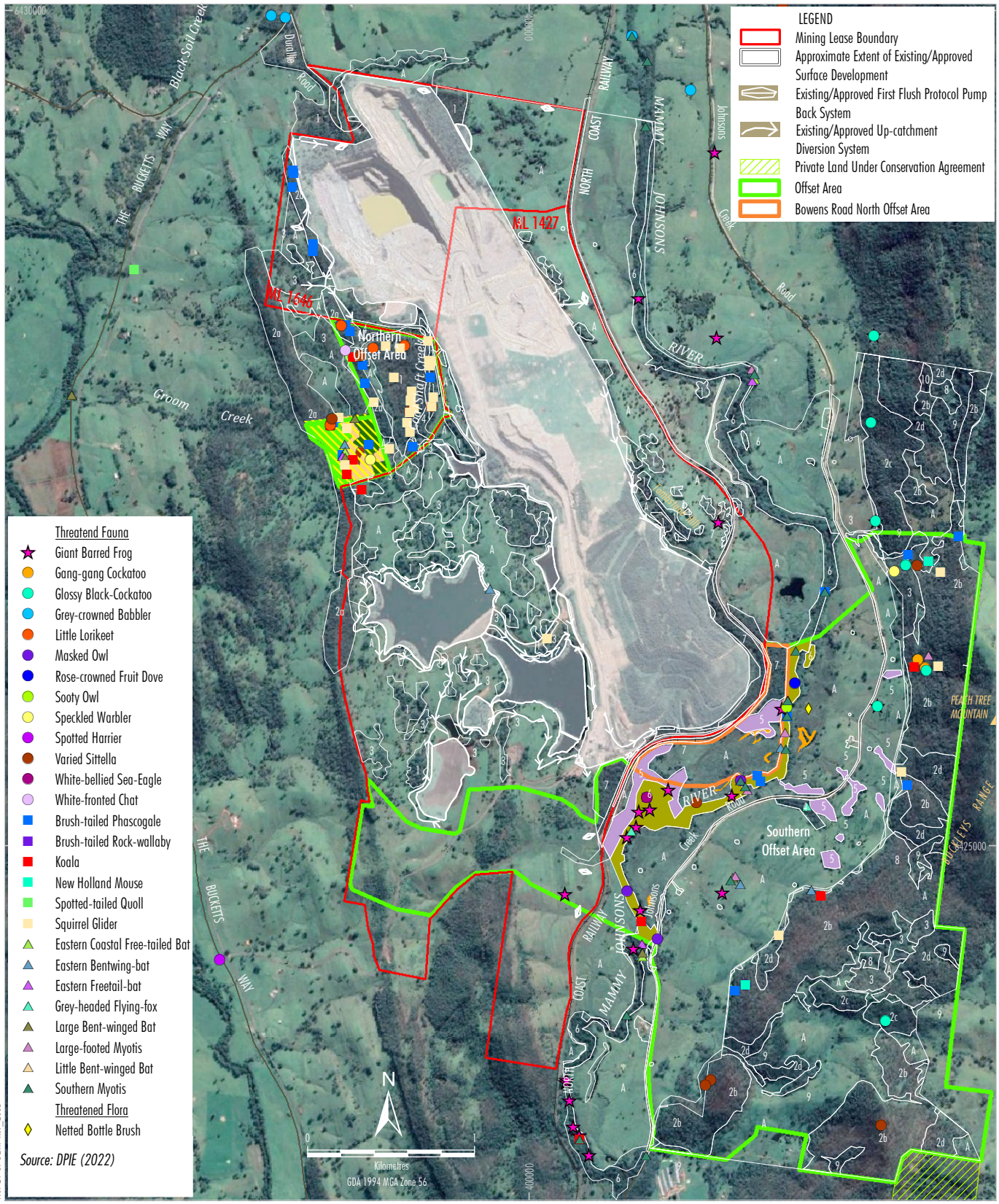
DURALIE COAL MINE

Offset Arrangement
(Appendix 5 of the Duralie Coal Mine Project Approval Conditions)

Figure 4



YAN-21-37 DEMP Rev_208B

VEGETATION MAPPING

2014 Plant Community Type
- Spotted Gum - Grey Ironbark Open Forest
- Grey Box - Forest Red Gum - Grey Ironbark Open Forest

2014 Vegetation Map Units
- Derived Grassland
- Acacia Regeneration

2009 Vegetation Communities
- 1 Spotted Gum - Red Ironbark - Thick-leaved Mahogany Forest
- 2a-2d Spotted Gum – Grey Ironbark – Thick-leaved Mahogany Forest
- 3 Red Gum Grassy Woodland
- 4 Grey Gum – Red Gum – Apple Riparian Forest
- 5 Cabbage Gum Floodplain Forest - River-flat Eucalypt Forest on Coastal Floodplains Endangered Ecological Community
- 6 Riparian Closed Forest - Lowland Forest on Floodplain Endangered Ecological Community
- 7 Stringybark – Paperbark Forest
- 8 Dry Gully Rainforest
- 9 Blue Gum Moist Forest
- 10 Perch Sedgeland
- 11 Freshwater Wetlands Endangered Ecological Community

2009 Vegetation Map Units
- A Derived Grasslands
- B Cropping

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

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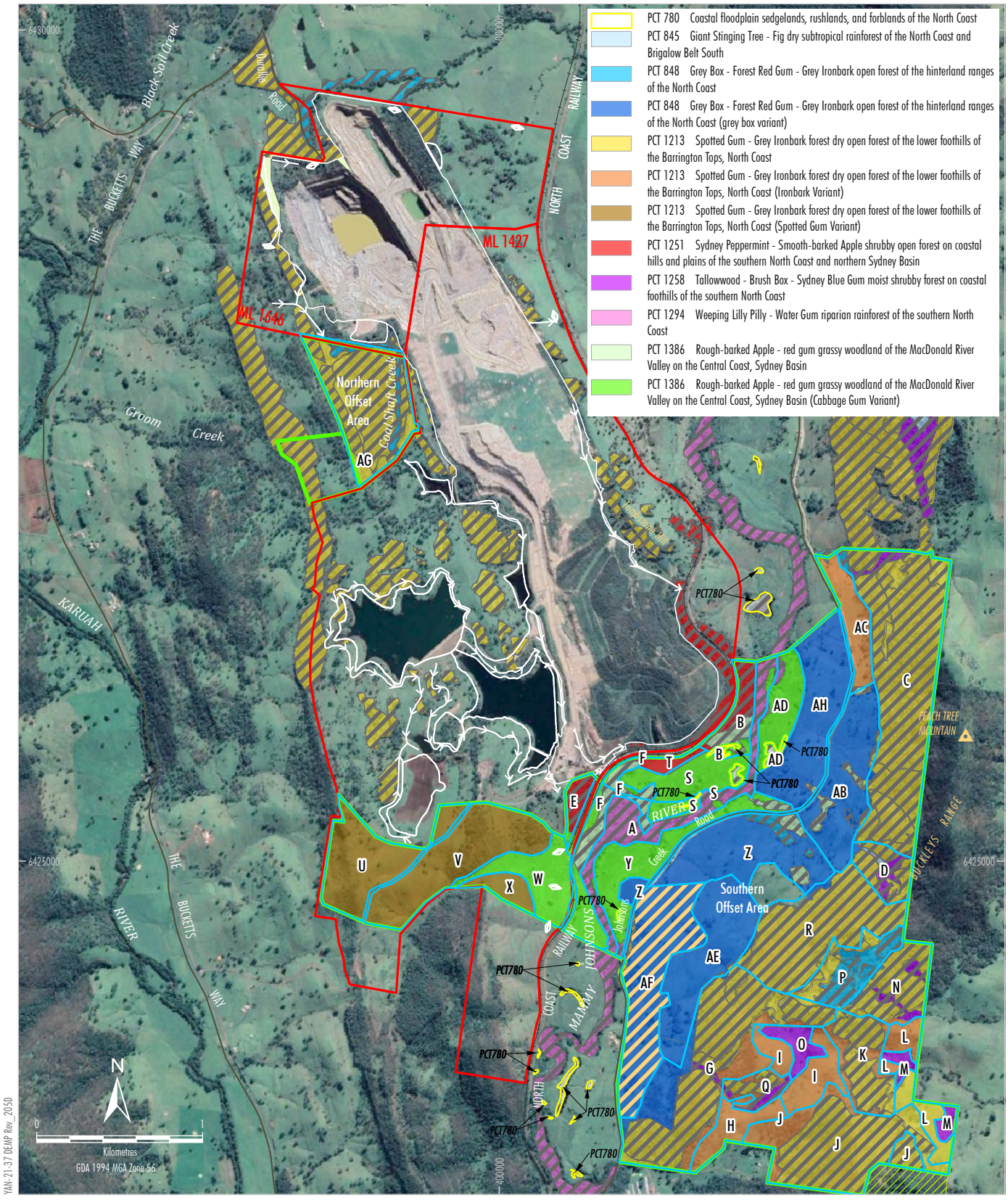
DURALIE COAL MINE

Ecological Vegetation Mapping and Threatened Species Locations

Figure 5



LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System
- Private Land Under Conservation Agreement
- Offset Area
- Remnant
- Forest Density Revegetation Region
- VMU Layer Region *

*Note * Refer to Appendix C for VMU characteristics as observed at the time of survey.*

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

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DURALIE COAL MINE

Remnant and Proposed Vegetation

Figure 6

Table 3
Offset Strategy and Habitat for Threatened Species

Biodiversity Management Plan-Related NSW Project Approval Conditions	DCM Offset Strategy
Habitat for Threatened Fauna Species *34. The Proponent shall ensure that the offset area:* *(a) provides suitable habitat for all the threatened fauna species recorded in the surface development area, namely the Swift Parrot, Brown Treecreeper (eastern subspecies), Speckled Warbler, Grey-crowned Babbler (eastern subspecies), Varied Sittella and Squirrel Glider; and* *(b) includes the following habitat types:* • *Woodland/open woodland;* • *Forest; and* • *Riparian forest.*	The Offset areas provide suitable habitat for all of these threatened fauna species. The Offset areas includes the following habitat types: • Woodland/open woodland (approximately 354 ha); • Forest (approximately 305 ha); and • Riparian forest (approximately 20 ha). The proportion of these habitat types are likely to change over time as the Offset areas are vegetated. **It is considered that this condition has been met.**
Swift Parrot/Brown Treecreeper/Grey-crowned Babbler *35. The Proponent shall ensure that the offset area:* *(a) provides appropriate habitat resources for the Swift Parrot, Brown Treecreeper and Grey-crowned Babbler;* *(b) contains a total of 174 ha of the following vegetation types[1]:* • *Spotted Gum – Grey Ironbox forest dry open forest of the lower foothills of the Barrington Tops, North Coast;* • *Grey Box – Forest Red Gum – Grey Ironbark open forest of the hinterland ranges of the North Coast; and* • *Sydney Peppermint – Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin; and*	The Offset areas provide appropriate habitat resources for the Swift Parrot, Brown Treecreeper and Grey-crowned Babbler. It contains approximately 282 ha (remnant) and an additional 303 ha (proposed revegetation) of the vegetation types listed in the conditions. **It is considered that this condition has been met.**
(c) the revegetation areas within the offset area contains: • *Winter flowering eucalypts (such as Spotted Gum [Corymbia maculata], Narrow-leaved Ironbark [Eucalyptus crebra], White Stringybark [Eucalyptus globoidea]) as habitat resources for the Swift Parrot.* • *Species typical of open eucalypt woodlands (such as Spotted Gum [Corymbia maculata], Red Ironbark [Eucalyptus fibrosa], Grey Ironbark [Eucalyptus siderophloia] as habitat resources for the Grey-crowned Babbler; and* • *Appropriate understorey species (such as tussock grasses).*	As described in Section 6, the revegetation areas within the Offset areas will (or already) contain: • Spotted Gum (*Corymbia maculata*); and • Grey Ironbark (*Eucalyptus siderophloia*). Appropriate understorey species (such as tussock grasses) already occur in the Offset areas.
Speckled Warbler *36. The Proponent shall ensure that the offset area:* *(a) provides appropriate habitat resources for the Speckled Warbler:* *(b) contains a total of 126ha of Spotted Gum – Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast[1]; and* *(c) the revegetation areas within the offset area includes Eucalyptus species, tussock grasses and shrub species as habitat resources for the Speckled Warbler.*	The Offset areas provide appropriate habitat resources for the Speckled Warbler. It contains approximately 127.6 ha (remnant) and an additional 275.6 ha (revegetation) of the vegetation types listed in the conditions. **It is considered that Conditions 36a and 36b, Schedule 3 have been met.** As described in Section 6, the revegetation areas within the Offset areas will contain: • eucalyptus species; • tussock grasses; and • shrub species.

Table 3 (continued)
Offset Strategy and Habitat for Threatened Species

Biodiversity Management Plan-Related NSW Project Approval Conditions	DCM Offset Strategy
Varied Sittella *37. The Proponent shall ensure that the offset area:* *(a) provides appropriate habitat resources for the Varied Sittella;* *(b) contains a total of 172ha of the following vegetation types[1]:* • *Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast; and* • *Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.* *(c) the revegetation areas within the offset area includes species typical of eucalypt forests and woodlands, especially rough-barked species, smooth-barked gums and Acacia species as habitat resources for the Varied Stilleta.*	The Offset areas provide appropriate habitat resources for the Varied Sittella. It contains approximately 282 ha (remnant) and 303 ha (revegetation) of the vegetation types listed in the conditions. **It is considered that Conditions 37a and 37b, Schedule 3 have been met.** As described in Section 6, the revegetation areas within the Offset areas will contain: • rough-barked species (e.g. *Eucalyptus siderophloia*); • smooth-barked gums (e.g. *Corymbia maculata*); and • Acacia species (e.g. *Acacia irrorata*).
Squirrel Glider *38. The Proponent shall ensure that the offset area:* *(a) provides appropriate habitat resources for the Squirrel Glider;* *(b) contains a total of 128ha of the following vegetation types:* • *Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast; and* • *Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.* *(c) the revegetation areas within the offset area includes species typical of woodland/forest (such as Spotted Gum [Corymbia maculata], Red Ironbark [Eucalyptus fibrosa], Grey Ironbark [Eucalyptus siderophloia]) as habitat resources for the Squirrel Glider.*	The Offset areas provide appropriate habitat resources for the Squirrel Glider. It contains approximately 282 ha (remnant) and 300 ha (revegetation) of the vegetation types listed in the conditions. **It is considered that Conditions 38a and 38b, Schedule 3 have been met.** As described in Section 6 the revegetation areas within the Offset areas will contain: • Spotted Gum (*Corymbia maculata*); and • Grey Ironbark (*Eucalyptus siderophloia*).
39. Hollow bearing habitat features must be introduced into the areas of habitat resources and the revegetation areas identified in approval condition 38 (squirrel glider-related). *Note: For clarity, the total areas included in approval conditions 35 -38 are not cumulative, whereby the area of habitat resources provided for one of the fauna species identified in approval condition 35 may be the same for all species mentioned in approval conditions 35 to 38.*	This condition is addressed in Section 6.4.
Endangered Ecological Communities *40. The Proponent shall ensure that the offset area contains at least:* • *2 ha of Freshwater Wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions.* • *10 ha of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Cabbage Gum Floodplain Forest).* • *19 ha of Lowland Forest on Floodplain in the NSW North Coast Bioregion.* *Note: See the mapped areas in the figure in Appendix 5*	Figure 6 demonstrates the following coverage within the Offset areas: • 2 ha of Freshwater Wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions. • 10 ha of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Cabbage Gum Floodplain Forest). • 19 ha of Lowland Forest on Floodplain in the NSW North Coast Bioregion. **It is considered that Condition 40, Schedule 3 has been met.**

Note: There is no Condition 35(b).

[1] Note: vegetation types referred to in Conditions 35 to 38 are in accordance with the Vegetation Types in the Hunter/Central Rivers as described in the Office of Environment and Heritage (2011) *Threatened Species Profile Databases for the Swift Parrot, Brown Treecreeper (eastern subspecies) and Brush-tailed Phascogale http://threatenedspecies.environment.nsw.gov.au/tsprofile/*

Condition 2, Schedule 5 of the NSW Project Approval outlines the management plan requirements that are applicable to the preparation of the BMP. Table 4 presents these requirements and indicates where they are addressed within the BMP.

Table 4
Management Plan Requirements

NSW Project Approval (08_0203) Condition	BMP Section
2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
a) detailed baseline data;	Section 4
b) a description of:	
• *the relevant statutory requirements (including any relevant approval, licence or lease conditions);*	Section 3
• *any relevant limits or performance measures/criteria;*	Sections 3 and 7
• *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 the relevant statutory requirements, limits, or performance measures/criteria;	Sections 5 and 6
d) a program to monitor and report on the:	Section 8
• *impacts and 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;	Section 9
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Sections 8 and 10
g) a protocol for managing and reporting any;	Section 10
• *incidents;*	
• *complaints;*	
• *non-compliances with statutory requirements; and*	
• *exceedences of the impact assessment criteria and/or performance criteria; and*	
h) a protocol for periodic review of the plan.	Section 10
Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted.	

3.2 DURALIE COAL MINE - RELEVANT COMMONWEALTH APPROVAL CONDITIONS

The conditions of the Commonwealth Approval (EPBC 2010/5396) relevant to this BMP are described in Table 5 along with where each condition is addressed in this BMP. Table 5 and referenced Sections further define how objectives will be delivered through implementation of the BMP.

Table 5
Commonwealth Approval Conditions Relevant to this Biodiversity Management Plan

Commonwealth Approval EPBC 2010/5396 Condition	Relevant Section that Addresses the Condition
Offset Measures	
13. Within 12 months of the commencement of the action the proponent must permanently protect and secure an offset area to compensate for the approved disturbance relating to Matters of National Environmental Significance within the project area. This offset area must include:	
a) a minimum of 1.5 kilometres (in streamside length) of known or suitable Giant Barred Frog habitat (including a minimum width of 80 metres on either side of stream or river edges); and,	Figure 5
b) 177 ha of Swift Parrot habitat.	
Note: For clarity, offset areas to be provided to meet the requirements of the NSW Government, which meet all of the requirements of this approval, will be adequate for the purpose of these conditions.	
14. To offset the impacts on the habitat of the Giant Barred Frog and Swift Parrot, the person taking the action must, by December 2011, obtain the Minister's approval of an Offset Management Plan. This plan must include:	
a) the desired outcomes/objectives of implementing the plan;	1.2
b) details of the offset area, clearly defining the location and boundaries of the offset area, through maps and/or textual descriptions as well as an accompanying shapefile;	4.2
c) a detailed description of the Swift Parrot and Giant Barred Frog habitats in the offset area;	4.2.6
d) management actions to protect and enhance the Swift Parrot habitat, for example, weed control and fire management measures;	5 and 6
e) management actions to protect and enhance the Giant Barred Frog habitat including implementing a buffer zone approximately 60m from the creekline along areas of the MJR and relevant tributaries; appropriate fencing of the riparian corridor; weed control; rehabilitation and enhancement of degraded riparian zone vegetation; and establishment of riparian vegetation in cleared areas alongside the MJR and relevant tributaries to improve habitat connectivity;	6
f) a monitoring plan including the undertaking of ecological surveys to assess the success of the management measures against identified milestones and objectives;	8
g) performance measures and reporting requirements against identified objectives, including trigger levels for corrective actions, and actions to be taken to ensure performance measures and objectives are met;	7
h) a process to report to the Department the offset area management actions undertaken and the outcome of those actions, identifying any need for improved management.	10
i) For the five years after the commencement of operations, reports are to be submitted annually on or before the anniversary of the commencement of operations. Subsequently reports are to be submitted every fifth year on or before the anniversary of the commencement of operations;	10.1
j) a description of the potential risks to successful management and rehabilitation in the offset areas, and a description of the contingency measures that would be implemented to mitigate these risks; and,	9
k) details of parties responsible for monitoring, reviewing and implementing the plan.	11
Note: the monitoring plan for offset areas required in Condition 13. f) above and the monitoring plan for the Giant Barred Frog required in Condition 7. c) may be combined where appropriate.	
15. The approved Offset Management Plan must be implemented. Any changes to the Offset Management Plan must be approved by the Minister and approved variations to the Plan must be implemented. This report may be made publicly available on the internet by the Department.	10.3
16. Within one year of the commencement of the action, the person taking the action must demonstrate in writing to the satisfaction of the Minister that a conservation covenant or similar instrument has been registered on the "title/s of land containing the offset area required in Condition 12. This must provide for the protection of this offset area in perpetuity, through one of the following means: • *a Conservation Agreement under s 69 of the National Parks and Wildlife Act 1974 (NSW),* • *placing a restrictive or public positive covenant over the offset land under s.88B-E of the Conveyancing Act 1919 (NSW), or* • *a Planning Agreement under s 93F(1) of the Environmental Planning and Assessment Act, 1979 (NSW).*	1.4

Of relevance to the BMP, Conditions 17 to 25 of the Commonwealth Approval EPBC 2010/5396 also state:

Publication of Plans

17. *All plans approved by the Minister under these conditions must be published on the proponent's website within 1 month of approval by the Minister.*
18. *The department may request the proponent to publish a plan in a specified location or format and specified accompanying text. The proponent must comply with any such request.*

Reporting and Auditing

19. *Within 30 days of commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement.*
20. *Within 3 months of every 12 month anniversary of the commencement of the action, the person taking the action must submit to the Department a report addressing compliance with the conditions of this approval. Annual Reports must be provided until the Minister is satisfied that the proponent has complied with all conditions of the approval and has implemented all commitments made in plans/programs approved by the Minister.*
21. *Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report is submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.*
22. *If, at any time after five years from the date of this approval, the Minister notifies the person taking the action in writing that the Minister is not satisfied that there has been substantial commencement of the action, the action must not thereafter proceed without the written agreement of the Minister.*
23. *If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans/programs referred to in these conditions, the person taking the action must submit for the Minister's approval a revised version of any such plan/program. If the Minister approves such a revised plan/program, that plan/program must be implemented in place of the plan/program originally approved.*
24. *If the Minister believes that it is necessary or desirable for the better protection of threatened species and threatened ecological communities (TECs) (s.18 & s.18A) to do so, the Minister may request that the person taking the action make specified revisions to the plans or programs approved under these conditions of approval and submit the revised plan or program for the Minister's approval. The person taking the action must comply with any such request. The revised approved plan or program must be implemented in place of the plan or program originally approved.*
25. *The person taking the action must maintain accurate records of all activities associated with or relevant to the above conditions of the approval, and make them available on request by the Department. Such documents may be subject to audit by the Department and used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department website. The results of audits may also be publicised through the general media.*

3.3 BOWENS ROAD NORTH OFFSET STRATEGY

Condition 41 of the Stratford Extension Project Development Consent (SSD-4966) states:

41. *The Applicant shall implement the Bowens Road North Offset Strategy, as described in the modification application Bowens Road North Mod 4 and accompanying Environmental Assessment titled Bowens Road North Open Cut June 2010 Modification, in conjunction with the biodiversity offset strategy for the Duralie Extension Project, and comply with the relevant requirements for the implementation of this strategy in the Duralie Extension project approval (see MP 08_0203).*

Note: The lands to which the Bowens Road North Offset Strategy applies are shown conceptually in Figure 2 of Appendix 8 and are located about 20 km south of the Stratford Mine and contiguous with more extensive lands of the Duralie Mine Offset Strategy.

The Bowens Road North Offset Strategy Offset area is located adjacent to the Southern Offset area for the DCM (Figure 4) and is 29 ha in size (Stratford Coal Pty Ltd, 2010). This BMP provides for the management of the Bowens Road North Offset Strategy Offset area.

3.4 OTHER COMMITMENTS RELEVANT TO THE BIODIVERSITY MANAGEMENT PLAN

Condition 43 (d), Schedule 3 of the NSW Project Approval (08_0203) states:

This plan must include … the measures described in the EA and in the expert report of Dr Goldney dated 7 April 2011 in Land and Environment Court proceedings No 10090 of 2011 to avoid or mitigate impacts on biological diversity, native flora and fauna and threatened species;…

Table 6 provides other relevant commitments (additional to those already captured by the NSW Project Approval (08_0203) conditions) as derived from measures described in the DEP EA (DCPL, 2010) and in the expert report. The table also provides relevant sections within the BMP that apply to these commitments.

Table 6
Other Commitments Relevant to this Biodiversity Management Plan

Commitments	Relevant Section that Addresses the Commitment
Speed limits would be set at the DCM	5.5
Wildlife warning signs would be installed on roads in the vicinity of the DCM	5.5
Signage would be installed to identify the Offset areas	6.7
Canopy bridges would be installed to facilitate the cross of arboreal mammals where there is not existing substantial canopy connection.	6.14

3.5 LICENCES, PERMITS AND LEASES

In addition to the NSW Project Approval (08_0203) and Commonwealth Approval (EPBC 2010/5396), all activities at the DCM will be conducted in accordance with a number of licences, permits and leases which have been issued or are pending issue.

Key licences, permits and leases pertaining to the DCM include:

- Mining Lease (ML) 1427 issued under Part 5 of the NSW *Mining Act 1992* and approved by the NSW Minister for Mineral Resources in April 1998.
- ML 1646 issued under Part 5 of the NSW *Mining Act 1992* and approved by the NSW Minister for Primary Industries in January 2011.
- EPL 11701 issued under Part 3 of the NSW *Protection of the Environment Operations Act 1997* (PoEO Act) by the Environment Protection Authority in September 2002 (as modified by subsequent licence variations).
- Groundwater Licence – Duralie Coal Open Cut (WAL41518) issued under NSW *Water Management Act 2000* by the NSW Office of Water (now WaterNSW) in December 2017.
- DLWC Bore Licence for monitoring bores (20BL168539) dated 31 October 2002, three bores added on 2 February 2004.

- NSW Department of Industry - Water (now Water NSW) Bore Licence for monitoring bores WR1, WR2 and DB11W (20BL173570, 20BL173568, 20BL173569) dated 5 August 2013.
- Rehabilitation Management Plan approved by the NSW Resources Regulator.
- Water Supply Works Approval (20WA202053) under the NSW *Water Management Act 2000* issued by the Department of Water and Energy (now –WaterNSW) on 15 May 2009 for the Coal Shaft Creek diversion and various on-site water management structures[1].
- Mining and occupational health and safety related approvals granted by the NSW Resources Regulator and/or Mining, Exploration and Geoscience (MEG) and SafeWork NSW.

3.6 OTHER LEGISLATION AND GUIDELINES

DCPL will operate the DCM consistent with the NSW Project Approval (08_0203), the Commonwealth Approval (EPBC 2010/5396) and any other legislation that is applicable to an approved Part 3A Project under the EP&A Act.

Relevant legislation that may be applicable to the DCM is described in the DCM Environmental Management Strategy.

In addition to the Acts referred to above and in Section 3.2, the following NSW Acts may be applicable to the conduct of the DCM:

- *Contaminated Land Management Act 1997;*
- *Dangerous Goods (Road and Rail Transport) Act 2008;*
- *National Parks and Wildlife Act 1974;*
- *Mining Act 1992;*
- *Biosecurity Act, 2015;*
- *Rail Safety (Adoption of National Law) Act 2012;*
- *Roads Act 1993;*
- *Biodiversity Conservation Act 2016* (BC Act)*;*
- *Work Health and Safety (Mines and Petroleum) Act 2013 and Work Health and Safety (Mines and Petroleum) Regulation 2014;*
- *Crown Lands Amendment (Multiple Land Use) Act 2013;*
- *Dams Safety Act 2015 and Dams Safety Regulation 2019;*
- *Water Management Act 2000;*
- *Fisheries Management Act 1994;* and
- *Petroleum (Onshore) Act 1991.*

[1] This approval replaced the previous *Water Act, 1912* Licence 20SL060324 for these structures.

4 EXISTING ENVIRONMENT

A summary of the existing environment at the DCM and Offset areas is described in the sections below. A detailed description of the existing environment is provided in the *Terrestrial Flora and Fauna Assessment* (Cenwest Environmental Services and Resource Strategies, 2010), *Duralie Open Pit Modification Fauna Assessment* (Australian Museum Consulting, 2014) *and Duralie Open Pit Modification Flora Assessment* (FloraSearch, 2014).

Since commencement of the BMP in 2012 reporting of the progress of the BMP has been included in the Annual Biodiversity Reports which are attached to the DCM Annual Reviews. The most recent Annual Biodiversity Report 2021 is included in Appendix F.

4.1 DURALIE COAL MINE

The DCM is located within ML 1427 and ML 1646 (Figure 2). The portion of ML 1427 and ML 1646 not currently subject to mining development is managed for agricultural use.

The DCM is located in an area characterised by substantial local topographic relief. The mine is situated in a valley which is bounded by ridgelines to the east (Buckleys Range) and west (Linger and Die Ridge). Elevations within the DCM area generally range from approximately 50 m along the river flats of the Mammy Johnsons River to 180 m on the ridge tops to the west of the existing mining lease. A prominent hill rising to an elevation of approximately 130 m, referred to as Tombstone Hill, is located to the east of the open pit.

4.1.1 Climate

On-site weather data are collected at the meteorological station situated near the centre of ML 1427. On-site temperature records from 2003 onwards indicate that in the summer months at the DCM, maximum temperatures would be expected to range from 20 to 44 degrees Celsius (^{o}C) while during winter months temperatures can fall as low as -3^{o}C. The highest temperatures generally occur in January and the lowest occur during July.

Mean annual rainfall for the nearby district of Stroud over the period 1889 to 2010 is 1,147 millimetres (mm). Historical records show that rainfall tends to be highest in March and lowest in September. Average daily evaporation rates calculated monthly for the 2021 reporting period ranged from 1.1 millimetres per day (mm/day) (June 2021) to 3.7 mm/day (November 2020) (DCPL, 2021).

Rainfall data collected from the Craven Bureau of Meteorology (2018) site (records since 1961) indicate that all months of the year can have effectively zero rainfall. There is also a chance of reasonable rainfall in any month of the year. Summer months and early autumn have the highest average rainfall. July and August have the greatest risk of frost.

Landholders have noted that flooding of the Mammy Johnsons River floodplains occurred biannually up until 1970, with reductions in rainfall leading to less frequent flooding within the last 10 years. The most recent flood occurred in March 2021, with inundation of the floodplains occurring during this event.

4.1.2 Threatened Flora

No threatened flora species listed under the BC Act or EPBC Act have been recorded in the DCM or immediate surrounds based on the findings already reported and a review of database records and relevant literature (EcoBiological, 2009a, 2009b; FloraSearch, 2014).

4.1.3 Environmental Weeds

In NSW all plants are regulated under the NSW *Biosecurity Act 2014* with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

State level determined priority weed species are set by NSW Department of Primary Industries (DPI). The NSW *Biosecurity Act 2014* and regulations provide specific legal requirements for state level priority weeds and high risk activities. The state determined priority weed species that have been recorded in the locality include (EcoBiological, 2009a):

- *Chrysanthemoides monilifera* (bittou bush);
- *Lantana camara* (lantana);
- *Rubus fruticosus* (blackberry);
- *Senecio madagascariensis* (fireweed); and
- *Sporobolus fertilis* (rat's tail grass).

Regionally determined priority weed species are listed in the *Hunter Regional Strategic Weed Management Plan 2017 – 2022* along with regional strategic responses. The regionally determined priority weed species that have been recorded in the locality include (EcoBiological, 2009a, Cenwest and Resource Strategies, 2010):

- *Lantana camara* (Lantana);
- *Rubus fruticosus* (Blackberry);
- *Sporobolus fertilis* (Rat's Tail Grass); and
- *Xanthium occidentale* (Noogoora Burr).

Greening Australia was contracted to undertake an initial weed assessment of the Offset areas in 2013, the results of which confirmed with the presence of the above-listed weeds. The aim of the weed assessment was to assist in setting priorities and developing on-ground actions for weed control. Management of environmental weeds at the DCM is described in Section 5.9 and 6.5.

DCPL continues to engage contractors to undertake weed management activities at the DCM and Offset areas on an ongoing basis. Ongoing weed control activities are described in the DCM Annual Reviews.

4.1.4 Fauna Composition

A total of 197 native vertebrate species have been located within the Project area and surrounds during the fauna surveys from 1996 to 2009, comprising of 18 amphibians, 14 reptiles, 128 birds and 37 mammals. In general, the number and diversity of animals within the area is estimated to have increased due to vegetation thickening since the original Duralie Mine commencement (Cenwest Environmental Services and Resource Strategies, 2010).

Further monitoring of fauna usage of the Offset areas and DCM has been conducted every three years to assess the success of the Offset areas in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity and species richness and abundance. The survey conducted by AMBS Ecology & Heritage (AMBS) during 2018 (AMBS, 2018) recorded a total of 124 species of vertebrate, comprising 10 frogs, 8 reptiles, 66 birds and 40 mammals, including fifteen of the species detected are listed as threatened or migratory on the schedules of the BC Act and/or EPBC Act. Four of these species have been recorded for the first time during dedicated fauna surveys for the DCM, including the Little Lorikeet, Masked Owl, Long-nosed Potoroo and New Holland Mouse.

The fauna surveys suggest the DCM Offset and rehabilitation areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs. The number of species recorded utilising the rehabilitation area is encouraging, particularly given the relatively young age of the vegetation.

The next fauna survey was undertaken in November 2021. Results from the survey will be included in the 2022 Annual Biodiversity Report to be included in the 2022 DCM Annual Review.

4.1.5 Threatened Fauna

The threatened fauna species listed under the BC Act and/or EPBC Act that have been recorded in the Project area and/or surrounds are shown on Figure 5.

Threatened fauna species listed under the BC Act and/or EPBC Act that have been recorded in the surface development area are listed in Table 7.

Table 7
Threatened Fauna Species

Scientific Name	Common Name	Conservation Status[1]	
		BC Act	EPBC Act
Birds			
Lathamus discolour	Swift Parrot	E	CE
Climacteris picumnus	Brown Treecreeper (eastern subspecies)	V	-
Pyrrholaemus sagittata	Speckled Warbler	V	-
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-
Daphoenositta chrysoptera	Varied Sittella	V	-
Glossopsitta pusilla	Little Lorikeet	V	-
Tyto novaehollandiae	Masked Owl	V	-
Mammals			
Phascogale tapoatafa	Brush-tailed Phascogale	V	-
Petaurus norfolcensis	Squirrel Glider	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-
Myotis macropus	Large-footed Myotis	V	-
Miniopterus australis	Little Bentwing-bat	V	-
Potorous tridactylus	Long-nosed Potoroo	V	V
Pseudomys novaehollandiae	New Holland Mouse	-	V

Source: Cenwest Environmental Services and Resource Strategies (2010), Australian Museum Consulting (2014) and AMBS (2018).

[1] Threatened Species status under the BC Act and/or EPBC Act.
V = Vulnerable; E = Endangered; CE = Critically Endangered.

4.1.6 Exotic Animals

EcoBiological (2009a) estimated that the relative abundance of the Black Rat and Red Fox was uncommon, while the Brown Hare and European Rabbit were abundant and common, respectively. Though, Red Fox and Wild Dog are commonly sighted in the general area. Of these, the Wild Dog, Red Fox and European Rabbit are declared pests under the *Local Land Services Act, 2013*.

A feral animal survey was undertaken by AMBS (2017) during April 2017 to monitor the success of control programs and determine priorities for ongoing control measures. AMBS (2017) concluded that:

- Red Fox and Feral Cats may represent a threat to biodiversity within the study area;
- Wild Dogs are present in the study area, and may or may not be a threat to biodiversity; and
- European Rabbit is present at low densities, but its abundance can increase rapidly, particularly if dog, fox and cat numbers decrease.

Ongoing pest animal control activities are described in the DCM Annual Reviews.

The next triennial feral animal survey was undertaken by AMBS in September 2021. Results from the survey will be included in the 2022 Annual Biodiversity Report to be included in the 2022 DCM Annual Review.

4.1.7 Vegetation and Habitat

Vegetation/habitat retained in the mining lease includes of the following (Figure 6):

- Spotted Gum – Red Ironbark – Thick-leaved Mahogany Forest (Vegetation Community 1);
- Spotted Gum – Grey Ironbark – Thick-leaved Mahogany Forest (Vegetation Community 2a); and
- Red Gum Grassy Woodland (Vegetation Community 3).

4.1.8 Biodiversity Values to be Lost through Clearing of Vegetation/Habitat

A detailed description of the biodiversity values to be lost through clearing of vegetation communities in the surface development area, including as habitat for the threatened species that are recorded in the surface development area are described in the *Terrestrial Flora and Fauna Assessment* (Cenwest Environmental Services and Resource Strategies, 2010), *Duralie Open Pit Modification Fauna Assessment* (Australian Museum Consulting, 2014) *and Duralie Open Pit Modification Flora Assessment* (FloraSearch, 2014).

4.2 OFFSET AREAS

The Offset areas described below incorporate the offsets for the Duralie Extension Project and Bowens Road North Offset Strategy (Table 8). The offsets in the Southern Offset area abut one another (Figure 3) and are to be combined for management. The following descriptions incorporate all of these areas unless otherwise noted.

Table 8
Offset Area Summary

Component	Size (ha)
Duralie Extension Project	692.5
Bowens Road North Offset Strategy	29
Total	**721.5**

The area conserved is large (721.5 ha) and retains extensive examples of a diversity of dry and wet forest types with a relatively intact understorey.

Considerable vegetative resilience is evident as the edges of most all remnants have woody regrowth with an understorey of native grasses and shrubs. Additionally, alluvial vegetation communities are also present including 'Cabbage Gum open forest or woodland on flats of the North Coast and New England Tablelands'.

A detailed description of the baseline existing environment of the Offset areas is provided in the *Terrestrial Flora and Fauna Assessment* (Cenwest Environmental Services and Resource Strategies, 2010), *Duralie Open Pit Modification Fauna Assessment* (Australian Museum Consulting, 2014) and *Duralie Open Pit Modification Flora Assessment* (FloraSearch, 2014).

4.2.1 Landscape Function Assessment

A rapid assessment of landscape function was conducted in the Offset areas by Greening Australia in 2011 and 2012. The rapid assessment of landscape function noted that, while most of the Vegetation Management Units (VMU) were largely functional, the removal of cattle from the Offset areas coupled with establishment of native vegetation and minimal soil disturbance (Section 6.6), will lead to significant transformation towards higher levels of landscape function.

The BMP, through establishment of approximately 721.5 ha of protected, locally occurring vegetation, will also link three large patches of vegetation to the north, south and west of the Offset area. This corridor vegetation will also cover important, rare alluvial Threatened Ecological Communities (TECs) (including riparian and Cabbage gum communities) adjacent to riparian corridor along the Mammy Johnsons River.

The Offset areas are likely to provide a large gain in biodiversity value over the next few decades. The Offset areas currently support moderate biodiversity values. Greening Australia noted that many of the paddocks in the Offset areas that have been cleared still retain a diverse range of native grass species, and the forested paddocks are dominated by tree regrowth that supports a diverse understorey of native shrubs and herbaceous species. Plate 1 and Figure 6 provide clear imagery relating to the scale of function of the Offset areas.

Plate 1: *The ridge to river to ridge connectivity that will be re-established within the Duralie Biodiversity Management Plan. The non-forested paddocks in this photo are targeted for revegetation in the Plan (Vegetation Management Units AA, V and floodplain Vegetation Management Unit in between).*

The Offset areas provide an opportunity to rapidly protect and restore a diversity of flora and fauna. The Offset areas are significant in size and retain examples of a diversity of dry and wet forest types with a relatively intact understorey. The area retains considerable resilience with most remnants containing woody re-growth with an understorey of native grasses and shrubs. Significantly, the Offset will restore, through revegetation, effective ecological connectivity from forested ridges to the riparian forest along the Mammy Johnsons River. This *ridge to river* approach will provide connectivity that has otherwise been lost throughout the length of this river valley.

To monitor the effectiveness of revegetation in the Offset areas, monitoring of Landscape Function Analysis and vegetation dynamics in the Offset area has been undertaken annually. A rapid assessment of landscape function was conducted in the Offset areas by Kleinfelder in 2017. Kleinfelder (2017) concluded that overall, the remnant and regrowth areas are showing good signs of natural recruitment and enhanced biodiversity.

Since 2017, the rapid assessment of landscape function in the Offset areas has been repeated annually with results presented in the DCM Annual Reviews. The results from the most recent February 2021 assessment are provided in the *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (provided in Appendix A of this BMP).

Revegetation of the Duralie Offsets is continuing, with the majority of the VMUs now planted either in part or in full (Appendix A). Several of the VMUs have been subjected to several rounds of disturbance, by design or unintentionally, which has possibly influenced the soil biophysical processes as seen in results included within the *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (Appendix A). The *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* suggests that these VMUs should be left for a period of time to allow for conditions to improve before any remedial action is undertaken (Appendix A).

VMUs where target densities have been achieved (i.e. VMUs F and W) can now also be left to mature for a period of time to allow the vegetation to mature and determine what, if any further remedial actions are to be undertaken (Appendix A).

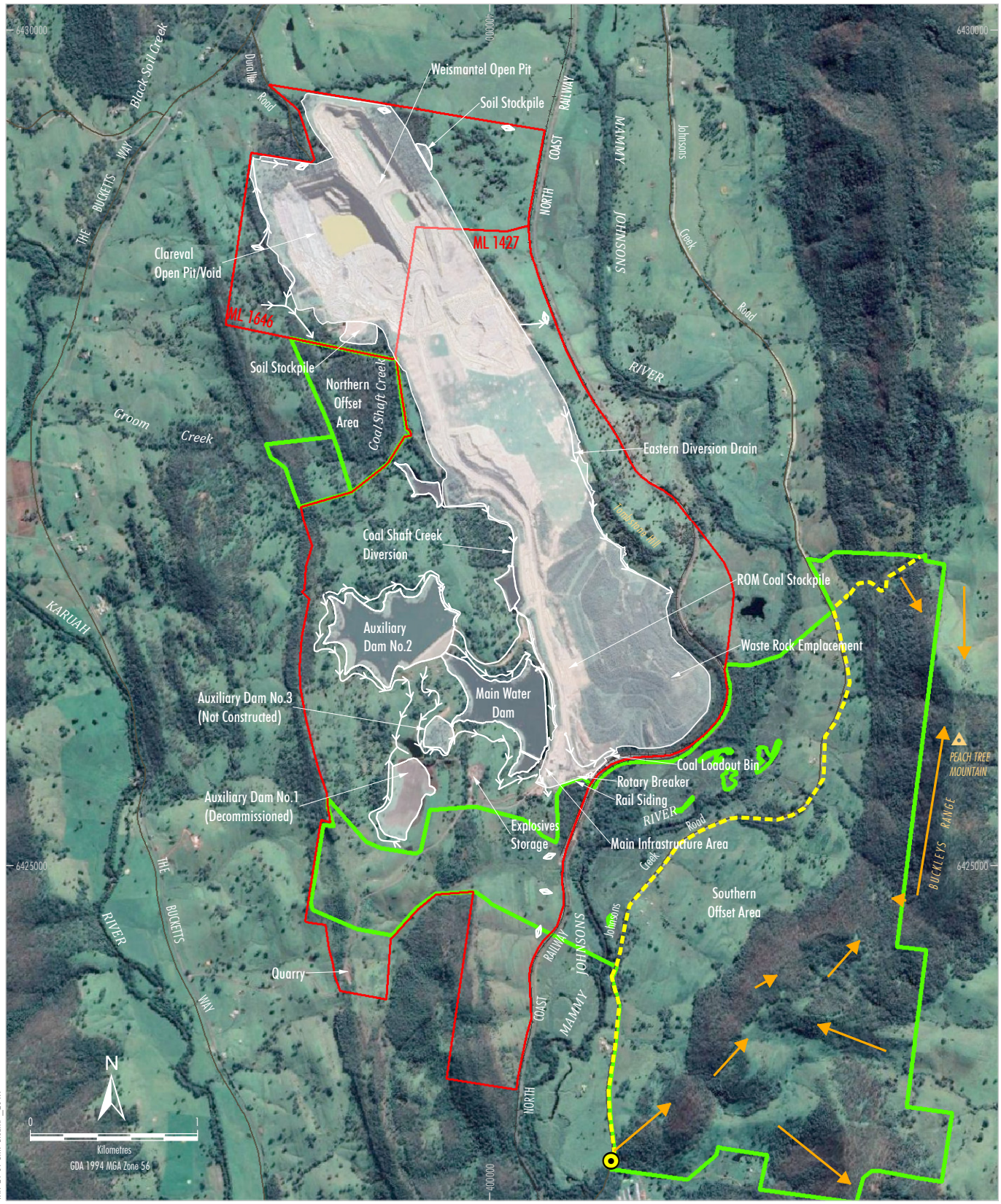
As suggested in the *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021*, a much smaller number of VMUs can be considered for further planting to occur in the near future (i.e. VMUs AD, I, U, T and Y) (Appendix A).

4.2.2 Site History

DCPL (Tony Dwyer, Personal Communication, 07/11/2011) and other sources suggest the following general history of the Offset areas:

1. The site has been extensively grazed since the early 1800s for livestock production with some areas of clearing. Timber harvesting has been a feature for over a century.
2. Agriculture was intensified in the 1950s particularly with the development of dairies, exotic pasture ‘improvement’ and further clearing.
3. Elevated areas to the east were subsequently allowed to re-grow while alluvial areas and the western slopes were predominantly maintained or re-cleared for cattle production (Cenwest Environmental Services and Resource Strategies, 2010).
4. No fires (controlled or otherwise) were reported within the proposed Offset Areas in the period 2009-2011, though controlled burns of native pasture are common in the valley. A portion of the DCM Offset Areas were affected by an unplanned bushfire in November 2019. The fire was ignited near Johnsons Creek Road, and burnt for approximately 10 days (Kleinfelder, 2020). Kleinfelder (2020) determined that the vegetation communities affected by the unplanned bushfire are capable of recovering, provided the interval to the next fire is sufficient.

Figure 7 shows fire paths, as determined by site investigation (conducted by Kleinfelder [2020]), and fire intensity mapping for the Buckley’s Range Fire.



YAN-21-37 DMP BiodMP_201A

LEGEND

- Mining Lease Boundary
- Existing/Approved First Flush Protocol Pump Back System
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved Up-catchment Diversion System
- Offset Area
- Fire Origin
- Backburn
- Fire Path

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

Buckleys Range Bushfire
(November 2019)

Figure 7

4.2.3 Vegetation

Vegetation types present in the Offset areas are listed in Table 9 based on the vegetation mapping by EcoBiological (2009a, 2009b) and FloraSearch (2014). Revised vegetation mapping is presented in Figure 6[2].

During the baseline surveys it was observed that the remnant vegetation in the Offset areas was predominantly re-growth of spotted gum-grey ironbark-thick-leaved mahogany forest, as well as cabbage gum floodplain forest, stringybark–paperbark forest, riparian closed forest and small areas of communities such as dry gully rainforest, blue gum moist forest and freshwater wetlands. A low abundance of shrub species on some slopes and ridges was noted (potentially as a consequence of past burning practices). Shrub species were noted as dense in remnant alluvial communities. The ground layer was mostly dominated by native species except for alluvial areas where exotic species dominate.

The condition of the majority of remnant vegetation on-site was noted to be of moderate to high quality with limited edge effects. Only areas associated with alluvial systems showed significant exotic cover in the ground layer. Open paddock areas with retained paddock trees provided some natural regeneration around individual parent trees.

Open pastures were studied by Greening Australia to determine their pre-clearing ecosystem types and a resulting spatial layer was created by Greening Australia for use in ecosystem revegetation/ installation efforts.

4.2.4 Threatened Flora

No threatened flora species listed under BC Act and/or EPBC Act have been recorded as occurring within the Offset areas (EcoBiological, 2009a, 2009b; FloraSearch, 2014).

4.2.5 Environmental Weeds

The state determined priority weed species that have been recorded in the Offset areas include (EcoBiological, 2009a, Cenwest and Resource Strategies, 2010, FloraSearch, 2014):

- *Senecio madagascariensis* (fireweed);
- *Lantana camara* (lantana);
- *Sporobolus fertilis* (rat's tail grass);
- *Rubus fruticosus* (blackberry); and
- *Ligustrum sinense* (small-leaf privet).

Regionally determined priority weed species are listed in the *Hunter Regional Strategic Weed Management Plan 2017 – 2022* along with regional strategic responses. The regionally determined priority weed species that have been recorded in the locality include (EcoBiological, 2009a, Cenwest and Resource Strategies, 2010, FloraSearch, 2014):

- *Lantana camara* (Lantana);
- *Rubus fruticosus* (Blackberry); and
- *Sporobolus fertilis* (Rat's Tail Grass).

[2] Two errors were detected within the original vegetation mapping produced by EcoBiological for the northern part of the Offset areas (a small area of ironbark dominated forest on a ridgeline mapped as an alluvial woodland community and a small patch of *E. molucanna* forest on a foothill mapped as an alluvial cabbage gum forest). These have been corrected by Greening Australia and updated within the site mapping.

Table 9
Vegetation Types Present in the Offset Areas

Vegetation Types EcoBiological (2009a, 2009b) and FloraSearch (2014)		Biometric Vegetation Type (Vegetation Types in the Hunter/Central Rivers as described in OEH (2018)	Dominant canopy spp	Equivalent TEC (Vegetation Types in the Hunter/Central Rivers as described in OEH (2018)
11	Freshwater wetlands	Coastal floodplain sedgelands, rushlands, and forblands of the North Coast		Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
3	Grey gum - red gum - apple riparian forest; and 4 Grey box - forest red gum - grey ironbark open forest	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast	Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*Eucalyptus tereticornis*), Grey Ironbark (*Eucalyptus siderophloia*)	Not Listed.
5	Cabbage gum floodplain forest	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin	Rough-barked Apple (*Angophora floribunda*), Forest Red Gum (*Eucalyptus tereticornis*), Cabbage Gum (*Eucalyptus amplifolia* subsp*. amplifolia*)	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
2a-2d	Spotted gum - grey ironbark-thick leaved mahogany forest	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	Spotted Gum (*Corymbia maculata*), Grey Ironbark (*Eucalyptus siderophloia*)	Not Listed.
7	Stringybark -paperbark forest	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	Sydney Peppermint (*Eucalyptus piperita*), Smooth-barked Apple (*Angophora costata*)	Not Listed.
8	Dry gully rainforest	Giant Stinging Tree - Fig dry subtropical rainforest of the North Coast and Brigalow Belt South		Not listed.
9	Blue gum moist forest	Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast		Not listed.
6	Riparian closed forest	Weeping Lilly Pilly - Water Gum riparian rainforest of the southern North Coast		Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion - Hunter/Central Rivers (as updated http://threatenedspecies.environment.nsw.gov.au/tsprofile/profile_data.aspx?id=10497&cma=Hunter/Central+Rivers
Derived Grasslands		Derived Grasslands in Coastal Valleys		Not listed.
Acacia Regeneration		Acacia Regeneration		Not listed.

Source: EcoBiological (2009a, 2009b) and FloraSearch (2014).

Greening Australia were contracted to undertake an initial weed assessment of the Offset areas in 2013. The aim of the weed assessment was to assist in setting priorities and developing on-ground actions for weed control. The results of the survey confirmed the presence of the above-listed priority weed species. Management of environmental weeds within the Offset areas is described in Section 5.9 and 6.5.

DCPL continues to conduct an annual control program and ongoing weed management activities at the DCM and Offset areas. The key species targeted included Blackberry, Lantana, Privet, Wild tobacco and Giant Parramatta Grass.

4.2.6 Threatened Fauna Species

Threatened fauna species listed under the BC Act and/or EPBC Act that have been recorded in the Offset areas and/or surrounds are shown in Figure 5. The biodiversity value of the vegetation in the Offset areas for the threatened fauna species that are recorded in the surface development areas (Section 4.1.5) is described in Table 10. Table 3 also provided a summary of habitat for various threatened fauna species.

4.2.7 Soil Stability

The Mammy Johnsons River, which traverses the site, retains an almost continuous canopy layer throughout the area. Where vegetation remains intact, banks are resistant to the erosive forces of moderate (common) flood events. Removal of vegetation has occurred in some areas including a highly eroded bank of a side channel within VMU A (Plate 2). Section 6.8 describes how this would be addressed.

Plate 2: *Bank erosion in Vegetation Management Unit A*

Table 10
Biodiversity Value of the Vegetation in the Offset Areas for Various Threatened Fauna Species

Scientific Name	Common Name	Conservation Status[1]		Description
		BC Act	EPBC Act	
Lathamus discolour	Swift Parrot	E	E	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). Potential foraging and roosting resources for the Swift Parrot occur within the Offset areas (i.e. winter flowing Eucalypts such as *Corymbia maculata*). The Offset area contains approximately 282 ha of mature, diverse vegetation and an additional 303 ha of proposed revegetation of the following vegetation types which can potentially be utilised by the Swift Parrot for foraging and roosting: • Spotted Gum – Grey Ironbox forest dry open forest of the lower foothills of the Barrington Tops, North Coast; • Grey Box – Forest Red Gum – Grey Ironbark open forest of the hinterland ranges of the North Coast; and • Sydney Peppermint – Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.
Mixophyes iteratus	Giant Barred Frog	E	E	Mammy Johnsons River (the dominant riparian feature with the Offset area) is a permanent flowing drainage feature within fringing rainforest and riparian vegetation. This is a key associated habitat type for the Giant Barred Frog (NSW Scientific Committee, 2011). Based on a minimum 80 m width either side of the drain centre, together with a minimum 2.4 km stretch within the Offset area, approximately 38.4 ha of potentially suitable breeding and foraging habitat exists within the offset boundary. Vegetation within the area is almost entirely mature, with a dense sub canopy and established ground layer.
Climacteris picumnus	Brown Treecreeper (eastern subspecies)	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). Most mature vegetation within the Offset areas is lacking in a dense shrub layer which is the preferred habitat for this species. The derived grasslands are rich in tussock grasses and all areas (both revegetation and remnant vegetation) include stringybark Eucalypt species such as *E. acmeniodes* and *E. microcorys.*
Pyrrholaemus sagittata	Speckled Warbler	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). All of the Offset areas contain or will contain utilised species such as Eucalyptus siderophloia and much of the eastern portion of the area is dominated by other utilised trees such as Corymbia maculata. The derived grasslands are rich in tussock grasses which are also utilised by the species.
Daphoenositta chrysoptera	Varied Sittella	V	-	All of the Offset areas contain Eucalypt forests and woodland which would provide suitable habitat for this species. This species has also been recorded within the Offset areas by AMBS (2014) and wider surrounds by EcoBiological (2009a, 2009b).

Table 10 (continued)
Biodiversity Value of the Vegetation in the Offset Areas for Various Threatened Fauna Species

Scientific Name	Common Name	Conservation Status[1]		Description
		BC Act	EPBC Act	
Pomatostomus temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). All of the Offset areas contain or will contain utilised species such as *Eucalyptus siderophloia* and much of the eastern portion of the area is dominated by other utilised trees such as *Corymbia maculata*. The derived grasslands are rich in tussock grasses which are also utilised by the species.
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). The majority of the Offset site is dominated by (or will be revegetated into) open dry foothill forest which is a key habitat for this species. The Brush-tailed Phascogale is also typically associated with *Eucalyptus siderophloia* and other utilised trees such as *Corymbia maculata* and *E. acmeniodes*, which are abundant on-site.
Petaurus norfolcensis	Squirrel Glider	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). All of the Offset areas contains or will contain utilised species such as *Eucalyptus siderophloia* and much of the eastern portion of the area is dominated by other utilised trees such as *Corymbia maculata*. The Offset areas also contain mature trees with hollows for nesting within mature regrowth vegetation.
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). The majority of the Offset areas is or will become dry sclerophyll forest which is favoured by this species. The Offset areas also contain mature trees with hollows for nesting within mature regrowth vegetation.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	This species was recorded within the Project area (Cenwest and Resource Strategies, 2010). Caves (a favoured roosting site for this species) are not known to occur within the Offset site, but nearby buildings will provide limited roosting opportunities together with food resources gathered from the Offset vegetation.
Myotis macropus	Large-footed Myotis	V	-	Caves are not known to occur within the Offset site, but nearby buildings, bridges and foliage will provide roosting opportunities together with food resources gathered from the Offset vegetation.

Source: Cenwest Environmental Services and Resource Strategies (2010).

[1] Threatened Species status under the BC Act and/or EPBC Act.
V = Vulnerable; E = Endangered.

4.3 VEGETATION MANAGEMENT UNIT BOUNDARIES, OBJECTIVES AND ASSOCIATED TREATMENTS

VMU boundaries were created by Greening Australia by assimilating vegetation mapping boundaries, literature review, global information system (GIS) desktop analysis and the on-site assessment. VMUs primarily represent areas that have similar:

- soil type;
- elevation;
- likely pre-clearance vegetation types;
- remnant vegetation; and
- vegetation condition or growth stage.

For example, adjacent areas of alluvium mapped as previously supporting Cabbage Gum Floodplain Forest, with an obviously active soil (as demonstrated by regenerating species) has been grouped together into one VMU. An adjacent area with similar characteristics but demonstrating low or no recruitment (a potentially “dead” soil) has been separated into another distinct VMU.

In cases where abiotic or biotic filters were present to block successional processes (particularly changes in hydrology), target communities for VMU were adjusted to current conditions to improve the success of rehabilitation efforts.

Appendix B provides a description of the Offset area characteristics, including Ecological Community, Offset area size and proposed treatment.

Appendix C provides a summary of VMU characteristics, including VMU area size and the recommended treatment (i.e. remnant enhancement, regrowth management and installation).

Plates 3 to 9 are indicative of the Offset areas. Mapping of the Offset area VMUs is provided on Figure 8.

VMU objectives were set by Greening Australia with a clear view to maximise existing characteristics of the VMUs with recognition of the resources required to undertake such works. To determine this, treatment levels were generated based on on-ground assessments and Greening Australia’s extensive field experience to determine cost-effective means of restoring prioritised revegetation areas.

Local vegetation types were used by Greening Australia as a descriptive unit as it is believed that the key species and inter-geological relationships described within each ecosystem type allow for major ecosystem functions and persistence within a landscape.

Specific VMU objectives and associated techniques were developed by Greening Australia by utilising the following information:

- pre-clearing information and current VMU characteristics;
- previous accumulated research; and
- integration of existing environment considerations outlined in Section 4.

As an example of this, established regrowth was prescribed treatments that would enhance existing site characteristics such as shrub layer diversity. Similarly, in areas that lacked functional elements for that particular system, suitable regeneration techniques and reintroduction of suitable plant material was recommended to ensure critical functional elements were present.

Plate 3: Vegetation Management Unit A - High quality closed riparian forest along Mammy Johnsons River

Plate 4: Vegetation Management Unit S - Exotic pasture on alluvial flats

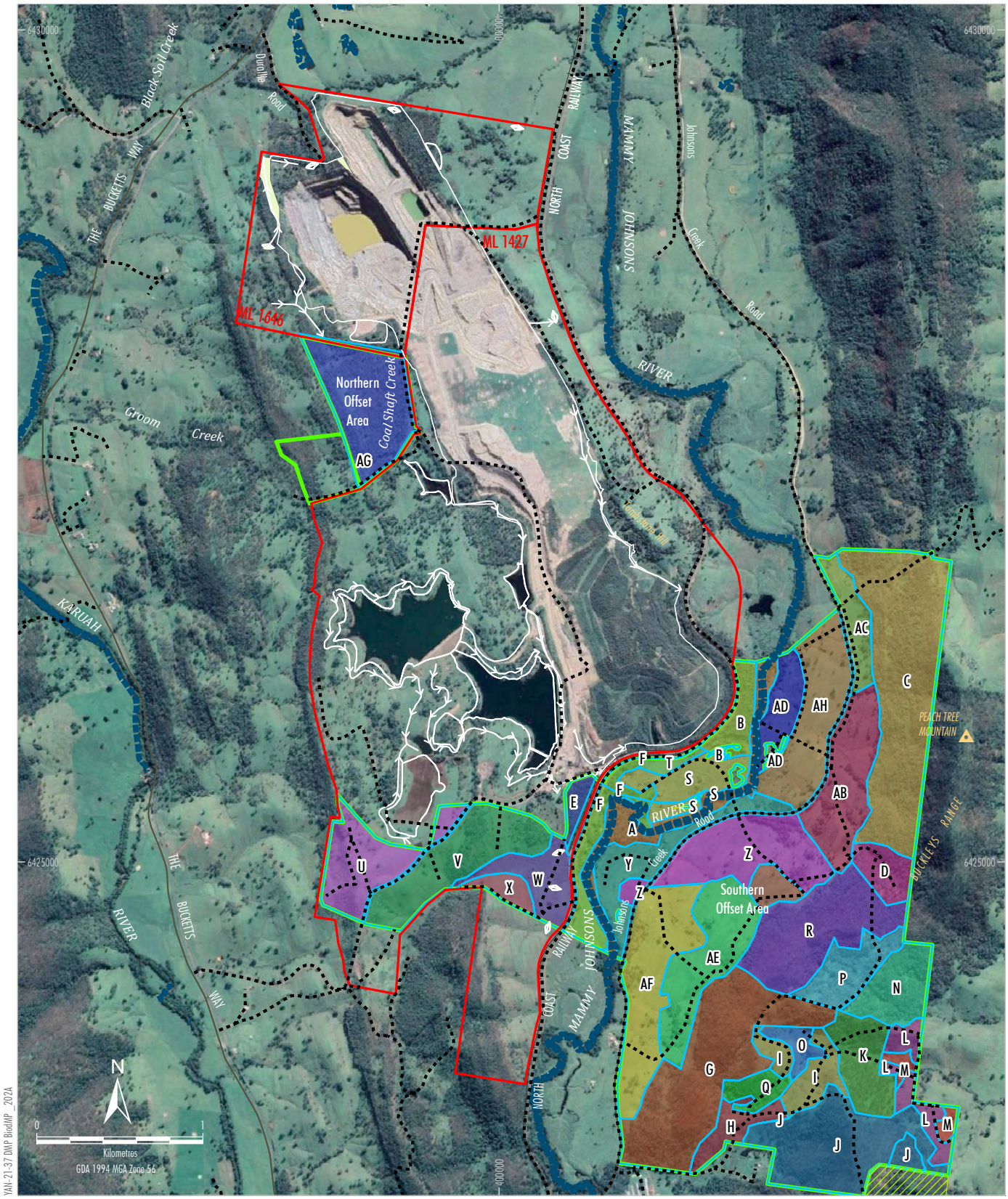
Plate 5: Vegetation Management Unit C - Natural regeneration of ironbark community

Plate 6: Vegetation Management Unit H - Cleared elevated slopes of spotted gum community

Plate 7: Vegetation Management Unit V - Westerly aspect of cleared area; spotted gum vegetation community

Plate 8: Vegetation Management Unit R - Naturally regenerating upper slopes

Plate 9: Vegetation Management Unit P - Open native grasslands on ridge-tops transitioning to forest.



LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System
- Private Land Under Conservation Agreement
- Offset Area
- Access Track
- Watercourse
- VMU Layer Region *

*Note * Refer to Appendix C for VMU characteristics as observed at the time of survey.*

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

Vegetation Management Unit (VMU Overview)

Figure 8

5 MANAGEMENT OF BIODIVERSITY AT THE DURALIE MINE SITE

In accordance with Condition 5, Schedule 2 of the NSW Project Approval (08_0203), mining operations at the DCM ceased 31 December 2021. The sections below provide the long-term measures that will be implemented to manage remnant vegetation and habitat on the DCM site (ML 1427 and ML 1646). Short and medium-term measures were completed during mining operations.

5.1 PROTECTING VEGETATION AND SOIL

As described in Section 1.1, following the cessation of mining operations on 31 December 2021, no new disturbance areas or clearing activities are proposed.

The portion of ML 1427 and ML 1646 not subject to mining development was managed for agricultural use (Section 4.1). Stocking rates were estimated according to weather and seasonality with the aim to prevent rank pasture development/fire hazards while limiting overgrazing and potential pugging/erosion.

As described in Section 1.1, irrigation activities for reducing the total site water inventory at the DCM have ceased, as such the vegetation monitoring program of irrigation areas is now redundant and the DCM's WAMP has been revised to reflect this.

Rehabilitation at the DCM is undertaken in accordance with the DCM RMP (as revised) to minimise impacts on vegetation and soil through revegetation and controlling erosion. Rehabilitation was undertaken progressively and concurrently with mining operations, and continues to follow the progression outlined in the existing RMP.

5.2 REHABILITATING CREEKS AND DRAINAGE LINES

In accordance with Condition 43(d), Schedule 3 of the NSW Project Approval (08_0203), rehabilitation of creeks and drainage lines at the mine will seek to ensure no net loss of stream length and aquatic habitat.

The DCM RMP describes management of the post-mine landforms in accordance with Condition 57, Schedule 3 of the NSW Project Approval (08_0203). It also covers the long-term rehabilitation of the Coal Shaft Creek Diversion.

The current design of the post-mining alignment of Coal Shaft Creek is documented in the Coal Shaft Creek Reconstruction Plan, prepared in accordance with Condition 29(b), Schedule 3 of the NSW Project Approval. The Coal Shaft Creek Reconstruction Plan is included as an attachment of the Surface Water Management Plan (Attachment C of the DCM WAMP).

The conceptual longitudinal channel profile will include habitat creation initiatives such as the provision of irregular pool and riffle sequences, use of material recovered from the existing channel or some other suitable source, placement of large boulders and/or timber to form pools upstream and promote aquatic habitat and planting of riverine vegetation on banks to enhance stability (Gilbert & Associates, 2010). Following the completion of detailed design, the Coal Shaft Creek Reconstruction Plan will be revised and submitted to DPE – Water for consultation, prior to submission to DPE for approval.

5.3 MANAGING POTENTIAL IMPACTS FROM SALINITY THROUGH IRRIGATION

An assessment of the suitability of mine water for irrigation was undertaken for the Duralie Open Pit Modification by Horizon Soil Survey & Evaluation (2014). Horizon Soil Survey & Evaluation (2014) concluded that irrigation activities at the DCM were sustainable and the predicted irrigation water salinities for the Duralie Open Pit Modification would not cause soil structural degradation or inhibit plant growth in irrigation areas.

The DCM WAMP describes the management of the mine irrigation areas and approved irrigation activities during operations. However, as described in Section 1.1, irrigation activities for the purpose of reducing the total site water inventory at the DCM have ceased and irrigation equipment removed. The DCM's WAMP has been revised to reflect this.

The *2017 Irrigation Area Monitoring Report* (Horizon Environmental, 2017) concluded that there was no significant detrimental effect on soil properties, or suitability of soil in irrigated areas for future agricultural use (i.e. grazing on native pasture). Annual monitoring has provided a relative assessment of pasture and soil condition over time.

Horizon Environmental (2019) prepared the *Duralie Coal Mine Irrigation Areas Monitoring Report 2019,* following the cessation of irrigation activities in 2018, which concluded:

- *We found no detectable adverse impact from irrigation management on pasture cover or composition. Complete ground cover is being maintained on the irrigated pasture.*
- *There does not appear to be a detrimental effect on ground cover or pasture composition in the irrigated pastures compared with the dryland, reference sites.*
- *Soil salinities in irrigation areas were comparable to respective reference sites on different geologies. However, surface soils have low levels of major nutrients (extractable phosphorus and potassium) that will limit productivity.*

5.4 VEGETATION CLEARANCE PLAN

A vegetation clearance plan (also called a vegetation clearance protocol [VCP]) was developed to minimise the impact of the Project vegetation clearance activities on flora and fauna in the short to medium-term (in accordance with the requirements of Condition 27 of ML 1427). The key components of the VCP are the:

- delineation of areas to be cleared of native remnant vegetation (refer to Section 5.1);
- undertaking of pre-clearance surveys;
- implementation of fauna management measures; and
- vegetation clearance supervision.

As described in Section 1.1, following the cessation of mining operations on 31 December 2021, no new disturbance areas or clearing activities are proposed. As such, pre-clearance surveys will no longer be required for approved mining operations.

5.5 GENERAL MEASURES FOR MANAGING POTENTIAL IMPACTS ON FAUNA

General measures for managing potential impacts on fauna during operations included:

- Maintenance of a clean, rubbish-free environment in order to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna (e.g. introduced rodents and birds).
- No domestic pets allowed in the mine site.
- Employees and contractors not permitted to keep native fauna or to encourage fauna through feeding.
- Signage provided on Johnsons Creek Road to increase awareness and to assist in reducing potential vehicle strike.
- 60 km per hour speed limit signs installed.

5.6 LANDSCAPING

Landscaping with planted trees has been undertaken in accordance with previous approved versions of the DCM Mining Operations Plan and RMP for visual impact mitigation purposes. Landscaping included:

- maintenance of the vegetation screen between the North Coast Railway line and the Project, with additional maintenance plantings as required; and
- planting of a vegetation screen (to be established with advanced locally occurring native tree species) to screen views from the portion of The Bucketts Way where the Project would be visible to traffic travelling along the road.

5.7 COLLECTING AND PROPAGATING SEED

During the habitat assessment phase of the VCP (Section 5.4), trees were checked for their provision of seed to be utilised in the Project rehabilitation program, followed by the collection of seed during felling activities. A key aim of seed collection (a short to medium-term measure) was to collect local provenance seed stock for propagation purposes. Seed collection for the Offset area revegetation activities was undertaken in the short term (Section 6.10 and Table 20). Seed collection for the rehabilitation areas will continue to be undertaken in the short to medium-term. Despite the cessation of vegetation clearance activities and the VCP after the cessation of mining operations on 31 December 2021, seed collection from vegetation within the Offset areas will continue to be undertaken as required to collect local provenance seed stock for propagation purposes.

Appendix D details flora species suitable for use within the Offset areas while other flora species may be suitable for use within the proposed landscaping and rehabilitation areas (Sections 5.6 and 5.2, respectively). Key species with a wide distribution over the site include *Acacia irrorata* and *Eucalyptus siderophloia*.

Where possible, all seed collection is to be conducted under the framework of the *Florabank Guidelines* (Florabank, 2021). This includes best practice in collection activities, cleaning, data collection, germination testing and storage. The only exception to these guidelines is that all trees can be collected from entirely to maximise salvage potential.

Seed will be collected for use in plant propagation programs to provide tube stock for revegetation activities. Such tubestock should be:

- free of disease, displaying active growth and vigour with root ball development persisting to the base of the tube;
- clearly labelled;
- optimally a height of approximately 25 centimetres (cm); and
- show no evidence of root binding or “J rooting”, and it is recommended that stock is hardened off before planting.

Seed collection will be documented annually in the Annual Review (Section 10.1.1).

5.8 SALVAGING AND REUSING MATERIAL FOR HABITAT ENHANCEMENT

Habitat features (e.g. trunks, logs, large rocks, branches, small stumps and roots) were salvaged, during vegetation clearance activities and stockpiled for relocation to areas undergoing rehabilitation (Appendix F). Surplus logs were introduced into the rehabilitation areas to provide habitat resources for a range of invertebrate and ground dwelling fauna. As vegetation clearance activities and the VCP ceased following the cessation of mining operations on 31 December 2021, the salvage of habitat features and materials also ceased at this time.

Relocation of trunks, logs, branches, small stumps and roots to post-mine rehabilitation areas may benefit the revegetation by increasing the mulch cover for the soil. The ground-layer vegetation and low shrubs will be incorporated into the topsoil when it is stripped. This will possibly enhance the soil seed bank on the rehabilitation.

Salvage and reuse of material for habitat enhancement is to be documented annually in the Annual Review.

5.9 WEED CONTROL

Procedure for Controlling and Monitoring Weeds

Staff and contractor inductions include staff and contractor requirements to prevent incursion or spread of priority and/or environmental weeds (e.g. using designated access tracks). The incidental transport of seed from the site was minimised during construction and operations phases, and will be minimised during the mine closure phase. Vehicles travelling into an area identified as having weeds that have the opportunity to be spread by vehicular access are to utilise the bay prior to entering or leaving the site.

Priority and/or environmental weeds will continue to be controlled and monitored by an appropriately qualified person. Recommended techniques for removal of priority weeds that have been published by DPI Agriculture are consulted prior to weed control, e.g. *NSW Weed Control Handbook: A guide to weed control in non-crop, aquatic and bushland situations* (DPI, 2018). The control of weeds is intended to be adaptive and will be informed/reviewed based on monitoring.

The implementation of alternative measures that favour the restoration of healthy native vegetation is also considered an effective method of weed management. The use of mechanical slashers and other such machinery may be used to control weeds in an effective manner, and the use of such machinery available to DCM now and in the future shall be assessed on a case by case basis appropriate to the area in question.

Due to the potential adverse impacts of herbicides on amphibians, weed control methods implemented at the mine are restricted to mechanical removal and/or “environmentally friendly” products. Other methods of weed control, which may be utilised by the mine in appropriate areas in consultation with a suitably qualified person, may include activities such as crash grazing and the use of fire for burning off areas of vegetation and areas which are heavily infested by weeds.

Prior to the use of any chemical controls, the chemicals will be approved by DCPL and the Safety Data Sheet for the chemical will be obtained prior to spraying. Relevant permitting for controlled actions (such as use of certain pesticides and control within riparian corridors/drains such as Coal Shaft Creek) are to be investigated and obtained where appropriate prior to control activities.

Frequency, Timing and Duration

The procedure for controlling and monitoring weeds will be implemented annually (or at other times when rainfall conditions are favourable to weed outbreaks) as determined by DCPL.

Record Keeping and Reporting

A summary of the weed management and monitoring results will be reported in the Annual Review (Section 10.1.1).

5.10 FERAL PEST CONTROL

Procedure for Controlling Feral Animals

Measures to control exotic animals undertaken at the DCM include:

1. Monitoring of the abundance of feral animals.
2. Identification of suitable control methods for target feral animals (e.g. trapping and/or baiting for European Rabbits and European Red Foxes).
3. Implementation of the selected control methods on the target feral animals.
4. Re-monitoring of the abundance of feral animals to evaluate the effectiveness of the control methods.
5. Follow-up control where previous control has been sub-optimal.

Control measures are implemented by mine staff or by an appropriate Pest Control Contractor(s) as required. All personnel involved in feral animal control are required to hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use. The *Humane Pest Animal Control: Code of Practice and Standard Operating Procedures* (DPI, 2013, or its revision) is followed.

Control methods for moderately common or abundant feral animals are outlined in Table 11. A selection of these techniques or additional techniques may be undertaken depending on the feral animal species which is in an abundance that requires control (as determined through monitoring) and the success of these control techniques. The control of feral animals is intended to be adaptive and will be informed/reviewed based on monitoring.

Table 11
Control Methods for Target Feral Animals

Scientific Name	Common Name	Status[1]	Control Method	Relevant Documents
Canis lupus dingo	Wild Dog	Declared pest	• Trapping and Shooting. • Ground baiting (using 1080 poison).	A and B
Vulpes vulpes	European Red Fox	Declared pest	• Trapping and Shooting. • Ground baiting (using 1080 poison).	A, B, C and D
Oryctolagus cuniculus	European Rabbit	Declared pest	• Warren ripping/fumigation; and/or • Ground baiting (using Pindone poison carrots).	A, B and E

[1] *Local Land Services Act, 2013.*

A *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015).

B *Vertebrate Pest Control Manual* (DPI, 2014).

C *Threat Abatement Plan for Predation by European Red Fox* (DEWHA, 2008).

D *NSW Threat Abatement Plan for Predation by the Red Fox* (*Vulpes vulpes*) (OEH, 2011).

E *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (Department of the Environment and Energy, 2016).

Frequency, Timing and Duration

Monitoring of feral animals (including foxes, rabbits and dogs) is undertaken every two years by an appropriately qualified contractor. If the results of these surveys indicate that a control program is necessary, such a control program will be implemented and monitored as described in this section.

Record Keeping and Reporting

Feral animal monitoring and management will be documented annually in the Annual Review (Section 10.1.1).

5.11 CONTROLLING VEHICLE ACCESS

Vehicles can strike native fauna causing injury or death. Vehicle access to the mine site in the short to medium-term is limited to authorised personnel only. As described above, speed limits of 60 km per hour will be imposed on vehicles using the mine roads and tracks.

5.12 BUSHFIRE MANAGEMENT

Condition 54, Schedule 3 of the NSW Project Approval (08_0203) states that DCPL will ensure that the Project is suitably equipped to respond to any fires on site and assist the Rural Fire Service and emergency service as much as possible if there is a fire in the surrounding area.

In the case of a bushfire incident, the RFS are to be called upon as the primary response unit to contain, fight and manage bushfires. DCM personnel may provide secondary support roles, services and equipment where requested by the RFS and where practical as approved by the sites Operations Manager.

Bushfire management/mitigation measures in place at the DCM will be undertaken in the short to medium-term (during operations and the mine closure phase) and include:

- Controlled grazing – cattle are grazed on portions of ML 1427 where active mining operations are not occurring and appropriate fencing is available. Sustainable stocking levels result in low residual fuel loads.

- Hazard reduction burns of vegetation (including weeds), chemical control or mechanical slashing of vegetation (including weeds) in accordance with appropriate licenses and approvals – in areas where controlled grazing is not possible or appropriate and fuel loads are high, hazard reduction burns may be undertaken.

- In the case of a bushfire incident, the RFS will be called upon as the primary response unit to contain, fight and manage bushfires. The Rural Fire Service, if required, could be assisted by mine personnel and mine resources on the approval of the DCM's Operation Manager.

- DCPL personnel may assist as directed by the NSW RFS with providing access as required to fight fires on the Mining Lease, Biodiversity Offset Area and mine owned property.

- Access tracks/firebreaks are to be maintained to ensure free access at all times.

Relevant NSW RFS permit to burn authorities will be obtained prior to undertaking hazard reduction burning and back-burning activities and will be undertaken by suitably qualified and competent contractors. Burning activities will be coordinated with the RFS as required.

Bushfires threatening the mine site or offset areas would be managed by the DCM Emergency Response Team as described in the DCM Emergency Management Principle Control Plan.

Bushfire management will continue to be undertaken across the DCM rehabilitation site and the Offset areas by DCPL during the mine closure phase.

6 MANAGEMENT OF THE OFFSET AREAS

As described in Section 4.3, the Offset areas have been divided into VMUs - units that have similar characteristics, goals and resultant treatments. The following sections outline the general principles and constraints underlying each VMU type.

This BMP has been prepared for the three year period between December 2021 and December 2024 and includes broader concepts for the longer term (6+ years). Short-term measures were completed between 2012 and 2018.

Since commencement of the BMP in 2012, reporting of the progress of the BMP has been included in the Annual Biodiversity Reports which are attached to the DCM Annual Reviews. The most recent Annual Biodiversity Report for 2021 is included in Appendix F of the revised BMP. The relevant updates have been made to the performance criteria tables.

6.1 VMU OBJECTIVES AND SUSTAINABLE ECOSYSTEMS

As stated in Section 4.3, VMU objectives aim to maximise existing characteristics of the VMUs with recognition of the resources required to undertake such work. Specific VMU objectives and associated techniques were developed by Greening Australia by utilising the following information:

- pre-clearing information and current VMU characteristics;
- previous accumulated research; and
- integration of existing environment considerations outlined in Section 4.

The primary objective of VMUs in the Offset areas is to achieve self-sustaining vegetation communities (i.e. mature plants assemblages that are able to produce viable seed that can grow within the area) as well as increasing the resilience to identified risks such as fire, herbivory and future weed invasion.

Disturbed ecosystems (as well as undisturbed ecosystems) move on a path or trajectory into various different states based on their condition and environmental conditions (Van Andel and Aronson, 2006). In the absence of intensive historical analysis, the Offset areas trajectories seem to be predominantly influenced by:

- time since clearing and fire;
- vicinity to remnant vegetation/seed sources;
- browsing by cattle; and
- inundation levels.

As noted previously, locally occurring vegetation types have been utilised as a basic ecological building block as it is expected that the key species described within each VMU allow for major ecosystem functions, integration with and persistence within a landscape.

The site is within a high rainfall area and most woody vegetation visible within the area is regrowth, indicating that once seed is introduced into an area, it can rapidly recover if events such as excessive fire and browsing can be reduced.

The main process observed on woodland and forest remnants within the site are shown on Figure 9 and appear to be the following progression:

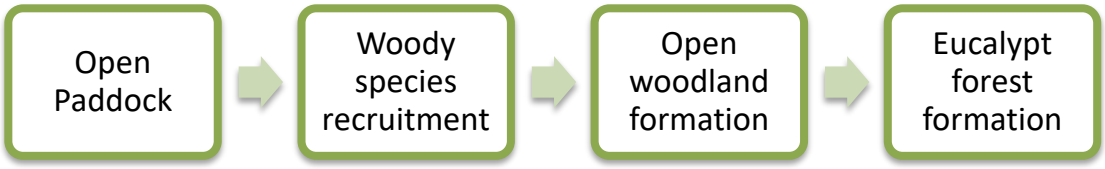


Figure 9: Site Trajectories

In general, sites that have been cleared and are situated adjacent to remnant vegetation in low-lying areas, appear to recover far more rapidly than heavily managed areas isolated from vegetation on higher/western parts of the site. This seems to indicate that a primary driver restricting canopy development is seed and the primary suppressing factor is grazing.

With this in consideration, "open paddock" revegetation-based Management Units are focused on providing this seed source through installation of canopy and shrub layer species.

Revegetation areas have been allocated woodland or forest planting canopy densities to enable project requirements to be met as well as create a diversity of vegetation structural types to encourage habitat diversity.

Existing homesteads and farm infrastructure such as sheds are to remain in place and be utilised for staff training, accommodation and revegetation equipment storage.

6.2 CANOPY DENSITIES

Project Approval Conditions (Tables 1 to 3) require the revegetation of both forest and woodland systems in an area most likely historically dominated by forest formation or structure. With this in consideration, woodlands are proposed as an intermediate structure, with recruitment, regeneration and growth allowing the areas to transition to forest over a number of decades.

The Australian Government Department of Agriculture Fisheries website (Department of Agriculture Fisheries, 2018) provides the following vegetation classes based on canopy crown coverage:

- woodland: 20 to 50% crown cover (equivalent to 10 to 30% projective foliage cover);
- open forest: 51 to 80% crown cover (30 to 70% projective foliage cover); and
- closed forest: 81 to 100% crown cover (more than 70% projective foliage cover).

The following points have been taken into account by Greening Australia to derive final stocking rates for canopy species (eucalypts) within woodland planting areas:

- 50% cover (upper threshold of woodland);
- estimated cover of a mature tree is 60 square metres (m^2); and
- an attrition rate (mortality) of 25% over 20 years (estimated time to woodland self sustainability).

Hence, final stocking rates for woodlands have been estimated by Greening Australia at **100 stems/ha**:

0.5 ha (50% of 1 ha)/60 m^2 (estimated coverage of mature tree)
= 80 stems/ha + attrition of 20 stems (estimated 20 stems/ha)
= **100 stems/ha.**

Similarly, the following points have been taken into account by Greening Australia to derive final stocking rates for canopy species (eucalypts) within forest planting areas:

- estimated cover of a mature tree is 60 m^2; and
- an attrition rate of 25% over 20 years (estimated time to forest maturity).

With this in consideration final stocking rates for forests have been estimated by Greening Australia at **207 stems/ha**:

1 ha/60 m^2 (estimated coverage of mature tree)

= 166 stems/ha + attrition of 41 stems (estimated 41 stems/ha)

= **207 stems/ha.**

6.3 VMU TREATMENTS WITHIN OFFSET AREAS

The primary target of all VMUs in the Offset areas is to increase the biodiversity value of the site and effectively manage the existing vegetation communities. Table 12 outlines the three primary treatment techniques, additional targets and their advantages and disadvantages.

Table 12
Vegetation Treatment Types and Summaries

Treatment Type	Description/Additional Targets	Advantage	Disadvantage	Revegetation	Weed Control
Remnant enhancement	Treatment of mature vegetation (mapped as remnant or non-remnant) which is largely limited to focused control of key weeds noted as having the potential to block successional processes.	Little resource allocation. Results are highly controlled and can be noted within a short space of time.	Limited opportunity to enhance existing biodiversity directly, although biodiversity is typically already high.	-	✓
Regrowth management	Treatment of immature vegetation of varying ages. May require targeted control (e.g. spot spraying or mechanical treatments) of either native or non-native species to ensure remnant status can be obtained but with a secondary goal of biodiversity enhancement.	Lower resource allocation. Generally shorter timeframes than installation-based techniques.	Limited opportunity to enhance existing biodiversity directly, although biodiversity is typically already high.	-	✓
Installation (revegetation/ planting)	Intensive installation of vegetation either through direct seeding or to a lesser degree tubestock installation.	Higher opportunity to introduce additional species. Opportunity for greater community to benefit from trial-based research.	Little implementation of these techniques has been trialled at scale for the majority of ecological communities on-site. Most work will be reliant on successful techniques obtained from trials. Seed collection will be required. Most costly treatment.	✓	✓

Primary Offset treatment will take the form of weed control in remnant enhancement and Regrowth Management VMUs and revegetation/planting in “Installation” VMUs.

For VMU summaries and characteristics refer to Appendix C with mapping included in Figure 8. Refer to Section 6.11 for management specifications including site preparation, treatment and maintenance. Plant palettes including stocking rates for revegetation are located in Appendix D.

6.4 NEST BOX PROGRAM

Type of Nest Boxes

A variety of nest boxes have been installed in the Offset areas and within designated DCM rehabilitation areas for use by birds, arboreal mammals, and bats. Nest boxes were designed to maximise the likelihood that local hollow-dwelling fauna (in particular threatened species) will use them for shelter and breeding. The VCP that was developed to minimise the impact of the Project on flora and fauna involved monitoring requirements for hollows cleared as part of mine-clearing operations. When such hollows are cleared, boxes of a similar size and function were constructed and installed as specified in *Nest Boxes for Wildlife* (Franks and Franks, 2003) or similar.

As described in Section 5.2, in addition to the nest boxes, during operations DCPL salvaged habitat resources (including hollow-bearing habitat features) within approved disturbance areas at the DCM and relocated these to the proposed rehabilitation areas or revegetation Management Units (Appendix F).

Squirrel Glider

Hollow bearing habitat features are to be introduced into the relevant Offset areas to provide specific intermediate habitat for the Squirrel Glider. The following evidence has been used to generate relevant specifications:

- The Squirrel Glider can glide more than 50 m in one move (Goldingay *et al.,* 2011) and are known to come to ground level and to even move between trees along the ground (D. Goldney, personal observation).
- The estimated home range area for this species varies from 2 to 13 ha, with densities from 0.4 to 3 individuals per ha with multiple individuals nesting within the one site (Quin, 1993; Traill and Coates, 1993; Suckling, 1995).
- The main existing habitat area for this species is most likely to occur within the mature regrowth VMUs to the east of the offset due to these patches maturity, size and connectivity to the north and south.

Installation

Nest box installation within the offset areas and within designated DCM rehabilitation areas has occurred over six periods with the most recent installation in March 2021. To date, the nest box program has involved:

- 18 nest boxes for the Squirrel Glider installed in February 2013;
- 106 nest boxes targeting a variety of hollow-dependent species installed in August 2013;
- 45 nest boxes targeting a variety of hollow-dependent species installed in September 2014;
- 42 nest boxes targeting a variety of hollow-dependent species installed in September 2016;
- 26 nest boxes targeting a variety of hollow-dependent species were installed in the DCM rehabilitation area between 16 October 2019 and 18 October 2019;

- 9 nest boxes targeting the Feathertail Glider (*Acrobates pygmaeus*) were installed during September and October 2019; and
- 25 nest boxes targeting a variety of hollow-dependent species were installed in the DCM rehabilitation area between 22 March 2021 and 26 March 2021.

The boxes will continue to be checked annually and maintained if infested (e.g. by bees) or replaced if in disrepair. Monitoring and reporting is outlined in Section 8. Performance criteria and completion criteria for the nest box program is provided in Table 13.

Table 13
Nest Box Program Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Nest box strategy including target species, habitat trees/feature, nest box deigns maintenance and monitoring	Nest box plan developed following habitat assessment and pre-clearance surveys (Section 5.4).	-	Development of nest box strategy complete.
Nest box installation Includes installation of 18 Squirrel Glider boxes, however may be expanded as required.	Hollow bearing habitat features (nest boxes) installed (Section 6.4).	Ongoing installation of nest boxes as required commensurate with hollows cleared during mining operations.	Nest boxes installed.
Maintenance and monitoring of installed net boxes. Including monitoring for European bee invasion and repair/replacement	Monitoring in autumn and spring completed. Maintenance undertaken where required (Sections 6.4 and 8.5).	Annual nest box monitoring and maintenance (Sections 6.4 and 8.5).	Nest boxes monitored and maintained, being replaced where required, until all offset area completion criteria have been met.

6.5 WEED AND FERAL PEST CONTROL

6.5.1 Weed Control

Objective

The weed control program described below aims to manage weeds to minimise their impact on native flora and fauna.

Procedure for Controlling and Monitoring Weeds

Priority and/or environmental weeds will be controlled and monitored by an appropriately qualified persons using standard methods. The procedure for controlling and monitoring weeds is as follows:

1. Monitor the location and density of priority and/or environmental weeds through inspections of the Offset areas.
2. Identification of suitable control methods for target priority and/or environmental weeds (e.g. mechanical removal of identified weeds, application of herbicide, crash grazing and/or use of fire).
3. Implementation of the selected control methods on the target priority and/or environmental weeds.
4. Follow-up site inspections to evaluate the effectiveness of the weed control.
5. Follow-up control where previous control has been sub-optimal.

Recommended techniques for removal of priority weeds that have been published by DPI Agriculture will be consulted prior to weed control, e.g. *NSW Weed Control Handbook* (DPI, 2018). The control of weeds is intended to be adaptive and will be informed/reviewed based on monitoring.

The implementation of alternative measures that favour the restoration of healthy native vegetation is also considered an effective method of weed management. Other methods of weed control which may be utilised by the mine in appropriate areas in consultation with a suitably qualified person, may include activities such as crash grazing and the use of fire for burning off areas vegetation and areas which are heavily infested by weeds.

Prior to the use of any chemical controls, the chemicals will be approved by DCPL and the Safety Data Sheet for the chemical will be obtained prior to spraying. Relevant permitting for controlled actions (such as use of certain pesticides and control within riparian corridors/drains such as Coal Shaft Creek) are to be investigated and obtained where appropriate prior to control activities.

Frequency, Timing and Duration

The procedure for controlling and monitoring weeds will be implemented annually (or at other times when rainfall conditions are favourable to weed outbreaks) as determined by DCPL. Weed spraying activities are generally undertaken between the months of September and April each year. Physical management measures such as mechanical removal, slashing and/or back-burning can be undertaken at other times of the year as required.

Performance and Completion Criteria

Table 14 outlines the weed management actions to be implemented across the Offset areas, including performance and completion criteria for each action.

Record Keeping and Reporting

A summary of the weed management and monitoring results will be reported in the Annual Review (Section 10.1.1).

Table 14
Weed Control Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Weed Control/treatment program in remnant enhancement and regrowth management VMUs	Primary woody weed control (Sections 5.9 and 6.5). Primary control of priority target weeds described in Sections 5.9 and 6.5 commenced. Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Target/priority weed coverage within offset VMUs reduced by 90%.
Weed control/ management in Installation (revegetation) VMUs	Pre-cultivation spraying in all installation VMUs undertaken including control of exotic Sporobolus and fireweed (Figure 8 and Section 6.11). Second cultivation spray in all installation VMUs undertaken including control of exotic Sporobolus and fireweed where necessary (Section 6.11). Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Control of competitive plants within revegetation areas until maintenance phase (detailed in Section 6.11) is complete i.e. 90% of canopy and shrub species have survived 12 months after planting including replanting of lost species.
Monitoring and reporting	Monitoring and documentation of weed species, occurrence and densities a per Section 8.3.	Monitoring and documentation of weed species, occurrence and densities as per Section 8.3.	Monitoring and reporting completed.

6.5.2 Feral Pest Control

Objective

The objective of feral animal control program is to manage feral animals to minimise their impact on native flora and fauna. The feral animal control program for the Offset areas may be implemented in conjunction with the feral animal control program for the DCM (Section 5.10).

Procedure for Controlling Feral Animals

Measures to control exotic animals to be undertaken in the Offset areas include:

1. Monitoring the abundance of feral animals.
2. Identification of suitable control methods for target feral animals (e.g. trapping and/or baiting for European Rabbits and European Red Foxes).
3. Implementation of the selected control methods on the target feral animals.
4. Re-monitoring the abundance of feral animals to evaluate the effectiveness of the control methods.
5. Follow-up control where previous control has been sub-optimal.

Control measures will be implemented by mine staff or by an appropriate Pest Control Contractor(s) as required. All personnel involved in feral animal control will be required to hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use. The *Humane Pest Animal Control: Code of Practice and Standard Operating Procedures* (DPI, 2013, or its revision) will be followed.

Control methods for moderately common or abundant feral animals are outlined in Table 11. A selection of these techniques or additional techniques may be undertaken depending on the feral animal species which is in an abundance that requires control (as determined through monitoring) and the success of these control techniques. The control of feral animals is intended to be adaptive and will be informed/reviewed based on monitoring.

Frequency, Timing and Duration

Monitoring of feral animals (including foxes, rabbits and cats) will be undertaken every two years by an appropriately qualified contractor. If the results of these surveys indicate that a control program is necessary, such a control program will be implemented and monitored as described in this section.

Performance and Completion Criteria

Table 15 outlines the feral animal management actions to be implemented across the Offset areas, including performance and completion criteria for each action.

Table 15
Feral Animal Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Feral animal control program	Initial study undertaken.	Feral animal control as required.	Feral animal numbers within offset areas minimised as evidenced through monitoring data
Monitoring and reporting	Monitoring and documentation of feral animal species undertaken.	Monitoring undertaken.	Monitoring and reporting completed.

Record Keeping and Reporting

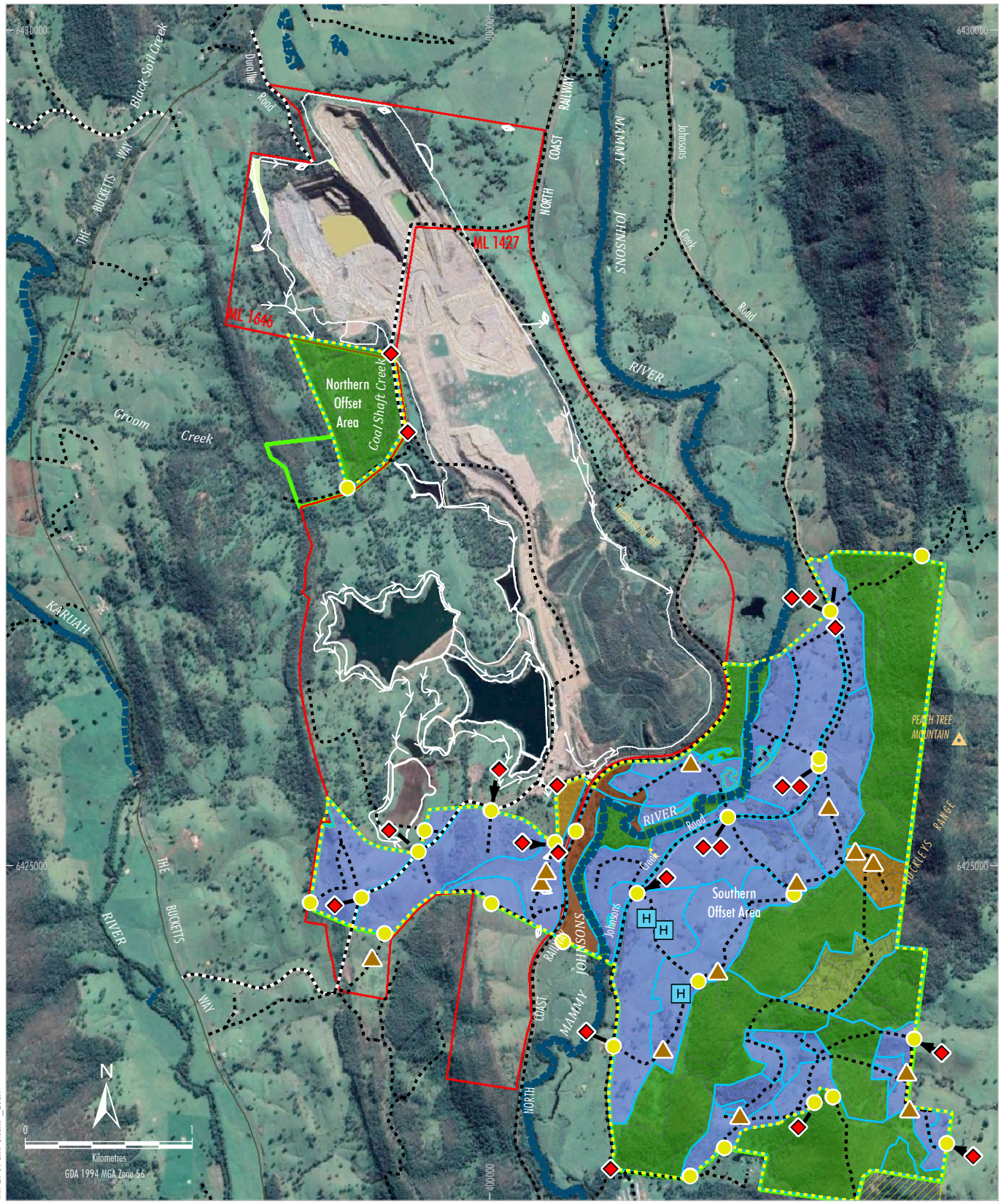
Feral animal monitoring and management will be documented annually in the Annual Review (Section 10.1.1).

6.6 MANAGING GRAZING AND AGRICULTURE

Livestock has been excluded from the Offset areas through the installation of new fencing in 2014 within general location of mapping as per Figure 10 (including the exclusion of livestock from the riparian corridor along the Mammy Johnsons River), except for use during 'crash grazing' in preparation for revegetation activities (Section 6.11) following a field assessment by a qualified consultant, or for weed control and fuel load reduction (Appendix F).

DCPL will continue to monitor the installed fencing and gates and undertake maintenance where required.

Performance criteria and completion criteria for managing grazing and agriculture is provided in Table 16.



LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System
- Private Land Under Conservation Agreement
- Offset Area
- Heritage Site
- Sign Identifying Offset (one side of road)
- Sign Identifying Offset (both sides of road)
- Rock Culvert
- Gate
- Fence
- Access Track
- Watercourse
- Arrows
- VMU Layer Region
- Installation
- Remnant Enhancement
- Remnant Enhancement/Installation
- Remnant Enhancement/Regrowth Management
- Regrowth Management

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

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Infrastructure and VMU Treatment Type

Figure 10

Table 16
Managing Grazing and Agriculture Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Managing grazing and agriculture	Livestock excluded from the Offset through installation of gates and fencing illustrated in Figure 10 (Section 6.7).	-	Livestock excluded from the offset.
Monitoring and maintenance of fencing and gate infrastructure	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 8).	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 8).	Gates and fencing monitored and maintained.

6.7 CONTROLLING ACCESS

Site access is a key feature of the BMP to facilitate installation, inspection and bushfire management. Installation works to control access and manage grazing in the Offset areas was completed in 2014. Ongoing maintenance activities on access tracks, culverts, gates and fences will be undertaken. All livestock have continued to be excluded from the Offset area with the exception of use for 'crash grazing' in preparation for revegetation activities.

In 2014, DCPL installed wildlife warning signage in accordance with advice from Great Lakes Council (GLC) and with regard to Australian Standard AS1742.2. Further correspondence was held with a GLC Ecologist in 2015 regarding future requirements for traffic controls within the Offset areas. This has been completed and was reassessed in 2018, resulting in the installation of additional signage on the key access points to the Offset areas.

DCPL will continue to undertake monitoring and maintenance (where required) of the tracks, fire trails, warning signs, culverts and fences that have been installed.

Performance criteria and completion criteria for controlling access is provided in Table 17.

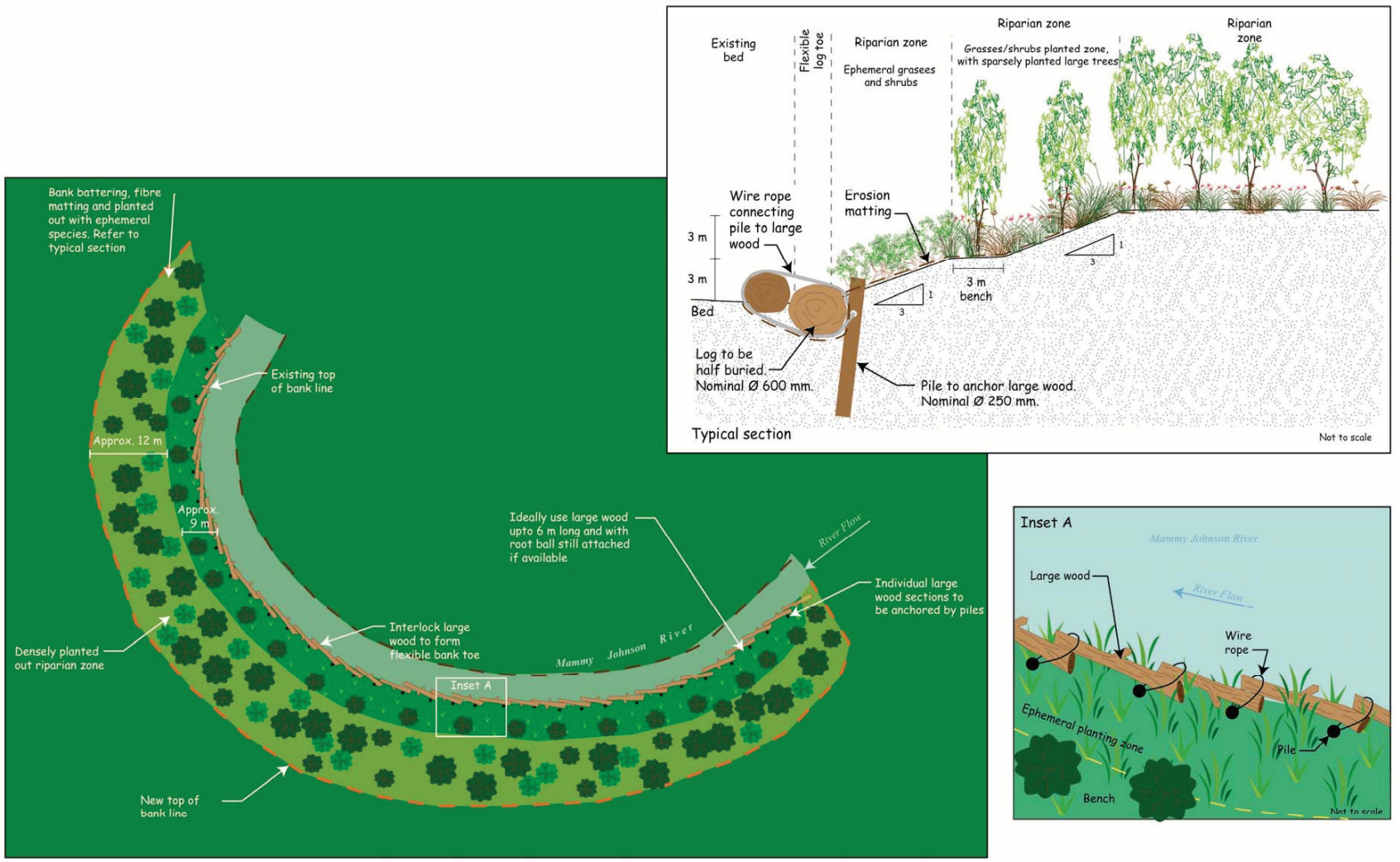
Table 17
Controlling Access Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management	Operational Review developed. Review includes road, fire trail and culvert construction and requirements for fencing and revegetation cultivation/site preparation[1]. Maintenance activities, particularly track maintenance and slashing have been considered (Section 6.7, plus related Sections 6.9 and 6.5)	-	Operational Review undertaken and outcomes implemented.
Community and stakeholder engagement	Assessment of surrounding landholders and the local community to evaluate opportunities for participation in implementation of this Biodiversity Management Plan undertaken. Local council consultation has commenced regarding placement of signage on the Johnson's Creek Road bisect area of the Offset (see Figure 10 for location) (Section 6.7). Signage has been installed on the Johnson's Creek Road bisect area of the Offset to alert drivers of potential fauna on the roads.	-	Opportunities for landholder and community participation in the BMP identified. Local council consulting regarding signage. Signage installed on Johnsons Creek Road.
Infrastructure including access tracks, fencing, fire trails and culverts	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 10 and the Operational Review[1] (Section 6.7).	-	Access related infrastructure identified in the Operational Review and completed.
Monitoring and maintenance of infrastructure including tracks, fire trails, signs, culverts and fences.	Monitoring and maintenance of all access tracks and fire trails has been undertaken[1] (Sections 6.7, 6.9 and 8).	Monitoring and maintenance of all access tracks, fire trails and warning signs has been undertaken[1] (Sections 6.7, 6.9 and 8).	Regular monitoring and maintenance program for roads, tracks, fire trails, signs, fences and culverts.

[1] Relevant performance criteria for Swift Parrot.

6.8 MAMMY JOHNSONS RIVER BANK STABILISATION

One area within the Mammy Johnsons River riparian corridor has been identified as being erosive, with a high likelihood of further land loss over time due to continuing erosion processes (Section 4.2.7). Alluvium consultants have undertaken a site assessment and prepared a detailed design concept for the stabilisation of the erosion. A concept drawing for one of the options is shown on Figure 11. DCPL would discuss potential options for remediation/management of the eroded section of the Mammy Johnsons River with DPE-Water and BCD. The outcomes of this consultation would be included in future revisions of this BMP. Performance criteria and completion criteria for Mammy Johnsons River bank stabilisation is provided in Table 18.



YAN-21-37 DMP BiodMP_001A

Source: Alluvium (2012)

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Mammy Johnson River Bank
Stabilisation - Conceptual Arrangement
of Large Wood Option

Figure 11

Table 18
Mammy Johnsons River Bank Stabilisation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
River bank stabilisation design	Design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River has been prepared.	-	Design of stabilisation plan completed.
Consultation	-	Consultation with relevant authorities undertaken to determine the preferred option for remediation/management of the eroded section of MJR. DPE-Water/NRAR engaged regarding relevant approval[1] requirements under the *Water Management Act* (Section 6.8).	Preferred option for Mammy Johnsons River bank stabilisation confirmed and relevant approvals obtained as applicable.
River bank in-stream remediation	-	Preferred option for Mammy Johnsons River bank stabilisation works implemented[1] (Section 6.8).	Rehabilitation of severely eroded section of Mammy Johnsons River completed.

[1] Relevant performance criteria for Giant Barred Frog.

6.9 BUSHFIRE MANAGEMENT

The objective of bushfire management in the Offset areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity. Fire was excluded from the Offset areas for the initial three years of BMP implementation (up to 2015) (the life of the original version of the BMP) with risk management focused on the maintenance of access trails, the identification of dangerous fuel loads and landholder liaison to mitigate possible bushfire outbreaks. Since 2012, to assist with bushfire management, access tracks and fire breaks have been constructed throughout the Offset areas (Figure 10) and maintained in consultation with the NSW RFS. As stated in Section 4.2.2, a portion of the Offset areas was affected by an unplanned bushfire in November 2019.

Ongoing bushfire management in the Offset areas may include the following:

- All access trails identified in Figure 10 are to be inspected at least once a year.
- If any access trails identified in Figure 10 are determined as being inaccessible for a 4WD vehicle, such tracks are to be repaired within one month of reporting.
- Land managers adjacent to the Offset areas are to be contacted at least once a year to discuss fire issues and burning programs on adjacent properties. Any identified issues are to be considered and where relevant and feasible, incorporated into future management activities.
- Vegetation fuel loads within the Offset areas (including weed infestations), identified during annual monitoring as having the potential to significantly impact on the success of revegetation activities are to be reviewed and where appropriate, integrated into future management activities through fuel reduction activities. Fuel reduction activities can be undertaken through crash/pulse grazing, strategic mechanical slashing or hazard reduction burns in consultation with a suitably qualified and experienced person.
- Back burning may be used to reduce biomass (including weeds), prior to undertaking revegetation works. The use of back burning will be dictated by the vegetation type and the revegetation methodology implemented and will be assessed in consultation with a suitably qualified and experienced person.

Relevant NSW RFS permit to burn authorities will be obtained prior to undertaking hazard reduction burning and back-burning activities and will be undertaken by suitably qualified and competent contractors. Burning activities will be co-ordinated with the RFS as required.

In the case of a bushfire incident, the RFS will be called upon as the primary response unit to contain, fight and manage bushfires. DCM personnel and equipment may provide secondary support roles and services where requested by the RFS and where practical as approved by the sites Operations Manager.

Performance criteria and completion criteria for bushfire management is provided in Table 19.

Table 19
Bushfire Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management.	Operational Review completed[1]. Areas addressed within the review include road, fire trail and culvert construction along with maintenance activities, particularly track slashing (Sections 5.12 and 6.7).	-	Operational Review completed[1].
Fire excluded from the offset for initial 3 years.	Fire excluded from offset prior to 2015 (Section 6.9).	-	Fire excluded from offset prior to 2015.
Bushfire management activities through hazard reduction actions installation and maintenance of relevant access infrastructure.	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 10 and the Operational Review 2 (Sections 6.7 and 6.9). Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification[1], hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks, hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Regular bushfire management measures in place.
Monitoring and maintenance	Fuel loads monitored and documented (Sections 6.9 and 8). Identified issues incorporated into future management planning.	Fuel loads monitored and documented (Sections 6.9 and 8). Identified issues incorporated into future management planning.	Fuel loads monitored and maintained. Risks identified and managed as part of hazard reduction actions.

[1] Relevant performance criteria for Swift Parrot.

6.10 SEED COLLECTION/PURCHASE AND TUBESTOCK SUPPLY

A key aim of seed collection is to collect, where available, local provenance seed stock for propagation purposes. Seed collections will be undertaken in accordance with the following basic guidelines:

- Contractors with an appropriate license are to collect seed stock.
- The seeds are only collected from suitable stock plants, using the appropriate methodology.
- The seeds are stored appropriately.

- Seeds are collected as per plant palette requirements.
- Required approvals are to be identified, sought and obtained from relevant authorities, prior to collection. Scientific licensing through the relevant regulatory body may be required for the project. Enquiries will be necessary to clarify the position of the scientific licensing unit in relation to communities not listed under the BC Act but considered equivalent communities for this project.
- Seed collection plan is communicated to relevant personnel.
- Provenance seed for tubestock and direct seeding is to be collected on-site where available. Alternate access to large remnants may be necessary dependent on seed availability. Access to other remnants may be negotiated with DCPL or adjacent landowners.
- Information gathering and research should be undertaken on each species targeted for restoration to identify flowering times, genetic integrity, flowering populations, ideal storage requirements, pre-treatments required, average numbers of germinants and average numbers of seeds per gram.
- All seed collection is to be conducted under the framework of the 'Florabank Guidelines' (Florabank, 2021 [or latest version]). This includes best practice in collection activities, cleaning, data collection, germination testing and storage.
- Grown-on hyco stock is to be free of disease, displaying active growth and vigour with root ball development persisting to the base of the tube. Tubestock should optimally be a height of approximately 25 cm. There should be no evidence of root binding or "J rooting", and it is recommended that stock is hardened off before planting.
- Plant palettes can be adjusted where field trials or supplementary research demonstrate alternative species/density suitability.

Performance criteria and completion criteria for seed collection and tubestock supply is provided in Table 20.

Table 20
Seed Collection and Tubestock Supply Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Collecting and propagating seed	Seed collection (of required species as specified in Section 6.10 and Appendix D) has commenced during vegetation clearance or an alternate seed source has been obtained. (Sections 5.7 and 6.10). Seed collection from cleared vegetation finalised (Section 5.7). Seed collection to obtain required quantities and species for future revegetation continued (Section 6.10, Appendix D).	Seed collection to obtain required quantities and species for future revegetation conducted as required.	Seed collection necessary to obtain required quantities and species for future revegetation completed.
Plant propagation/ tubestock supply	Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Section 5.7, 6.10 and Appendix D or adjusted based on additional literature/field trial results.	Propagation of species required for revegetation/supplementary infill planting work in Offsets undertaken as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Plant propagation necessary to obtain quantities and species required for revegetation completed.

6.11 TUBESTOCK INSTALLATION

6.11.1 Preparation

- Biomass will be reduced by slashing, crash grazing paddocks or back-burning of vegetation prior to installation to reduce grass height and to control weed infestations.
- Existing homesteads and farm infrastructure such as sheds are to remain in place and be utilised for staff training, accommodation and revegetation equipment storage.
- Planting areas (and future installed stock) are to be evenly spaced to facilitate even distribution of canopy and shrub species across the site.
- Planting areas to be sprayed twice with broad spectrum herbicide prior to cultivation, once during the winter to kill cool season herbage, and once during late summer to kill summer active herbage.
- Planting areas where no cultivation can be undertaken should be spot sprayed with broad spectrum herbicide to 0.5 m radius.
- In low lying areas in particular, rip to 0.5 m, cultivate and mound to approximately 20 cm. Row centres are to be 4 m apart. Elevated areas may not require mounding. Rows should avoid native vegetation (excluding wattles) and follow contours where possible. Gaps in mounded rows are to be left every 30 m to facilitate drainage; cultivation to be undertaken as per *Plantations and Reafforestation (Code) Regulation 2001* where required.
- Cultivation to be undertaken when maximum soil shatter can be achieved (i.e. when soil is dry) a second cultivation may be undertaken prior to planting.
- After 2 months, prior to planting, assess rows and treat with (spot spray) a registered chemical broad spectrum mix to reduce observed competition.

6.11.2 Installation

- Ensure nursery stock is saturated prior to installation and sprayed with an alum-based product or similar to reduce chances of herbivory. During installation, a surrounding buffer around planting areas are also to be sprayed with a similar product and a broad hectare rate to further reduce chances of herbivory. The product is to be applied as per manufacturer's specification.
- The nursery stock will be planted into the mounded rip lines by hand planting methods. Depth of planting is critical, planted stock are to be planted into mounded rows so that there is a minimum 20 mm covering of site soil over the top of the original potting media.
- Planting areas where no cultivation has been undertaken are to be planted into 0.5 m radius spot spray.
- The planted stock will be slightly lower than the ground surface immediately surrounding the plant.
- Install plants as per plant palettes in Appendix D, preferably when the site has reached field moisture capacity, but prior to winter to reduce the risk of frost damage.
- Canopy plants are not to be planted within the drip line of existing canopy trees. Similarly, shrub layer plants are not to be planted within the drip line of existing shrubs.
- Follow up watering to be undertaken as necessary.
- Planting to be considered finalised after installation of all prescribed plants.
- Direct seeding may be conducted in the event tubestock is unavailable or tubestock growth has been unsuccessful.

6.11.3 Maintenance

- Monitor for herbivory every week for the first two months (can be undertaken by on-site staff during the maintenance period). If herbivory is noted then an alum-based product or similar is to be sprayed in a surrounding buffer around planting areas as well as intervals through the planting areas. The product is to be applied as per manufacturer's specification. If herbivory continues, targeted species are to be covered with tree guards.
- Water as required for first year. Undertake spot spraying (0.5 m radius) of installed plants targeting all exotic plants that threaten plant growth.
- Allow grass to fill in areas between plants to ensure soil stability, control broad leaf weeds between plants.
- Maintenance phase to be considered completed three years after completion of planting. 90% survival of shrub-layer plants required after 12 months from planting. All canopy species to have survival rate of 90% after 12 months from planting. Replanting of lost species below these thresholds is required before the maintenance period can be considered closed.

6.12 DIRECT SEEDING

6.12.1 Site Preparation

- Direct seeding lines should follow the contour of the site. In order to accurately spray these lines initial marking of the site may be required.
- First spray in autumn using a broad spectrum herbicide, while day time temperatures are still over 25°C (~March). This targets C4 grasses.
- Second spray six to eight weeks later using a broad spectrum herbicide when there is a profusion of new weeds. This can sometimes be early spring if it's a dry winter.
- Final spray using a broad spectrum herbicide, just before or at the time of seeding.
- No pre-emergent chemicals are to be used as this will impact germination of sown seed.

6.12.2 Direct Seeding

- Seeding should occur early in spring to enable sown seed to take advantage of increasing soil warmth.
- Seeding rate is 750 metres per hectare (m/ha) for an open mixed use site, this may be increased to 1,500 m/ha or above to increase stocking rates.
- Seeding is undertaken using specially designed direct seeders, these machines create one seeding line per pass. Seed distribution is calibrated, however variability in species distribution is not uncommon.

6.12.3 Maintenance

Maintenance of direct seeding is always a challenge, which is why site preparation is so important. There are no chemicals safe to spray directly over the lines, with the exception of grass-selective herbicides. These require high rates and have no effect on broad leaf weeds.

Slashing is one option after a year or two to let more light in, but the operator must be very careful not to slash the young trees or to cover them in cut material.

Shielded spray units either used by hand or on a quad bike can be very effective to run alongside the trench, but the high risk of off-target impacts on sown plants can occur and experienced operators are required.

Performance criteria and completion criteria for revegetation is provided in Table 21.

6.13 HARM TO NATIVE FLORA AND FAUNA

While damage to native shrubby/grassy vegetation is unavoidable during mechanised activities such as revegetation site preparation, DCPL staff and contractors are to avoid damage to native vegetation and fauna wherever possible. This will be achieved by briefing employees and contractors prior to working in the biodiversity offset areas and by restricting access.

6.14 CANOPY BRIDGES

Greening Australia prescribed that canopy bridges or perches are not required to be constructed as the Offset areas contain mature regrowth and VMU Z forms an adequate series of perches across the Offset area, across Johnson's Creek Road and into the Mammy Johnsons Creek Management Units which are heavily vegetated.

As stated in Section 6.7, DCPL installed wildlife warning signage in accordance with advice from GLC and with regard to Australian Standard AS1742.2. Further correspondence was held with GLC Ecologist in 2015 regarding future requirements for traffic controls within the Offset areas.

Table 21
Revegetation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Operational Review	Operational review including access, tracks and cultivation requirements for implementing revegetation completed (Section 6.7).	-	Operational Review completed and implemented.
Implementing Revegetation - Weed management and maintenance	Pre-cultivation spraying in all installation VMUs including control of exotic *Sporobolus* and fireweed undertaken (Sections 6.5 and 6.11). Pre-plant weed treatment in all installation VMUs as per Figure 8 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-plant weed treatment in all installation VMUs as per Figure 8 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-planting weed control undertaken, including control of threatening weeds Sporobolus and Fireweed. Competitive plants controlled during revegetation establishment.
Implementing revegetation	Initial cultivation of all proposed trial installation VMUs commenced (VMUs I, S, U and AB.) according to guidelines in Section 6.11. Trial revegetation for VMUs I, S, U and AB completed. Plant palettes adjusted where field trails or research demonstrate alternative species/density (Section 6.10). Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Revegetation planting finalised. All plants prescribed in Appendix D have been installed (Section 6.11). Based on learnings from the revegetation trials, planting of tubestock/direct seeding in installation VMUs according to species palette and quantity guidelines in Appendix D and Section 6.1 has been completed.	Species type and quantities planted according to threshold guidelines in the species palette or as guided by on site trials. 90% survival of canopy and shrub-layer plants 12 months after installation, including replacement of lost plants to above threshold levels. Revegetation areas have met Assessment Criteria and Completion criteria described in Table 22, Section 7 (e.g. 90% of all initial canopy species rates are present within VMUs).
Monitoring and reporting	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 8).	Monitoring and reporting of revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 8).	Annual Monitoring and reporting completed.

7 PERFORMANCE AND COMPLETION CRITERIA FOR THE OFFSET AREAS

7.1 PERFORMANCE CRITERIA FOR THE OFFSET AREAS

The BMP is designed to perform for three years and then be reviewed (subject to the review requirements described in Section 10). The performance criteria are designed to fit within this period with the opportunity for review following three years. While many of the success criteria proposed below are achievable within this period, those relating to success of revegetation-based VMUs may require management beyond this period and should be brought forward into subsequent BMP updates.

The performance of the offset will be monitored against the performance criteria provided in Tables 13 to 21 for each monitoring period. The performance criteria have been developed to meet the objectives for the offset (Section 3). All criteria link to specifications listed in Section 6 (and monitoring/reporting specifications in Section 8).

The original BMP performance criteria provided for the management of the Offset areas from 2012 to 2018. Revised performance criteria were then developed for June 2018 onwards and were included in a revised version of the BMP prepared in 2018. The revised performance criteria from June 2018 onwards remain applicable and have been retained in this revised BMP and continue to reflect the medium and long-term management of the Offset areas which will be undertaken until the completion criteria have been met (Section 7.2).

7.2 COMPLETION CRITERIA FOR THE OFFSET AREAS

In accordance with Condition 33, Schedule 3 of the NSW Project Approval (08_0203), DCPL is required to implement the Offset strategy and achieve the broad completion criteria to the satisfaction of the Secretary of the DPE. Following obtainment of Completion Criteria, Management Units can be removed from management specifications and monitoring/reporting requirements.

Table 22 lists the broad Offset strategy completion criteria below. Management actions specific to Completion Criteria are described in Tables 13 to 21.

Table 22
Offset Strategy Completion Criteria and Assessment Targets

Domain	Completion Criteria	Assessment Target
Enhancement Areas (i.e. existing remnant vegetation)	Areas of existing remnant vegetation within the Offset areas (299 ha) have been conserved and enhanced.	Priority weeds within Remnant Enhancement Management Units are managed for three years, achieving a minimum 90% reduction in infestation extent. All remnant vegetation is conserved using the legally binding mechanism specified in Section 1.3.
Revegetation Areas	357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas as a self-sustaining ecosystem. The methodology for determining a self-sustaining ecosystem shall be to the satisfaction of the Secretary of the DPE. Woodland/open woodland and forest revegetation areas that provide habitat resources for the threatened species by including the flora species referred to in NSW Project Approval conditions 35 to 38.	90% of all initial canopy species rates are to be present within individual management Units. Average stem DBH of such species to be 10 cm utilising a representative sample of each Vegetation Management Unit (existing trees over 20 cm DBH cannot be utilised for this assessment). Signs of canopy and shrub layer recruitment are to be present a minimum 40 m from adjacent vegetation within individual management areas.
Direct links between the Offset Areas and Rehabilitation Area	Native vegetation has been established which directly links vegetation areas of the Offset areas with the Rehabilitation area.	Management Units A, E, B, T, W, S, X, Y, Z and F have met individual Completion Criteria as above to ensure a continuous link across the floor of the Mammy Johnsons River valley floor.

8 MONITORING OF THE BIODIVERSITY OFFSET STRATEGY

8.1 MONITORING THE EFFECTIVENESS OF REVEGETATION IN THE OFFSET AREA

Monitoring activities are linked to the outcomes defined in Section 6. They measure the Offset area's progression towards achieving these outcomes, and outline the potential threats and risks to achieving them. The following specifications are to be carried out in relation to monitoring.

A detailed Landscape Function Analysis Report was undertaken prior to plan implementation to obtain a baseline for any future landscape function analysis reporting if required. This report was undertaken by a suitably qualified practitioner with experience in this assessment method.

Further monitoring is to be undertaken annually until the completion criteria (Section 7.2) have been reached. Monitoring will include:

- Permanent photo monitoring at one GPS points per VMU is to be installed within the Offset. The photo monitoring is to overlap in a magnetic north, south, east and west direction with photos to be clearly marked with the date, location, direction, time of day and type of camera used.
- Permanent transect monitoring of one 100 m transect per VMU are to be installed within the Offset. Transect monitoring is to be undertaken within representative areas to assess the effectiveness of restoration and to assess completion status, focusing on:
  - canopy cover;
  - average stem DBH of canopy species utilising a representative sample of each VMU (existing trees over 20 cm DBH cannot be utilised for this assessment);
  - signs of canopy and shrub layer recruitment present outside a minimum 40 m from adjacent vegetation;
  - average height (and species composition) of each vegetation stratum;
  - native sub-canopy species encountered within 1 m of the transect; and
  - correct labelling with date, location, GPS points for end points of transect and any other observations.
- Each VMU is to be observed, with relevant comments provided for the following:
  - the impacts of fire, fuel loads and browsing on achieving the management outcomes;
  - fencing and track maintenance;
  - current fire fuel loads and the risk they present to the Offset;
  - the distribution and identification of any weeds that may impact on achieving management outcomes, including any declared weeds;
  - evidence of ecological successional processes within Offset areas;
  - revegetation efforts, including measurement of canopy species height;
  - opportunistic flora and fauna observations;
  - illegal access and vandalism;
  - need for pest animal control;
  - drainage (erosion or waterlogging) as an impediment to meeting area objectives;
  - general species success (should be recorded for all species across each VMU type);
  - herbivory/disease;

- recruitment;
- emerging/“sleeper” weeds;
- effects of flood and fire events if they occur;
- effects of poorly drained areas on revegetation stock;
- weed control success;
- time/resource allocation (do not include trial setup meetings or auditing);
- impact on non-native and native vegetation;
- implementation difficulties; and
- general notes regarding enhancing success and reducing failure.

8.2 USAGE OF THE OFFSET AREAS BY FAUNA

Fauna usage of the Offset areas will be documented over time. Fauna surveys will be conducted every three years to assess the success of the offset in providing habitat for a range of vertebrate fauna. The surveys will include an assessment of habitat complexity and species richness and abundance. A fauna survey was undertaken in November 2021. Results from the survey will be included in the 2022 Annual Biodiversity Report to be included in the 2022 DCM Annual Review.

Specific species to target within such monitoring are:

- the Swift Parrot (including quantification foraging/roosting resources in terms of hectares); and
- the Giant Barred Frog (including the quantification of potential breeding and foraging habitat in hectares within the Offset area).

The monitoring results from each monitoring period is to be compared as part of DCM reporting (Section 10).

8.3 EFFECTIVENESS OF THE WEED CONTROL

Weed control will be undertaken at the mine site (Section 5.9) and within the Offset areas (Section 6.5.1). Follow-up inspections will be undertaken to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.

8.4 EFFECTIVENESS OF THE EXOTIC ANIMAL CONTROL

Feral animal control will be undertaken at the mine site (Section 5.10) and within the Offset areas (Section 6.5.2). Monitoring of feral animals (including pigs, foxes, dogs, rabbits and other previously unidentified pest species) is to be undertaken every three years by a suitably qualified practitioner. The last feral animal monitoring survey was undertaken in September 2021 and results will be included in the 2022 Annual Biodiversity Report to be included in the 2022 DCM Annual Review.

8.5 EFFECTIVENESS OF THE NEST BOX PROGRAM

The nest boxes will continue to be monitored by suitably qualified personnel to observe fauna usage. Occupation of nest boxes is typically low during the first year after installation. However, the quarterly inspections will enable occupation timing to be documented. Following the first year, monitoring will occur annually in spring and may then be reduced to biennial monitoring following a review of the monitoring reports. The entrance to the nest box will be blocked prior to inspection to reduce the chance of possible nocturnal inhabitants escaping and risking predation (Freegard and Richter, 2009). Surveillance of bat boxes will be undertaken via watching for exiting bats at dusk (de Souza-Daw, 2003). Bat boxes will not be opened once occupied by bats (de Souza-Daw, 2003) as disturbing hibernating bats can lead to exhaustion of food reserves and death of the animal (Strahan, 2004). Where nest boxes have a large entrance hole that can be checked by shining a torch into the opening, opening of the lid is considered unnecessary. If the nest box has not been occupied after two years, consideration will be given to moving the nest box to an alternative location.

The following data will be recorded during each monitoring event:

- date;
- type of nest box and its specifications (at commencement of study);
- nest box number and location;
- signs of animal presence (e.g. scats, fur, feathers, nesting material, etc.);
- species of animals present (or possibly present inferred from secondary evidence);
- number of individuals;
- trees species (for nest boxes installed above ground level);
- tree height and DBH (only for Squirrel Glider nest boxes);
- box height and aspect;
- breeding data where possible; and
- sex and age of individuals (if possible).

A monitoring report will be prepared annually that includes a summary of the parameters described in Section 6.4. The monitoring results will be reported in the Annual Review report (Section 10.1.1). The Annual Review report will document any proposed changes to the nest box program for the ensuing 12 months.

9 CONTINGENCY MEASURES

The following sections provide contingency measures in the event that the performance criteria are not met in a particular monitoring period.

Risk management has been built into management specifications, but some unforeseen events may still restrict prescribed management outcomes.

Following field inspections of the Offset areas, the following key threats have been identified as having the potential to restrict achievement of performance criteria:

- unplanned fires;
- access to seed supply for revegetation;
- waterlogged and compacted soils;
- access to waterlogged/mountainous areas;
- biological (flora and/or fauna) infestations;
- stochastic abiotic and biotic environmental events;
- inappropriate grazing regimes; and
- illegal access and potential vandalism.

These threats will most likely have an impact on revegetation seed supply and compliance regarding survival rates of installed tubestock.

In relation to specific Giant Barred Frog and Swift Parrot objectives, the following key threats have been identified as having the potential to restrict achievement of performance criteria and relate to the damage of existing potential habitat:

- unplanned fires;
- biological (flora and/or fauna) infestations;
- stochastic abiotic and biotic environmental events; and
- illegal access and potential vandalism.

Subsequent subsections summarise all impacts and provide the means in which these impacts are to be abated.

9.1 LIMITED REVEGETATION SEED SUPPLY

Should seed numbers be insufficient for growing on of suitable seed stock, the following contingency measures may be considered.

- deferment of planting to the subsequent year;
- sourcing of alternative locally occurring plants that meet structural requirements of the ecosystems into which they are to be installed (e.g. an alternative subdominant eucalypt).
- substitution of keystone species is not deemed acceptable; and
- sourcing of specified species from outside of the project area and surrounds (i.e. elsewhere in the bioregion). Such seed is to be sourced from similar listed vegetation communities and areas with similar rainfall/temperature gradients to the Offset site.

9.2 BROADSCALE PLANT LOSSES WITHIN INSTALLATION MANAGEMENT AREAS

Should installed tubestock numbers be insufficient to meet annual targets, the following contingency measures may be considered:

- deferment of planting to the subsequent year;
- mounded tracks or planting rows for access to boggy areas within floodplains;
- replacement planting within the subsequent year;
- amendment to access, fencing and grazing arrangements; and
- amendment to planting specifications where it can be demonstrated that suggested alterations will not impact on achieving completion criteria.

10 REPORTING, AUDITING AND REVIEWING

10.1 GENERAL REPORTING

In accordance with Condition 2(g), Schedule 5 of the NSW Project Approval (08_0203), DCPL has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

The management of incidents is described in the DCM Pollution Incident Response Management Plan. The management of complaints and non-compliances is described in detail in the DCM Environmental Management Strategy.

10.1.1 Annual Review and Annual Biodiversity Report

In accordance with Condition 3, Schedule 5 of the NSW Project Approval (08_0203), DCPL will prepare an Annual Review of the environmental performance of the DCM by the end of December each year. Annual Reviews will be made publicly available on the Duralie Coal website, in accordance with Condition 10, Schedule 5 of the NSW Project Approval (08_0203).

The Annual Review will specifically address the environmental performance of this BMP and will:

- describe the development (including any on-site rehabilitation and revegetation undertaken within the Offset areas) carried out in the past year, and the development proposed to be carried out over the next year;
- a summary of the VCP outcomes (Section 5.4);
- describe seed collection and propagation progress (species, seed and tubestock quantities) (Section 5.7);
- Identify material salvaged for habitat enhancement and describe the reuse of the material (Section 5.8);
- describe weed monitoring and control outcomes (Section 5.9), including:
  - communication with landholders/leases and key site management staff relating to listed weed issues;
  - pre-treatment coverage of listed weeds;
  - control activities on-site; and
  - post-treatment effectiveness/coverage of listed weeds;
- describe feral animal pest monitoring and control outcomes (Section 5.10);
- provide an overview on bushfire management (Section 5.12);
- a summary of the nest box program outcomes (Section 6.4);
- a summary of the Offset area progress (Section 6);
- include a comprehensive review of the monitoring results over the past year, including a comparison of these results against the monitoring results of previous years;

- identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

10.1.2 Commonwealth Approval Compliance Reports

Within 3 months of every 12 month anniversary of the commencement of the action (i.e. within 3 months of 14 January), DCPL will submit to the DAWE a report addressing compliance with the conditions of Commonwealth Approval [EPBC 2010/5396] (refer to Condition 20). Annual Compliance Reports will be provided until the Commonwealth Minister is satisfied that DCPL has complied with all conditions of the Commonwealth Approval [EPBC 2010/5396] and has implemented all commitments made in plans/programs approved by the Commonwealth Minister.

In accordance with Condition 25, DCPL must maintain accurate records of all activities associated with or relevant to the Commonwealth Approval [EPBC 2010/5396], and make them available on request by DAWE. Such documents may be subject to audit by the DAWE and used to verify compliance with the conditions of approval. Summaries of any audits undertaken will be posted on the DAWE's website. The results of audits may also be publicised through the general media.

In accordance with Condition 14(i), for the five years after the commencement of operations (until 14 January 2017), a report on addressing the compliance with the BMP is to be prepared and submitted annually on or before the anniversary of the commencement of operations (i.e. on or before 14 January of each year).

Subsequent reports are to be submitted every fifth year (from 2017) on or before the anniversary of the commencement of operations.

The DAWE has advised that it will accept a single report including the requirements of Condition 20 (i.e. compliance with conditions of the Commonwealth Approval) and Condition 14(i) (i.e. compliance with the BMP) on or before the anniversary of commencement (14 January).

Table 23
Monitoring and Reporting Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Monitoring and reporting	Monitoring and reporting has been undertaken[1] as per requirements in Sections 8 and 10. Independent Environmental Audit has been supplied to the NSW Secretary of the DPE for review (Section 10.2).	Monitoring and reporting has been undertaken[1] as per requirements in Sections 8 and 10.	Monitoring requirements completed when all completion criteria are achieved in accordance with Section 7 (e.g. 357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas are a self-sustaining ecosystem).

[1] Relevant performance criteria for Giant Barred Frog and Swift Parrot.

10.2 INDEPENDENT ENVIRONMENTAL AUDIT

10.2.1 NSW Project Approval (08_0203) – Independent Environmental Audit

By the end of December 2011[3], and every 3 years thereafter, unless the Secretary of the DPE directs otherwise, DCPL will commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:

a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of the DPE;

b) include consultation with the relevant agencies;

c) assess the environmental performance of the project and assess whether it is complying with the requirements of the NSW Project Approval (08_0203) and any relevant EPL or mining lease (including any assessment, plan or program required under these approvals);

d) review the adequacy of strategies, plans or programs required under the approvals in (c) above; and

e) recommend appropriate measures or actions to improve the environmental performance of the project, and/or any assessment, plan or program required under the approvals in (c) above.

Within six weeks of the completion of this audit, or as otherwise agreed by the Secretary of the DPE, DCPL will submit a copy of the audit report to the Secretary of the DPE, together with its response to any recommendations contained in the audit report.

10.2.2 Commonwealth Approval EPBC 2010/5396 – Independent Audit

Upon the direction of the Commonwealth Minister, DCPL must ensure that an independent audit of compliance with the Conditions of Commonwealth Approval [EPBC 2010/5396] is conducted and a report is submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.

10.3 REVIEW OF THE BMP

In accordance with Condition 4, Schedule 5 of the NSW Project Approval (08_0203), the BMP will be reviewed, and if necessary revised to the satisfaction of the Secretary of the DPE within three months of the submission of:

- an Annual Review, in accordance with Condition 3, Schedule 5 of NSW Project Approval (08_0203);
- an incident report, in accordance with Condition 6, Schedule 5 of NSW Project Approval (08_0203);
- an audit, in accordance with Condition 8, Schedule 5 of NSW Project Approval (08_0203);
- any modification to the conditions of the NSW Project Approval (08_0203); or
- prior to the commencement of clearing associated with development approved under MOD 2 of Project Approval (08_0203) (as described in the *Duralie Open Pit Modification Environmental* Assessment).

This BMP will be made publicly available on the Duralie Coal website, in accordance with Condition 10, Schedule 5 of the NSW Project Approval (08_0203). A hard copy will also be kept at the DCM.

[3] The last independent environmental audit was conducted in December 2020.

If DCPL wishes to carry out any activity otherwise than in accordance with the plans/programs referred to in Commonwealth Approval [EPBC 2010/5396], DCPL must submit for the Minister's approval a revised version of any such plan/program. If the Minister approves such a revised plan/program, that plan/program must be implemented in place of the plan/program originally approved.

If the Commonwealth Minister believes that it is necessary or desirable for the better protection of threatened species and TECs (s.18 and s.18A) to do so, the Commonwealth Minister may request that DCPL make specified revisions to the plans or programs approved under the Commonwealth Approval [EPBC 2010/5396] and submit the revised plan or program for the Minister's approval. DCPL must comply with any such request. The revised approved plan or program must be implemented in place of the plan or program originally approved.

11 RESPONSIBILITIES

The DCPL Environment and Community Superintendent will be responsible for the monitoring, review and implementation of the BMP.

This BMP will be reviewed as a result of relevant recommendations made by the Independent Environmental Audit (Section 10.2). The DCPL Environment and Community Superintendent will be responsible for the implementation of any revisions in consultation with relevant regulatory agencies where applicable.

In accordance with Condition 41, Schedule 3 of Project Approval (08_0203), DCPL will:

a) not destroy, damage, remove or harm any native flora or fauna in the Offset area; or

b) not carry out in the Offset area or the vicinity of the Offset area any activity that may cause, or is likely to result in, or will or might threaten the viability of, native flora or fauna in the Offset area, or threaten the success of the Offset strategy; and

c) ensure that its agents, contractors, licensees and invitees (and use best endeavours to ensure that any other persons) also comply with (a) and (b).

12 CONSERVATION BOND FOR THE OFFSET AREAS

In accordance with Condition 44, Schedule 3 of the NSW Project Approval (08_0203), DCPL lodged a conservation bond to ensure that the Offset strategy is implemented in accordance with the performance and completion criteria. The sum of the bond was determined by:

a) calculating the full cost of implementing the Offset strategy; and

b) employing a suitably qualified quantity surveyor to verify the calculated costs, to the satisfaction of the Secretary of the then DP&E.

If the Offset strategy is not completed to the satisfaction of the Secretary of the DPE, the Secretary will call in all or part of the conservation bond, and arrange for the satisfactory implementation of the offset strategy.

The conservation bond will be reviewed and updated in accordance with Condition 45, Schedule 3 of NSW Project Approval (08_0203).

13 REFERENCES

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ATTACHMENT 1

RECORD OF CONSULTATION WITH BCD

Planning, Industry & Environment

Our ref: DOC22/188249-3
Your ref: MP08_0203

Mr Michael Plain

Environment and Community Superintendent
Stratford Coal Limited
michael.plain@yancoal.com.au

Dear Mr Plain

Duralie Coal Mine Extension (MP 08_0203) – Review of revised Biodiversity Management Plan

I refer to the e-mail dated 11 March 2022 in which the Planning and Assessment Division (P&A) of the Department of Planning and Environment (the Department) invited Biodiversity and Conservation Division (BCD) to provide advice in relation to the Duralie Coal Mine Extension (MP 08_0203).

BCD has reviewed the revised Biodiversity Management Plan (BMP) for the Duralie Coal Mine and notes that mining activities ceased on 31 December 2021. BCD recommends that the following changes are made to the BMP:

1) Update the Table of Contents to include page numbers for the 'List of Tables', 'List of Plates' and 'List of Figures'.
2) Update Section 1.1 'Current Status of the DCM' to include the detail that mining operations at the site were suspended in October 2018 and give the date of when they resumed.
3) Update Figure 6 'Remnant and Proposed Vegetation' by:
    a) Adding the Plant Community Type Code to each vegetation community, e.g. add '(PCT 845)' to vegetation community 8 'Giant Stinging Tree – Fig dry subtropical rainforest of the North Coast and Brigalow Belt South'.
    b) Removing the duplicate of 'Tallowwood – Brush Box – Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast' in the legend
    c) Changing the two shades of dark green, and two shades of dark blue used in the colour ramp as they are too similar. Chose colours and patterns that make all vegetation communities easy to see and identify on the map, and
    d) Add an arrow to show the location of the coastal floodplain sedgeland vegetation community.
4) In Section 4.2.2 'Site History' include reference to parts of the offset areas burning in November 2019 (as stated in Section 6.9 'Bushfire Management') and show the area burnt on a map.
5) Merge Sections 4.1.1 'Climate' and 4.2.3 'Climate'.
6) Add the Plant Community Type Code to the vegetation community name to the following parts of the BMP:
    a) Table 9 'Vegetation Types Present in the Offset Area'
    b) Appendix B 'Site Characteristics'
    c) Appendix D 'Plant Palattes for specified offset revegetation' and
    d) Appendix E 'Reference Site Information'.
7) The text in the table in Appendix C 'Vegetation Management Unit Summaries for the Offset Areas' is too small and thus too hard to read (even when the page is magnified on a computer screen). BCD recommends that font size is increased and that the table is presented over several pages (perhaps rotated 90 degrees) so that the text is legible when the page is viewed when the zoom level is set to 100%
8) In Appendix E 'Reference Site Information' give the eastings, northings and datum for each site

If you have any further questions in relation to this matter, please contact Robert Gibson, Senior Regional Biodiversity Conservation Officer, on 4927 3154 or via email at huntercentralcoast@environment.nsw.gov.au

Yours sincerely

STEVEN CRICK
Senior Team Leader Planning
Hunter Central Coast Branch
Biodiversity and Conservation Division

28 March 2022

ATTACHMENT 2
DPE LETTER OF APPROVAL OF BMP

Department of Planning and Environment

Our ref: MP08_0203-PA-20

John Cullen
Operations Manager
Duralie Coal Pty Ltd
3364 Bucketts Way South
Stratford, NSW 2422

22/02/2023

Subject: **Biodiversity Management Plan for Duralie Extension Project (08_0203)**

Dear Mr. Cullen,

I refer to the Biodiversity Management Plan submitted in accordance with Schedule 3, Condition 43 of the approval for the Duralie Extension Project (08_0203).

I note the revision of the Biodiversity Management Plan has been prepared in consultation with Biodiversity and Conservation Science division.

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions in approval (08_0203).

Accordingly, as nominee of the Planning Secretary, I approve the Biodiversity Management Plan (Revision J, December 2022).

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Scotney Moore, on 02 9274 6342.

Yours sincerely

Wayne Jones
Team Leader - Post Approval
Resource Assessments

As nominee of the Planning Secretary

APPENDIX A

DURALIE COAL MINE BIODIVERSITY OFFSETS MONITORING REPORT 2021

Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021

Johnson's Creek Road, Stroud Road

20213674

14 September 2021

KLEINFELDER
Bright People. Right Solutions.

Suite 3, 240-244 Pacific Highway,
Charlestown, NSW 2290

Phone: +61 2 4949 5200

Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021

Site Address

Kleinfelder Project: 20213674

Kleinfelder Document: NCA21R129955

Prepared for:

Stratford Coal Pty Ltd
3364 Bucketts Way South
Stratford, NSW, 2422

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Document Control:

Version	Description	Date
1.0	Draft for client comment	
Nigel Fisher	M Plain	13 September 2021
2.0	Final	
Nigel Fisher	M Plain	14 September 2021

EXECUTIVE SUMMARY

Duralie Coal Pty Ltd (DCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Duralie Coal Mine (DCM). Approval for mining was granted in 1997 and coal production commenced in 2003. The DCM operates under two key approvals, NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396). Both may be viewed at http://www.duraliecoal.com.au. In accordance with Section 7 of the Duralie Coal Mine – Biodiversity Management Plan (2018), monitoring and assessment of the effectiveness of the Offset Area revegetation is required using the stipulated methodologies which both components of Ecosystem Functional Analysis (EFA) which includes Landscape Functional Analysis (LFA) and Vegetation Dynamics to measure the progression of the rehabilitation towards a self-sustaining ecosystem, floristic surveys and walkover surveys to assess the effectiveness of the revegetation efforts and weed control. The BMP refers to VMUs as either "installation/revegetation" or "remnant enhancement". Installation VMUs being representative of the VMUs that require extensive revegetation with woodland species, while Enhancement were VMUs requiring minimum work, usually only weed control. This report presents the results of the monitoring undertaken over four days (4th, 5th, 9thand 10th) in March 2021 and represents the third Offset areas survey undertaken by Kleinfelder. As an additional note, in November 2019, a section of the Duralie Offset areas was affected by the Buckley's Range Fire with all VMUs located to the east of Johnson's Creek Rd affected.

*A total of 18 transects were surveyed in March 2021, an increase of three transects (VMU X, V, and AH) that were surveyed in 2019 and 2020 (**Table 2**). These included 17 "installation" transects and one forested transect designated "regrowth management".*

Table 1: Vegetation Management Units that were selected for monitoring in 2020 and the revegetation actions that have been undertaken within these VMUs including those undertaken after the monitoring survey was undertaken

VMU	Existing Vegetation	VMU Type	Revegetation Actions/Dates			Vegetation Community
			Seeded	Planted	Planted	
AD	Pasture	Installation		May 2017	-	Rough-barked Apple – Red Gum – Grassy Woodland on Floodplain (Cabbage Gum Variant)
F	Pasture	Installation	-	Sept 2018	April 2020	
S	Pasture	Installation	Sept 2015	Sept 2015	May 2021	
W	Pasture	Installation	-	Sept 2018	April 2020	
Y	Pasture	Installation	-	May 2017	-	
T	Pasture	Installation	Sept 2015	-	-	Sydney Peppermint - Smooth-Barked Apple Shrubby Open Forest
AC	Pasture	Installation	Aug 2017	-	May 2021	Spotted Gum - Grey Ironbark Forest (Ironbark Variant)
I	Pasture	Installation	Sept 2015	-	-	
P	Forest	Regrowth Management	Nil	Nil	Nil	
AA	Pasture	Installation	Dec 2016		May 2020	Spotted Gum-Grey Ironbark Forest (Spotted Gum variant)
U	Pasture	Installation	Sept 2015	Sept 2015	May 2021	
V	Pasture	Installation	-	-	May 2020	
X	Pasture	Installation	-	-	April 2020	
AB	Pasture	Installation	Aug 2017	-	May 2021	Grey Box - Forest Red Gum - Grey Ironbark open forest (grey gum variant)
AE	Pasture	Installation	Dec 2016	-	May 2021	

VMU	Existing Vegetation	VMU Type	Revegetation Actions/Dates			Vegetation Community
			Seeded	Planted	Planted	
AF	Pasture	Installation	Dec 2016	-	May 2021	
AH	Pasture	Installation	-	-	April 2020	Grey Box - Forest Red Gum - Grey Ironbark open forest (grey box variant)
Z	Pasture	Installation	Dec 2016/ Aug 2017	-	May 2021	

The LFA used data from the 2013 baseline monitoring event conducted by Greening Australia for comparison and tracking changes over time. This data is presented as averages for the three indices.

The 2021 survey show that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or the 2019 Buckley's Range Bushfire have generally recorded lower LFA indices and are still in the process of recovery. VMUs associated with the Grey Box - Forest Red - Gum Grey Ironbark community (VMUs AA, AB, AE and AF) and VMU AC are noticeably affected. Earlier planted VMUs and VMUs that have been recently planted, but only slashed or burned the once recorded higher LFA indices. These included the Rough-barked Apple – Red Gum Woodland and Spotted Gum – Grey Ironbark Forest VMUs, and as a point of contrast, VMU AH in the Grey Box - Forest Red - Gum Grey Ironbark community which has only been planted in May 2020.

Vegetation Dynamics were conducted eight installation and the regrowth management VMU. The survey recorded improved stem densities in VMUs AA, F and W (33 stems/ha, 361 stems/ha and 110.6 stems/ha respectively) as a result of replanting undertaken in May 2020. VMU Y also recorded an increase in stem density, but as a result of the relocation of the transect to better capture replanting efforts. The VMU U transect was also relocated to better represent the planting effort, resulting in a slight reduction in calculated stem density. The regrowth management VMU P, also recorded a slight decrease from the previous survey, whereas VMU I, also affected by the Buckley's Range Fire recorded a dramatic increase in shrub numbers (no canopy recorded on this VMU), up from nil in 2019 to 660 stems/ha this survey.

Walkover surveys recorded good natural regeneration, especially along the edges of the installation VMUs where remnant vegetation is starting to colonise the grassy areas. Weeds were recorded in all VMUs with Blackberry the most widespread despite obvious control efforts. Privet was very common in the VMUs adjoining Mammy Johnson's River, as was Wild Tobacco. Lantana was occasionally recorded in the grassy areas but was more common in the remnant vegetation areas.

Recommendations from this survey include –

- *Allowing VMUs AA, AB, AC, AE, AF and Z have been planted in 2021, and require time for "rest" from further disturbance to allow for the accumulation of litter and soil nutrients.*
- *Additional infill planting on VMUs AD, Y (shrubs only) and VMU I (targeted at the crown of the transect hill)*
- *Consideration to expanding the planting of VMU U*
- *Consideration of planting of VMUs L, M and T.*

Weed control efforts to be expanded, recognising that weed control will always be a requirement until the Offsets are surrendered. Targeted weed control on VMU U along the ridgeline. It is further suggested that the use of drones to survey the Offsets areas for location of weed infestations be undertaken.

Overall, the revegetation of the Offsets areas is progressing well with successful establishment of native species of the targeted vegetation communities achieved. Further work is required to achieve target densities in some VMUs, and work to be instigated on the few remaining installation VMUs where revegetation has not yet been undertaken.

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1 INTRODUCTION

1.1 BACKGROUND

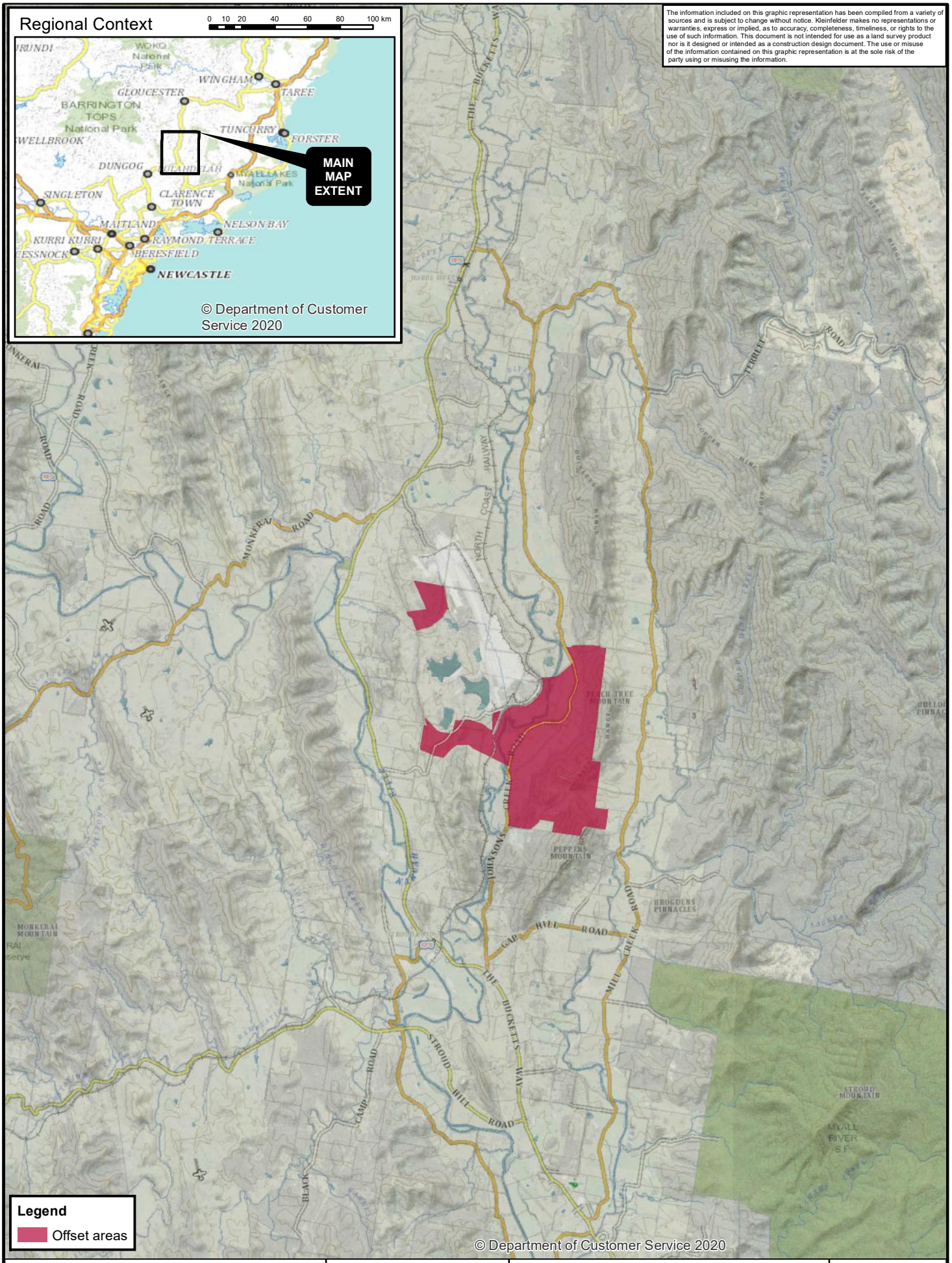
Duralie Coal Pty Ltd (DCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Duralie Coal Mine (DCM). The DCM is located between the small towns of Stroud Road and Wards River, approximately 80km north of Newcastle in New South Wales (**Figure 2**). Approval for mining was granted in 1997 and coal production commenced in 2003.

The DCM operates under two key approvals, NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396). Both may be viewed at http://www.duraliecoal.com.au.

In accordance with Section 7 of the Duralie Coal Mine – Biodiversity Management Plan (2018), monitoring and assessment of the effectiveness of the Offset Area revegetation is required. This assessment will be conducted using the stipulated methodologies which both components of Ecosystem Functional Analysis (EFA) which includes Landscape Functional Analysis (LFA) and Vegetation Dynamics to measure the progression of the rehabilitation towards a self-sustaining ecosystem, floristic surveys and walkover surveys to assess the effectiveness of the revegetation efforts and weed control.

An initial survey of 33 Vegetation Management Units (VMUs) was conducted by Greening Australia in February 2013 (**Appendix A**). This survey provided baseline data for the comparison of wooded VMUs to pasture or cleared VMUs and to track progression over time. The BMP refers to VMUs as either “installation/revegetation” or “remnant enhancement”. Installation VMUs being representative of the VMUs that require extensive revegetation with woodland species, while Enhancement were VMUs requiring minimum work, usually only weed control.

This report presents the results of the monitoring undertaken over four days (4th, 5th, 9thand 10th) in March 2021 and represents the third Offset areas survey undertaken by Kleinfelder. As an additional note, in November 2019, a section of the Duralie Offset areas was affected by the Buckley’s Range Fire with all VMUs located to the east of Johnson’s Creek Rd affected.



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DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020

Locality

Stratford Coal Pty Ltd
2021 Duralie Biodiversity Offsets Monitoring Report
Duralie Open Cut Coal Mine Biodiversity Offsets
Johnson's Creek Rd, Stroud Road, NSW

FIGURE:

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2 METHODOLOGY

2.1 GENERAL METHODS

The monitoring methodology has been stipulated in Section 7.1 of the BMP and is summarised as follows for each VMU:

- One permanent 100m transect established based on the existing 50m LFA transect – where this is deemed to be suitable.
- Photographic record at one GPS point – photos taken looking north, south, east and west with details of photography.
- Elements to be assessed/measured are as follows –
    - LFA soil surface indicators (50m transect).
    - Vegetation dynamics using EFA methodology.
    - Average stem Diameter at Breast Height (DBH) of canopy species measured in the EFA – not to include existing trees >20cm DBH.
    - Observations of canopy and shrub recruitment outside of 40m from existing vegetation.
    - Native sub-canopy species encountered with 1m of the transect; and,
    - Average height and species composition of each stratum.

In addition, each VMU is to be observed qualitatively for the following parameters.

- the impacts of fire, flood, fuel loads and browsing on achieving the management outcomes.
- fencing and track maintenance.
- current fire fuel loads and the risk they present to the Offset.
- the distribution and identification of any weeds that may impact on achieving management outcomes, including any declared weeds.
- evidence of ecological successional processes within Offset areas.
- revegetation efforts, including measurement of canopy species height.
- opportunistic flora and fauna observations.
- illegal access and vandalism.
- need for pest animal control.
- drainage (erosion or waterlogging) as an impediment to meeting area objectives.
- general species success (should be recorded for all species across each VMU type).
- herbivory/disease.
- recruitment.
- emerging or “sleeper” weeds.
- effects of poorly drained areas on revegetation stock.
- weed control success.
- time/resource allocation (do not include trial setup meetings or auditing).
- impact on non-native and native vegetation.
- implementation difficulties, and,
- general notes regarding enhancing success and reducing failure.

2.2 TRANSECTS SURVEYED

A subset of VMU transects, which were established in the 2013 baseline survey, were selected. A total of 18 transects were surveyed in March 2021, an increase of two transects that were surveyed in 2019 and 2020 (**Table 2**). These included 17 “installation” transects and one forested transect designated “regrowth management”. **Figure 2** shows the location of the transects surveyed during the 2020 monitoring round. **Appendix A** shows the location of the original 33 transects surveyed by Greening Australia in 2013.

Table 2: Vegetation Management Units that were selected for monitoring in 2020 and the revegetation actions that have been undertaken within these VMUs including those undertaken after the monitoring survey was undertaken

VMU	Existing Vegetation	VMU Type	Revegetation Actions/Dates			Vegetation Community
			Seeded	Planted	Planted	
AD	Pasture	Installation		May 2017	-	Rough-barked Apple – Red Gum – Grassy Woodland on Floodplain (Cabbage Gum Variant)
F	Pasture	Installation	-	Sept 2018	April 2020	
S	Pasture	Installation	Sept 2015	Sept 2015	May 2021	
W	Pasture	Installation	-	Sept 2018	April 2020	
Y	Pasture	Installation	-	May 2017	-	
T	Pasture	Installation	Sept 2015	-	-	Sydney Peppermint - Smooth-Barked Apple Shrubby Open Forest
AC	Pasture	Installation	Aug 2017	-	May 2021	Spotted Gum - Grey Ironbark Forest (Ironbark Variant)
I	Pasture	Installation	Sept 2015	-	-	
P	Forest	Regrowth Management	Nil	Nil	Nil	
AA	Pasture	Installation	Dec 2016		May 2020	Spotted Gum-Grey Ironbark Forest (Spotted Gum variant)
U	Pasture	Installation	Sept 2015	Sept 2015	May 2021	
V	Pasture	Installation	-	-	May 2020	
X	Pasture	Installation	-	-	April 2020	
AB	Pasture	Installation	Aug 2017	-	May 2021	Grey Box - Forest Red Gum - Grey Ironbark open forest (grey gum variant)
AE	Pasture	Installation	Dec 2016	-	May 2021	
AF	Pasture	Installation	Dec 2016	-	May 2021	
AH	Pasture	Installation	-	-	April 2020	Grey Box - Forest Red Gum - Grey Ironbark open forest (grey box variant)
Z	Pasture	Installation	Dec 2016/ Aug 2017	-	May 2021	

2.3 LANDSCAPE FUNCTIONAL ANALYSIS

Landscape Functional Analysis is a monitoring technique that uses eleven soil surface characteristics to determine the functional status of a landscape and is fully described in Tongway and Hindley (2011). These soil surface characteristics correspond to a range of physical, chemical and biological processes that control movement of water, topsoil and organic matter in a landscape. The landscape is divided into a patch and interpatch systems along transects where water and nutrients are accumulated or shed, respectively.

2.4 VEGETATION STRUCTURE

The second component of the monitoring consisted of assessing the vegetation structure at each transect. The "point-centre-quadrat" method as outlined in Tongway and Hindley (2011) was employed to record density of the canopy vegetation present at each transect. At 5m x 5m points along transects, the distance to the nearest stem or other important species or structural component that met the stipulated criteria was measured and the plant height, and DBH were recorded. Data was presented as density (stems/ha), average distance between stems (m) and an assessment of the quality of the data i.e., whether the number of stems measured presented an accurate determination of the above features. This was assessed by the number of stems measured. i.e., data was "Poor" if < 10 stems measured, "Good" if >10 and <19 stems were measured, and "Excellent if 20+ stems were measured.

2.5 DATA ANALYSIS

The collected data is input into a software system purpose designed for LFA where a series of tables are generated providing data on both a hillside and a patch basis. This data can then be used to provide insight into the functional status of the landscape.

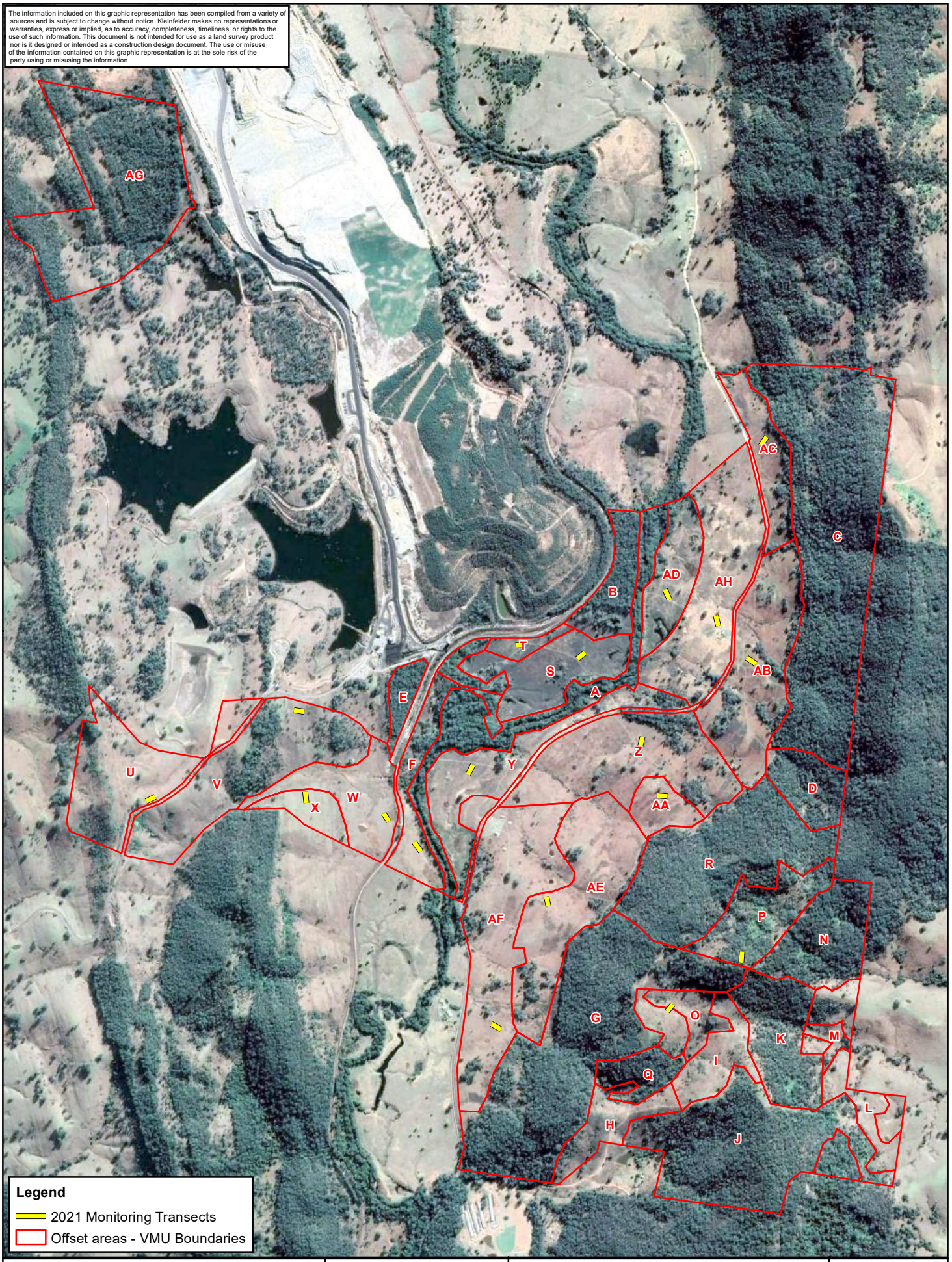
Vegetation Structure data is also input into purpose-designed software where woody plant density on a per hectare basis is calculated. These surveys were conducted in conjunction with the LFA monitoring using the same transects for data collection from the 15 VMUs. Vegetation Structure data was only collected where stems met the criteria as stipulated in the BMP, and as such not all VMUs have such data.

Greening Australia conducted LFA monitoring across the 33 VMUs in 2013. These data comprise the baseline data for comparison of monitoring to the subset of Offset VMUs undertaken in 2019 (**Table 3**). Data are averaged for all VMUs, and then further broken down into the three vegetation communities that are discussed in **Section 3**.

Table 3: LFA Index results from the 2013 Greening Australia monitoring event. Data are shown as the average of all Installation VMUs monitored in 2013, and then the average for each vegetation community targeted for restoration.

Index	Vegetation Communities			
	All	**Rough-barked Apple – Red Gum Grassy Woodland**	**Spotted Gum - Grey Ironbark Forest**	**Grey Box – Forest Red Gum – Grassy Woodland**
Stability	71.5	76.8	70.4	70.8
SE	4.2	2.3	1.4	0.6
Infiltration	47.3	47.1	37.2	35.9
SE	3.9	3.5	1.3	0.5
Nutrient Cycling	44.6	36.4	25.9	19.7
SE	4.8	5.1	2.1	0.7

SE = Standard error of the mean for each of the indices.



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PROJECT REFERENCE: 20213674

DATE DRAWN: 2021/08/06 13:18Version 1

DRAWN BY: GJoyce

DATA SOURCE:
Stratford Coal - 2015
Google Earth - 2018

Location of Transects and VMUs Surveyed for 2021 Duralie Offsets Monitoring

Stratford Coal Pty Ltd
2021 Duralie Biodiversity Offsets Monitoring Report
Duralie Open Cut Coal Mine Biodiversity Offsets
Johnson's Creek Rd, Stroud Road, NSW

FIGURE:

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3 RESULTS

Results are presented by VMU and grouped by the vegetation community targeted for restoration.

3.1 ROUGH-BARKED APPLE – RED GUM GRASSY WOODLAND ON FLOODPLAIN (CABBAGE GUM VARIANT)

3.1.1 VMU F

VMU F is located between Mammy Johnson's Cr and the northern rail line and consists of four hectares of alluvial flat that was partially planted in September 2018 with tubestock to revegetate to Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant). Local cattle gained access to the VMU after that planting and grazed extensively including upon the tubestock, but the VMU has responded well and now has a dense cover of exotic grasses and herbs (**Plate 1**). This area was replanted in April 2020 with another round of ripping and slashing to reduce groundcover biomass, with the tubestock planted into rip lines.

The LFA indices this survey has remained relatively stable when compared to the 2020 survey. The Stability Index score of 65.0 ± 2.6 is unchanged for the 2020 survey. The Infiltration Index score of 44.2 ± 2.9 and the Nutrient Cycling Index scores of 44.2 ± 2.9 and 32.3 ± 4.3 are both substantially below last year's survey (**Chart 1**). All indices for this VMU are below the 2013 Baseline Average (BA) scores, and the 2017 Analogue Average site scores. The Stability Index is below the 2013 Vegetation Community (VC) score, while the remaining indices remain unchanged in comparison.

Plate 1: VMU F showing exotic ground cover and scattered Wild tobacco looking towards Mammy Johnson River

The EFA survey component of the monitoring was conducted this survey, after the replanting undertaken in April 2020 (**Table 4**). The results produced an estimated 361 stems/ha at a mean distance of 5.61m between stems with 'excellent" data. Canopy and shrub species were recorded, all planted (as opposed to natural regeneration). Natural regeneration was restricted to the vegetation along the Mammy Johnson's Creek, and a few Eucalypts seedlings parallel to the rail corridor.

The vegetation survey recorded a total of 28 flora species composed of 15 native species and 13 exotic species. *Ligustrum sinense* (Small-leaved Privet) was prevalent amongst the vegetation lining Mammy Johnson's Ck, while *Solanum mauritianum* (Wild Tobacco) and *Rubus fruticosus* spp. agg. (Blackberry) were observed scattered throughout the VMU.

3.1.2 VMU S

VMU S consists of alluvial flat between Mammy Johnsons River and the northern rail line. It was the first of the areas prepared in the spring of 2015. This area was treated twice by broad acre application of glyphosate with a fire between the two herbicide applications. The area was broadcast seeded with a mix of native canopy, shrubs and grasses. Tubestock planting of canopy species was also undertaken to supplement the seeding effort with the aim to revegetate to Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant).

The Stability Index recorded this survey was 72.5 ± 4.1, the Infiltration Index was 58.4 ± 3.0 and the Nutrient Cycling Index score was 43.5 ± 5.1. These scores were equivalent to the last survey and compare favourably to the 2013 VC average. The Stability Index is equivalent to the both the 2013 Baseline Average and 2017 Analogue Average scores (**Chart 1**).

EFA data on the transect recorded 12 stems/ha at a mean distance of 12.4m with "excellent" data quality (**Table 4**). Individual stems utilised for the EFA monitoring were predominantly canopy species, (and mainly *Eucalyptus amplifolia*), although other Eucalyptus species and some shrub species were recorded.

This survey a total of 33 flora species were recorded along the transect an increase of three species from the previous survey. There were 16 native species (15 forb, herb and grass species) and 17 exotic species.

Natural regeneration was dense around the paddock trees (Cabbage Gums) with growth stimulated by the original clearing fire. Planted canopy away from the transect was progressing well, with many trees visible above the Fleabane and Purpletop. These last two species are still very dense and dominate the vegetation in sections of the VMU (**Plate 2**). During the walkover and the flora survey, several *Callistemon salignus* (Willow Bottlebrush) trees, and nine native grass species (up from five the previous survey) were observed indicating that the original seeding effort has had a modest effect in increasing the flora diversity.

Weeds observed included Privet, Blackberry and Wild Tobacco.

Plate 2: VMU S transect. Note the prevalence and density of weeds

3.1.3 VMU T

VMU T, classified as Sydney Peppermint - Smooth-Barked Apple Shrubby Open Forest, is the only installation VMU in this vegetation community. It is a small VMU of 2.7 ha located between the northern rail line and adjacent to VMU S. Due to its small size and proximity to VMU S it was treated at the same time and with the same seed

mix - Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant) as VMU S, September 2015.

LFA indices were recorded as follows, Stability Index 76.3 ± 2.8, Infiltration Index 64.5 ± 3.1 and Nutrient Cycling Index 50.7 ± 4.6 (**Chart 1**). The Stability Index results are equivalent to all reference and analogue scores, while the Infiltration and Nutrient Cycling Indices have increased over the 2013 VC score. The Infiltration Index score is equivalent to the 2017 Analogue and 2013 Baseline scores.

With no canopy or shrubs on this VMU, no EFA was conducted. This VMU does have naturally regenerating canopy and shrubs species at its extremities, just visible in **Plate 3**. The VMU itself is dominated by exotic grasses, Paspalum (*Paspalum dilatatum)* and Narrow-leafed Carpet Grass (*Axonopus filiformis*) and forbs although the flora species count is evenly divided between native species (nine) and exotics (11 species) for a total of 20 species, a slight increase on the previous survey.

Plate 3: VMU T looking west showing dominance of exotic groundcovers

3.1.4 VMU W

VMU W consists of 10 ha of alluvial flats and slightly elevated ground adjacent to the flats and is a mixture of exotic and native grasses and groundcovers. This area was partially planted in September 2018 with tubestock to revegetate to Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant) and had further in-fill planting in May to June 2020. Prior to planting, this VMU had ground preparation in between the previously planted rip lines, i.e., the area was partially slashed to reduce groundcover biomass, with the tubestock planted into the new rip lines. The monitoring transect was also re-located by about 20m downslope and to the east. This took the transect off the access track and away from fencing that limited access to a section of the VMU, and better reflected the area where revegetation works have occurred.

LFA indices recorded this survey were as follows. The Stability Index 66.1 ± 2.2, the Infiltration Index 33.5 ± 1.7 and the Nutrient Cycling Index 22.1 ± 2.4. These are well below all of the reference and analogue index scores (**Chart 1**).

The EFA recorded 111 stems/ha at an average spacing of 9.5m with “excellent” data (**Table 4**). These were overwhelmingly *E. amplifolia* and from the latest planting program. Based on height, only three stems were judged to have survived from the original planting effort (**Plate 4**).

The flora monitoring identified a total of 22 species, evenly divided between natives and exotics with 11 species each. Wild Tobacco was encroaching from the rail corridor to the east.

Plate 4: **VMU W looking west. Several of the planted trees are visible. Th e taller tree is a survivor from the original revegetation effort.**

3.1.5 VMU Y

VMU Y consists of alluvial flats 25 ha in size, located between Johnson Creek Rd and Mammy Johnsons River. It was planted in May 2017 with tubestock to revegetate to Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant). Prior to planting this VMU was slashed to reduce groundcover biomass, with the tubestock planted into rip lines. This survey the transect was relocated approximately 100m to the southwest to better represent revegetation efforts and remove edge effects of remnant vegetation and natural revegetation.

The LFA Indices recorded this survey were as follows, Stability Index 65.6 ± 2.2, Infiltration Index 52.6 ± 2.5 and the Nutrient Cycling Index 35.9 ± 3.6 (**Chart 1**). These results are above the 2013 VC averages, but below the 2013 Baseline and 2017 Analogue averages.

The EFA results recorded 85 stems/ha at an average spacing of 10.86m with “excellent” data quality. These stems were mainly *E. amplifolia* with a smaller number of other Eucalypts and *Melaleucas.*

The flora survey recorded a total of 23 species, 10 natives and 13 exotics. This the exotic dominated groundcover nature of the VMU (**Plate 5**). The walkover survey recorded many individual woody weeds including Wild Tobacco and Privet, mainly emerging from the remnant vegetation along Mammy Johnson Cr, while Blackberry was found scattered throughout the VMU. Evidence of weed control works was also observed where Blackberry patches had been sprayed. Unfortunately, evidence of herbicide overspray damaging, and occasionally killing planted canopy stems was also observed.

Plate 5: **VMU Y looking south along the LFA transect. Note the numerous trees from the revegetation planting and the large paddock Ironbark in the background**

3.1.6 VMU AD

VMU AD is located adjacent to Mammy Johnson River at the northern end of the offset areas area. It consists of alluvial flat with overflow flood channels. This area was planted with tubestock in May 2017 to revegetate to Rough-barked Apple – Red-Gum grassy woodland on Floodplain community (Cabbage Gum Variant). Before planting the area was slashed, ripped and tubestock canopy and shrubs planted into rip lines.

The LFA Indices recorded this survey were as follows. Stability Index 76.9 ± 4.7, Infiltration Index 46.5 ± 5.3, and the Nutrient Cycling Index 41.5 ± 7.8 (**Chart 1**). These indices are comparable to the 2012 VC averages, but only the Stability Index score is equivalent to the 2013 Baseline and 2017 Analogue averages.

The EFA results recorded 30 stems/ha at an average spacing of 11.44m with “good” quality data (**Table 4**). The stems measured were predominantly *E. amplifolia* with a very few other species recorded which were *E. crebra, E. punctata* and *E. tereticornis.*

The flora survey recorded a total of 23 species, composed of seven native species and 16 exotic species. This area is dominated by a dense exotic grass and herb groundcover that has made recording survival of the planted stems difficult. Woody weeds Privet and Wild Tobacco are encroaching from the vegetation along Mammy Johnson Creek, while Blackberry was commonly observed throughout the VMU during the walkover.

Plate 6: **VMU AD looking North from the LFA transect showing dense exotic ground cover in the foreground and large paddock trees in background. Several of the planted trees are visible in front of the paddock trees.**

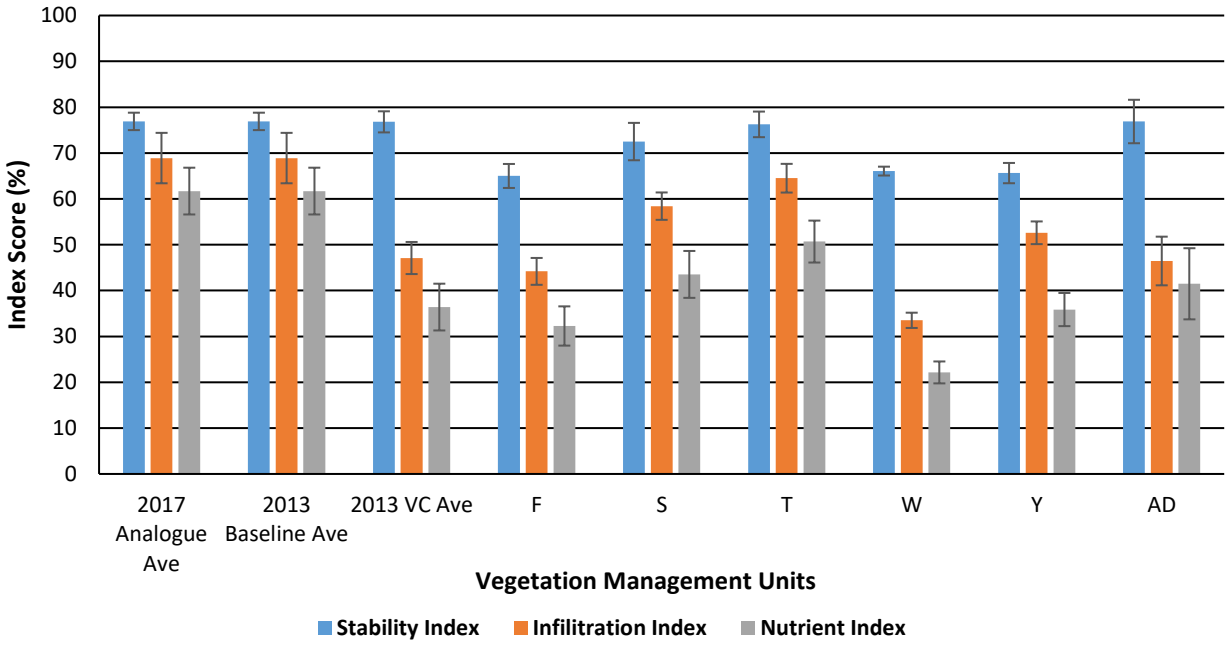


Chart 1: **LFA indices for the VMUs Rough-barked Apple - Red Gum Woodland on Floodplain (Cabbage Gum Variant) vegetation community. Error bars are standard error of the means**

Table 4: Vegetation Dynamics (EFA) data for the 2021 survey. Data is only shown where stems were able to be measured as per the methodology.

VMU	Mean Distance between Plants (m)	No. plants/ha	Data Quality	Strata measured
F	5.26	361	Excellent	Nearest stem, all strata, planted
I	3.89	660	Good	Nearest shrub natural regen
P	3.86	901	Excellent	Nearest stem for each stratum, natural regen
S	28.7	12	Excellent	Nearest stem, Canopy and shrubs, planted
U	12.39	65	Excellent	Nearest stem, Canopy, planted
W	9.508	111	Excellent	Nearest stem, Canopy, planted
Y	10.86	85	Excellent	Nearest stem, Canopy, midstorey, planted
AA	17.43	33	Good	Nearest stem, all strata, planted and natural regen
AD	11.44	30	Good	Nearest stem, Canopy, planted

Please Note. Data quality - Excellent = 20+ stems measured, Good = ≥10 stems and <19 stems, Poor = < 10 stems measured.

3.2 Spotted Gum – Grey Ironbark Forest (Ironbark and Spotted Gum Variants)

3.2.1 VMU I

VMU I is 13.1 ha in size and is located in the eastern section of the offset areas. It consists of steep slopes of predominantly native grasses and groundcovers with natural re-growth of shrubs and canopy species with isolated paddock trees. In 2015 this VMU was crash grazed to reduce groundcover biomass prior to seeding with shrub and canopy species of the Spotted Gum – Grey Ironbark (Ironbark Variant) vegetation community. This seeding effort had no discernible effect and all stems measured for the EFA are natural regeneration. The other major disturbance to this VMU was the November 2019 Buckley's Range Bushfire that burned the entire VMU.

The LFA Indices recorded for this survey were as follows. Stability Index 69.0 ± 0.5, Infiltration Index 35.2 ± 3.2, Nutrient Cycling Index 28.1 ± 2.3 (**Chart 2**). These results are equivalent to the 2013 Baseline and 2013 VC averages.

The EFA results recorded a calculated 660 stems/ha at an average spacing 3.89m with "good" data quality. It should be noted here that these were naturally regenerating shrubs only.

The flora survey recorded a total of 48 species composed of 35 native and 13 exotic species, a very slight increase of the natives compared to last year's survey. No major woody weeds were recorded during the survey of this VMU, but the 2019 fire has served to stimulate some of the herbaceous weeds particularly Narrow-leaved Cotton Bush (*Gomphocarpus fruticosus)*, which is very pronounced at the top of the transect (**Plate 7**). The vegetation in the vicinity of the transect is divided quite clearly between exotic grasses and weeds at the top of the transect, whereas lower down the slope, native grasses dominate, and shrubby regeneration is occurring (**Plate 8**).

Plate 7: **VMU I - looking downslope from top of LFA transect showing largely exotic grasses and herbaceous weeds at this section of the transect**

Plate 8: **VMU I - looking down the LFA transect from approximately the half-way point showing native grasses and shrubby regeneration. The taller trees are *Acacia implexa.***

3.2.2 VMU P

VMU P is located in the remnant vegetation on the eastern side of the Offset areas on steeply sloping ridge country. It is 15 ha in size and classified as Spotted Gum – Grey Ironbark Forest (Grey Ironbark Variant). This VMU was classified by Greening Australia as "Regrowth Management" which indicates that weed control was the primary management action required. This VMU was burnt I the 2019 bushfire which greatly reduced the

The LFA indices recorded for this VMU were as follows. Stability Index 738. ± 1.7, Infiltration Index 50.6 ± 8.8, and Nutrient Cycling Index 42.0 ± 6.7 (**Chart 2**). These results are well above the 2013 Baseline and 2013 VC averages. The Stability Index score is equivalent to the 2013 Analogue average, but the remaining indices are below the Analogue averages.

The EFA results recorded for this VMU calculates 901 stems/ha at an average spacing of 3.86m with "excellent" data. This is a slight reduction from the previous survey which recorded 1096 stems.

The flora survey recorded 51 flora species composed of 40 native and 11 exotic species. This represents a reduction of four native from last survey and an increase of nine exotic species. The only woody weed species

recorded was Lantana, making a comeback after the 2019 fire. The remaining additional exotic species are herbaceous colonisers after disturbance such as Cobblers Pegs (*Bidens pilosa*) and Fleabane *(Conyza bonariensis*).

Plate 9: VMU P looking down the LFA transect showing the excellent recovery from the effects of the 2019 bushfire

3.2.3 VMU U

VMU U is the furthest west of the VMUs, located on the entrance road to DCM and at 23.8 ha is one of the larger areas. This area is relatively steep hills and ridges with a mixture of cleared exotic grassland and naturally regenerating shrub and canopy. This VMU was only partially revegetated due to the steepness of the majority of the area. The revegetation consisted of a combination of seeding of canopy and shrub species over the majority of the VMU, with seeding of shrub species and planting of canopy tubestock over the remaining, much smaller area. The seeding effort has largely been unsuccessful, while the tubestock planting resulted in reasonable survival of the canopy.

The LFA results recorded for this VMU were as follows. Stability Index 76.3 ± 1.7, infiltration Index 55.1 ± 5.6 and the Nutrient Cycling Index 45.6 ± 2.8 (**Chart 2**). These results are well above the 2013 Baseline and 2013 VC averages. The Stability Index score is equivalent to the 2013 Analogue average, but the remaining indices are below the Analogue averages.

The EFA results recorded 65 stems/ha at an average spacing of 12.4m with “excellent” data. These were entirely planted species, and all but one was *C. maculata.* The flora survey recorded a total of 30 flora species composed of 17 natives and 13 exotic species. The groundcover was a mix of exotic and native grass species with the panted canopy beginning to emerge and become visible (**Plate 10**). Woody weeds observed included Lantana, Wild Tobacco and Blackberry. These were concentrated in the naturally regenerating areas of the VMU, on the steeper and rocky sections and along the ridgeline. Weed control, while desirable will be difficult and potentially hazardous to personnel due to the slope and difficult footing.

Plate 10: VMU U looking downslope along the LFA transect showing largely exotic groundcover and planted canopy

3.2.4 VMU V

This is a nominal very large VMU (31.7 ha), but much is very steep and there are large areas of natural revegetation. This resulted in three smaller aeras designated V1, V2 and V3 being planted for a total of 7.6 ha. The monitoring transect was located in the largest of these areas, V1 adjacent to the main DCM access **road (Plate 11**). The VMU is dominated by native grasses, especially Kangaroo Grass (*Themeda triandra*), with some exotic greases and herbaceous weeds and scattered trees. The are was planted with tubestock in May 2020 with slashing and ripping occurring just prior to planting. This is the first survey of this area utilising this methodology.

The LFA results recorded for this VMU were as follows. Stability Index 75.5 ± 4.8, Infiltration Index 54.8 ± 1.5, and Nutrient Cycling Index 44.9 ± 5.8 (**Chart 2**). These results are well above the 2013 Baseline and 2013 VC averages. The Stability Index score is equivalent to the 2013 Analogue average, but the remaining indices are below the Analogue averages.

No EFA was conducted on this VMU this survey.

The flora survey recorded a total of 41 species, 25 natives and 16 exotic species. No woody weeds were recorded along the transect. Lantana was observed in the remnant and regenerating areas, while blackberry was observed scattered throughout the VMU, with a large patch near the entrance gate.

Plate 11: VMU V looking down the LFA transect. The ground cover is largely native grasses. Planted canopy and shrubs are too small to see at this stage of monitoring

3.2.5 VMU X

VMU X is 5.4 ha in size, located across the small valley from VMU V and adjacent to VMU W (**Plate 12**). The groundcover is dominated by Paspalum (*Paspalum dilatatum*) but has very good native grass species diversity. This VMU was planted in April 2020 after slashing and ripping with tubestock of the Spotted Gum-Grey Ironbark Woodland (Spotted Gum Variant) community.

The LFA results for this VMU were as follows. Stability Index 76.1 ± 4.5, Infiltration Index 49.6 ± 4.9, and the Nutrient Cycling Index 42.4 ± 6.9 (**Chart 2**). These results were above the 2013 VC average, equivalent to the 2013 Baseline average. The Stability Index result was equivalent to the 2013 Analogue average, but the remaining indices were below the 2013 Analogue averages.

No EFA was conducted on this VMU this survey.

The flora survey recorded a total of 30 species, 20 natives and 10 exotics. Of the ten grass species recorded on the transect, nine were native with Paspalum the lone exotic grass. No woody weeds were observed. This VMU is isolated form remnant vegetation with few paddock trees. Natural regeneration was not observed.

Plate 12: VMU X looking down the LFA transect. Groundcover is dominated by Paspalum, but there is good native grass species diversity. VMU W is at the base of the slope, VMU V on the opposite slope.

3.2.6 VMU AA

This VMU is a small 6 ha area on the upper slopes of the cleared pasture, immediately below the remnant native vegetation east of Johnsons Creek Rd and was fire affected. This area was seeded in December 2016 with a mixture of Spotted Gum-Grey Ironbark Forest (Spotted Gum variant) and Grey Box - Forest Red Gum - Grey Ironbark open forest (Grey Gum variant) communities. Slashing of the grassy groundcover prior to seeding was undertaken. Then in May 2020, the area was re-slashed and ripped before installation of tubestock was conducted. In addition to the 2019 Buckley's Range fire, this is the third major disturbance to this VMU in five years.

The LFA results for this VMU were as follows. Stability index 70.0 ± 2.5, Infiltration Index 51.5 ± 5.1, and the Nutrient Cycling Index 36.9 ± 5.6 (**Chart 2**). These results are above the 2013 VC averages, but equivalent to the 2013 Baseline average and below the 2013 Analogue averages.

As EFA surveys have been conducted previously for this VMU, EFA was conducted this survey. Results recorded 32.9 stems/ha at an average spacing of 17.43m with data rated as "good". A combination of naturally regenerating and planted canopy stems were recorded, while the few shrub species stems recorded were all planted. The flora survey recorded 28 species composed of 17 natives and 11 exotics. Natural regeneration was observed adjacent to the transect where paddock trees of Grey Box (*Eucalyptus moluccana*) were included in the EFA (**Plate 13**), and along the eastern border of the VMU where remnant vegetation is slowly recolonising the grassland.

Plate 13: VMU AA looking North towards remnant vegetation.

3.2.7 VMU AC

VMU AC is a relatively small VMU (11.3 ha) located at the northern end of the Offset areas between the remnant vegetation up slope and to the east and Johnsons Creek Rd, downslope and to the west. It consists of lower slopes covered predominantly by native grasses and some exotic groundcover with isolated patches or remnant native vegetation, especially in the water courses/gullies. In the winter of 2017 this VMU was subjected to an ecological burn and then in the August of 2017 was broadcast seeded with a mix of native seed consistent with the Spotted Gum – Ironbark Forest (Ironbark Variant) vegetation community. This area was also affected by the Buckley's Range fire in December 2019.

The LFA results for this survey were as follows. Stability Index 63.9 ± 1.7, Infiltration Index 38.9 ± 2.3 and the Nutrient Cycling Index 23.1 ± 3.1 (**Chart 2**). The Stability Index score was below all comparison scores, while the remaining indices were equivalent to the 2013 Baseline and VC averages. All indices were lower than the 2013 Analogue averages.

No EFA was conducted on this VMU.

The flora survey recorded a total of 27 species with 19 natives and eight exotics. The area was dominated by native grasses but did have areas with high levels of herbaceous wees such as Purpletop (*Verbena bonariensis*) and Fleabane. Natural regeneration was observed in many areas of this VMU, not unexpected given that the area is relatively narrow with remnant vegetation upslope of the grassy areas.

Plate 14: VMU AC looking SW down the LFA transects towards Johnsons Creek Rd

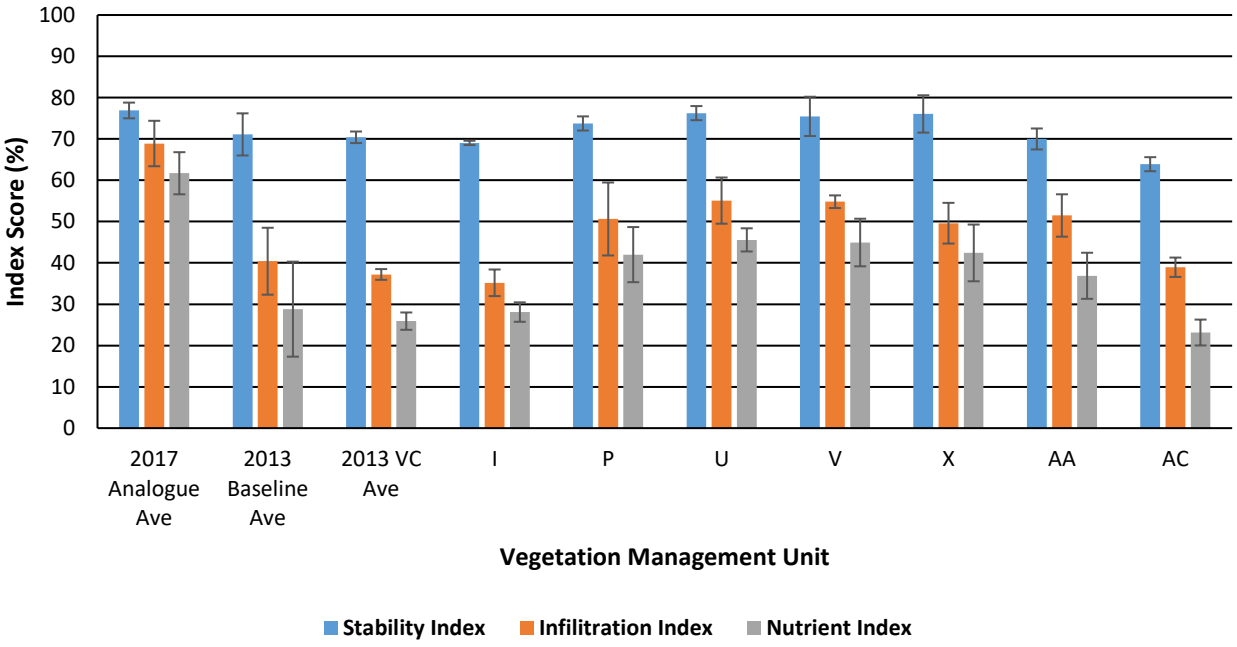


Chart 2: LFA indices for the VMUs for the Spotted Gum – Grey Ironbark Forest (Ironbark and Spotted Gum Variants) vegetation communities. Error bars are standard error of the means

3.3 GREY BOX - FOREST RED GUM - GREY IRONBARK OPEN FOREST (GREY GUM AND GREY BOX VARIANTS)

The December 2019 Buckley's Range Fire burnt through four of the following VMUs – VMUs Z, AB, AE, AF. VMU AH located to the west of Johnsons Creek Rd was not affected. No EFAs were conducted on these VMUs as they had not been planted at the time of the survey.

3.3.1 VMU Z

VMU Z is one of the larger VMUs at a nominal 33.6 ha, situated on the eastern side of Johnsons Creek Rd and consists of mid to lower slopes covered in native and exotic groundcovers with isolated paddock trees and associated regrowth and two larger patches of remnant native vegetation. This area was seeded over two periods – the first occurred in the spring/summer of 2016, where approximately 17 ha was slashed before broadcast seeding occurred at the same time as VMUs AA, AE and AF. The remaining approximately 16 ha was treated with an ecological burn before broadcast seeding occurred in August 2017 at the same time as VMU AB and AC.

LFA results for this VMU were as follows. Stability Index 66.7 ± 0.0, Infiltration Index 37.9 ± 0.0 and the Nutrient Cycling Index 20.5 ± 0.0 (**Chart 3**). The Stability Index result was below all comparison scores while the remaining indices were equivalent to the 2013 Baseline and 2013 VC averages.

The flora survey recorded 18 species, 14 natives and four exotics. This area was dominated by Blady Grass (*Imperata cylindrica*). Some minor generation from surviving seeding was recorded along the transect. Natural regeneration was observed along the northern edges of the VMU and from paddock trees (**Plate 15**). Blackberry treated areas were observed in the ephemeral drainage lines.

Plate 15: VMU Z looking south towards paddock trees where natural regeneration is evident.

3.3.2 VMU AB

VMU AB is situated just north of and adjoins VMU Z and is 28.9 ha in size. It also consists of lower to mid slopes covered in a combination of native and exotic groundcovers and grasses. There are perhaps more areas of remnant native vegetation compared to the previous VMU, scattered paddock trees and deeper gullies with Rough-barked Apple – Red Gum Grassy Woodland (Cabbage Gum Variant). VMU AB is classified as Grey Box – Forest Red Gum – Grey Ironbark Open Forest (Grey Gum Variant). In the spring of 2017 this VMU was treated with an ecological burn before broadcast seeding with the canopy and shrub from the above vegetation community.

The LFA results for this VMU were as follows. Stability Index 63.8 ± 2.8, Infiltration Index 39.6 ± 3.9, and the Nutrient Cycling Index 23.6 ± 5.5 (**Chart 3**). The Stability Index result was below all comparison scores while the remaining indices were equivalent to the 2013 Baseline and 2013 VC averages.

The flora survey recorded a total of 24 species, 12 natives and 12 exotics (**Plate 16**). Natural regeneration was observed in the gullies and along the edges of this VMU where remnant vegetation is slowly recolonising the grasslands. Lantana was observed in the remnant vegetation areas, and Blackberry was observed in scattered locations through the VMU.

Plate 16: VMU AB looking south from transect start showing mainly exotic grasses and forbs and remnant vegetation

3.3.3 VMU AE

VMU AE is located on the eastern side of Johnsons Creek Rd, mid-slope between the remnant vegetation to the east and more pasture (VMU AF) downslope and to the west. It is approximately 30.8 ha in size and was dominated by exotic grasses and herbs with patches of native grasses. VMU AE is classified as Grey Box – Forest Red Gum – Grey Ironbark Open Forest (Grey Gum Variant). In the spring/summer of 2016 this VMU was treated by slashing and then broadcast seeded.

The LFA results for this VMU were as follows. Stability Index 63.0 ± 2.5, Infiltration Index 29.6 ± 6.5, and the Nutrient Cycling Index 20.5 ± 0.0 (**Chart 3**). The Stability Index result was below all comparison scores while the remaining indices were equivalent to the 2013 Baseline and 2013 VC averages.

The flora survey recorded a total of 23 species, 14 natives and nine exotics. This area largely open pasture with exotic grasses dominating on the lower slopes and native grasses dominating the further upslope and east towards the remnant vegetation (**Plate 17**). Natural regeneration was observed along the eastern boundary with good recruitment of both canopy and shrub species, while the remaining stands of paddock trees also act as areas of recruitment, albeit with less diversity, restricted largely to the offspring of the largest trees in the stand. Evidence of Blackberry treatment was observed, and no other large infestations of woody weeds were recorded during the surveys.

Plate 17: VMU AE looking west from the transect

3.3.4 VMU AF

VMU AF is 36.5 ha of lower to mid-slopes located below and to the west of VMU AE and adjacent to Johnsons Creek Rd. The groundcover was dominated by exotic grasses and forbs. There were remnant paddock trees and native vegetation in several patches and small gullies. VMU AF is classified as Grey Box – Forest Red Gum – Grey Ironbark Open Forest (Grey Gum Variant). In the spring/summer of 2016 this VMU was treated by slashing and then broadcast seeded.

The LFA results for this VMU were as follows. Stability Index 63.0 ± 2.5, Infiltration Index 39.2 ± 5.9, and the Nutrient Cycling Index 26.1 ± 5.5 (**Chart 3**). The Stability Index result was below all comparison scores. The Infiltration Index result was equivalent to the 2013 Baseline and 2013 VC averages, while the Nutrient Cycling Index was equivalent to the 2013 Baseline averages, but above the 2013 VC average.

The flora survey recorded a total of 23 species, 13 natives and 10 exotics (**Plate 18**). This included several the native shrub Prickly Moses (*Acacia ulicifolia*). These may be seeded, regenerating form the seed bank or a combination. Again, natural regeneration was observed in remnant patches and along the eastern and the south-western boundaries where canopy and shrub species are recolonising not the grassland areas. This VMU was intensely burned and the effect upon the remnant patches is noticeable with loss of some native diversity and an increase in exotic groundcovers. Blackberry and other woody weeds were observed scattered in the ephemeral creek lines.

Plate 18: VMU AF looking north from transect showing native and exotic groundcovers and regenerating canopy in the background

3.3.5 VMU AH

VMU AH is a 31 ha of lower slopes is located on the western side of Johnsons Creek Rd, just upslope of VMU AD. The groundcover is dominated by exotic grasses with scattered paddock trees (Plate 19). This VMU is classified as Grey Box – Forest Red Gum – Grey Ironbark Forest (Grey Box Variant). It was planted in May 2020 with tubestock after slashing and ripping. This was the first survey for this VMU conducted by Kleinfelder as part of the Duralie Offsets Monitoring Program.

The LFA results for this VMU were as follows. Stability Index 63.1 ± 1.4, Infiltration Index 50.9 ± 1.8, and the Nutrient Cycling Index 30.7 ± 2.6 (Chart 3). The Stability Index result was below all comparison averages. The Infiltration Index result was considerably higher than all other VMUs in this community, but also the 2013 Baseline and 2013 VC averages, but still lower than the 2017 Analogue averages. The Nutrient Cycling Index result was also higher than most of the other VMUs in this community, considerably higher than the 2013 VC average, equivalent to the 2013 Baseline average, but much lower than the 2017 Analogue averages.

No EFA was conducted on this VMU this survey.

The flora survey recorded a total of 24 species, 10 natives and 14 exotic species. No native grasses were recorded for this VMU, highlighting its past use for grazing. Blackberry and Privet were recorded in this VMU.

Plate 19: **VMU AH looking north showing largely exotic ground cover with isolated paddock trees**

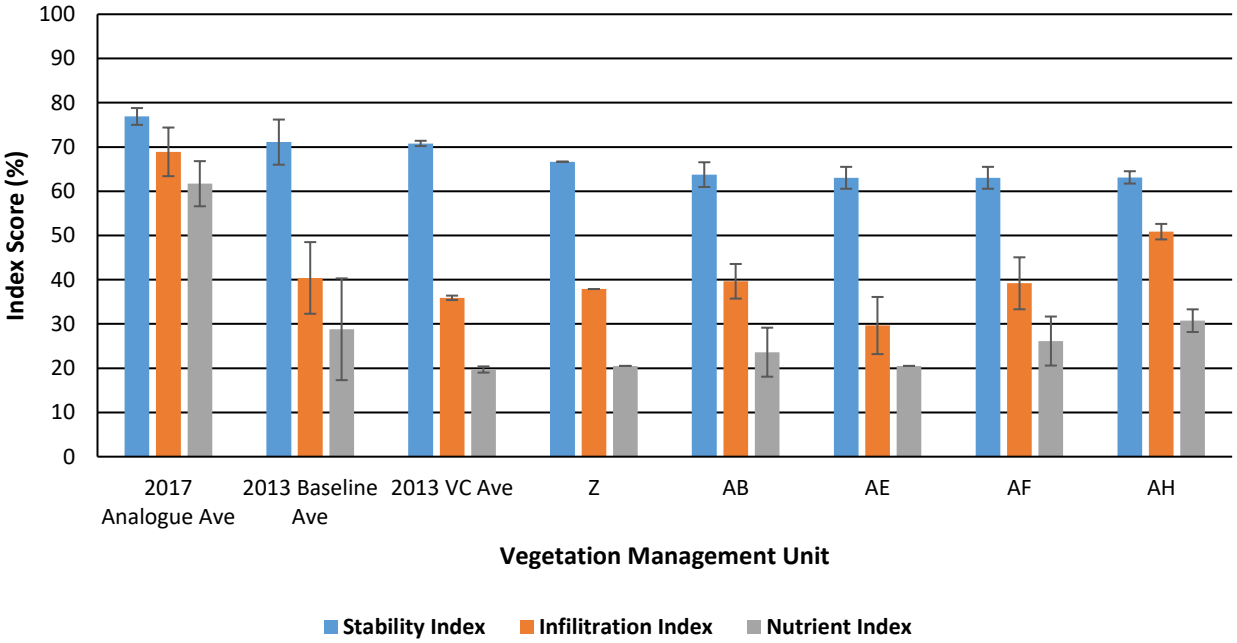


Chart 3: **LFA Indices for the Grey Box - Forest Red Gum - Grey Ironbark Forest (Grey Gum and Grey Box Variants) vegetation communities. Error bars are standard error of the means**

4 HISTORICAL DATA

Six surveys in total have now been completed for the offset areas, with the first two completed in 2013 and 2014 by Greening Australia, a subset of VMUs were surveyed in 2017 and the latest three full surveys in 2019, 2020 and 2021 by Kleinfelder Australia. The complete data fro the Kleinfelder surveys EFA surveys are presented in **Table 5**. Historical data for the Rough-barked – Red Gum – Grassy Woodland communities shows that the Stability Index has been inconsistent across the five VMUs with historical data available in **Chart 4**. Historical data for the Spotted Gum – Grey Ironbark community VMUs is presented in **Chart 5**, with historical data for the Grey Box – Forest Red Gum – Grey Ironbark community presented in **Chart 6**. Discussion of these data will be incorporated in **Section 5 – Discussion** below.

Table 5: Comparison of the EFA data for the three surveys undertaken by Kleinfelder Australia (2019-2021)

VMU	Mean Distance between Plants (m)			No. plants/ha			Data Quality		
Year	2019	2020	2021	2019	2020	2021	2019	2020	2021
F	16	-	5.26	39.1	-	360.7	Good	-	Excellent
I	17.4	-	3.89	33.01	-	660.06	Poor	-	Good
P	2.91	3.02	3.86	1183	1096.4	900.91	Excellent	Excellent	Excellent
S	19.55	31.07	28.7	26.2	10	12.13	Poor	Excellent	Excellent
U	10.67	11.5	12.39	87.83	74.88	65.13	Good	Good	Excellent
W	22.15	20.7	9.508	20.38	23.2	110.6	Good	Excellent	Excellent
Y	11.88	17.1	10.86	70.8	34	84.75	Good	Excellent	Excellent
AA	23.9	26.5	17.43	17.8	14.2	32.9	Poor	Good	Good
AD	8.38	40.1	11.44	142.4	6.2	29.56	Poor	Good	Good

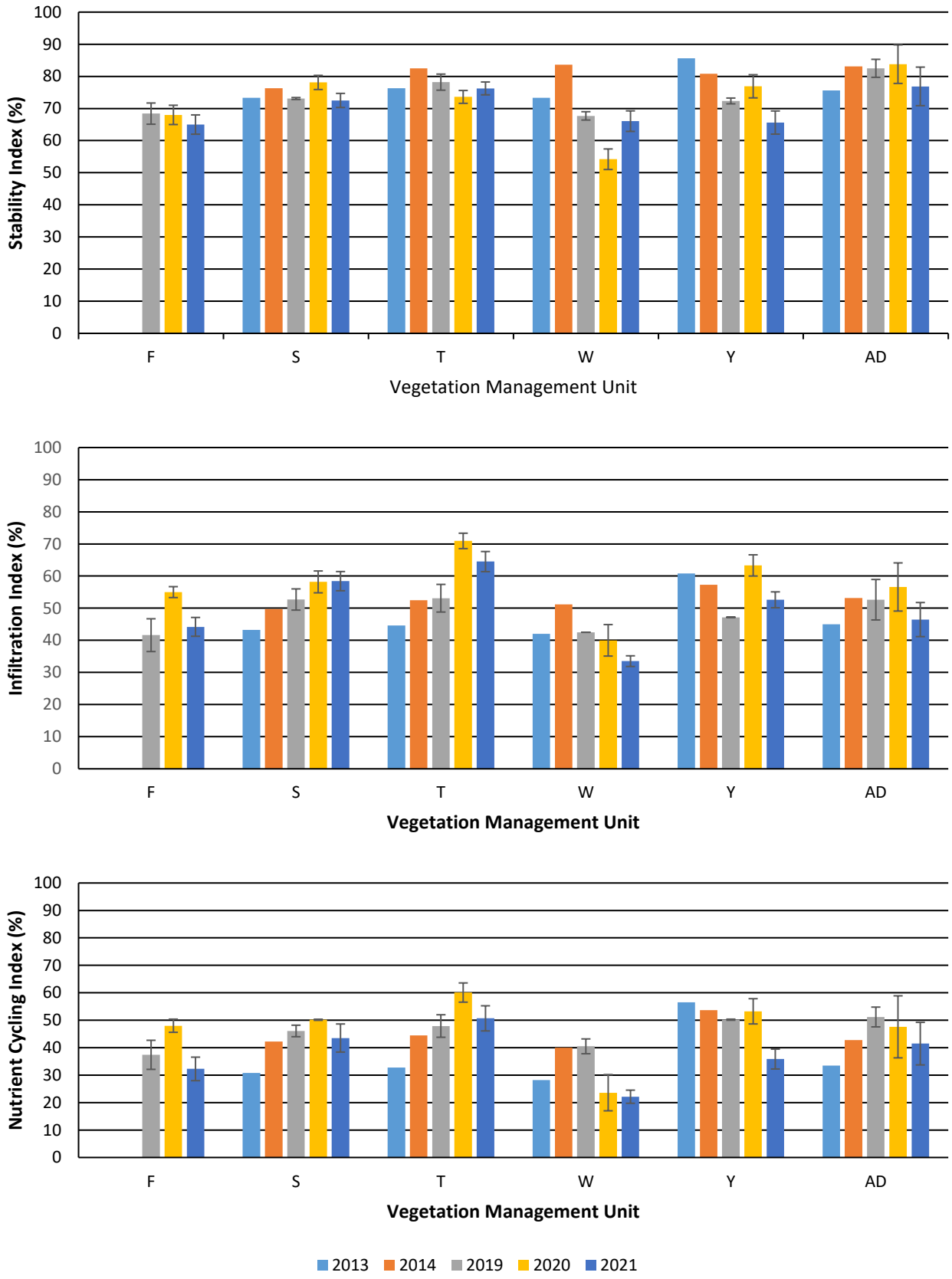


Chart 4: Historical comparison of the LFA Indices for the Rough-barked Apple – Red Gum – Grassy Woodland Vegetation community VMUs. Top – Stability Index, Middle – Infiltration Index, Bottom – Nutrient Cycling Index

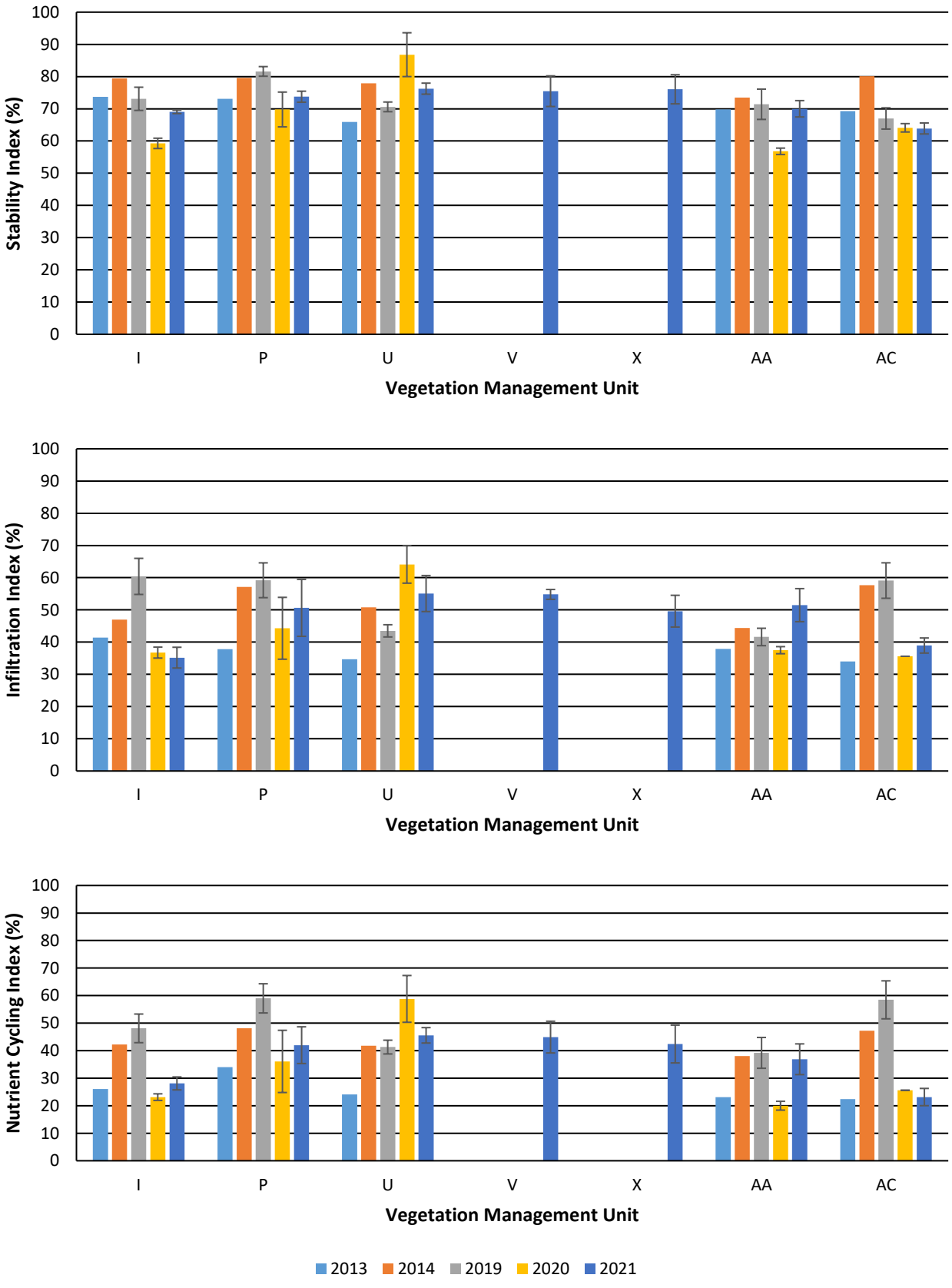


Chart 5: Historical comparison of the LFA Indices for the Spotted Gum – Grey Ironbark Vegetation community VMUs. Top – Stability Index, Middle – Infiltration Index, Bottom – Nutrient Cycling Index

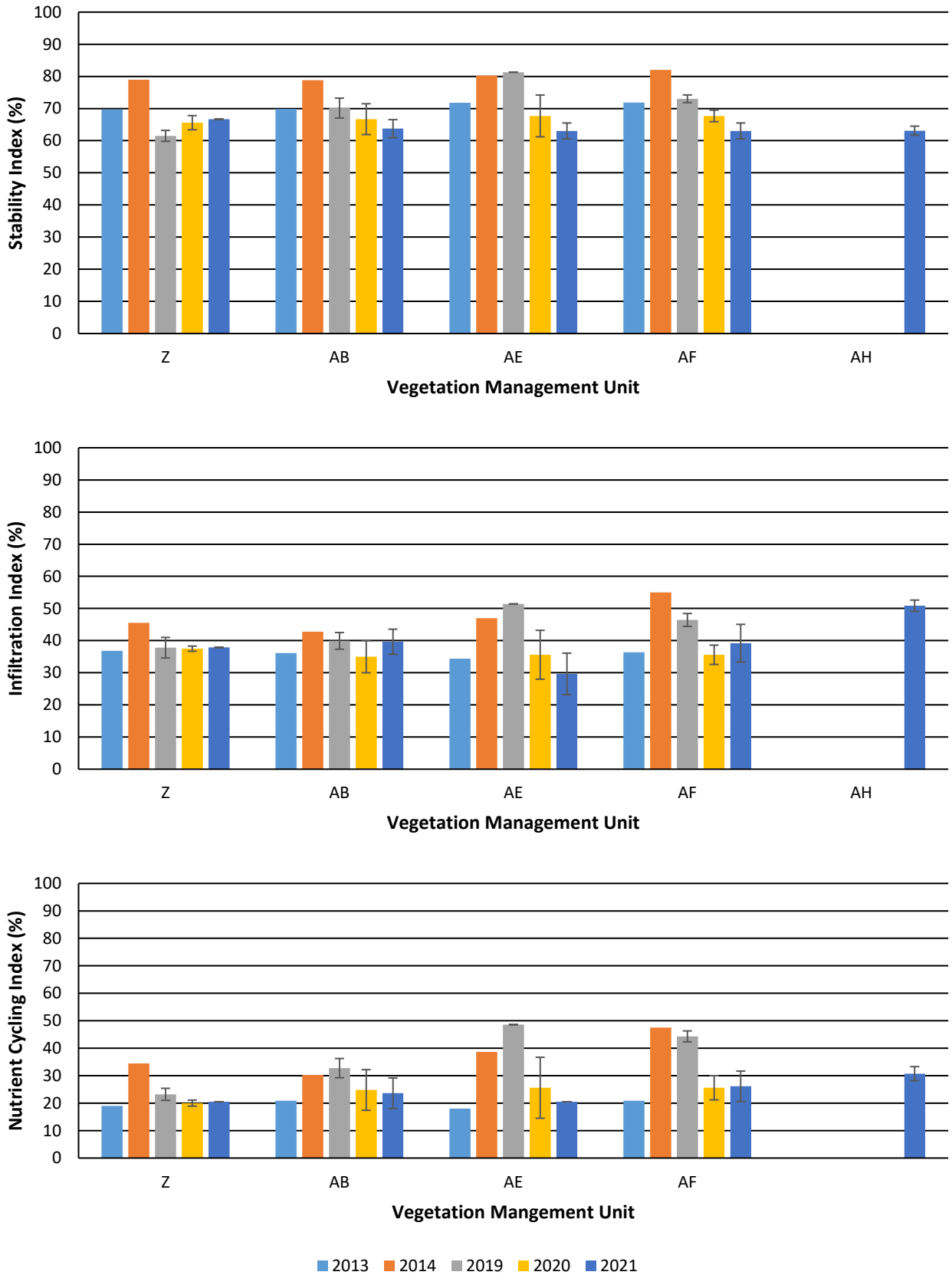


Chart 6: `Historical comparison of the LFA Indices for the Grey Box – Forest Red Gum - Grey Ironbark Vegetation community VMUs. Top – Stability Index, Middle – Infiltration Index, Bottom – Nutrient Cycling Index

5 WALKOVER AND WEED OBSERVATIONS

5.1 WALKOVER

Walkover observations were made in the vicinity of the transects, and as Kleinfelder transited between transects. All observations refer to **Figure 3** and **Appendix C**.

Natural regeneration was observed at multiple locations throughout the Offsets with both canopy species and shrubs being observed at the seedling stage. Examples include OB1 – 6 in VMU AA, OB9 in VMU AB and OB21 in VMU U. Apart from recruitment of the Eucalypts and native legumes such as *Daviesia spp.* and *Acacia* species, noted early colonisers and species that can be retained in the soil seed bank, a new species *Comesperma ericinum* Pyramid Flower) was observed for the first time this survey.

Survival of planted tubestock was also noted away from transects with notable examples including VMU AD (OB15), VMU U (OB16 and OB17), and VMU V at OB18 and OB19. Flowering of planted tubestock was observed at OB20 in VMU Y where *Callistemon salignus* was in flower.

Generally, fencing on external boundaries was in good condition. At OB28 in VMU AE, a tree has fallen, blocking the track and damaging the fence. There were only two erosion issues noted during the surveys – near OB16 in VMU U, tunnelling was recorded in the gully (reported last survey). And tunnelling was recorded at OB29 in VMU R on the steep access track. The erosion at OB16 will be difficult to repair without major damage to planted vegetation, and posses do threat to revegetation or infrastructure at this stage.

5.2 WEEDS

Weed observations have been alluded to in the main report and all observations noted here refer to Figure 4.. Individual weed observations made during the walkover surveys no doubt under report the extent of weeds in some VMUs. The main weeds reported on are woody weeds that if not treated can act as deterrent to successful revegetation, or in a single case are herbaceous weeds that are in such concentration as to pose a threat to revegetation.

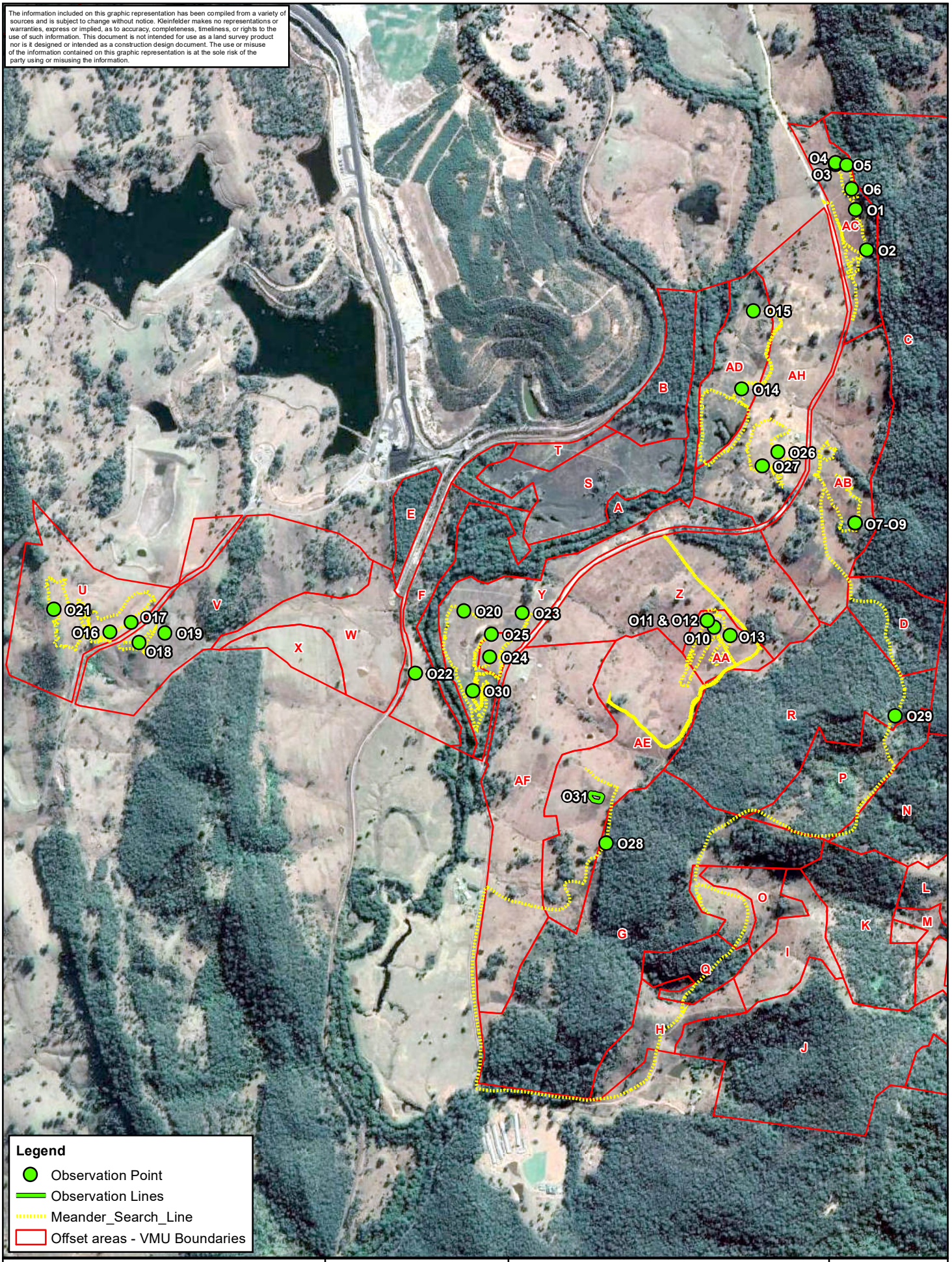
Blackberry was observed in most VMUs, and areas of previous treatment were also noted e.g., OB31 in VMU AE, but large patches were recorded in VMU U (W3 and W4) and smaller patches in VMU Y (W5, W6 and W7) and VMU AH (W8 and W10, W53).

Privet was recorded in the VMUs adjoining Mammy Johnson's River (Rough-barked Apple – Red Gum Grassy Woodland). This is not an unexpected result given that the vegetation along the river is heavily infested with Privet and this acts as a source. Privet was observed in VMU F and VMU S, recorded in VMU AD (W13), VMU AH (W49, W50 and W51), and VMU Y (W24 to W27).

Wild Tobacco was observed in all of the Rough-barked Apple – Red Gum Grassy Woodland VMUs but was also recorded in VMU U (W31).

Lantana was more prevalent in areas of remnant vegetation but was recorded encroaching into grassland areas such as VMU AB (W11) and VMU U (W28).

Less commonly observed/recorded weed species included Moth Vine in VMU Y (W21) and VMU AD (W15), Noogoora Burr in VMU Y at W45 and Inkweed in VMU P at W14. An area of interest is in VMU I, W2, where Narrow-leafed Cotton Bush has heavily infested the crown of the hill. This weed is not usually a weed of concern given its widespread but usually sparser occurrence, but this is a particularly heavy infestation, and its location at the top the hill facilitates spread and hinders natural recruitment of native species.



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PROJECT REFERENCE: 20213674

DATE DRAWN: 2021/09/08 09:22Version 1

DRAWN BY: GJoyce

DATA SOURCE:
Stratford Coal - 2015
Google Earth - 2018

Walkover Observations

Stratford Coal Pty Ltd
2021 Duralie Biodiversity Offsets Monitoring Report
Duralie Open Cut Coal Mine Biodiversity Offsets
Johnson's Creek Rd, Stroud Road, NSW

FIGURE:

3

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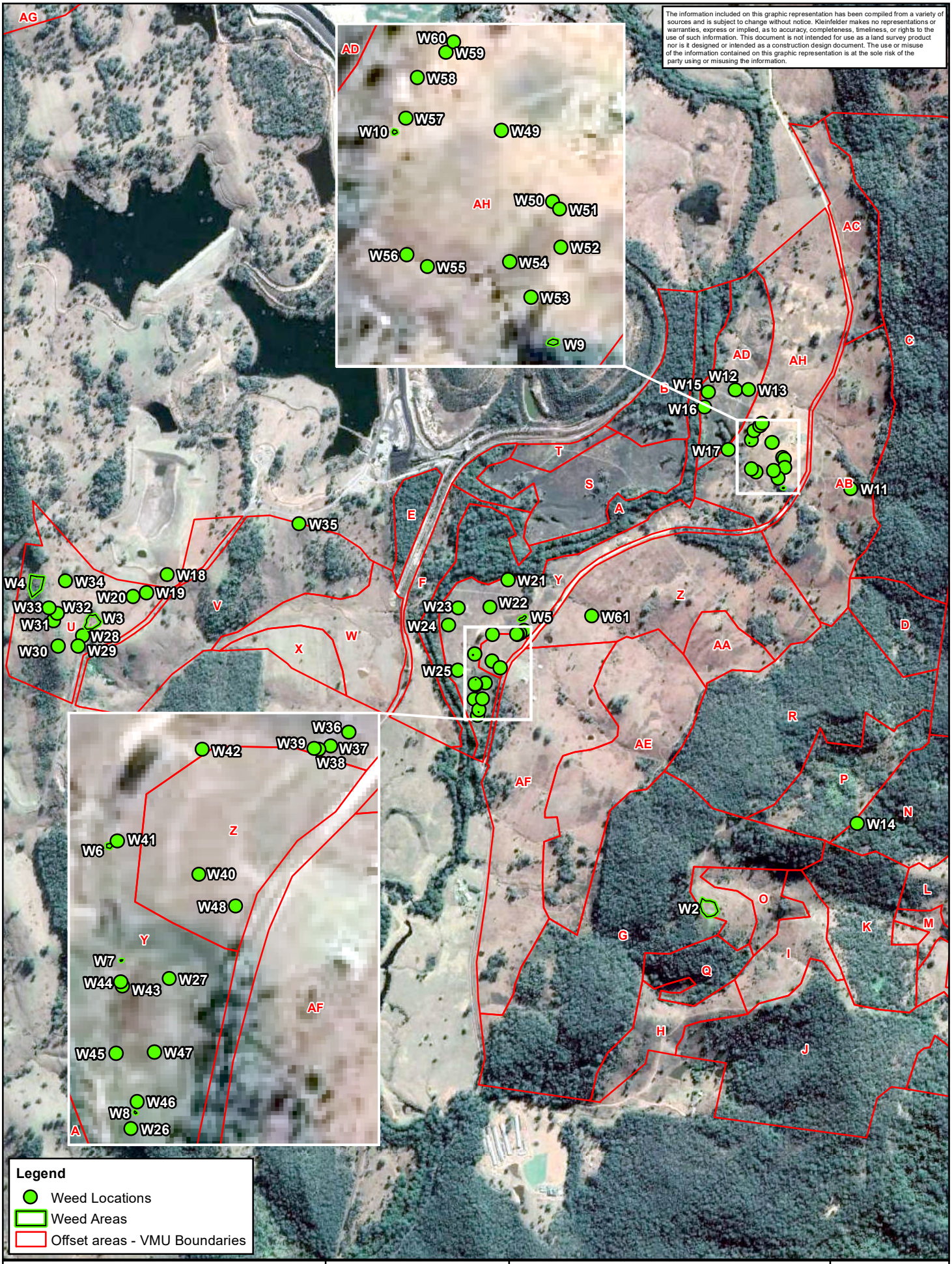

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DATE DRAWN: 2021/09/07 12:02Version 1

DRAWN BY: GJoyce

DATA SOURCE:
Stratford Coal - 2015
Google Earth - 2018

Weed Observations

Stratford Coal Pty Ltd
2021 Duralie Biodiversity Offsets Monitoring Report
Duralie Open Cut Coal Mine Biodiversity Offsets
Johnson's Creek Rd, Stroud Road, NSW

FIGURE:

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6 DISCUSSION AND RECOMMENDATIONS

6.1 LANDSCAPE FUNCTIONAL ANALYSIS

LFA Indices for the installation VMUs are generally recovering well from the multiplied disturbances that has occurred over the period of the monitoring. Of the 18 VMUs surveyed, most have experienced at least one round of biomass reduction and/or fire, either as a controlled burn (VMUs AA, AB, and Z) and/or as the Buckley's Range Fire in 2019 or as one or more episodes of slashing. Two VMUs (I and U) have had grazing used to control biomass albeit, with only minimal success. This level of disturbance has influenced the Infiltration and Nutrient Cycling Indices. When VMUs are listed according to the time since disturbance and number of disturbances (**Chart 7**) there is a rough correlation with index scores, with the most recently and frequently disturbed areas recording the lowest Index scores, with the Infiltration and Nutrient Cycling indices being particularly affected, although the Stability Index scores also show this pattern. There may be some confounding factors including aspect and position in landscape, but VMUs (with the exception of VMU AA) recently affected by fire and slashing have the lowest index scores.

This indicates that the VMUs with lower indices now require time to mature and allow for increases in soil nutrients and litter accumulation before further in-planting is undertaken.

6.2 VEGETATION DYNAMICS AND FLORISTICS

Nine VMUs had vegetation dynamics measured, and eight of these were Installation VMUs. Of these only VMUs F, W have achieved or nearly achieved the target stems densities, while VMU Y has nearly achieved the canopy density target of 100 canopy stems/ha for woodland – noting that the majority of surviving stems are canopy. VMU AA has recently undergone a planting event, and the increased stems do reflect additional stems. Next year's survey will be a more accurate representation of survival as the planted stems mature and become visible above the pasture grasses. In the light of the above statement regarding the allowance of time before additional panting is to be undertaken, the Rough-barked Apple – Red Gum Woodland VMUs, VMUs AD and Y have had a sufficient time since last planted to allow for additional in-fill planting to occur. In the case of VMU Y, shrub and midstory species are required, while VMU AD requires additional stems of all strata to reach target densities.

Natural recruitment was observed in most VMUs (VMU X being the only exception). Mainly this is limited to edges adjacent to remnant vegetation, or amongst stands of paddock trees. The Buckley's Range Fire did stimulate some native regeneration (i.e., VMU I), especially of shrubs, although where the fire was the least intense in VMU AC there was sporadic natural regeneration across much of the area.

As reported in **Section 5.2** – **Weeds** woody weeds are also regenerating, and almost all of the VMUs are affected to some degree. The weed species that are suggested to require treatment are Blackberry, Lantana, Inkweed, Noogoora Burr, Privet and Wild Tobacco. The DCM are conducting weed control works targeting Blackberry, but additional works are required to prevent further infestations, and as the planting efforts increase, more labor-intensive methods will be required. VMU U requires works to be undertaken along the ridgeline with emphasis on staff safety. VMUs along Johns Creek also require efforts to control Privet and Wild Tobacco encroachment.

It is acknowledged that weed control works will always be required as adjoining properties where control works are not performed as often will act as a constant source of re-infestation.

The flora monitoring show that as a rule, the installation VMUs become more dominated by exotic grasses and herbs the closer to Johnsons Creek they are located. These VMUs, Rough-barked Apple – Red Gum Woodland, were more intensively grazed, and in the case of VMU S and T were used for dairy farming. Native grasses, such as *Themeda triandra* and *Imperata cylindrica*, dominate on the upper slopes of VMUs e.g., VMU V, U, AA, AB, AC and AE. Efforts to reduce the coverage of exotics and re-introduce native species has proven difficult due to the prevalence of the exotic species soil seed bank. As has been observed on the spoil emplacement revegetation, it is envisaged that as the planted canopy and shrubs mature, they will act to shade out some of the exotic species and allow native grand covers to colonise.

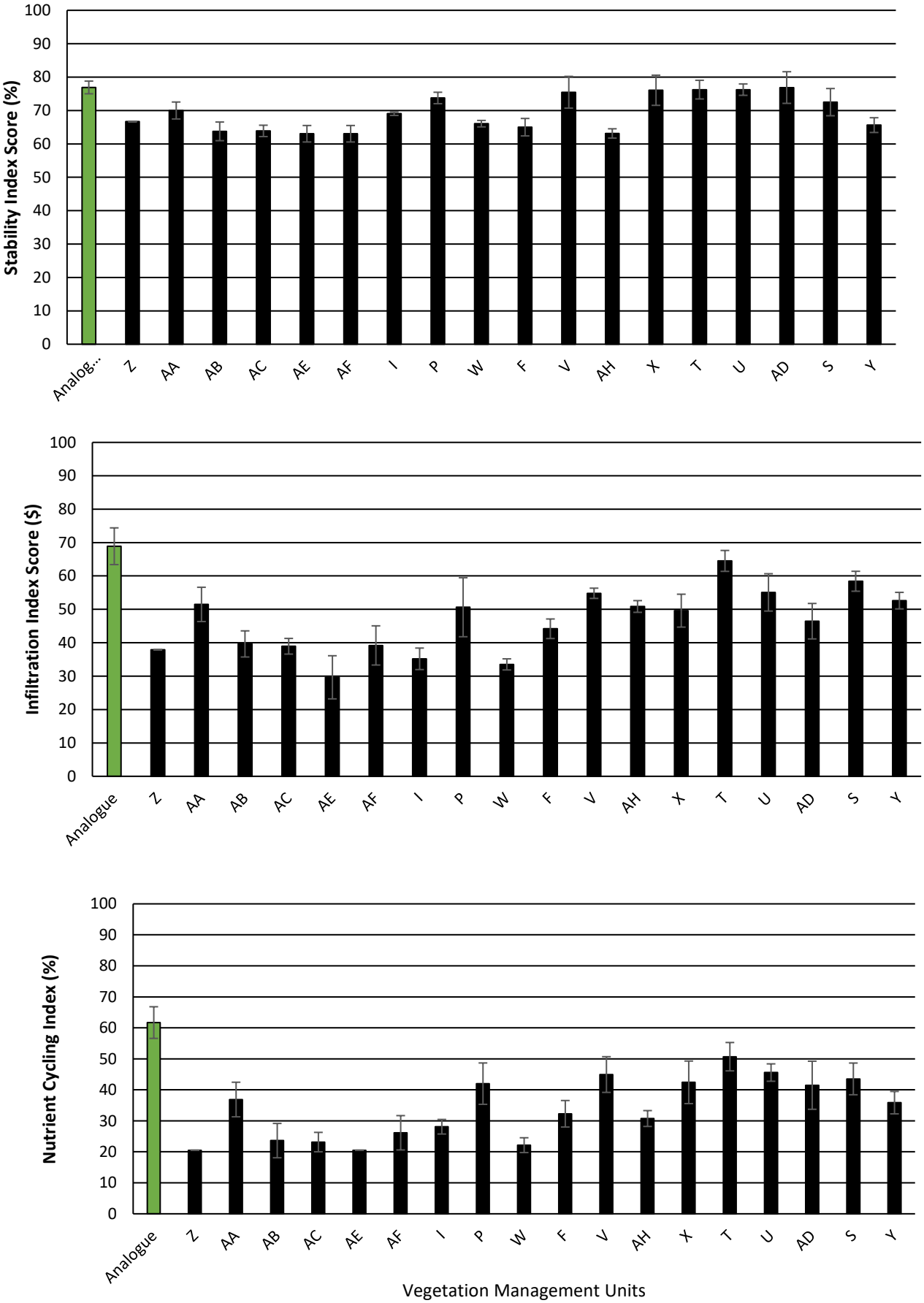


Chart 7: **Vegetation Management Units (from left to right) in decreasing intensity, number and/or time since last major disturbance such as slashing, ripping, fire or grazing.**

6.3 RECOMMENDATIONS

Since the completion of the field work for this report, installation of tubestock has been undertaken on several VMUs within the Offsets. These included VMUs AB, AC, AE, AF, S, U and Z. When combined with the tubestock installation undertaken in May 2020, additional survey effort will be required – vegetation dynamics – to measure the effectiveness of these planting campaigns. Currently vegetation dynamics have been conducted on nine of the VMUs (**Table 4**), with eight of those installation VMUs. Next survey it is anticipated that an additional nine VMUs will require this level of monitoring. This

Additional planting will be required for several VMUs to achieve target densities. As noted in the individual VMU discussions, these include;

- VMU AD – all strata, including additional canopy.
- VMU Y – additional shrub and midstory species only.
- VMU I – The eastern slope of this VMU has also been seeded but with little apparent success. This area could also have tubestock installation and/or seeding implemented. It is suggested that a weed control program targeting the Narrow-leaved Cotton Bush on the crown of the hill be implemented followed by a tubestock planting program.
- VMU U has had seeding (unsuccessful) and tubestock installed over a portion of the VMU, and since the monitoring was conducted, this section had had additional shrub, midstory and some canopy planted. Additional areas to the north and west could have tubestock installed. Further weed control efforts, beyond that already conducted to reduce Blackberry, is recommended to be undertaken, especially along the ridgeline and in the natural regeneration areas.
- VMU T has not had tube stock installation and consideration should be made for this area to be planted.

Additionally, VMUs L and M, located at the eastern extremity of the Offsets Areas, have not previously been surveyed or planted, but are listed as installation VMUs. Previous walkover surveys had noted good natural regeneration in these areas. These two VMUs should now be included in active revegetation and included in the surveys from next year.

As noted in the above discussion, VMUs AA, AB, AC, AE, AF and Z have been planted in 2021, and require time for “rest” from further disturbance to allow for the accumulation of litter and soil nutrients. It is suggested that further monitoring be conducted only at this stage before any in-fill planting that may be required is conducted.

Further weed control efforts are required and will be on-going. The use of drones to locate weed infestations, especially Blackberry in the grassy areas is suggested as a cost- effective monitoring technique to effectively target weed control works.

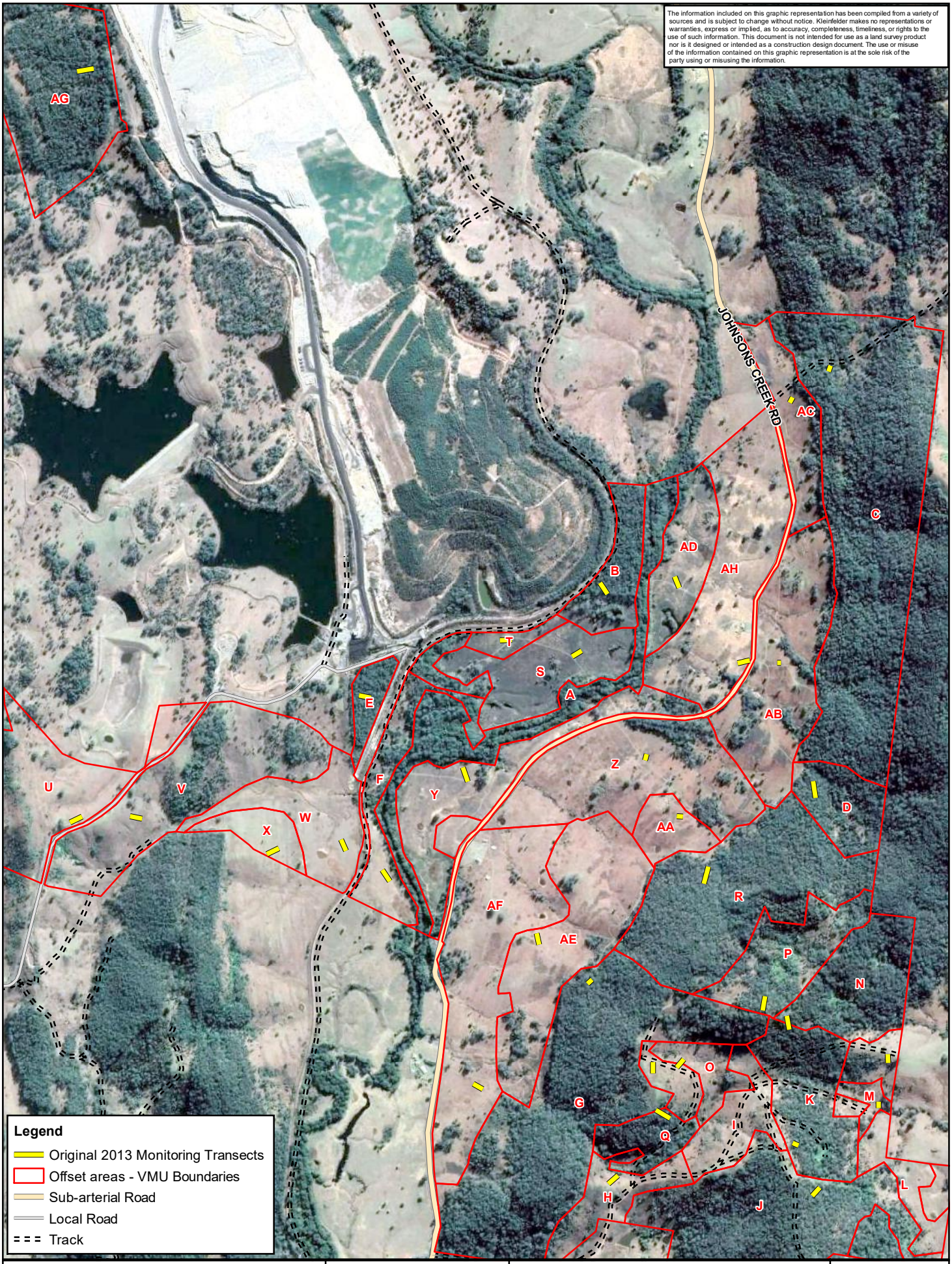
6.4 CONCLUSIONS

The revegetation of the Duralie Offsets is continuing, with the majority of the VMUs now planted either in part or in full. Several of the VMUs have been subjected to several rounds of disturbance, by design or unintentionally, and this has possibly influenced the soil biophysical processes as seen by the LFA monitoring. These VMUs should now be left for a period of time (to be determined by the LFA monitoring) to allow for conditions to improve before any further remedial action is undertaken.

Those VMUs where target densities have been achieved (VMU F and W) can now also be left to mature for a period of time to allow the vegetation to mature and determine what, if any further remedial actions are to be undertaken.

A much smaller number of VMUs can be considered for further planting to occur in the near future i.e., VMUs AD, I, U, T and Y.

APPENDIX A: ORIGINAL TRANSECT LOCATIONS



Metres
0 100 200 400 600 800 1,000
N

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PROJECT REFERENCE: 20193654

DATE DRAWN: 19/09/2019 09:24 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2019
Stratford Coal - 2015
Google Earth - 2018

Offset Areas and Original 2013 Monitoring Transect Locations

Stratford Coal Pty Ltd
2020 Duralie Biodiversity Offsets Monitoring Report
Duralie Open Cut Coal Mine Biodiversity Offsets
Johnson's Creek Rd, Stroud Road, NSW

FIGURE:

5

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APPENDIX B: RAINFALL DATA

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
2013	156.8		192.8	132.2	67.6	134	49.4	8.4	19.4	53	285.4	50.2	1149.2
2014	14.6	65.2	97.4	79.8	25.4	37.8	28.6	142.2	73.6	36	40.2	163.8	804.6
2015	140.2	46.8	144.6	255	127.4	39.2	30.2	68.8	99	36.8	130.8	79.6	1198.4
2016	303.4	71.2	47.4	31.2	16.6	150.6	57.8	89.4	72.4	51.4	83.2	52.2	1026.8
2017	57.6	100.2	323.8	87.4	20.4	133	10.6	22	9.2	76	44.4	64.4	949
2018	27.4	131.8	263.2	75	21.8	170	5.8	11.8	43.4	143.2	60.8	65.2	1019.4
2019	22.8	58	162.4	47.4	35.8	93.4	30.2	18.6	75.0	39.0	24.0	10.4	617.0
2020	70.2	242.6	114.8	27.8	76.8	70.8	116.8	32.6	38.4	88.4	33.4	207.8	1120.4
2021	173.6	196.6											
Mean	**114.5**	**124.7**	**145.6**	**100.9**	**89.1**	**100.9**	**73.3**	**64.1**	**62.7**	**77.8**	**85.3**	**102.1**	**1137.1**

Data from BOM – Monthly Rainfall statistics for Stroud Post Office.

APPENDIX C: WALKOVER AND WEED OBSERVATIONS

Observation Type	Comments	Label	VMU
Observation	Natural recruitment of Eucalypts and shrubs in remnant - 5m from drip line	O1	AC
Observation	Good Natural recruitment - canopy and shrubs	O2	AC
Observation	High cover of native grasses, e.g. *Themeda triandra* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass) and *Austrostipa scabra* (Speargrass). *Comesperma ericinum* (Pyramid Flower) regeneration	O3	AC
Observation	Eucalyptus natural regeneration	O4	AC
Observation	*Ozothamnus* diosmifolius (Rice Flower) - natural regeneration	O5	AC
Observation	Eucalyptus, Daviesia natural regeneration	O6	AC
Observation	Eucalypts natural regeneration	O7	AB
Observation	Very high native ground cover - *Themeda triandra* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass) and *Austrostipa scabra* (Speargrass)	O8	AB
Observation	Natural regeneration - Eucalypts, shrubs and climbers	O9	AB
Observation	Eucalypts natural regeneration	O10	AA
Observation	Eucalypts natural regeneration	O11	AA
Observation	Planted Eucalypts survival	O12	AA
Observation	Planted Eucalypts and Acacia survival	O13	AA
Observation	Good Eucalypts survival	O14	AD
Observation	Good Eucalypts survival	O15	AD
Observation	Good *C. maculata* survival - planted	O16	U
Observation	Good *C. maculata* survival - planted	O17	U
Observation	Small amount of Acacia and Eucalypts survival	O18	V
Observation	Small amount of Eucalypts survival	O19	V
Observation	*Callistemon rigidus* flowered	O20	Y
Observation	*Eucalyptus* seedling natural recruitment good diversity on ridge and west and downslope of ridge	O21	U
Observation	Photo point VMU F	O22	F
Observation	Good survival – *E. amplifolia*., *C. rigidus*, *M. styphelioides*	O23	Y
Observation	Good survival - *E. amplifolia*	O24	Y
Observation	Good survival - *Eucalyptus amplifolia*, *Callistemon rigidus*	O25	Y
Observation	*A. longifolia* survival	O26	AH
Observation	Some Eucalypts spp., and *A. longifolia* survival	O27	AH
Observation	Fallen tree blocking track and damaged fence	O28	AE
Observation	Erosion – Tunnel, On track	O29	R

Observation Type	Comments	Label	VMU
Observation	Off-target Chem spraying. *Eucalyptus amplifolia* dieback	O30	Y
Observation	*Rubus fruticosus agg.* (Blackberry) treated area	O31	AE
Weed	*Gomphocarpus fruticosus* (Narrow-leaf Cotton Bush)	W2	I
Weed	*Rubus fruticosus agg.* (Blackberry) - 5x large patches	W3	U
Weed	*Rubus fruticosus agg.* (Blackberry) -large patches	W4	U
Weed	*Rubus fruticosus agg.* (Blackberry) patches	W5	Y
Weed	*Rubus fruticosus agg.* (Blackberry) patches	W6	Y
Weed	*Rubus fruticosus agg.* (Blackberry) patches	W7	Y
Weed	*Rubus fruticosus agg.* (Blackberry) patches	W8	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W9	AH
Weed	*Rubus fruticosus* agg. (Blackberry)	W10	AH
Weed	*Lantana camara* (Lantana)	W11	AB
Weed	*Rubus fruticosus* agg. (Blackberry) - some missed during weed control	W12	AD
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W13	AD
Weed	*Phytolacca octandra* (Inkweed)	W14	P
Weed	*Araujia sericifera* (Moth Vine)	W15	AD
Weed	*Rubus fruticosus* agg. (*Rubus fruticosus agg.* (Blackberry)	W16	AD
Weed	*Ligustrum sinense* (Privet - Narrow-leaf) Located across oxbow	W17	AH
Weed	*Rubus fruticosus agg.* (Blackberry)	W18	U
Weed	*Rubus fruticosus agg.* (Blackberry)	W19	U
Weed	*Paspalum dilatatum*	W20	U
Weed	*Araujia sericifera* (Moth Vine)	W21	Y
Weed	*Rubus fruticosus agg.* (Blackberry)	W22	Y
Weed	*Rubus fruticosus agg.* (Blackberry)	W23	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W24	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W25	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W26	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W27	Y
Weed	*Lantana camara* (Lantana)	W28	U
Weed	*Rubus fruticosus* agg. (Blackberry)	W29	U
Weed	*Lantana camara* (Lantana) and *Rubus fruticosus* agg. (Blackberry)	W30	U
Weed	*Solanum mauritianum* (Wild tobacco)	W31	U
Weed	*Lantana camara* (Lantana)	W32	U
Weed	*Lantana camara* (Lantana)	W33	U

Observation Type	Comments	Label	VMU
Weed	*Rubus fruticosus* agg. (Blackberry)	W34	U
Weed	*Rubus fruticosus* agg. (Blackberry)	W35	V
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W36	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W37	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W38	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W39	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W40	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W41	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W42	Y
Weed	*Rubus fruticosus agg.* (Blackberry)	W43	Y
Weed	*Rubus fruticosus agg.* (Blackberry)	W44	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W45	Y
Weed	*Xanthium occidentale* (Noogoora Burr)	W46	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W47	Y
Weed	*Rubus fruticosus agg.* (Blackberry)	W48	Y
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W49	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W50	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W51	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W52	AH
Weed	*Rubus fruticosus agg.* (Blackberry)	W53	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W54	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W55	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W56	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W57	AH
Weed	*Rubus fruticosus agg.* (Blackberry)	W58	AH
Weed	*Ligustrum sinense* (Privet - Narrow-leaf)	W59	AH
Weed	*Rubus fruticosus agg.* (Blackberry)	W60	AH
Weed	*Rubus fruticosus agg.* (Blackberry) along creek line	W61	Z

APPENDIX B

SITE CHARACTERISTICS

The following table outlines key characteristics and size of the Bowens Road North Offset Areas and Duralie Coal Mine Offset Areas including proposed treatment (i.e. remnant vegetation management and/or revegetation).

Associated Project	Offset Ecological Community	Offset Areas (ha)	Proposed Offset Treatment
Bowens Road North Offset Strategy Offset	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin	14.2	Revegetation(Regrowth management/ revegetation)
Bowens Road North Offset Strategy Offset	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	3.7	Revegetation (Regrowth management/ revegetation)
Bowens Road North Offset Strategy Offset	Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	1.1	Remnant
Bowens Road North Offset Strategy Offset	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin	6.0	Remnant
Bowens Road North Offset Strategy Offset	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	4.0	Remnant
Original Duralie Mine Offset	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	3.1	Remnant
Duralie Extension Offset	Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	2.2	Remnant
Duralie Extension Offset	Giant Stinging Tree - Fig dry subtropical rainforest of the North Coast and Brigalow Belt South	0.4	Remnant
Duralie Extension Offset	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast	12.9	Remnant
Duralie Extension Offset	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin	10.1	Remnant
Duralie Extension Offset	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	233.6	Remnant
Duralie Extension Offset	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	3.6	Remnant
Duralie Extension Offset	Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	7.7	Remnant
Duralie Extension Offset	Weeping Lilly Pilly - Water Gum riparian rainforest of the southern North Coast	20.2	Remnant
Duralie Extension Offset - Northern	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	5.2	Remnant
Duralie Extension Offset - Northern	Grey Box – Forest Red Gum – Grey Ironbark open forest of the hinterland ranges of the North Coast	3.5	Remnant
Duralie Extension Offset	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast	166.7	Revegetation (Regrowth management/ revegetation)
Duralie Extension Offset	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin	45.0	Revegetation (Regrowth management/ revegetation)
Duralie Extension Offset	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	169.6	Revegetation (Regrowth management/ revegetation)

Associated Project	Offset Ecological Community	Offset Areas (ha)	Proposed Offset Treatment
Duralie Extension Offset	Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	0.1	Revegetation (Regrowth management/ revegetation)
Duralie Extension Offset	Tallowwood - Brush Box - Sydney Blue Gum Moist shrubby forest on coastal foothills of the southern Northern Coast	10.3	Revegetation (Regrowth management/ revegetation)
Duralie Extension Offset - Northern	Acacia Regeneration	0.3	Revegetation (Regrowth management/ revegetation)
Duralie Extension Offset - Northern	Derived Grasslands in Coastal Valleys	3.5	Revegetation (Regrowth management/ revegetation)

APPENDIX C

VEGETATION MANAGEMENT UNIT SUMMARIES FOR THE OFFSET AREAS

The following table summarises Vegetation Management Unit characteristics as observed at the time of survey.

VMU	Size (ha)	State Classified Ecosystem	Ecobiological-mapped Ecosystem	Parent material-geology / soil condition	Framework species present (order of dominance) / overall coverage / average height	Biotic blocks to succession (weeds) : grass density	Biotic blocks to succession (weeds) : shrub / other	Abiotic Blocks	Site Resilience (low – high)	Recommended Treatment (Installation / Regrowth Management / Remnant Enhancement)
A	21.1	Weeping Lilly Pilly - Water Gum riparian rainforest of the southern North Coast	6. Riparian Closed Forest	Alluvium	*Waterhousia floribunda, Casuarina cunninghamiana, Tristaniopsis laurina, Eucalyptus saligna, rainforest spp.* Equivalent to: Lowland Forest on Floodplain EEC / 95% / 25m	*Sporobolus sp* restricted to remnant edges & tracks	privet >50%; tobacco tree 20-50%; purple top 10%; Tradescantia is present on site, Salix sp. Present on site. Isolated camphor laurel	Compaction due to cattle	High	Remnant enhancement
B	9.8	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant) / / Sydney Peppermint – Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	5. Cabbage Gum Floodplain Forest 7. Stringybark Paperbark Forest	Alluvium Conglomerate	5. *Eucalyptus amplifolia, Eucalyptus globoidea* Equivalent to: Riverflat Eucalypt Forest on Coastal Floodplain EEC / 70%/ 35m 7. *E.acmenoides, E. carnea, E. amplifolia* / 80% / 30m	whiskey grass 40% (open areas)	small leaf privet 10%	None noted	High	Remnant enhancement
C	70.5	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	Sedimentary	*E. siderophloia, E. teriticornis* / 70% / 8m *E. siderophloia, E. canaliculata* / 70% / 8m	whiskey grass isolated	Erosion - cattle grazing & overstocking Remnant regrowth overstocked - no action required. Blackberry 20%; small leaf privet isolated, lantana isolated	Compaction due to cattle Steep slopes Highly erodable	High	Remnant enhancement
D	9.5	Combination of Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast / / Rainforest and Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	2b, 2c. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest 8. Dry Gully Rainforest 9. Blue Gum Moist Forest	TBC	*Corymbia maculata, E. tereticornis* / 70% / 16m	None noted	Lantana scattered 2%; very thick lantana in gully point 71.	None noted	High	Remnant enhancement / Regrowth Management
E	3.9	Sydney Peppermint – Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	7. Stringybark Paperbark Forest	TBC	7. E.*acmenoides, E. carnea, E. globoidea* /60% / 18m	Sporobolus sp restricted to remnant edges & tracks. Excellent native grasses in buffer area and remnant.	Isolated lantana, isolated tobacco tree, Grevillia robusta.	Isolated remnant bordered by train line.	High	Remnant enhancement / Regrowth Management
F	15.3	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	5. Cabbage Gum Floodplain Forest	Alluvium	*Eucalyptus amplifolia, E. teriticormis, Eucalyptus globoidea* Equivalent to: Riverflat Eucalypt Forest on Coastal Floodplain EEC	Exotic pasture grasses (95%) High biomass	None noted	Compaction / Periodic inundation	Low (Some parent trees available)	Remnant enhancement / Installation (half of VMU)
G	60.9	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2b. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEAT / PEA	2b. *E. carnea, E. saligna, E. tereticornis* / 70% / 15m (remnant area)	Lantana	None noted	Compaction due to cattle	High	Remnant enhancement

VMU	Size (ha)	State Classified Ecosystem	Ecobiological-mapped Ecosystem	Parent material-geology / soil condition	Framework species present (order of dominance) / overall coverage / average height	Biotic blocks to succession (weeds) : grass density	Biotic blocks to succession (weeds) : shrub / other	Abiotic Blocks	Site Resilience (low – high)	Recommended Treatment (Installation / Regrowth Management / Remnant Enhancement)
H	9.3	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2b. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	Clay / Loam PEA / Volcanic	Open paddock	Sporobolus sp. Present. Whiskey grass and fireweed present. Kikuyu present in pasture.	Patches of blackberry in Gully.	Compaction due to cattle	Low	Installation
I	13.3	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2b. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	Clay / Loam PEA / Volcanic	Open paddock	Exotic grass pasture	Isolated lantana, Scotch thistle isolated, thick along fence line. Blackberry 10%	Compaction due to cattle	Low	Installation
J	44.5	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2b. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	Clay / Loam PEA / Volcanic	Open paddock and remnant regrowth area. *E. teriticornis, E. acmenoides, E. canaliculata, E. siderophloia, E. carnea* / 80% / 17m	Whiskey Grass 10%	Thistle < 1%, lantana < 1%, blackberry 1-10% small to medium briars, cida is thick along the top of the paddock	Compaction due to cattle	Med / High	Remnant enhancement
K	17.5	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest & Spotted Gum-Red Ironbark Thick Leaved Mahogany Forest	PEA	*Corymbia maculata, Ang. florabunda* / 80% / 15m	Sporobolus sp. Present on tracks	High fire frequency, Steep slopes, Lanatana thick and dense within the shrub layer >50%	Compaction due to cattle	Med / Low	Remnant enhancement
L	11.3	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEA	Open paddock	Light exotic pasture, good native grass diversity	Macropod grazing	Compaction	Med	Installation
M	4.1	Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	9. Blue Gum Moist Forest	PEA	*E. saligna, Lophostemon confertus* / 10% / 17m	Light exotic pasture, good native grass diversity	Cattle & macropod grazing. Seeding remnant trees above drainage lines. Lantana 20-50%, isolated blackberry	Compaction due to cattle	Med	Installation
N	16.6	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant) // Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest 9. Blue Gum Moist Forest	PEA	*C. maculata, E. acmenoides* / 80% / 17m	None noted	Open areas dominated by lantana >50%	None noted	High	Remnant enhancement
O	5.4	Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	9. Blue Gum Moist Forest	PEA	Upper slopes: *C. maculata, E. acmenoides* / 80% / 17m Drainage lines: community 9 - no remnant vegetation	Whiskey Grass and Sporobolus sp present	9. Blue Gum Moist Forest - no parent trees available.	Compaction due to cattle	Low	Installation

VMU	Size (ha)	State Classified Ecosystem	Ecobiological-mapped Ecosystem	Parent material-geology / soil condition	Framework species present (order of dominance) / overall coverage / average height	Biotic blocks to succession (weeds) : grass density	Biotic blocks to succession (weeds) : shrub / other	Abiotic Blocks	Site Resilience (low – high)	Recommended Treatment (Installation / Regrowth Management / Remnant Enhancement)
P	15.0	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEA	*E. tereticornis, E. acmenoides* / 60% / 20m	>20% native grass cover in open cleared areas, bidens present.	Lantana <10%, becomes thicker under canopy	Grazing impacts & compaction due to cattle	High	Regrowth management
Q	6.5	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest 9. Blue Gum Moist Forest	PEA	2d. Slopes: *C. maculata, E. acmenoides* / 70% / 17m 9. Drainage lines: *L.confertus, E. saligna*-mixed rainforest understory / 30%/ 17m	Inaccessible, steep upper slopes	Blackberry thick briars running along riparian zone >10%, Lantana < 1%, Crofton Weed < 1%	Compaction due to cattle	Med (Some native cover & parent trees available)	Installation
R	38.9	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEA	*E. siderophloia, E. teriticornis* / 70% / 8m *E. siderophloia, E. canaliculata* / 70% / 8m		Erosion - cattle grazing & overstocking Remnant regrowth overstocked - no action required. Blackberry 20% Small leaf privet isolated, lantana isolated Lantana <10%	Compaction due to cattle Steep slopes Highly erodable	High	Remnant enhancement
S	16.5	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	5. Cabbage Gum Floodplain Forest	Alluvium	Open paddock and scattered paddock trees. *Eucalyptus amplifolia, Eucalyptus globoidea* Equivalent to: Riverflat Eucalypt Forest on Coastal Floodplain EEC	100% cover of exotic pasture, including Kikuyu and clover. Significant biomass of grass material.	None noted	Compaction due to cattle	Low	Installation
T	2.7	Sydney Peppermint – Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin	7. Stringybark Paperbark Forest	Alluvium	Open paddock and sparce paddock trees. *Eucalyptus amplifolia, Eucalyptus globoidea, E. tereticornis*.	100% cover of exotic pasture, including Kikuyu and clover. Significant biomass of grass material.	None noted	Compaction due to cattle	Low	Installation
U	24.0	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Spotted gum Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEAT / PEA	Open paddock and scattered paddock trees. *E. siderophloia, C. maculata, E. globoidea, E. carnea, E. tereticornis.*	Open paddocks of native & exotic pasture. *T. australis & I. cylindrica. Sporobolus sp* present.	Blackberry outside paddock area, asparagus fern present	Compaction due to cattle	Low - Med (Limited reproductive parent trees available. Native groundcover diverse but low abundance).	Installation
V	31.7	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Spotted gum Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEAT / PEA in bands	Open paddock and scattered paddock trees. *C. maculata, E. siderophloia, E. canaliculata, E. moluccana, E. tereticornis*	Groundlayer a mix of exotic and native grasses. Good native cover. Fireweed & *Sporobolus sp*. in paddock.	Cattle & macropod grazing. Seeding remnant trees in patches. Lantana 20-50%, blackberry < 1%. Gully area approx. 4,000m2 of blackberry. As valley progresses north, blackberry and lantana increase. Powerlines present on site.	Compaction due to cattle	Low - Med (Limited reproductive parent trees available. Native groundcover diverse but low abundance).	Installation

VMU	Size (ha)	State Classified Ecosystem	Ecobiological-mapped Ecosystem	Parent material-geology / soil condition	Framework species present (order of dominance) / overall coverage / average height	Biotic blocks to succession (weeds) : grass density	Biotic blocks to succession (weeds) : shrub / other	Abiotic Blocks	Site Resilience (low – high)	Recommended Treatment (Installation / Regrowth Management / Remnant Enhancement)
W	14.8	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	5. Cabbage Gum Floodplain Forest	Alluvium	Open paddock and scattered paddock trees. *E. amplifolia, E. tereticornis*. Equivalent to: Riverflat Eucalypt Forest on Coastal Floodplain EEC	Groundlayer a mix of exotic and native grasses. Good native cover; *T. australis, I. cylindrica. Fireweed & Sporobolus sp*. in paddock.	Cattle & macropod grazing. Seeding remnant trees in patches. Powerlines present on site. Lantana <1 %, blackberry < 1 %	Compaction due to cattle	Low - Med (Limited reproductive parent trees available. Native groundcover diverse but low abundance).	Installation
X	5.4	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Spotted gum Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEAT / PEA in bands	Open paddock and scattered paddock trees. Slopes: *C. maculata, E. carnea, E. canaliculata*. Lower slopes: *A. floribunda*	Groundlayer a mix of exotic and native grasses. Good native cover. Isolated fireweed	Cattle & macropod grazing. Seeding remnant trees in patches. Powerlines present on site. Isolated blackberry <1 %, isolated Lantana < 1 %	Compaction due to cattle	Low - Med (Limited reproductive parent trees available. Native groundcover diverse but low abundance).	Installation
Y	20.1	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	5. Cabbage Gum Floodplain Forest	Alluvium	Open paddock and scattered paddock trees. *E. amplifolia, E. tereticornis, A. floribunda, Waterhousia floribunda* in flowing water.	Groundlayer dominated by exotic grasses. High levels of grass biomass present. Significant undulations in soil profile.	Cattle & macropod grazing. Seeding remnant trees in patches. Powerlines present on site.	Compaction due to cattle	Low (Limited reproductive parent trees available. Exotic groundcover dominant).	Installation
Z	33.6	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	3. Grey box-Red GumGrey Ironbark Open Forest	Alluvium	Open paddock and scattered paddock trees. 3. *E. tereticornis, E. mollucanna, E. siderophloia.* 4. *E. canaliculata, A. floribunda, E. acmenoides, E. tereticornis.* 5. *E. amplifolia, E. globoidea*	Groundlayer a mix of exotic and native grasses / sedges. Isolated fireweed. Whiskey grass dominates on lower slope S/E of road.	Cattle & macropod grazing. Seeding remnant trees in patches.	Compaction due to cattle	Low - Med (Limited reproductive parent trees available. Native groundcover present - *Carex appressa*).	Installation
AA	5.8	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Spotted gum Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest	PEAT / PEA in bands	Open paddock and scattered paddock trees. 2a-d. *E. siderophloia, C. maculata, E. globoidea, E. carnea, E. tereticornis*. 3. *E. tereticornis, E. mollucanna, E. siderophloia*. 4. *E. canaliculata, A. floribunda, E. acmenoides, E. tereticornis*. 5. *E amplifolia, E. globoidea*	Groundlayer a mix of exotic and native grasses / sedges. Good native cover. Isolated fireweed.	Cattle & macropod grazing. Seeding remnant trees in patches.	Compaction due to cattle	Med (Parent trees present, natural regeneration occurring, good native ground cover).	Installation
AB	28.9	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast (grey gum variant)	3. Grey box-Red Gum-Grey Ironbark Open Forest		Predominantly open paddock with some regenerating trees to east and in gullies.	Groundlayer a mix of exotic and native grasses / sedges.	Lantana: 1 stem/ 1000sqm, blackberry: 1 stem / 1000sqm.	Compaction due to cattle	Low	Installation

VMU	Size (ha)	State Classified Ecosystem	Ecobiological-mapped Ecosystem	Parent material-geology / soil condition	Framework species present (order of dominance) / overall coverage / average height	Biotic blocks to succession (weeds) : grass density	Biotic blocks to succession (weeds) : shrub / other	Abiotic Blocks	Site Resilience (low – high)	Recommended Treatment (Installation / Regrowth Management / Remnant Enhancement)
AC	11.3	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant)	2a-2d. Spotted Gum-Grey Ironbark-Thick Leaved Mahogany Forest		Predominantly open paddock with some regenerating trees to east.	Groundlayer a mix of exotic and native grasses / sedges.	Cattle & macropod grazing.	Compaction due to cattle	Low	Installation
AD	12.2	Rough-barked Apple - red gum grassy woodland of the MacDonald River Valley on the Central Coast, Sydney Basin (Cabbage gum variant)	Cabbage Gum Floodplain Forest		Predominantly open paddock with some regenerating trees on boundaries / gullies. Large wetland (2ha) within area.	Groundlayer predominantly exotic pastures.	Cattle & macropod grazing. Privet @ 1/sqm in drains, blackberry @ 10% cover.	Compaction due to cattle	Low	Installation (do not plant wetland).
AE	30.8	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast (grey gum variant)	3. Grey box-Red Gum-Grey Ironbark Open Forest		Predominantly open paddock with some regenerating / paddock trees.	Groundlayer predominantly native pastures.	Cattle / macropod grazing. Blackberry @ 5 %.	Compaction due to cattle	Low	Installation
AF	36.5	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast (grey gum variant)	3. Grey box-Red Gum-Grey Ironbark Open Forest		Predominantly open paddock with some regenerating / paddock trees.	Groundlayer predominantly native pastures.	Cattle / macropod grazing. Blackberry @ 5 %.	Compaction due to cattle	Low	Installation
AG	48.0	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast (Ironbark Variant) // Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast Derived Grasslands in Coastal Valleys	1. Spotted Gum – Red Ironbark – Thick-leaved Mahogany Forest 2a* Spotted Gum – Grey Ironbark - Thick-leaved Mahogany Forest 3 Red Gum Grassy Woodland 4 Grey Gum – Red Gum – Apple Riparian Forest		Predominantly mature regrowth with some small regenerating cleared areas dominated by native pastures.	Groundlayer predominantly native pastures.	Blackberry / lantana @ 5 %.		High	Remnant Enhancement / Installation
AH	31.0	Grey Box - Forest Red Gum - Grey Ironbark open forest of the hinterland ranges of the North Coast (grey box variant)	3. Grey box-Red Gum-Grey Ironbark Open Forest		Predominantly open paddock with some regenerating / paddock trees.	Groundlayer predominantly native pastures.	Cattle / macropod grazing. Blackberry @ 5 %. 3 mature camphor laurels. Mulberry.	Compaction due to cattle	Low	Installation

APPENDIX D

PLANT PALETTES FOR SPECIFIED OFFSET REVEGETATION

The following palettes provide species specification for listed revegetation Management Units. Delineation of shrubby versus grassy understorey Units is also provided, with reduced numbers of shrub plants specified in Units with a high diversity of native grass/forb species (e.g. Vegetation Management Unit V).

Grey Box - Forest Red Gum - Grey Ironbark open forest (grey box variant)
Pallette

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**	**Z (do not plant under dripline of existing trees)**	33.6	3360	40320	**43680**
Framework species layer					**AH**	31	3100	37200	**40300**
Eucalyptus molluccana	30	0.01						**TOTAL:**	**83980**
Eucalyptus tereticornis	20								
Eucalyptus siderophloia	20								
Eucalyptus canaliculata	5								
E. microcorys	10								
Remaining mix of above species									
			Plants / hectare:	**1200**					
Shrublayer			**Total plants (shrub):**	**1,200**					
Allocasuarina torulosa	20	0.12	Plant within moist areas.						
Ozothamnus diosmifolius	10								
Leptospermum polygalifolium	20								
Acacia falcata	10								
Breynia oblongifolia	10								
Acacia irrorata	10								
Remaining mix of above									

Spotted Gum - Grey Ironbark forest (Ironbark variant)

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**					
Framework species layer					**H**	9.3	930	13950	**14880**
Corymbia maculata	15	0.01			**I**	13.3	1330	19950	**21280**
Eucalyptus siderophloia	40				**L**	11.3	1130	16950	**18080**
Eucalyptus carnea	5								
Eucalyptus microcorys	5				**Q**	6.5	650	9750	**10400**
					R	38.9	3890	58350	**62240**
					AC	11.3	1130	16950	**18080**
Remaining mix of above species	35								
Shrublayer	**Where Required**						0	0	**0**
Allocasuarina torulosa	10	0.15	**Plants / hectare:**	**1500**				**TOTAL:**	**144960**
Bursaria spinosa	10		**Total plants (shrub):**	**1,500**					
Davesia ulicifolia	5								
Acacia irrorata	30								
Leptospermum polygalifolium	10		Plant in moist areas.						
Remaining mix of above									

Rough-barked Apple - red gum grassy woodland on Floodplain (Cabbage Gum Woodland Variant) pallette

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants (Canopy)	Total # Plants (Shrub)	TOTAL PLANTS
Size (ha):	**1**								
Framework species layer			**Canopy Plants / hectare:**	**100**	**F (do not plant under dripline of existing trees)**	15.3	1530	22950	**24480**
Eucalyptus amplifolia	70	0.01			**S (do not plant wetland)**	16.5	1650	24750	**26400**
Eucalyptus siderophloia	3				**W**	14.8	1480	22200	**23680**
Eucalyptus resinifera	3				**Y**	20.1	2010	30150	**32160**
Eucalyptus saligna	5				**AD (Do not plant wetland)**	12.2	1220	18300	**19520**
Eucalyptus globoidea	3							**TOTAL:**	**126240**
Eucalyptus tereticornis	5								
Remaining mix of above species									
Shrublayer		0.15							
Melaleuca nodosa	15		**Plants / hectare:**	**1500**					
Melaleuca decora	15		**Total plants (shrub):**	**1,500**					
Melaleuca stypheloides	10								
Melaleuca linariifolia	10								
Callistemon salignus	10								
Breynia oblongifolia	2								
Leptospermum poygalifolium subsp. cismontanum	5								
Ozothamnus diosmifolius	2								
Remaining mix of above									

Spotted Gum - Grey Ironbark forest (Spotted Gum variant)

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**					
Framework species layer					**U**	24	2400	52800	**55200**
Corymbia maculata	50	0.1			**V (do not plant under dripline of existing trees)**	31.7	3170	6000	**9170**
Eucalyptus siderophloia	20				**X**	5.4	540	11880	**12420**
Eucalyptus carnea	10				**AA**	5.8	580	1800	**2380**
Eucalyptus microcorys	5								
Remaining mix of above species									
Shrublayer	**Mod-Relatively sparce**								
Allocasuarina torulosa	5	0.22	**Plants / hectare:**	**2200**				**TOTAL:**	**79170**
Bursaria spinosa	10		**Total plants (shrub):**	**2,200**					
Davesia ulicifolia	10								
Acacia ulicifolia	5								
Breynia oblongifolia	10								
Acacia irrorata	30								
Leucopogon juniperinus	5								
Remaining mix of above									

Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest pallette

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**	**O**	5.4	540	10800	11340
Framework species layer					**M**	4.1	410	8200	8610
Eucalyptus saligna	30	0.01						**TOTAL:**	**11340**
Lophostemon confertus	30								
Eucalyptus microcorys	20								
Eucalyptus acmenoides	5								
Remaining mix of above species									
Shrublayer									
Acacia irrorata	25	0.2	**Plants / hectare:**	**2000**					
Allocasuarina torulosa	5		**Total plants (shrub):**	**2,000**					
Cryptocarya microneura	5								
Baekhousia myrtifolia	15		Plant within drainage lines						
Trochocarpa laurina	5								
Synoum glandulosum	5		Plant within drainage lines						
Glochidion ferdinandi	20								
Ficus coronata	5								
Remaining mix of above species									

Grey Box - Forest Red Gum - Grey Ironbark open forest (grey gum variant) Pallette

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**	**AB**	28.9	2890	1400	**4290**
Framework species layer					**AE**	30.8	3080	3000	**6080**
Eucalyptus canaliculata	30				**AF (Forest density planting, 207stems / ha for canopy species)**	36.5	7555.5	36500	**44056**
Angophora floribunda	10						0	0	**0**
Eucalyptus acmenoides	20	0.01					0	0	**0**
Eucalyptus tereticornis	15							**TOTAL:**	**54426**
E. microcorys	10								
Remaining mix of above species									
			Plants / hectare:	**1000**					
Shrublayer			**Total plants:**	**1,000**					
Melaleuca stypheloides	25		Plant within drainage lines						
Melaleuca linariifolia	25		Plant within drainage lines						
Glochidion ferdinandi	10								
Breynia oblongifolia	5								
Acacia irrorata	10	0.1							
Bursaria spinosa	10								
Alloasuarina torulosa	5								
Remaining mix of above									

Sydney Peppermint - Smooth-barked Apple shrubby open forest pallette

Species	Minimum percentage of layer	Density of layer (plants per sqm)	Notes		VMU Units	Size (ha)	Total # Plants-Canopy	Total # Plants-Shrub	TOTAL PLANTS
Size (ha):	**1**		**Canopy Plants / hectare:**	**100**	**T**	2.7	270	5400	5670
Framework species layer									
Eucalyptus acmenoides	30	0.01						**TOTAL:**	**5670**
Eucalyptus carnea	20								
Eucalyptus amplifolia ssp *amplifolia*	10								
Eucalyptus fibrosa	5								
Eucalyptus siderophloia	5								
Eucalyptus globoidea	5								
Angophora floribunda	10								
Remaining mix of above									
			Shrub Plants / hectare:	**2000**					
Shrubs	**Dense**		**Total plants (shrub):**	**2,000**					
Melaleuca nodosa	40	0.2	Plant within drainage lines / depressions						
Acacia irrorata	20								
Leptospermun polygalifolium	20								
Breynia oblongifolia	5								
Remaining mix of above	10								

APPENDIX E

REFERENCE SITE INFORMATION

Summary of Site Surveys

Site No.	Description	Ecosystem	Length	Sample Size	Total Cover	EDL Cover %	EDL Av. Ht.	T1 Cover %	T1 Av. Ht.	T2 Cover %	T2 Av. Ht.	Shrub Cover %	Notes	Dominant species
1	Remnant regrowth vegetation	Cabbage Gum Forest	50	1	74	84	24.8	84	20	64	8.67	64	Mature regrowth transitioning to Open Forest	*Eucalyptus saligna*
2	Remnant Regrowth Vegetation	Stringy-bark Paperbark Forest	50	1	70	50	27.5	50	27.5	90	4.25	90	Mature regrowth transitioning to Open Forest	*Eucalyptus amplifolia*
3	Remnant vegetation	2a-d. Spotted-Grey Ironbark-Thick leaved Mahogany Forest	50	1	65.2	94	25.0	94	25	36.4	1.07	36.4	Regrowth transitioning to forest. Westerly aspect to slope	*Corymbia maculata*
4	Remnant vegetation	4. Grey Gum - Red Gum - Apple Riparian Forest	50	1	68	82	22.3	79	22.3	58	8.78	48	Extracted from CRA Mapping 1999	*Eucalyptus canaliculata, Angophora floribunda*
5	Remnant vegetation	9. Moist Blue Gum Forest	50	1	72	84	28.6	92	28.6	86	9.4	92		*Eucalyptus saligna, Lophostemon confertus*
6	Remnant vegetation	3. Grey Box - Forest Red Gum - Grey Ironbark open forest	50	1	62	68	27.5	62	27.5	31	3.68	28		*Eucalyptus molluccana and Eucalyptus tereticornis.*

APPENDIX F

ANNUAL BIODIVERSITY REPORT 2021

Duralie Coal Mine Annual Biodiversity Report 2021

FOR THE YEAR ENDING 30 JUNE 2021

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Appendix B: DCM Annual Review 2021 – Figure 4 Mining & Rehabilitation Areas

Appendix C: AMBS Ecology & Heritage - Nest Box Programme for the Duralie Offset Area, Annual Report for 2020.

Appendix D: AMBS Ecology & Heritage - Invasive Animal Study, Duralie Coal Mining Lease and Offset areas, 2017.

Appendix E: Kleinfelder – DCM Biodiversity Offsets Planting Program Report Autumn 2021

Appendix F: Kleinfelder - Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021.

Appendix G: AMBS Ecology & Heritage - DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, 2018.

Appendix H: Alluvium - Mammy Johnson's River – Bank Stabilisation Detailed Design, 2013.

1 INTRODUCTION

The Duralie Coal Mine (**DCM**), located in the Southern part of the Gloucester Basin NSW, is approximately 30 kilometres south of Gloucester and is owned and operated by Duralie Coal Pty Ltd (**DCPL**), a fully owned subsidiary of Yancoal Australia Limited (**YAL**). This Annual Biodiversity Report has been prepared in accordance with the DCM Biodiversity Management Plan (BMP).

1.1 Scope

In accordance with the Duralie Extension Project, Project Approval 08_0203 (as modified December 2014), the proponent (DCPL) is required in accordance with *Schedule 3, condition 43* to prepare and implement a Biodiversity Management Plan (BMP). This Plan must include a:

> *"a program to monitor and report on the effectiveness of the measures in the Biodiversity Management Plan and conditions 33-43 of this approval, and the performance of the Offset Strategy, with summary reporting to be carried out annually and comprehensive reporting every three years following the independent environmental audit".*

This DCM Annual Biodiversity Report provides a review of the effectiveness of measures in the BMP for the annual year ending 30 June 2021 in accordance with Section 7.2 of the BMP. The scope of the review includes the Mining Lease area ML1427 and ML1646 and Biodiversity Offset areas as indicated on Plan A.

This report (and associated Appendices) is included as an Appendix of the DCM Annual Review which is available on the Duralie Coal website www.duraliecoal.com.au.

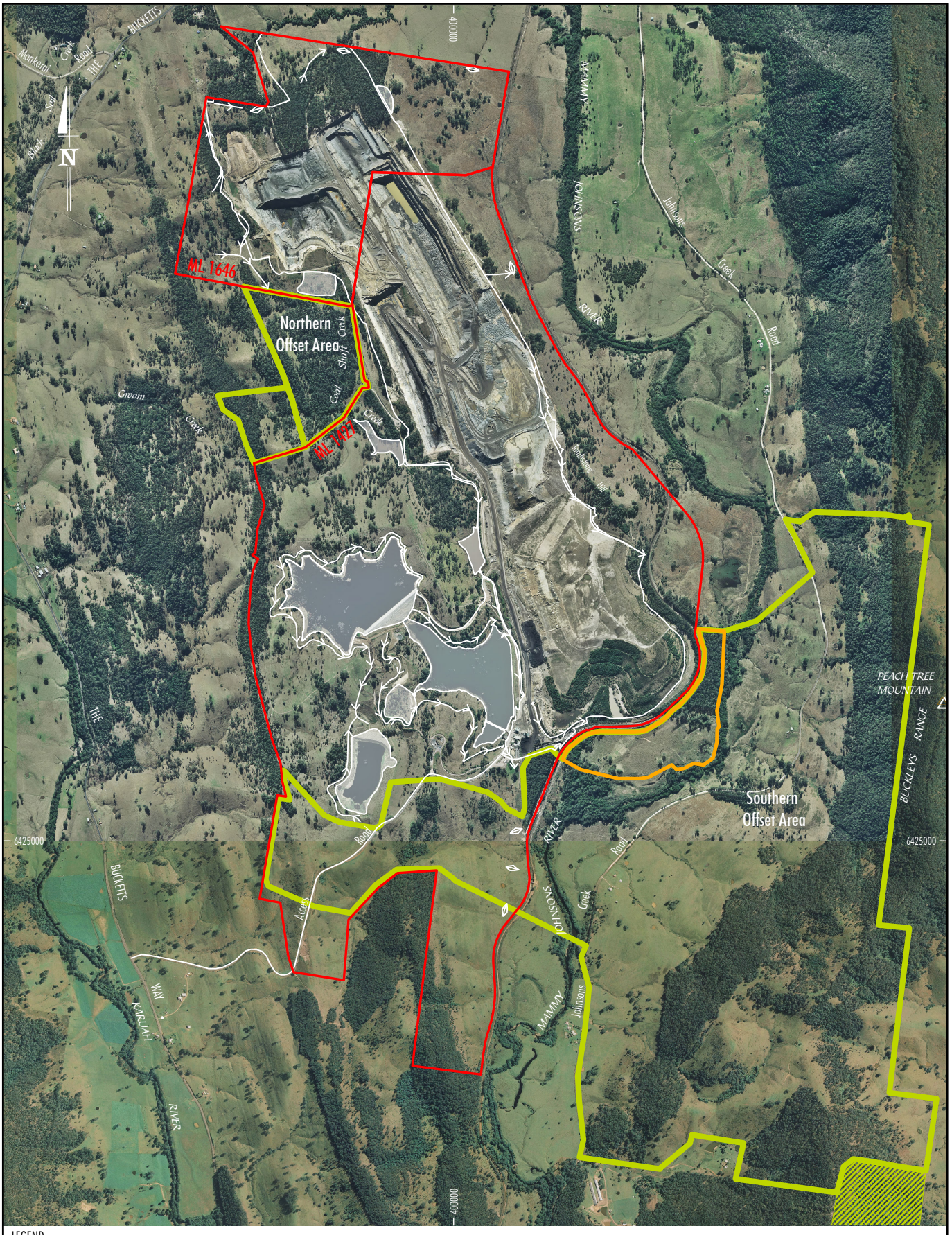
A revised BMP was submitted to the NSW Department of Planning and Environment (DP&E) and approved on **25 January 2019 (Appendix A).** Following the DCM Independent Environmental Audit undertaken in **December 2017** a revision of the BMP was prepared for the three-year period between August 2018 and July 2021 and includes broader concepts for the longer term (6+ years) management since commencement of the BMP in 2012. The key changes to the BMP include relevant updates to the performance and completion criteria tables with consideration to the works which have been completed to date.

An Independent Environmental Audit was again undertaken in December 2020. The BMP will be revised during the next reporting period to:

- reflect the current status and/or completion of the 2018 to 2021 BMP performance criteria.
- further development of longer-term (year 9+) performance criteria for the biodiversity offset strategy components.
- reflect the current stage of operations and to describe anticipated mine closure activities at the DCM for the mine closure phase.

2 STATUS OF BMP PERFORMANCE CRITERIA

Performance criteria as prescribed in the BMP is presented in **Tables 1 to 10**. The performance criteria have been developed to meet the specific objectives for the areas described in Section 2 of the BMP. All performance criteria are linked to the management specifications listed in the BMP Section 5 and Section 6, and monitoring/reporting specifications in the BMP Section 7. The status of BMP performance criteria is provided in the subsequent sections of this report.



LEGEND

- Mining Lease Boundary
- Approximate Extent of Project Major Surface
- Private Land Under Conservation Agreement
- Offset Area
- Bowens Road North Offset Area

0 1000

Metres

GRID DATUM MGA 94 ZONE 56

Source: DCPL (2014); AAHatch - Aerial Photography flown April 2009 and July 2013

BIODIVERSITY MANAGEMENT PLAN

FIGURE 3

Location of the Offset Areas

DURALIECOAL

Part of the Yancoal Australia Group

GCL-10-13 Bio MP 2018_204A

3 VEGETATION CLEARANCE PROTOCOL

3.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP Section 5.4 Vegetation Clearance Plan. Prior to any clearance operations a Clearing Plan is prepared, and vegetation pre-clearance surveys are undertaken.

Vegetation clearance for the Duralie Extension Project was finalised in 2017. During the 2020/2021 reporting period, no vegetation clearance was undertaken.

The area of disturbance at the end of June 2021 is shown in the DCM Annual Review 2021 Figure 4 (Appendix B).

Information obtained during vegetation clearance activities (i.e. habitat features, hollows cleared and fauna observed) has been used to determine the requirements for nest box replacement in the biodiversity offset areas (refer Section 4).

3.2 Salvaged and Reused Material for Habitat Enhancement

Section 5.8 of the BMP requires salvaged material from vegetation clearance activities to be used for habitat enhancement within the revegetation or rehabilitation areas. Habitat features such as trunks, logs, large rocks, branches, stumps and roots are salvaged and relocated where practicable.

As there was no vegetation clearance undertaken during the reporting period, no further habitat materials were salvaged.

During previous reporting periods cleared vegetation was managed as follows:

- Suitable trees and stumps salvaged and stockpiled for reuse.
- Mulched vegetation stored in stockpiles and used on the rehabilitation and incorporated into topsoil.

4 NEST BOX PROGRAM

Nest box management is undertaken in accordance with the BMP Section 6.4. Nest boxes will be installed to provide habitat opportunities in the short to medium-term for a number of arboreal fauna species including the Squirrel Glider.

Table 1: Nest Box Program Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Nest box strategy including target species, habitat trees/feature, nest box designs maintenance and monitoring	Nest box plan developed following habitat assessment and pre-clearance surveys (Section 5.4).		
Nest box installation Includes installation of 18 Squirrel Glider boxes, however may be expanded as required.	Hollow bearing habitat features (nest boxes) installed (Section 6.4).		Nest boxes installed.

Maintenance and monitoring of installed nest boxes. Including monitoring for European bee invasion and repair/replacement	Monitoring in autumn and spring completed. Maintenance undertaken where required (Sections 6.4 and 7.1).	Annual nest box monitoring and maintenance (Sections 6.4 and 7.1).	Nest boxes monitored and maintained, being replaced where required.

Legend	Not commenced	In progress	Completed

AMBS Ecology & Heritage (AMBS) was commissioned to implement the Nest Box Program as described in the BMP Section 5.4.2 and Section 6.4. The Nest Box Program consists of two main components:

- Replacing 18 boxes specifically targeting the Squirrel Glider; and
- Replacing boxes on a like for like basis for any hollow bearing trees cleared during vegetation clearance operations (refer to Section 3).

The installation of nest boxes has occurred over six periods with the most recent installation in **March 2021**. No further nest box installations were required resulting from vegetation clearance activities and the recent installations in the rehabilitation areas is to provide additional habitat enhancement. During the reporting period 25 nest boxes were installed in the rehabilitation areas for additional habitat enhancement and to supplement the initial 26 boxes installed in 2019. The next round of monitoring is scheduled for September 2021.

The current program involves:

- 18 nest boxes targeting the Squirrel Glider (*Petaurus norfolcensis*), installed during February 2013;
- 106 nest boxes targeting a variety of hollow-dependent species, installed during August 2013;
- 45 nest boxes targeting a variety of hollow-dependent species, installed during September 2014;
- 42 nest boxes targeting a variety of hollow-dependent species, installed during September 2016.
- 26 nest boxes targeting a variety of hollow-dependent species that were installed in the Rehabilitation Area between 16 October 2019 and 18 October 2019;
- 9 nest boxes targeting the Feathertail Glider (*Acrobates pygmaeus*) that were installed during September and October 2019; and
- 25 nest boxes targeting a variety of hollow-dependent species that were installed in the Rehabilitation Area between 22 March 2021 and 26 March.

An annual nest box monitoring report was completed by AMBS in **October 2020** (Appendix C).

The 2019 - 2020 Nest Box Programme for the Duralie Offset Area Report (AMBS, August 2021) summarises the work undertaken in relation to the Nest Box Programme for the Duralie Offset and Rehabilitation Area between October 2019 and November 2020, in accordance with the Duralie Coal Mine Biodiversity Management Plan (BMP). Works undertaken and other milestones that took place during this period included yearly monitoring of 210 nest boxes that have been installed between February 2013 and September 2016, the installation of eight new Feathertail Glider (hardwood) nest boxes in the Offset Areas, the installation of 26 nest boxes in the Rehabilitation Area, and quarterly monitoring of the new nest boxes .

A summary of results from the 2019-2020 report is provided below.

> *"Seventeen species were recorded or shown signs of previous occupation during the current reporting period, including the Squirrel Glider, Sugar Glider, Feathertail Glider (probable), Brush-tailed Phascogale, Brown Antechinus, Bush Rat, Common Brushtail Possum, Mountain Brushtail Possum, Common Ringtail Possum, Gould's Long-eared Bat, Lesser Long-eared Bat, Masked Owl, White-throated Treecreeper (probable), Eastern Rosella, Grey Shrike Thrush*

(possible), Australian Owlet-nightjar (probable) and Diamond Python. The nesting signs of the Grey Shrike Thrush is the first for the Nest Box Programme.

Three of the species recorded utilising the nest boxes are listed as vulnerable under the NSW Biodiversity Conservation Act 2016 (BC Act), the Squirrel Glider, Brush-tailed Phascogale and Masked Owl (previous signs of occupation). The Brush-tailed Phascogale was recorded nesting/breeding in a nest box on the Duralie Rehabilitation Area.

The majority of nest boxes were in good condition. Multiple nest boxes were destroyed due to a bushfire which occurred in the Southern Offset Area, as well as falling branches due to the ongoing drought. Nine nest boxes that were destroyed will require replacement. Two nest boxes that were impacted by fire and/or drought were replaced during the monitoring period.

Minor degradation was noted on several other nest boxes, such as peeling or splitting of the plywood, slight warping of the lid, disintegration of the brace plate, chewing of entrance holes, small cracks on the outside of the nest box, and moisture appearing inside the nest box. Eight nest boxes are likely to require replacing during the next monitoring survey due to more significant issues such as degradation of the lid, or heavy degradation. Five nest boxes were replaced during the current monitoring period due to ongoing degradation. Signs of the European Honey Bee were recorded at two nest boxes, but no bees were present at the time of the survey.

Overall, a total of 215 out of 245 nest boxes, or approximately 88%, have been occupied or shown signs of occupancy since their installation. This includes 100% of the Squirrel Glider nest boxes installed in February 2013, 86% of the additional nest boxes installed in August 2013, 93% of the additional nest boxes installed in September 2014, 95% of the additional nest boxes installed in September 2016, 85% of the nest boxes installed in the Rehabilitation Area in September-October 2019, and 33% of the Feathertail Glider (hardwood) nest boxes installed in September-October

Occupancy of nest boxes has generally increased over time until the previous few years when occupation rates have remained relatively constant. However, for some nest boxes there has been a noticeably decrease in occupation during 2019-2020, which is likely due to record low rainfall and extreme drought conditions. The record low rainfall experienced in the study area would negatively affect local animal populations, in particular reducing abundance and reproductive success.

Occupancy of nest boxes in the Duralie Rehabilitation Area is high 12 months after their installation. Additional nest box installations in the Rehabilitation Area may be beneficial, as the habitat is clearly deficient in tree cavities and roosting resources.

A total of twenty-five vertebrate species have now been recorded within nest boxes during the Nest Box Programme. This includes fourteen species of mammal, seven species of bird, one species of frog, and three species of reptile."

Plate 1 - Squirrel Gliders (Petaurus norfolcensis)

Plate 2 – Brush-tailed Phascogales (Phascogale tapoatafa)

5 WEED CONTROL AND MONITORING

Weed control is undertaken in accordance with the BMP Section 5.9 and Section 6.5. The weed control program aims to manage weeds to minimise their impact on native flora and fauna.

Table 2: Weed Control Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Weed Control/treatment program in remnant enhancement and regrowth management VMUs	Primary woody weed control (Sections 5.9 and 6.5). Primary control of priority target weeds described in Sections 5.9 and 6.5 commenced. Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Follow-up woody and priority weed control undertaken as per Sections 5.9 and 6.5.	Target/priority weed coverage within offset VMUs reduced by 90%.
Weed control/ management in Installation (revegetation) VMUs	Pre-cultivation spraying in all installation VMUs undertaken including control of exotic Sporobolus and fireweed (Figure 7 and Section 6.11). Second cultivation spray in all installation VMUs undertaken including control of exotic Sporobolus and fireweed where necessary (Section 6.11). Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Additional pre-planting weed treatment in all installation VMUs undertaken if required (Section 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11.	Control of competitive plants within revegetation areas until maintenance phase (detailed in Section 6.11) is complete i.e. 90% of canopy and shrub species have survived 12 months after planting including replanting of lost species.

Monitoring and reporting	Monitoring and documentation of weed species, occurrence and densities a per Section 7.1.	Monitoring and documentation of weed species, occurrence and densities as per Section 7.1.	Monitoring and reporting undertaken.

The general procedure for controlling weed involves:

- Monitoring to identify locations and densities of priority weed;
- Identification of suitable control measures;
- Implementation of the selected control measure by a suitable qualified person; and
- Follow-up inspections to evaluate effective of weed control.

Weed spraying activities are generally undertaken between the months of September and April each year. Physical management measures such as mechanical removal, slashing and/or back-burning can be undertaken at other times of the year as required.

Greening Australia were contracted to undertake an initial weed assessment of the offset area in August 2013. The aim of the weed assessment was to assist in setting priorities and developing on-ground actions for weed control and is presented in the form of a mapping survey. The mapping survey provides reference to individual weed infestations within each Vegetation Management Unit (**VMU**) for the biodiversity offset area. Each weed occurrence was allocated a priority ranking based on the species status i.e. noxious or agricultural, and the size and density of the infestation. The survey information contributed to the development of a strategic approach to the control of priority weeds and allow contractors to locate infestations using the mapping files. Additionally, it will continue to assist in tracking weeds to gauge the effectiveness of control measures and the potential spread and future distribution.

A contractor is engaged at the DCM to undertake weed management activities on an ongoing basis. Follow-up weed treatment of all remnant enhancement and regrowth management VMUs recommenced in **October 2020** and continued through to **April 2020**. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass.

Weeds monitoring to evaluate the effectiveness of control measures is undertaken in conjunction with the annual vegetation monitoring and is documented in the *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (Appendix F).

The 2020 monitoring report indicates that:

> *Weeds were recorded in all VMUs with Blackberry the most widespread despite obvious control efforts. Privet was very common in the VMUs adjoining Mammy Johnson's River, as was Wild Tobacco. Lantana was occasionally recorded in the grassy areas but was more common in the remnant vegetation areas.*
>
> *Recommendation:*
> *Weed control efforts to be expanded, recognising that weed control will always be a requirement until the Offsets are surrendered. Targeted weed control on VMU U along the ridgeline. It is further suggested that the use of drones to survey the Offsets areas for location of weed infestations be undertaken.*

6 FERAL ANIMAL CONTROL AND MONITORING

Feral animal control is undertaken in accordance with the BMP Section 5.10 and Section 6.5. The objective of feral animal control program is to manage feral animals to minimise their impact on native flora and fauna in the Biodiversity Offset Areas or the impact on agricultural production in other surrounding areas.

Table 3: Feral Animal Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Feral animal control program	Initial study undertaken.	Feral animal control as required.	Feral animal numbers within offset areas minimised as evidenced through monitoring data.
Monitoring and reporting	Monitoring and documentation of feral animal species undertaken.	Monitoring undertaken.	-

AMBS was commissioned to undertake the initial invasive animal survey, in accordance with Section 5.10 of the BMP in 2013. The objective of the study was to determine the range of invasive animals that occur or are likely to occur within the DCM and offset areas and provide recommendations for invasive animal control.

MDP Vertebrate Pest Management has been engaged by DCPL since 2016 to implement feral animal control programs across property owned by DCPL including both the Stratford & Duralie Mining Leases and the Stratford & Duralie Biodiversity Offset Areas. During the reporting period wild dog and fox control was undertaken between **October 2020** to **November 2020**. The program involved a combination of trapping and shooting. The programs were productive with a total of 4 wild dogs and 2 foxes trapped and shot over the control programs.

During the control programs no non-target species were trapped. Soft jaw wild dog traps were used to trap targeted pest animals. MDP Trap dog & trail camera monitoring was used to find and locate wild dog & fox signs in the program area for trap placement. The wild dog and fox numbers were moderate in the previous controlled areas of the Stratford/Duralie Mining Lease and Biodiversity Areas which demonstrates the control programs are being successful in having an impact and lowering the numbers and presence of wild dogs and foxes within that area. The program is showing positive results of reducing the impacts of wild dogs and foxes within the area to the native animals and reducing the impact of livestock attacks to the surrounding agricultural properties.

Plate 3 – Wild Dog

Plate 4 – Wild Dog

In accordance with the BMP Section 5.10 a follow-up feral animal monitoring survey was undertaken by AMBS Ecology & Heritage during **April 2017** to monitor the success of control programs and determine priorities for ongoing control measures. The feral animal survey covered the Duralie Mining Lease and Duralie Biodiversity Offset Area.

An extracted summary of the survey results from the *Invasive animal study of the Duralie Coal Mining Lease and Offset areas, Gloucester Valley* (September 2017) is provided below (Appendix D).

> *The results of the current invasive animal survey were similar to those from the initial invasive animal survey in 2013. A total of 14 invasive species have been recorded in the study area in the past or during recent surveys or are considered to have potential to occur. Eleven of these species were either not recorded or were recorded in very low numbers during the current surveys and are of little concern at the current time. These include the Common Starling, House Sparrow, Mallard, Rock Dove, Spotted Turtle-Dove, House Mouse, Black Rat, Brown Hare and Deer. In accordance with the BMP the abundance of these species should be monitored every two years to determine if future controls are necessary.*
>
> *Four species of invasive animal were repeatedly recorded in the study area and are a potential threat to native biodiversity. These are the Fox, Feral Cat, Rabbit and the Common Myna. Wild Dogs were also recorded in the study area. Wild Dogs are mostly seen as an agricultural threat, preying on sheep, calves and other livestock (Fleming et al. 2001). They are not generally considered to have severe negative impacts on biodiversity, although this topic has not been well studied.*
>
> *In summary:*
> *• Foxes and Feral Cats may represent a threat to biodiversity within the study area;*
> *• Wild Dogs are present in the study area, and while they may or may not be a threat to biodiversity, are currently a declared pest species;*
> *• The European Rabbit is present at low densities, but its abundance can increase rapidly, particularly if dog, fox and cat numbers decrease, and it is also a declared pest species;*
> *• The abundances of all of the above species within the study area are likely to be inter-related.*
>
> *It is therefore recommended that if control measures for Wild Dogs and/or European Rabbits are implemented in order to comply with the Pest Control Order, that any such control measures should be implemented together with control measures for Foxes and Feral Cats, in a co-ordinated manner, and the impacts monitored. Pest control in the study area should be considered in the context that the study area represents a small part of a much broader region. Pest control in the study area alone is likely to be of only temporary and limited benefit, unless carried out in a broader area in conjunction with other landholders, and carried out over the medium to long term.*

A feral animal survey of the Duralie Mining Lease and Duralie Biodiversity Offset Area is scheduled to be undertaken in September 2021. Feral animal monitoring will guide the ongoing management efforts for controlling feral animals.

7 CONTROLLING ACCESS AND MANAGING GRAZING

Controlling access and managing grazing is undertaken in accordance with the BMP Section 5.11, 6.6 and 6.7.

Table 4: Managing Grazing and Agriculture Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Managing grazing and agriculture	Livestock excluded from the Offset through installation of gates and fencing illustrated in Figure 9 (Section 6.7).		Livestock excluded from the offset.
Monitoring and maintenance of fencing and gate infrastructure	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Monitoring of gates and fencing to exclude livestock. Where required, maintenance undertaken and documented (Section 7.1).	Gates and fencing monitored and maintained.

Table 5: Controlling Access Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management	Operational Review developed. Review includes road, fire trail and culvert construction and requirements for fencing and revegetation cultivation/site preparation[2]. Maintenance activities, particularly track maintenance and slashing have been considered (Section 6.7, plus related Sections 6.9 and 6.5).		Operational Review undertaken and outcomes implemented.
Community and stakeholder engagement	Assessment of surrounding landholders and the local community to evaluate opportunities for participation in implementation of this Biodiversity Management Plan undertaken. Local council consultation has commenced regarding placement of signage on the Johnson's Creek Road bisect area of the Offset (see Figure 9 for location) (Section 6.7). Signage has been installed on the Johnson's Creek Road bisect area of the Offset to alert drivers of potential fauna on the roads.		Opportunities for landholder and community participation in the BMP identified. Local council consulting regarding signage. Signage installed on Johnsons Creek Road.
Infrastructure including access tracks, fencing, fire trails and culverts	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review[2] (Section 6.7).		Access related infrastructure identified in the Operational Review and completed.
Monitoring and maintenance of infrastructure including tracks, fire trails, signs, culverts and fences.	Monitoring and maintenance of all access tracks and fire trails has been undertaken[2] (Sections 6.7, 6.9 and 7.1).	Monitoring and maintenance of all access tracks, fire trails and warning signs has been undertaken[2] (Sections 6.7, 6.9 and 7.1).	Regular monitoring and maintenance program for roads, tracks, fire trails, signs, fences and culverts.

The implementation of the BMP management measures commenced in 2013. The BMP requires works to be undertaken to exclude livestock and control access to the Biodiversity Offset Areas.

Installation works to control access and manage grazing in the offset areas was completed in 2014. During the reporting period contractors were engaged to undertake maintenance activities on access tracks, culverts, gates and fences. The works included slashing of tracks, firebreaks and repairs to damaged gates and culverts. Additional signage was also

installed on the key access points to the Biodiversity Offset Areas. Fencing repairs were completed following the bushfires in November 2019

The *Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021* (Appendix F) found fencing on external boundaries was in good condition. At OB28 in VMU AE, a tree has fallen, blocking the track and damaging the fence. There were no signs of livestock at the time of the survey, however there was some evidence of previous access by cattle in several areas.

Livestock continue to be excluded from the Biodiversity Offset areas with the exception of 'crash grazing' programs in preparation for revegetation activities following a field assessment by a qualified consultant.

Roadside Flora and Fauna signage has been installed in accordance with advice from Great Lakes Council and with regard to Australian Standard AS1742.2. Further correspondence was held with GLC Ecologist in 2015 regarding future requirements for traffic controls within the offset areas.

Plate 5 – Biodiversity Offset fencing and signage

8 BUSHFIRE MANAGEMENT

Bushfire management is undertaken in accordance with the BMP Section 5.12 and Section 6.9. The objective of bushfire management in the Biodiversity Areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity.

Table 6: Bushfire Management Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Operational Review to facilitate site access for offset management activities including installation, inspection and bushfire management.	Operational Review completed[2]. Areas addressed within the review include road, fire trail and culvert construction along with maintenance activities, particularly track slashing (Sections 5.12 and 6.7).		

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Fire excluded from the offset for initial 3 years.	Fire excluded from offset prior to 2015 (Section 6.9).		Fire excluded from offset prior to 2015.
Bushfire management activities through hazard reduction actions installation and maintenance of relevant access infrastructure.	Access tracks, fire trails, firebreaks, fencing and culverts have been completed as per Figure 9 and the Operational Review 2 (Sections 6.7 and 6.9Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification2, hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Fire management activities have been undertaken as required, including yearly access trail inspection, maintenance and repair of inaccessible tracks within one month of identification2, hazard reduction burning (Sections 5.12, 6.7 and 6.9).	Regular bushfire management measures in place.
Monitoring and maintenance	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning	Fuel loads monitored and documented (Sections 6.9 and 7.1). Identified issues incorporated into future management planning.	Fuel loads monitored and maintained. Risks identified and managed as part of part of hazard reduction actions.

Where possible, fire was excluded from the Biodiversity Offset area during the first three years (up to 2015) to assist with native regeneration. To assist with bushfire management, access tracks and firebreaks have been constructed and maintained as shown in the BMP Figure 9.

Hazard reduction burning has been undertaken in consultation with the RFS. Continued discussions have been held with the RFS to conduct fire management activities and any such activities will be assessed and implemented to ensure the most appropriate period for ecological burn activities whilst also giving due consideration to personnel and asset safety. Following the revegetation works, the aim is to exclude fire from the offsets areas for at least 5 years to allow for tubestock and seedlings to establish.

Monitoring of fuel loads to evaluate bushfire risk and guide bushfire hazard reduction activities is undertaken in conjunction with the annual vegetation monitoring. Further detail is included in Section 10 and Appendix F. Bushfire risk will continue to be mitigated through the maintenance of access tracks and fire breaks.

The 2021 monitoring survey noted that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or bushfire (i.e. 2019) have generally recorded lower LFA indices and are still in the process of recovery and should be provided sufficient time to establish.

9 REVEGETATION MANAGEMENT

9.1 Seed Collection and Propagation

Seed collection and propagation is undertaken in accordance with the BMP Section 5.7 and 6.10.

Table 7: Seed Collection and Tubestock Supply Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Collecting and propagating seed	Seed collection (of required species as specified in Section 6.10 and Appendix D) has commenced during vegetation clearance or an alternate seed source has been obtained. (Sections 5.7 and 6.10). Seed collection from cleared vegetation finalised (Section 5.7). Seed collection to obtain required quantities and species for future revegetation continued (Section 6.10, Appendix D).		Seed collection necessary to obtain required quantities and species for future revegetation completed.
Plant propagation/ tubestock supply	Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Section 5.7, 6.10 and Appendix D or adjusted based on additional literature/field trial results.	Propagation of species required for revegetation/supplementary infill planting work in Offsets undertaken as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Plant propagation necessary to obtain quantities and species required for revegetation completed.

Revegetation in the BMP Revegetation Areas has occurred via seed and tubestock. Local endemic species are preferentially used where a seed supply is available, however consideration will be given to the use of a high quality seed sourced further from the site as required.

Where possible, seed required for revegetation activities has been collected from within the Biodiversity Offset area and surrounds. Specific tree and shrub species which have not been available for collection have been sourced through external third-party suppliers. Further seed collection may be undertaken if found necessary to meet the completion criteria of the BMP offset revegetation and mine site rehabilitation.

Kleinfelder along with several nurseries have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works.

9.2 Revegetation and Regeneration

Revegetation management is undertaken in accordance with the BMP Section 6.11 and 6.12. The aim of revegetation is to establish a range of habitat niches including native canopy, and understorey, with the goal of achieving self-sustaining vegetation communities as well as increasing the resilience to identified risks such as fire, herbivory and future weed invasion. The Revegetation VMUs in the Biodiversity Areas will be revegetated to substantially increase the area of native vegetation and maximise habitat diversity and a range of successional stages.

Table 8: Revegetation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
Operational Review	Operational review including access, tracks and cultivation requirements for implementing revegetation completed (Section 6.7).		Operational Review completed and implemented.
Implementing Revegetation - Weed management and maintenance	Pre-cultivation spraying in all installation VMUs including control of exotic Sporobolus and fireweed undertaken (Sections 6.5 and 6.11). Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-plant weed treatment in all installation VMUs as per Figure 7 undertaken as required (Sections 6.5 and 6.11). Control of competitive plants within revegetation areas as detailed in Section 6.11. Maintenance including watering and herbivory controls, undertaken as required (Section 6.11).	Pre-planting weed control undertaken, including control of threatening weeds Sporobolus and Fireweed. Competitive plants controlled during revegetation establishment.
Implementing revegetation	Initial cultivation of all proposed trial installation VMUs commenced (Vegetation Management Units I, S, U and AB.) according to guidelines in Section 6.11. Trial revegetation for VMUs I, S, U and AB completed. Plant palettes adjusted where field trails or research demonstrate alternative species/density (Section 6.10). Propagation of species required for revegetation work in Offsets commenced. Species and quantity as per guidelines in Sections 5.7 and 6.10 and Appendix D.	Revegetation planting finalised. All plants prescribed in Appendix D have been installed. (Section 6.11). Based on learnings from the revegetation trials, planting of tubestock/direct seeding in installation VMUs according to species palette and quantity guidelines in Appendix D and Section 6.1 has been completed	Species type and quantities planted according to threshold guidelines in the species palette or as guided by on site trials. 90% survival of canopy and shrub-layer plants 12 months after installation, including replacement of lost plants to above threshold levels. Revegetation areas have met Assessment Criteria and Completion criteria described in Table 24, Section 8 (e.g. 90% of all initial canopy species rates are present within VMUs).
Monitoring and reporting	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Monitoring and reporting of trial revegetation results, changes to plant palette, plant health, establishment success and maintenance activities. (Section 7.1).	Annual Monitoring and reporting completed.

Revegetation Planning, Trials & Schedule

Pre-cultivation weed spraying was undertaken in Summer to Autumn 2016 in preparation for the trial revegetation works. Initial revegetation works for VMUs I, S and U commenced in Autumn of 2016. Preparation works were completed including seed collection, inoculation, growing of tube-stock and ground preparations including weed spraying. The trial revegetation program included methods involving both tube-stocking, and direct seeding. Ground preparation was site specific and included weed spraying, crash grazing and back burning as required.

Revegetation works in VMUs AF, AE, AA and Z were undertaken during **December 2016** and included ground preparation and direct seeding of approximately 80 hectares. Due to the inability to undertake controlled burning, slashing was undertaken as an alternative option prior to direct and broadcast seeding.

Plate 8 - Loading seed for revegetation works.

Plate 9 - Spreading native tree and shrub seed.

Revegetation Implementation

Tubestock was propagated during Summer 2016/2017 in preparation for Autumn planting in 2017. VMUs Y, AD and S, (approximately 40 hectares), located on alluvial flats near Mammy Johnsons River were prepared for planting by slashing, spraying for weeds and ripping. This was followed by the planting of approximately 7,200 tube-stock in **April 2017**. The results of the 2017 re-vegetation activities are reported in the *DCM Biodiversity Offsets Revegetation Program Report Spring 2016 - Autumn 2017*.

Following the hazard reduction burning in **August 2017**, revegetation works in VMUs Z, AB and AC were undertaken. In **September 2017**, direct seeding of approximately 52 hectares was completed, followed by harrowing.

Plate 10: Tube-stock being prepared for the biodiversity offset.

Plate 11: Planted tube-stock.

Tube-stock planting of VMUs F, V, W and X was proposed for Autumn 2018 including approximately 16,000 plants over 61 hectares. The native tree seed was propagated over the Summer of 2017/2018 by Cumberland Plain Seeds. However, due to the slower than expected establishment of the tubestock, planting was postponed during winter and completed in **September 2018**. The results of the 2018 re-vegetation activities are reported in the *DCM Biodiversity Offsets Results of Spring 2018 Planting Report*.

Plate 12: *Tubestock planted in September 2018.*

Plate 13: *Tubestock planted in September 2018.*

During Spring 2019 tubestock was propagated in preparation for further revegetation works in Autumn 2020 to reach the required woodland density and species diversity in VMUs F, V, W, X, AA and AH. The results of the 2020 re-vegetation activities are reported in the *DCM Biodiversity Offsets Planting Program Report Autumn 2020*.

During Spring 2020 tubestock was propagated in preparation for further revegetation works in Autumn 2021 to reach the required woodland density and species diversity in VMUs AB, AC, AE, AF, Z, U and S. The results of the 2021 re-vegetation activities are reported in the *DCM Biodiversity Offsets Planting Program Report Autumn 2021* (Kleinfelder, 2021) in **Appendix E**. Plans showing the area for revegetation in the Biodiversity Areas in 2021 are included in **Appendix E**.

The 2021 Duralie Offsets Planting Program revegetated, or in-fill planted into seven VMUs. The 2021 planting campaign successfully installed 24, 718 plants over 112 ha of the Offsets areas. This included the large sections of Grey Box – Forest Red Gum – Grey Ironbark Open Forest in VMUs AB, AE, AF and Z, 89 ha of the total. These areas had been unsuccessfully seeded previously, potentially due to drought conditions. The installation of the tubestock and hikos ensures that revegetation of the three strata has begun.

Plate 14: *Tubestock planting in VMU V in Mar 2020.*

Plate 15: *Tubestock preparation in 2020.*

A revegetation program for 2022 has been prepared to continue to progress towards the biodiversity offset completion criteria.

Monitoring

Following the initial re-vegetation works in 2015, annual vegetation monitoring (including LFA and vegetation dynamics) was undertaken in **January 2017** and continues to be undertaken annually. Vegetation monitoring was undertaken again in February 2021. The results from the biodiversity offset monitoring are shown in Section 10. Results from the annual monitoring will be used to measure revegetation against the performance criteria and completion criteria and to determine future works requirements and maintenance activities.

10 BIODIVERSITY OFFSET MONITORING AND REPORTING

The Biodiversity Offset monitoring and reporting program is prescribed in the BMP Section 7. The program aims to monitor and report on the effectiveness of the BMP management measures and progress against the detailed performance and completion criteria.

Table 9: Monitoring and Reporting Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	CC
Monitoring and reporting	Monitoring and reporting has been undertaken[3] as per requirements in Sections 7.1 and 7.2. Independent Environmental Audit has been supplied to the NSW Secretary of the DP&E for review.	Monitoring and reporting has been undertaken[3] as per requirements in Sections 7.1 and 7.2.	Monitoring requirements completed when all completion criteria are achieved in accordance with Section 8 (e.g. 357.5 ha of revegetated woodland/open woodland habitat areas and 36 ha of revegetated forest habitat areas are a self-sustaining ecosystem).

As described in the Section 7 of the BMP an annual report reviewing DCPL's environmental performance and progress against the requirements of the BMP including monitoring and reporting is prepared annually and appended to the *Duralie Coal Mine Annual Review*. The Annual Biodiversity Report, reports on monitoring for:

- Effectiveness of revegetation in the offset area;
- Usage of the offset areas by fauna;
- Effectiveness of weed control;
- Effectiveness of feral animal control;
- Nest box monitoring program.

10.1 Habitat and Vegetation Condition Monitoring

Habitat and vegetation condition monitoring is undertaken to quantitatively measure the change in habitat and vegetation condition over time. The visual monitoring and photo monitoring programs are undertaken concurrently with the vegetation monitoring to provide additional information on the change of the Biodiversity Offset Areas over time and inform maintenance requirements.

To monitor the effectiveness of revegetation in the Biodiversity Offset Areas, Greening Australia was commissioned to undertake the baseline monitoring of LFA and vegetation structure within the Biodiversity Offset areas in **February 2013**. The baseline monitoring provides information to track the progression towards meeting the completion criteria of the BMP.

The annual vegetation and landscape function monitoring continues to be undertaken and was repeated in **February 2021.** The results are provided in the *DCM Biodiversity Offset Monitoring Report 2021* prepared by Kleinfelder (Appendix F). An extracted summary is reproduced below. The next round of monitoring is scheduled for 2022.

> *In accordance with Section 7 of the Duralie Coal Mine – Biodiversity Management Plan (2018), monitoring and assessment of the effectiveness of the Offset Area revegetation is required using the stipulated methodologies which both components of Ecosystem Functional Analysis (EFA) which includes Landscape Functional Analysis (LFA) and Vegetation Dynamics to measure the progression of the rehabilitation towards a self-sustaining ecosystem, floristic surveys and walkover surveys to assess the effectiveness of the revegetation efforts and weed control. The BMP refers to VMUs as either "installation/revegetation" or "remnant enhancement". Installation VMUs being representative of the VMUs that require extensive revegetation with woodland species, while Enhancement were VMUs requiring minimum work, usually only weed control. This report presents the results of the monitoring undertaken over four days (4th, 5th, 9thand 10th) in March 2021 and represents the third Offset areas survey undertaken by Kleinfelder. As an additional note, in November 2019, a section of the Duralie Offset areas was affected by the Buckley's Range Fire with all VMUs located to the east of Johnson's Creek Rd affected.*
>
> *A total of 18 transects were surveyed in March 2021, an increase of three transects (VMU X, V, and AH) that were surveyed in 2019 and 2020 (Table 2). These included 17 "installation" transects and one forested transect designated "regrowth management".*
>
> *The LFA used data from the 2013 baseline monitoring event conducted by Greening Australia for comparison and tracking changes over time. This data is presented as averages for the three indices.*
>
> *The 2021 survey show that VMUs that have been subject to multiple disturbances such as ground preparation associated with revegetation and/or the 2019 Buckley's Range Bushfire have generally recorded lower LFA indices and are still in the process of recovery. VMUs associated with the Grey Box - Forest Red - Gum Grey Ironbark community (VMUs AA, AB, AE and AF) and VMU AC are noticeably affected. Earlier planted VMUs and VMUs that have been recently planted, but only slashed or burned the once recorded higher LFA indices. These included the Rough-barked Apple – Red Gum Woodland and Spotted Gum – Grey Ironbark Forest VMUs, and as a point of contrast, VMU AH in the Grey Box - Forest Red - Gum Grey Ironbark community which has only been planted in May 2020.*

Vegetation Dynamics were conducted eight installation and the regrowth management VMU. The survey recorded improved stem densities in VMUs AA, F and W (33 stems/ha, 361 stems/ha and 110.6 stems/ha respectively) as a result of replanting undertaken in May 2020. VMU Y also recorded an increase in stem density, but as a result of the relocation of the transect to better capture replanting efforts. The VMU U transect was also relocated to better represent the planting effort, resulting in a slight reduction in calculated stem density. The regrowth management VMU P, also recorded a slight decrease from the previous survey, whereas VMU I, also affected by the Buckley's Range Fire recorded a dramatic increase in shrub numbers (no canopy recorded on this VMU), up from nil in 2019 to 660 stems/ha this survey.

Walkover surveys recorded good natural regeneration, especially along the edges of the installation VMUs where remnant vegetation is starting to colonise the grassy areas. Weeds were recorded in all VMUs with Blackberry the most widespread despite obvious control efforts. Privet was very common in the VMUs adjoining Mammy Johnson's River, as was Wild Tobacco. Lantana was occasionally recorded in the grassy areas but was more common in the remnant vegetation areas.

Recommendations from this survey include –

- *Allowing VMUs AA, AB, AC, AE, AF and Z have been planted in 2021, and require time for "rest" from further disturbance to allow for the accumulation of litter and soil nutrients.*
- *Additional infill planting on VMUs AD, Y (shrubs only) and VMU I (targeted at the crown of the transect hill)*
- *Consideration to expanding the planting of VMU U*
- *Consideration of planting of VMUs L, M and T.*

Weed control efforts to be expanded, recognising that weed control will always be a requirement until the Offsets are surrendered. Targeted weed control on VMU U along the ridgeline. It is further suggested that the use of drones to survey the Offsets areas for location of weed infestations be undertaken.

Overall, the revegetation of the Offsets areas is progressing well with successful establishment of native species of the targeted vegetation communities achieved. Further work is required to achieve target densities in some VMUs, and work to be instigated on the few remaining installation VMUs where revegetation has not yet been undertaken.

10.2 Fauna Monitoring

Monitoring of fauna usage within the Biodiversity Areas is conducted every three years to document the fauna species response to improvement in vegetation and habitat in the Biodiversity Areas and assess the performance in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

AMBS was engaged to undertake fauna monitoring within the Biodiversity Offset areas and native mine rehabilitation areas during February 2018. The results are provided in the *DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, February 2018* (Appendix G). An extracted summary is provided below.

"Targeted fauna surveys were undertaken at five sites within the Duralie Offset Area and two sites in the Duralie Mine Rehabilitation Area during February 2018. At most sites survey techniques included pitfall traps, funnel traps, Elliott A traps, harp traps, ultrasonic call recording, spotlighting, diurnal bird surveys and reptile searches. Opportunistic observations of signs of fauna were noted throughout the field survey period, including during transit between surveys sites".

"A total of 124 species of vertebrate were recorded, comprising 8 frogs, 10 reptiles, 56 birds and 30 mammals…, most of which were native. With the exception of reptiles, a similar number of frog, mammal and bird species were recorded at Mine Rehabilitation Area sites compared with Offset Area sites. Five introduced species were recorded during the surveys, including Cattle (Bos taurus), House Mouse (Mus musculus), European Rabbit (Oryctolagus cuniculus), Black Rat (Rattus rattus) and Red Fox (Vulpes vulpes). Fifteen of the species detected are listed as threatened or migratory on the schedules of the Biodiversity Conservation Act 2016 (NSW) and/or the Environment Protection Biodiversity Conservation Act 1999 (Cth).

Plate 16: Koala (*Phascolarctos cinereus*)

Plate 17: Long-nosed Potoroo (*Potorous tridactylus*)

The next round of fauna monitoring is scheduled to be undertaken in November 2021 and the results will be included in the next Annual Biodiversity Report.

11 MAMMY JOHNSONS RIVER STABILISATION

In accordance with Section 6.8 of the BMP a detailed design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River (MJR) has been prepared by Alluvium (2013) (Appendix H). No works on the MJR bank stabilisation have commenced during the reporting period. Further planning is required.

Table 10: MJR Bank Stabilisation Performance Criteria (PC) and Completion Criteria (CC)

Management Action	Completed Activities to June 2018	Annually from June 2018 onwards PC Maintenance Phase	Completion Criteria
River bank stabilisation design	Design for the in-stream rehabilitation of a severely eroded section of Mammy Johnsons River has been prepared. Office of Water engaged regarding plan approval[1] (Section 6.8).		Design of stabilisation plan completed and approved by the Office of Water
River bank in-stream rehabilitation		In-stream rehabilitation works undertaken[1] (Section 6.8).	Rehabilitation of severely eroded section of Mammy Johnsons River completed.

12 LONG TERM SECURITY AND CONSERVATION BOND

12.1 Long Term Security

In accordance with Condition 42, Schedule 3 of Project Approval 08_0203, DCPL is required to make suitable arrangements for the long-term security of the Duralie Extension Project Biodiversity Offset Area. DCPL used the mechanisms available under section 88E(3) of the NSW Conveyancing Act, 1919, namely:

- Registration of a Positive Covenant under section 88E(3) of the NSW Conveyancing Act, 1919; and
- Registration of a Restriction on the Use of Land by a Prescribed Authority under section 88E(3) of the NSW Conveyancing Act, 1919.

Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in **May 2015**.

12.2 Conservation Bond

In accordance with Condition 44, Schedule 3 of Project Approval 08_0203, DCPL is required to lodge a Conservation Bond with the DP&E which covers the cost of implementing the Biodiversity Offset Strategy detailed in the BMP.

The conservation bond for the Biodiversity Offset areas was calculated by Greening Australia and verified by Rider Levett Bucknell in December 2013. The terms of the conservation bond in the form of a Bank Guarantee were approved by NSW Department of Planning & Environment (DP&E) on **12 December 2013**. The Bank Guarantee has been subsequently provided to DP&E.

In December 2020, an Independent Environmental Audit of the DCM was undertaken in accordance with PA 08_0203. A revision of the BMP was approved in January 2019 in accordance with PA 08_0203 Schedule 5 Condition 4. Following this, a revision of the conservation bond will be prepared and lodged with DP&E in accordance with Schedule 3 Condition 45.

The revised conservation bond will be prepared and lodged with DPIE in the next reporting period.

13 COMMONWEALTH EPBC APPROVAL COMPLIANCE REPORTS

In accordance with Condition 20 of the Commonwealth Approval [**EPBC 2010/5396**], during the reporting period DCPL submitted to the Department of Agriculture, Water and Environment (DAWE) the following compliance report:

- *Duralie Coal Extension Project Annual Compliance Report 2021,* submitted on **29 March 2021** (Condition 20).

Additionally, the following reports were submitted annually for the first five years following the commencement of the operation:

- *DCM Implementation of the Giant Barred Frog Management Plan Annual Reports (Condition 10);*
- *DCM Implementation of the Biodiversity Management Plan Annual Reports (Condition 14(i)).*

These reports are now required to be submitted every **fifth** (5) year before the anniversary of the commencement of the operations.

14 APPENDICES

Appendix A: DP&E approval of the BMP.

Appendix B: DCM Annual Review 2021 – Figure 4 Mining & Rehabilitation Areas

Appendix C: AMBS Ecology & Heritage - Nest Box Programme for the Duralie Offset Area, Annual Report for 2020.

Appendix D: AMBS Ecology & Heritage - Invasive Animal Study, Duralie Coal Mining Lease and Offset areas, 2017.

Appendix E: Kleinfelder – DCM Biodiversity Offsets Planting Program Report Autumn 2021

Appendix F: Kleinfelder - Duralie Coal Mine Biodiversity Offsets Monitoring Report 2021.

Appendix G: AMBS Ecology & Heritage - DCM Fauna Surveys of the Offset and Mine Rehabilitation Areas, 2018.

Appendix H: Alluvium - Mammy Johnson's River – Bank Stabilisation Detailed Design, 2013.

(Appendices available on request)