Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

PO Box 5697
West Chatswood NSW 1515

Prepared by:

SLR Consulting Australia

10 Kings Road, New Lambton NSW 2305,
Australia

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v1.0	5 March 2024	Fiona Iolini	David Conder	Jeremy Pepper

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Holcim Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

1.1 Background

The Lynwood Quarry (the 'site') is a hard rock quarry approximately two kilometres west of Marulan, in the Southern Highland IBRA Region and Bungonia Sub-region of New South Wales (NSW) (see Figure 1). Initial planning consent for the Lynwood Quarry was granted to Cemex (now Holcim) on 21 December 2005 for an approved five million tonnes per annum output. Since the original development approval, five modifications have been approved, with quarrying operations approved until 01 January 2038. Ecological monitoring is a requirement of the project approval and associated ecology reports and management plans.

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Holcim (Australia) Pty Ltd ('Holcim') to undertake ecological and rehabilitation monitoring at the Lynwood Quarry in 2023. SLR has undertaken ecological and rehabilitation monitoring at the quarry since 2020. In 2020, SLR established four retained vegetation monitoring plots (R1-R4) within areas of retained vegetation and baseline flora (BAM plot) and fauna (diurnal and nocturnal fauna census) data was collected at each of these locations. In 2020, SLR also established eleven Hoary Sunray monitoring plots.

In 2021, five rehabilitation monitoring plots (RM1-RM5) were established within areas of rehabilitation and two additional Box-Gum Woodland vegetation monitoring plots (BG1-BG2) were established. In 2022, an additional two core riparian zone monitoring plots (CR1-CR2) were established within riparian corridors of Joarimin and Marulan Creeks.

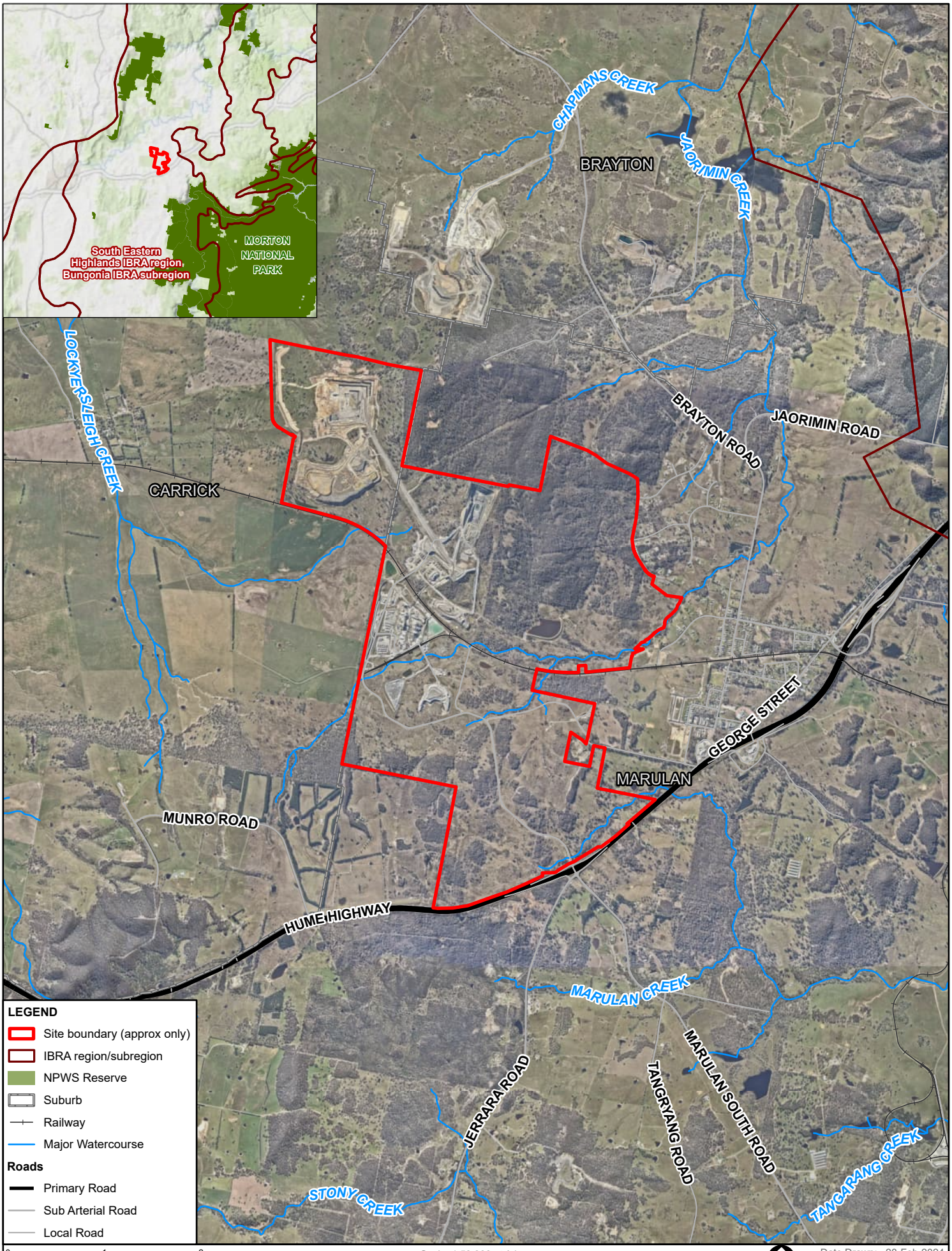
1.2 Previous Ecological Reports

Various documents were prepared during the approval phase of the quarry (Umwelt 2005, 2011, 2013, 2018a, 2018b) and these have been relied upon for background information in relation to the ecology and management of the site. A summary of previous ecological reports is provided below.

1.2.1 Ecological Assessment

Key findings of the *Ecological Assessment* (Umwelt 2005) are as follows:

- Four vegetation types occur across the site: Tableland Low Woodland, Western Tablelands Dry Forest, Tableland Grassy Box-Gum Woodland, Riparian Gum Box-Apple Woodland and Camden Woollybutt Low Open Forest.
- No threatened flora species were recorded; however, potential habitat exists for Buttercup Doubletail *Diuris aequalis*, Pine Donkey Orchid *Diuris tricolor*, Cotoneaster *Pomaderris cotoneaster*, Tallong Midge Orchid *Genoplesium plumosum* and Cambage Kunzea *Kunzea cambagei*.
- Areas of retained vegetation across the site provide habitat for a suite of local fauna species including the following threatened species listed as 'vulnerable' under the *Biodiversity Conservation Act 2016* (BC Act): Speckled Warbler, Squirrel Gilder, Eastern Coastal Free-tailed Bat (previously Eastern Freetail-bat), Eastern False Pipistrelle and Large Bent-winged Bat (previously known as Eastern Bentwing-bat).
- Potential habitat also exists for other BC Act listed threatened fauna species, including Giant Burrowing Frog, Rosenberg's Goanna, Striped Legless Lizard, Blue-billed Duck, Swift Parrot, Barking Owl, Masked Owl, Brown Treecreeper, Regent Honeyeater, Hooded Robin, Diamond Firetail, Spotted-tailed Quoll, Grey-headed Flying-fox and Large-eared Pied Bat.



Scale: 1:50,000 at A4
Coordinate System: GDA 1994 MGA Zone 55

Date Drawn: 28-Feb-2024
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Data Source: NSW SS, 2020
Aerial imagery supplied by Nearmap (December, 2023)

SLR

SITE LOCATION

FIGURE 1

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.V13844.00001 Lynwood Quarry Ecological Moni\06 SLR Data\01 CADGIS\GIS\630V13844_LynwoodEcologicalMonitoring\630V13844_LynwoodEcologicalMonitoring.aprx\630V13844_F01_SiteLocation

- To mitigate the impacts of the development the Ecological Assessment proposed monitoring in retained vegetation on a three-yearly basis involving four monitoring locations to be established within a Habitat Management Area (HMA), Jaorimin Creek Management Area and Cultural Management Area (CMA). The proposed approach was a standard 20 m by 20 m flora quadrat to record species diversity and structural composition, as well as photo monitoring and fauna monitoring targeting threatened species. Nest boxes were also proposed to be installed and monitored on an annual basis for 5 years.

1.2.2 Box-Gum Woodland Management Plan

Key aspects of the *Box-Gum Woodland Management Plan* (Umwelt 2013) are as follows:

- During construction, the site was found to contain a large population of the threatened plant Hoary Sunray *Leucochrysum albicans* var. *tricolor*, which at the time was listed as 'vulnerable', under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as well as areas of White Box – Yellow Box - Blakely's Red Gum Woodland, which at the time was listed as a 'critically endangered ecological community' (CEEC) under the BC Act[1].
- To mitigate and offset the loss of these threatened entities, the plan details management actions, regeneration, and revegetation strategies.
- A Biodiversity Offset Area (BOA) was set aside, which incorporates a 185 ha area in the southwest portion of the site and includes the Cultural Management Area. As such, 3-yearly plot monitoring in the CMA (as previously proposed under the Rehabilitation Plan mentioned below) was deemed suitable to capture the 'retained vegetation' monitoring requirements of the biodiversity offset area.
- The plan also commits to annual monitoring and reporting to determine success of rehabilitation and general condition including weed and pest animal presence, presence of Hoary Sunray and other matters of national environmental significance (MNES).

1.2.3 Rehabilitation and Landscape Management Plan

The relevant ecological and rehabilitation components of the *Rehabilitation and Landscape Management Plan* ('RLMP', Umwelt 2018a) can be summarised as follows:

- The rehabilitation efforts are to be focused on three areas over the first five years of operations: the haul road construction area, the western amenity bund and the southern edge of the overburden emplacement area.
- The key elements of the rehabilitation strategy include:
  - The early, timely and progressive rehabilitation of disturbed areas.
  - The surface of the southern overburden emplacement area and the Lynwood overburden emplacement area will be shaped in a generally irregular landform to resemble a natural surrounding landform wherever possible.
  - Stripped topsoil will be placed in stockpiles no greater in depth than 3 m and seeded with a cover crop if they are to remain in place for longer than six months.

[1] The Hoary Sunray *Leucochrysum albicans* var. *tricolor*, is currently listed as 'endangered', under the EPBC Act, but is not listed under the BC Act. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, is currently listed as a 'critically endangered ecological community' (CEEC) under both the BC Act and the EPBC Act.

  - Shaped areas will be covered with topsoil, seeded with a native species and cover crop mix with intent of achieving mixed grassland and woodland native vegetation communities.
  - Selected surface habitat features consisting of large rocks, logs and trees from clearing undertaken will also be placed across the rehabilitated area. These features will provide potential fauna habitat and will aid in achieving a stable landform.
- Weed control measures consist of a comprehensive weed survey of all areas of the quarry every 4 years, which will advise weed removal. Weed removal is to prioritise noxious[2] species.
- Feral animal control programs are to be implemented as required and include inspections for the presence of significant populations of feral animals.
- The granite pit benches are to be seeded with a native tree species mix and a grass species mix also used on the safety bund.
- Overburden and emplacement areas south of the Main Southern Railway are expected to be seeded with species from the Tableland Low Woodland vegetation community while the overburden emplacement areas to the north of the Main Southern Railway are expected to be seeded with a mixture of Tableland Grassy Box-Gum Woodland and Western Tablelands Dry Forest vegetation communities.
- Rehabilitation of the southern overburden emplacement area and western amenity bund aim to establish PCT1330 Yellow Box - Blakely's Red gum grassy woodland on the tablelands, Southeastern Bioregion.
- Holcim is to establish and maintain the HMA and Jaorimin Creek corridor for the conservation of ecological values. Management includes fencing and signposting the boundary of the management areas and removal of dilapidated fences throughout. The HMA is approximately 130 ha of which 105 ha is presently vegetated and an area of 25 ha is proposed to be rehabilitated via assisted regeneration and plantings.
- Species established will represent the existing vegetation communities within the HMA, being Western Tablelands Dry Forest, Tableland Grassy Box-Gum Woodland and Tableland Low Woodland. The riparian species to be established along the creek line will also include *Acacia mearnsii* and *A. dealbata*.
- The remaining remnant woodland occurring within the project area that is outside the quarry footprint and specific management areas, will also be managed during the life of the project to maintain its ecological values. Strategies will include management of grazing impacts, weed and feral animal control, sediment and erosion control and encouragement of natural regeneration.
- Maintenance and replacement of arboreal habitat is to occur through the relocation of salvaged tree hollows or installation of nest boxes. Nest boxes are to be monitored annually for a period of 5 years, followed by condition inspections every 4 years.
- Ecological monitoring is to include:
  - Annual monitoring of vegetation screens for 4 years
  - 3-yearly monitoring of retained vegetation, moving to 10-yearly if positive for 3 consecutive years

[2] Now known as 'priority weed' species under the *Biosecurity Act 2015*

  - 3-yearly fauna monitoring, moving to 10-yearly where positive for 3 consecutive years
  - Annual nest box monitoring for 5 years, then 4-yearly condition inspections
- Preliminary completion criteria are provided for the key rehabilitation works and HMA (see assessment at Section 4.0).

1.2.4 Riparian Area Management Plan Marulan Creek Catchment Area

The Riparian Area Management Plan for Marulan Creek (Umwelt 2011) provides details in relation to management of impacts to riparian areas of Marulan Creek during construction and operation of Lynwood Quarry. The main impacts in the vicinity of Marulan creek relate to the construction of the access road including the construction compound and the culvert at the location of creek crossing.

In relation to rehabilitation the plan states:

- Holcim propose to implement a program of rehabilitation works along existing drainage lines to reduce the current extent of bank and bed erosion and associated sediment transport, where possible.
- Rehabilitation works will initially include fencing of the third order section of Marulan Creek to prevent cattle access and allow for natural regeneration. This fenced area will be inspected annually for the first 3 years to assess the level of natural regeneration. If natural regeneration is not proceeding to an acceptable level by the third year of annual monitoring, then alternative regeneration measures including supplementary planting in accordance with measure in the RLMP will be considered.
- Lynwood Quarry's Environmental Officer will inspect Marulan Creek within the project area on a quarterly basis (and after severe storm events) to identify the condition of the vegetation and any significant erosion or creek stability issues.
- During the operational phase of the project monitoring of the management measures implemented will be undertaken in accordance with the RLMP.

1.2.5 Riparian Area Management Plan Jaorimin Creek Catchment

The Riparian Area Management Plan for Jaorimin Creek (Umwelt 2018b) provides details in relation to management of impacts to riparian areas of Jaorimin Creek during construction and operation of Lynwood Quarry. The active quarry area and several dams are within the creek catchment and a raft of controls (such as use of sediment devices, seeding and revegetation of disturbed areas, monitoring, limiting work areas) are suggested to limit impacts caused during construction and operation of these features.

The plan includes the objectives in relation to rehabilitation:

- The riparian corridor has been fenced to exclude cattle where required.
- Revegetation works have occurred along Jaorimin Creek south of the Main Southern Railway.
- Nest boxes along Jaorimin Creek have been established, monitored and are being maintained.
- The site is managing significant weed or feral animal infestations with a demonstrable reduction pre-construction.
- Monitoring has indicated that natural regeneration is occurring.

1.3 Ecological and Rehabilitation Monitoring Requirements

Based on the review of previously approved documentation (Umwelt 2005, 2013 and 2018), SLR devised the ecological and rehabilitation monitoring schedule from 2020-2030, as provided Table 1. The monitoring program will require updating as rehabilitation progresses, to add areas of active quarry that become available for rehabilitation (overburden emplacement areas and pits, etc.).

Table 1: Overview of Monitoring Program to 2030

Monitoring Method	Year 2020-2030 (✓ =survey required, ☑ =survey completed, ☒ survey not completed, ✓ additional survey)										
	20	21	22	23	24	25	26	27	28	29	30
1. Nest Box survey	☑	☑	☑	☑	✓						
2. Retained vegetation monitoring*	☑			☑			✓			✓	
3. Hoary Sunray Monitoring	☑			☑	✓		✓			✓	
4. Rehabilitation Monitoring Amenity Bund#		☑	☑	☑	✓						
5. Rehabilitation Monitoring of HMA+		☑	☑	☑	✓	✓					
6. Rehabilitation Monitoring of BOA		☑	☑	☑							
7. Rehabilitation Monitoring of BOA (revegetated)		☑	☑	☑	✓	✓	✓	✓	✓	✓	✓
8. Box-gum Woodland Monitoring (retained)		☑	☑	☑	✓	✓	✓	✓	✓	✓	✓
9. Rehabilitation monitoring of creek corridors^			☑	☑	✓	✓	✓	✓	✓	✓	✓

* After 2029 an assessment is required to determine whether the monitoring can move to 10-yearly intervals

Monitoring may cease after three years if vegetation meets completion criteria

\+ After 2025 an assessment is required to determine whether additional planting is required, if it is monitoring of HMA rehab should be extended

^ Monitor annually for 10 years from planting unless completion criteria are met sooner

The surveys of each monitoring method involve:

1 Usage and maintenance survey of 50 nest boxes is required to be undertaken annually for 5 years.

2 Vegetation and Fauna Monitoring of at four locations within areas of retained vegetation, including BAM plots and a fauna survey (involving diurnal reptile, amphibian and bird surveys, spotlighting, and use of ultrasonic bat-call detection and infrared camera devices) at 3-yearly intervals until at least 2029.

3 Hoary Sunray population estimates including counting the number of Hoary Sunray plants within ten 4 m^2 plots at locations at 3-yearly intervals in perpetuity. An additional survey is recommended in 2024 due to poor results at the 2023 survey.

4 Collection of BAM plot data at one location on the amenity bund annually for 3-years or until rehabilitation completion criteria are met. An additional survey is recommended in 2024 due to poor results at the 2023 survey.

5 Collection of BAM plot data at two locations within the northern Habitat Management Area, annually for 5 years.

6 Collection of BAM plot data at one location within the Biodiversity Offset Area annually for 3 years.

7 Collection of BAM plot data at one location within the regeneration portion of the Biodiversity Offset Area annually in perpetuity.

8 Collection of BAM plot data at two locations within the retained portion of the Box-Gum Woodland annually in perpetuity.

9 Collection of BAM plot at two locations within core riparian corridors, annually for 10 years.

1.4 Objectives

The purpose of the Lynwood ecological monitoring program is to monitor ecological values within rehabilitation and areas of retained vegetation within the site and demonstrate the achievement of objectives in accordance with the *Ecological Assessment* (Umwelt 2005), *Box-Gum Woodland Management Plan* (Umwelt 2013) and RLMP (Umwelt 2018).

The objectives of the 2023 ecological monitoring are to:

- Determine the current condition of rehabilitation and retained vegetation areas through comparison with benchmarks.
- Identify any deterioration or improvement in habitat quality within areas of retained vegetation.
- Assess changes to fauna species assemblages within the areas of retained vegetation.
- Detect any problems with management of natural areas through general opportunistic observations and make recommendations to address these issues, especially at the Biodiversity Offset Area.
- Determine whether nest boxes are being utilised by native fauna and determine whether any nest box maintenance actions are required.
- Detect changes in Hoary Sunray population size and try to determine any potential impacts on the population.

1.5 Climate Data

Temperature and rainfall data for the locality (sourced from Goulburn Airport AWS station 070330, BOM 2024a) are presented in Figure 2 and Figure 3, respectively.

The data indicates that in the months leading up to the survey (July to December 2023), in comparison to the monthly averages since 1994 and since monitoring began in 2020 the locality experienced above average monthly maximum temperatures. Monthly rainfall was lower than average except for November and December 2023 which were above average and higher than all other monitoring years except for 2021.

The temperature and rainfall patterns observed within the locality are generally consistent with those reported by BOM (2024b) for NSW in 2023, as summarised below:

- The state-averaged annual maximum temperature was 1.96°C above the 1961-1990 average, which is the third highest on record (since records began in 1910) and the highest since 2019.
- Maximum temperatures for March, June, August, September, and December were in the top ten warmest on record for their respective months.
- The state-averaged annual rainfall was 428.9 mm, which was 22.9 % below the 1961-1990 average.

Figure 2: Average Monthly Maximum Temperature (°C) Data for Goulburn (BOM 2024)

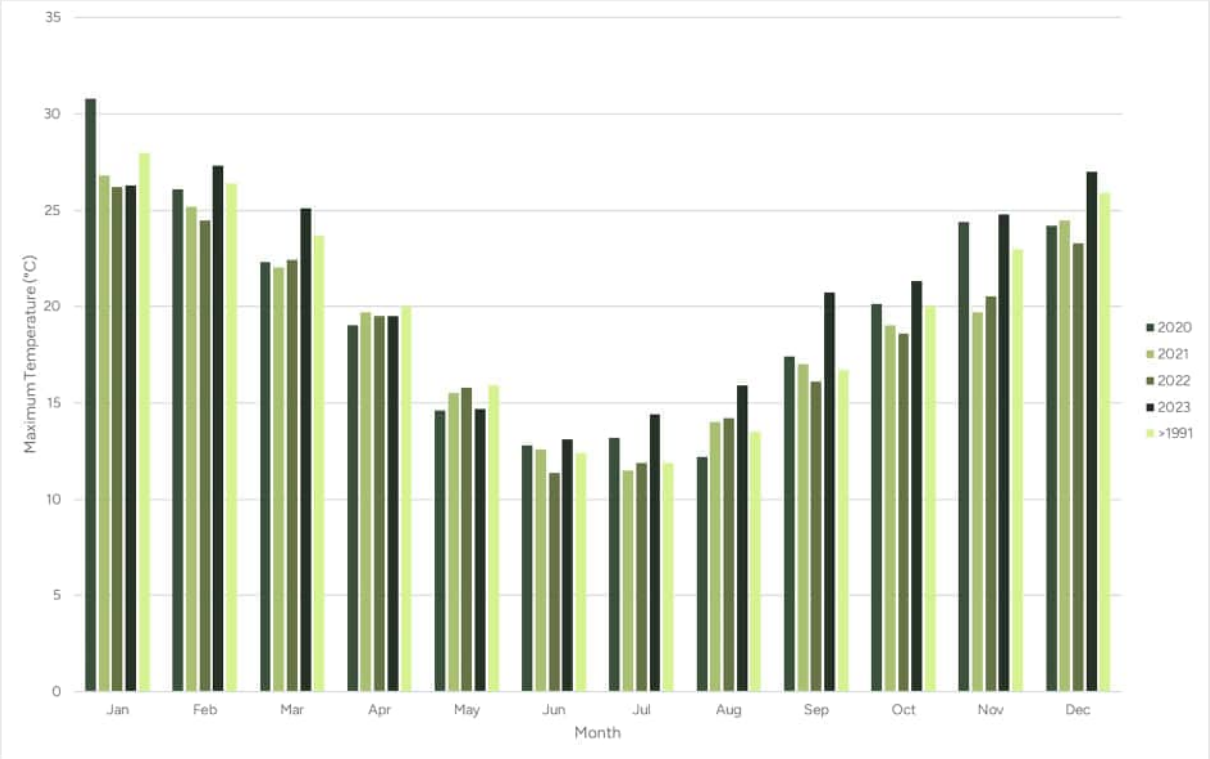
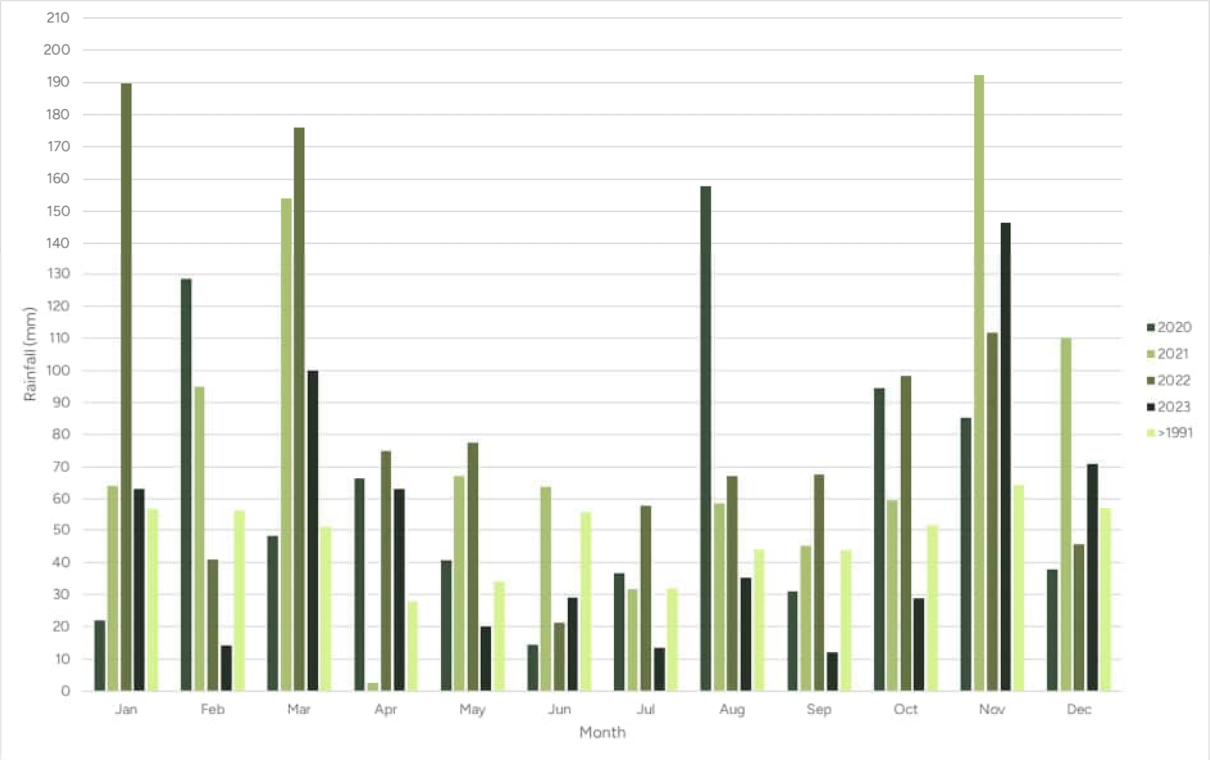


Figure 3: Average Monthly Rainfall (mm) for Goulburn (BOM 2023a)



2.0 Methods

2.1 Vegetation Monitoring Methods

2.1.1 Vegetation Monitoring Plot Selection

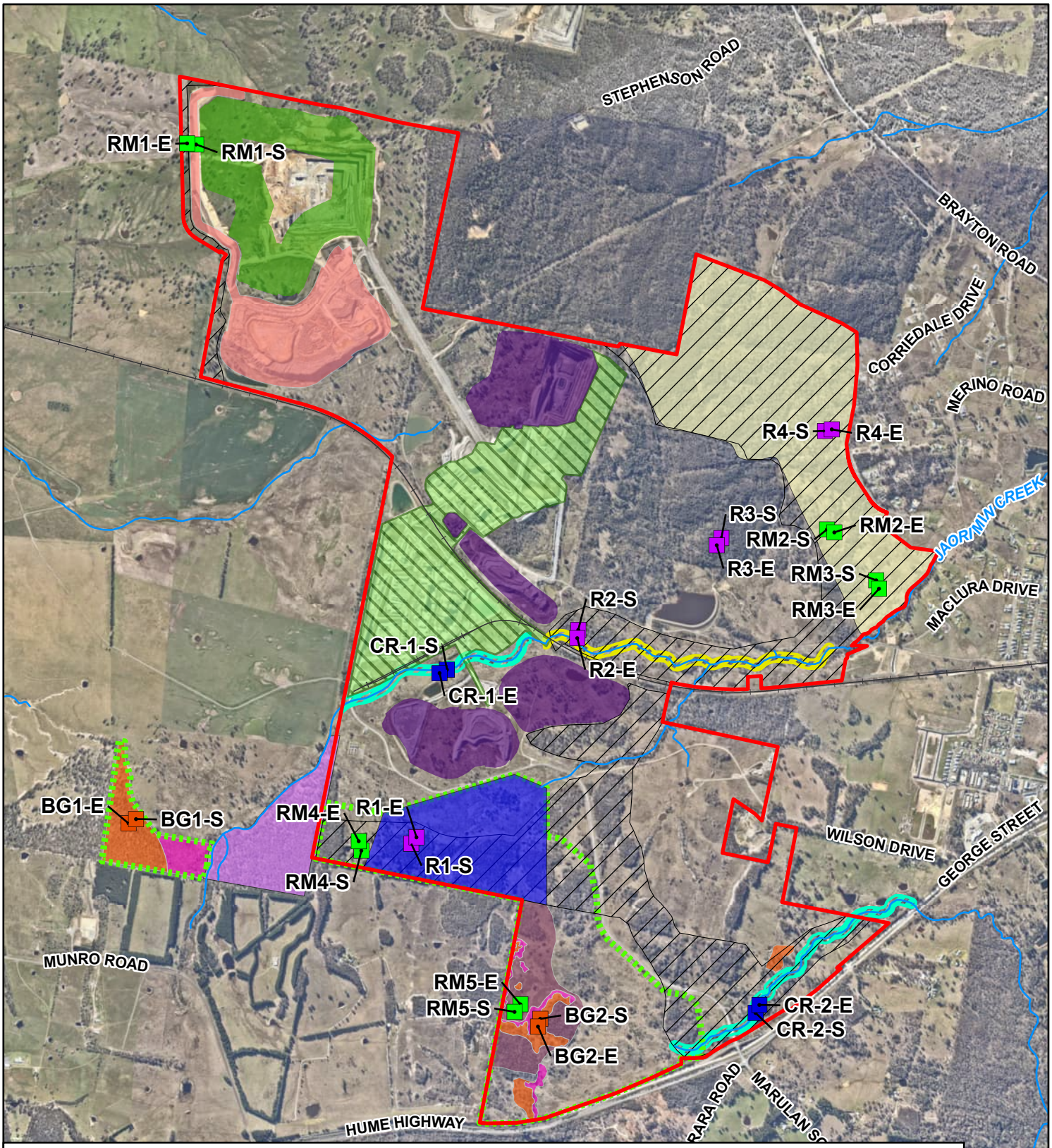
Monitoring plots have been pegged using metal star-pickets fitted with a yellow cap and marked with the plot reference. Two star-pickets were positioned at each plot, one at the start and one at the end of the midline (or 50 m transect) of each BAM plot. The plots were selected randomly whilst in the field, aiming to monitor each of the following areas:

- Amenity bund rehabilitation area - this is an approximate 8 ha revegetation area in the northwest of the site which is one of the areas directly impacted by the proposed quarry operations and which requires prioritised rehabilitation efforts according to the RLMP. One permanent rehabilitation monitoring plot (RM1) was established in this area in 2021.
- Habitat Management Area - this is 130 ha in the northeast of the site, of which 25 ha requires rehabilitation via assisted regeneration and planting according to the RLMP. Two retained vegetation plots were established in this area in 2020 (R3 and R4), and these plots are monitored every 3 years. In 2021 two rehabilitation monitoring plots (RM2 and RM3) were established within previously cleared and managed parts of the HMA. These plots are monitored annual for 5 years to determine whether planting is required.
- Cultural Heritage Management Area – the cultural heritage management area is directly south of the western emplacement area and is to be managed as retained native vegetation. One retained vegetation monitoring plot (R1) was established within this area in 2020.
- Joarimin Creek Management Area – occurs north of the Main Southern Railway and is to be managed as retained native vegetation. One retained vegetation monitoring plot (R2) was established within this area in 2020.
- Biodiversity Offset Area - this is 185 ha in the south of the site, of which 5.5 ha is to be regenerated (via direct seeding and tube-stock planting) according to the RLMP. One permanent rehabilitation monitoring plot (RM4) was established in this area in 2021.
- Box-Gum Woodland CEEC Regeneration - in relation to the 185 ha Biodiversity Offset Area in the south of the site, an additional 22 ha of this area is to be regenerated according to the Box-Gum Woodland Management Plan (Umwelt 2013). One permanent rehabilitation monitoring plot (RM5) was established in this area in 2021.
- Retained Box-Gum Woodland (non-revegetated area) - three additional areas in the south of the Lynwood Quarry site are to be monitored in accordance with the Box-Gum Woodland Management Plan (Umwelt 2013). Two permanent rehabilitation monitoring plots (BG1 and BG2) were established in this area in 2021.
- Core Riparian Corridors - the core riparian corridors of Jaorimin and Marulan Creeks extend as a narrow band through the north and south of the site respectively. These areas are to be rehabilitated including cattle exclusion and passive and active regeneration as required. Two permanent rehabilitation monitoring plots (CR1 and CR2) were established within these areas in 2022.

Location and details of the monitoring plots, vegetation communities (DPE 2022) and management areas are included in Table 2, Figure 4 and Figure 5.

Table 2: Monitoring Plot Location and Details

Management/ Rehabilitation Area	Plot	Transect Start		Transect End		State Vegetation Map (DPE 2022)
		Easting	Northing	Easting	Northing	
Cultural Heritage Management Area	R1	771155.1	6154011	771125.2	6153975	PCT 3643 Bungonia Tableland Silvertop Ash -Stringybark Forest
Joarimin Creek Management Area	R2	772059.7	6155132	772065.7	6155178	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest
Habitat Management Area	R3	772844.6	6155654	772870.5	6155695	PCT 3486 Wollondilly-Shoalhaven Slopes Grassy Open Forest
	R4	773491.9	6156306	773453.6	6156296	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest
Amenity Bund Rehabilitation Area	RM1	769915.4	6157908	769962.9	6157910	PCT 3376 Southern Tableland Grassy Box Woodland (prior to recent quarry development)
Habitat Management Area (Rehabilitation portion)	RM2	773464.8	6155743	773506.3	6155726	n/a
	RM3	773741.8	6155457	773757.6	6155409	n/a
Biodiversity Offset Area - Regeneration Area portion	RM4	770845.1	6153936	770830.3	6153989	n/a
Biodiversity Offset Area - Box-Gum Woodland CEEC Regeneration Area	RM5	771706.9	6153029	771739.9	6153072	n/a
Retained Box-Gum Woodland (non-revegetated area)	BG1	769577.1	6154113	769535.1	6154090	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest
	BG2	771851.8	6152990	771838.8	6152946	PCT 3643 Bungonia Tableland Silvertop Ash -Stringybark Forest
Riparian	CR1	771326.2	6154954	771285.1	6154935	n/a
	CR2	773062.9	6153023	773084.5	6153068	PCT 3373 Goulburn Tableland Box-Gum Grassy Forest



LEGEND

- Site boundary (approx only)
- Box Gum Woodland Monitoring
- Rehabilitation Monitoring
- Vegetation Monitoring Plot
- Riparian Monitoring
- Railway
- Major Watercourse
- Assisted Natural Regeneration
- Biodiversity Offset Area
- Box Gum Woodland (CEEC)
- Box Gum Woodland (CEEC) Regeneration
- Box Gum Woodland Derived Native Grassland (CEEC)
- Existing Approved Core Riparian Corridor
- Existing Approved Cultural Heritage Management Zone
- Existing Approved Habitat Management Area
- Habitat Management Area
- Joarmin Creek Management Area
- Rehabilitated Area – Biodiversity Values or Grazing
- Rehabilitated Area – Grazing
- Rehabilitated Areas – Biodiversity Values
- Rehabilitation Area – Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion (PCT 1330)

0 0.5 1 km

Scale: 1:30,000 at A4
Coordinate System: GDA 1994 MGA Zone 55

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Data Source: NSW SS, 2020
Aerial imagery supplied by Nearmap (December, 2023)
Conservation and Management Areas digitised from (Umwelt, 2018)

SLR

MONITORING SITES

FIGURE 4

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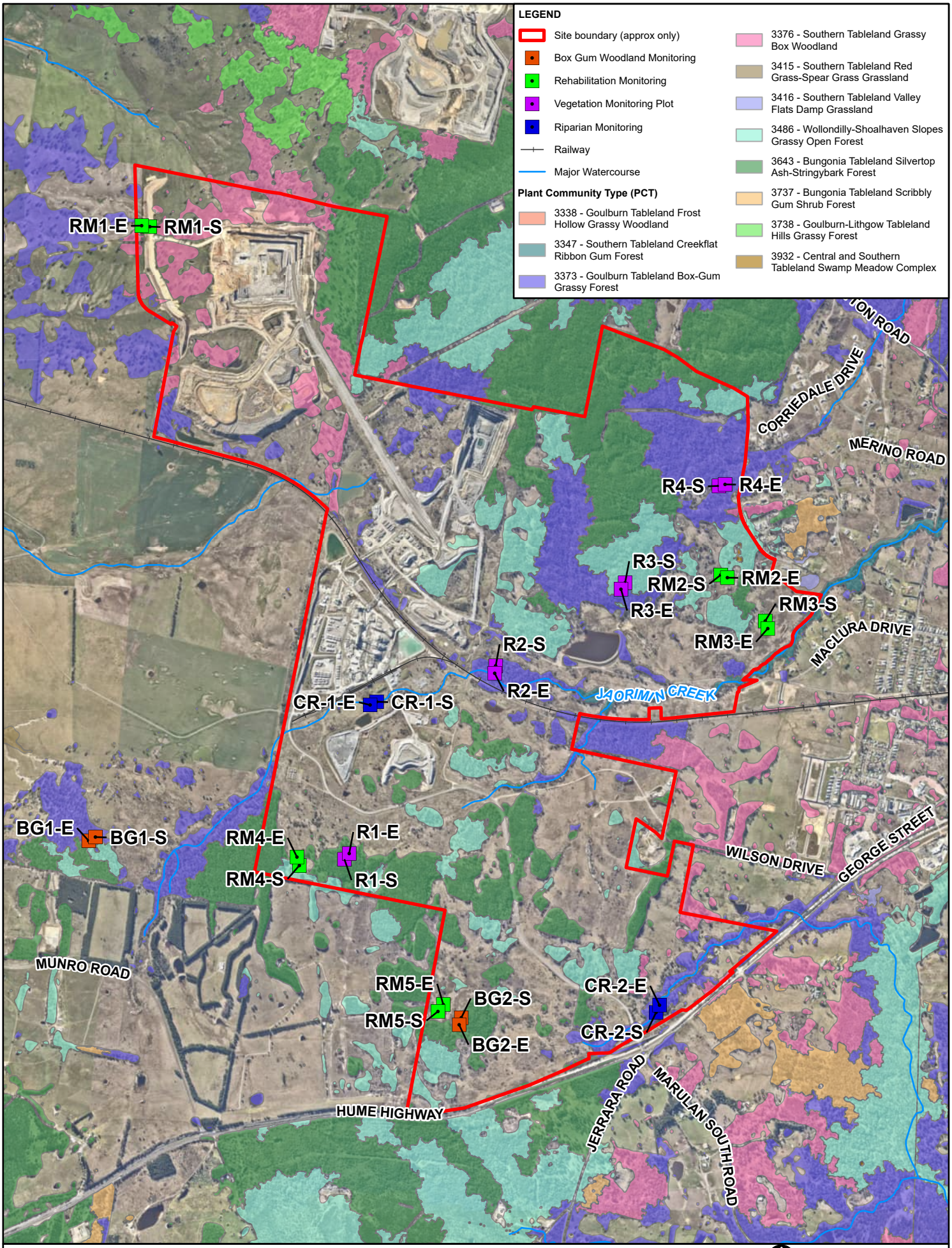

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Coordinate System: GDA 1994 MGA Zone 55

Date Drawn: 28-Feb-2024
Project Number: 630.V13844

Data Source: NSW SS, 2020
Aerial imagery supplied by Nearmap (December, 2023)
State Vegetation Type Map (Version C2.0.M2.0, NSW DPE 2023)

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PLAT COMMUNITY TYPES

FIGURE 5

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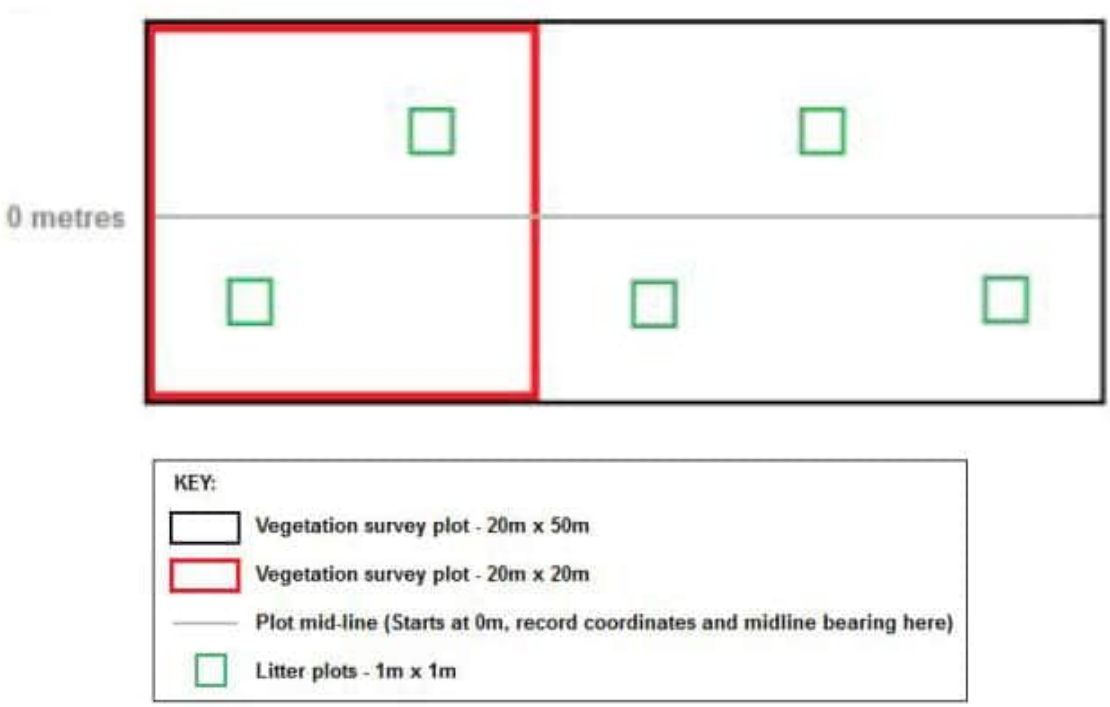
2.1.2 Vegetation Survey Technique

Flora monitoring was completed during the spring survey period at each of the nine permanent monitoring plots described above, following survey methods prescribed in the NSW Biodiversity Assessment Method (BAM) (DPIE 2020).

This involved a 20 m by 20 m floristic plot to assess species composition and structure, and a 20 m by 50 m plot to assess vegetation function. The function attributes collected under the BAM include tree stem size, hollow-bearing tree counts, and ground cover (litter, bare ground, cryptogram, and rock). The ground cover attributes are collected via five 1 m by 1 m plots along the midline, see Figure 6.

Figure 6: BAM Plot Layout



The BAM provides a repeatable assessment tool to compare vegetation and structural changes over time and to provide comparison for the areas of retained vegetation. All PCTs listed in the NSW BioNet Vegetation Classification database provide 'benchmark' scores for these attributes to which comparison with the relevant plot data can be made. Due to the widespread use of this method in NSW, this method was chosen to provide a consistent and replicable method of assessing the health of the retained vegetation.

To categorise the vegetation at each BAM plot into a PCT (where relevant), previous vegetation mapping and floristic data (Umwelt 2005), as well as current floristic composition data was compared to PCT's within the BioNet Vegetation Classification database. The PCT database was filtered using the Southern Highland IBRA Region and Bungonia Sub-region, followed by a close examination of floristics to match the vegetation at each plot.

2.2 Fauna Survey Techniques

Fauna monitoring was undertaken at each of the retained vegetation monitoring plots (R1, R2, R3, R4) during the winter and spring surveys utilising survey techniques and effort as detailed in Table 3.

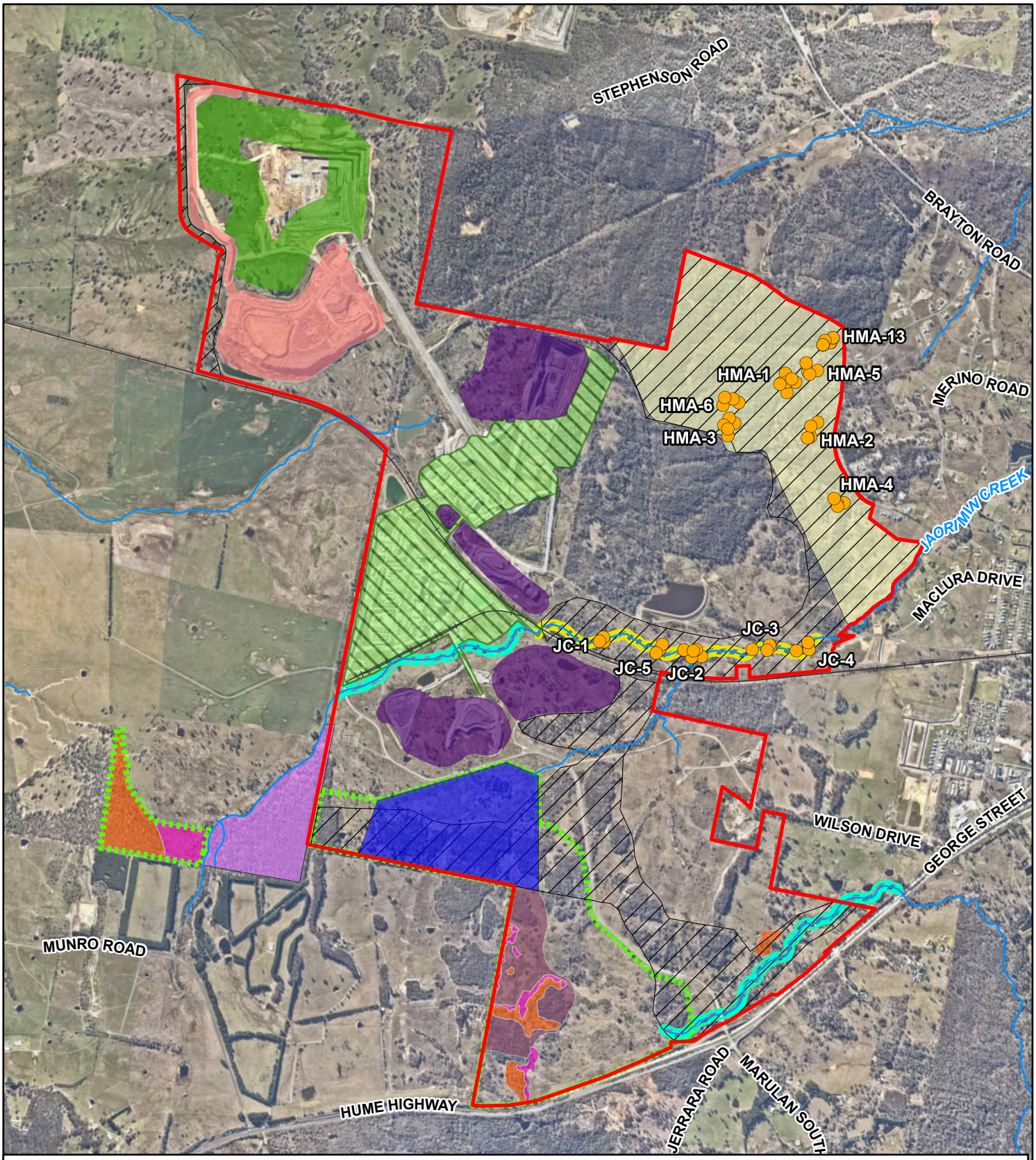
Table 3: Fauna Survey Techniques and Effort

Technique	Description	Identification	Total Hours
Reptile and Amphibian Survey - diurnal	Searches through areas of likely habitat such as under rocks and logs, in bark at the base of trees, around water sources and in man-made features.	Visual observation and vocal calls	4 (1hr per plot vicinity)
Bird Survey – diurnal	Slowly walking stratified transects within an approximate 2 ha area of the monitoring plot. Visual observations made through SLR Digital cameras (Canon EOS) or binoculars.	Calls, flight patterns and visual observations	4 (1hr per plot vicinity)
Spotlighting - diurnal	Conducted on foot using high-powered Head Torches (1000 Lumen). Targeted nocturnal amphibians, reptiles, birds, and mammals within an approximate 2 ha area of each monitoring plot.	Visual observation or vocal calls	4 (1hr per plot vicinity)
Ultrasonic Bat-call Detection - nocturnal	Echolocation calls are detected and recorded using a Bat detector. Bat detectors are positioned at a 45-degree angle approximately one metre off the ground. All night bat detectors were positioned with a clear view of potential micro-bat flyways. They are automated and programmed to start recording one hour before dusk and to stop recording one hour after sunrise the following morning.	Analysis by Luke Forster (Trace Ecology)	96 (or two nights 6pm to 6am per plot vicinity)
Infrared Cameras	Four infrared motion detection cameras were left recording over night at each of the monitoring plots. Each camera is set onto a tree at a 45-degree angle towards the ground where a suitable bait (such as cat food or oats) was placed as an attractant.	Analysis of photographic records	96 (or two nights 6pm to 6am per plot)

2.3 Nest Box Monitoring Methods

A total of 59 nest boxes were inspected as part of the winter monitoring event, with the locations of nest boxes shown in Figure 7. Of these 59 nest boxes, 50 have been monitored by SLR since 2020 and an additional nine were located and monitored during the survey. The nest box monitoring was completed by two qualified SLR ecologists, using a non-invasive remote camera inspection method to record the following details:

- Native fauna occupancy
- Presence of nests, eggs, or young
- Indirect signs of usage (eg scats, fur, feathers, egg fragments, nest material)
- Evidence of pest species (eg bees, exotic birds, such as Indian Miners)
- Nest box condition and maintenance requirements



LEGEND

- Site boundary (approx only)
- Location of Nest Box
- Railway
- Major Watercourse
- Assisted Natural Regeneration
- Biodiversity Offset Area
- Box Gum Woodland (CEEC)
- Box Gum Woodland (CEEC) Regeneration
- Box Gum Woodland Derived Native Grassland (CEEC)
- Existing Approved Core Riparian Corridor
- Existing Approved Cultural Heritage Management Zone
- Existing Approved Habitat Management Area
- Habitat Management Area
- Joarmin Creek Management Area
- Rehabilitated Area – Biodiversity Values or Grazing
- Rehabilitated Area – Grazing
- Rehabilitated Areas – Biodiversity Values
- Rehabilitation Area – Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion (PCT 1330)

0 0.5 1 km

Scale: 1:30,000 at A4
Coordinate System: GDA 1994 MGA Zone 55

Date Drawn: 28-Feb-2024
Project Number: 630.V13844

Data Source: NSW SS, 2020
Aerial imagery supplied by Nearmap (December, 2023)
Conservation and Management Areas digitised from (Umwelt, 2018)

SLR

NEST BOX LOCATIONS

FIGURE 7

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.V13844.00001 Lynwood Quarry Ecological Moni\06 SLR Data\01 CADGIS\GIS\630V13844_LynwoodEcologicalMonitoring\630V13844_LynwoodEcologicalMonitoring.aprx\630V13844_F05_NestBoxLocations

2.4 Hoary Sunray Monitoring Methods

Eleven Hoary Sunray monitoring plots have been established as detailed in Table 4 and Figure 8. Plot locations were selected randomly whilst in the field but aiming to include one plot within each of the patches of Hoary Sunray which had been previously mapped on the site (Umwelt 2013). Monitoring plots have been pegged using a metal star-picket at the centre of the plot, fitted with a yellow cap marked with the plot reference.

Table 4: Hoary Sunray Monitoring Plots

Monitoring Plot	Easting (MGA)	Northing (MGA)
Hoary Sunray 1 (HS1)	772565.1	6152919
Hoary Sunray 2 (HS2)	772620	6152739
Hoary Sunray 3 (HS)3	772245.9	6152606
Hoary Sunray 4 (HS4)	771609.9	6152464
Hoary Sunray 5 (HS5)	772046	6152762
Hoary Sunray 6 (HS6)	772158.6	6153676
Hoary Sunray 7 (HS7)	773014.4	6154255
Hoary Sunray 8 (HS8)	773071.2	6153755
Hoary Sunray 9 (HS9)	772905.5	6153843
Hoary Sunray 10 (HS10)	772401.6	6154880
Hoary Sunray 11 (HS11)	773440	6154894

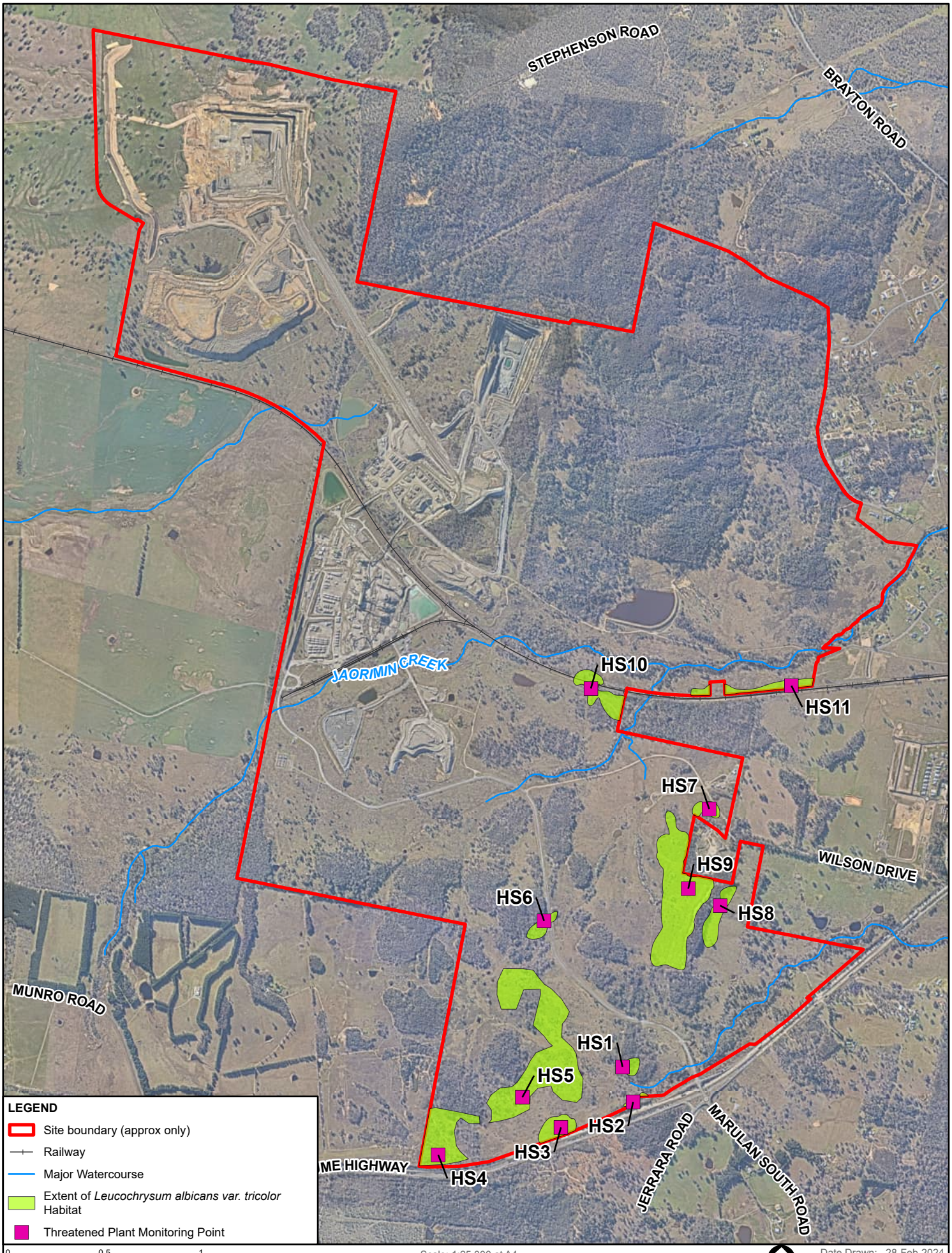
At each monitoring plot accurate counts of individuals of the Hoary Sunray were recorded within a $4m^2$ plot using a series of $1m^2$ quadrats laid out around the centre marker. Notes on disturbance and condition of the population at each plot were made and a reference photo was taken of each $1m^2$ quadrat.

2.5 Rehabilitation Inspection

2.5.1 General Survey

The following notes were recorded within each BAM plot, as required by the RLMP:

- Evidence of natural regeneration.
- The extent of the vegetative cover and species diversity and any requirement for additional revegetation works to be undertaken.
- The general health of the vegetation.
- Any occurrences of weed species in the revegetation area and any requirements for weed control activities.
- Presence of threatened or other significant species.
- Feral animals and the need for control.
- Erosion and the need for repair of eroded areas.
- Fire management.
- Any signs of disturbance, either by animals or humans.
- Evidence of site management (eg fencing and weed control actions).



Scale: 1:25,000 at A4
Coordinate System: GDA 1994 MGA Zone 55

Date Drawn: 28-Feb-2024
Project Number: 630.V13844

Data Source: NSW SS, 2020
Aerial imagery supplied by Nearmap (December, 2023)

SLR

HOARY SUNRAY MONITORING SITES

FIGURE 8

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.V13844.00001 Lynwood Quarry Ecological Moni\06 SLR Data\01 CADGIS\GIS\630V13844_LynwoodEcologicalMonitoring\630V13844_LynwoodEcologicalMonitoring.aprx\630V13844_F06_HoarySunrayMonitoring

- The success of any management programs implemented following previous monitoring inspections.
- Opportunistic fauna observations.

2.5.2 Biodiversity Offset Area Survey

A general inspection of the biodiversity offset area was also undertaken opportunistically whilst traversing across the site between monitoring plot locations. The survey involved searches for evidence of erosion, collecting notes on weeds and pests, evidence of planting, natural regeneration, and general management.

2.6 Survey Details

2.6.1 Survey Conditions

The current 2023 ecological and rehabilitation monitoring involved winter and spring surveys as detailed in Table 5.

Table 5: Details of the 2023 Ecological and Rehabilitation Monitoring

Date (2023)	Survey Technique	Weather Conditions*
24 July	Nest box inspections	Temp: -2.1°C (min) 13.6°C (max). Rain: 0.0 mm (no rain while onsite). Wind: calm. Moon phase: New moon to first quarter. Sunrise: 6:53am. Sunset: 5:09pm.
25 July	Nest box inspections	Temp: -2.2°C (min) 15.4°C (max). Rain: 0.0 mm (no rain while onsite). Wind: calm. Moon phase: New moon to first quarter. Sunrise: 6:53am. Sunset: 5:10pm.
11 December	Vegetation survey (BAM plots) and fauna (reptile and amphibian survey, spotlighting, bat detection and infrared camera recording)	Temp: 15.7°C (min) 29.7°C (max). Rain: 0.2 mm (light rain during evening survey). Rinds: light. Moon phase: Third quarter to new moon. Sunrise: 5:37am. Sunset: 7:58pm.
12 December	Vegetation survey (BAM plots) and fauna (spotlighting, bat detection and infrared camera recording)	Temp: 16.4°C (min) 27.1°C (max). Rain: 0 mm (no rain while onsite). Wind: calm. Moon phase: Third quarter to new moon. Sunrise: 5:37am. Sunset: 7:59pm.
13 December	Fauna survey (bat detection and infrared camera recording, morning birds) and Hoary Sunray	Temp: 14.1°C (min) 32.6°C (max). Rain: 0 mm (no rain while onsite). Wind: calm. Moon phase: New moon. Sunrise: 5:37am. Sunset: 8:00pm.
* Weather data sourced from BOM (2023) weather station Goulburn Airport (20 km SW of site) and www.timeanddate.com (Sydney 2023)		

2.6.2 Survey Limitations

Survey efficacy is influenced by a range of factors. For this type of survey, such limitations are generally due to a single, short duration survey that does not account for seasonal variation. Given the short period of time spent on site, the detection of certain species may be affected by:

- Seasonal migration (particularly migratory birds).
- Seasonal flowering periods (eg cryptic species unlikely to be detected outside of the known flowering period).

- Seasonal availability of food, such as blossoms for some fauna.
- Weather conditions during the survey period (cycles of activity related to specific weather conditions, eg reptiles and frogs inactive during cold weather).
- Species lifecycle (cycles of activity related to breeding).

2.6.3 SLR Permits and Licenses

The SLR ecology team operates under a Scientific Licence (licence number SL 00176, issued under the BC Act), which authorises field staff to trap, capture, harm, hold and release plants and animals protected under the BC Act and *National Parks and Wildlife Act 1974*, as well as an Animal Research Authority (issued by the Secretary of the NSW Animal Care and Ethics Committee of DPIE), which allows trapping of animals in NSW for the purposes of animal research.

2.7 Staff Roles and Qualifications

The roles and qualifications of all staff responsible for preparation of this report are listed in Table 6.

Table 6 Staff Roles and Qualifications

Staff Name/Title	Qualifications and Training	Role
Jeremy Pepper Technical Director, NSW Ecology Team Lead	Bachelor of Science (Hons Class 1), University of NSW 1996 Cert II Bushland Regeneration, TAFE NSW Cert III Horticulture (Arboriculture), TAFE NSW BAM accredited assessor (#BAAS17104)	Project Director
Fiona Iolini Associate Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2007 Certificate of Native Plant Identification, Sydney University 2008 Cert III Conservation and Land Management, TAFE NSW 2015 BAM accredited assessor (#BAAS19042)	Project Manager, field surveys, report preparation
David Conder Associate Ecologist	Bachelor of Applied Science, University of New England 1994	Report review
Joshua Drane Project Ecologist	Bachelor of Environmental Science, Australian Catholic University	Field surveys, data analysis, report preparation
Hannah Centra Project Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2021	Field surveys
James Hugo GIS technician	Master of Environmental Management and Sustainability, University of Newcastle (2020) Bachelor of Science (Hons), University of Newcastle (2016)	GIS data management and figure preparation

3.0 Results

3.1 Vegetation Monitoring

3.1.1 PCT Floristic Assessment

An assessment of the total number of matching floristic species at each of the monitoring plots (Table 7) indicates that overall, most plots reflect the PCTs as mapped by the SVT mapping. However, R2 is consistently most aligned with PCT 3486 and BG1 and BG2 with PCT 3376 rather than the mapped PCT. Plots that do not have PCTs mapped by the SVT mapping align with PCT 3376 (RM2, RM3, RM4, CR1) or PCT 3373 (RM5).

Table 7: PCT Floristic Assessment

Plot	Mapped PCT (SVT)	PCT code with most matching flora species per year and the total number of matching species				Final matching PCT
		2020	2021	2022	2023	
R1	3643	3643 (16)	n/a	n/a	3643 (21)	3643
R2	3373	3486 (21)	n/a	n/a	3486 (22)	3486
R3	3486	3373, 3486 (24)	n/a	n/a	3643 (25)	3486
R4	3373	3373, 3376 (22)	n/a	n/a	3373, 3486 (15)	3373
RM1	3376	n/a	3376 (3)	3373, 3376 (1)	3376 (11)	3376
RM2	n/a	n/a	3376 (12)	3376 (13)	3373, 3376 (14)	3376
RM3	n/a	n/a	3376 (10)	3373, 3376 (9)	3376 (5)	3376
RM4	n/a	n/a	3373, 3376 (9)	3373, 3376, 3486 (11)	3376 (11)	3376
RM5	n/a	n/a	3373, 3376 (12)	3373 (11)	3373 (8)	3373
BG1	3373	n/a	3376 (20)	3376 (20)	3376 (24)	3376
BG2	3643	n/a	3373, 3376 (19)	3376 (17)	3373, 3376 (13)	3376
CR1	n/a	n/a	n/a	3373, 3376 (6)	3376 (5)	3376
CR2	3373	n/a	n/a	3373 (13)	3373 (14)	3373

According to the species profiles (Appendix A) the PCTs at the monitoring plots in 2023 typically contain the following key species:

- PCT 3486 ‘Wollondilly - Shoalhaven Slopes Grassy Open Forest’ *Eucalyptus macrorhyncha*, *Eucalyptus bridgesiana*, *Lissanthe strigosa*, *Olearia viscidula*, *Bursaria spinosa*, *Hibbertia obtusifolia*, *Microlaena stipoides* and *Echinopogon ovatus*.
- PCT 3643 ‘Bungonia Tableland Silvertop Ash-Stringybark Forest’ *Eucalyptus sieberi*, *Eucalyptus agglomerata*, *Allocasuarina littoralis*, *Persoonia linearis*, *H. obtusifolia*, *Goodenia hederacea*, *Lomandra obliqua*, *Pomax umbellata*.
- PCT 3373 ‘Goulburn Tableland Box-Gum Grassy Forest’ *Eucalyptus melliodora*, *E. macrorhyncha*, *Eucalyptus blakelyi*, *Eucalyptus dives*, *L. strigosa*, *Pimelea curviflora*, *Melichrus urceolatus*, *H. obtusifolia*, *Themeda triandra*, *M. stipoides*, *Poa sieberiana*, *Elymus scaber*, *Aristida ramosa, Lomandra filiformis*, *Lomandra multiflora*, *Goodenia hederacea*, *Hydrocotyle laxiflor*a, *Oxalis perennans*,

Chrysocephalum apiculatum, *Tricoryne elatior*, *Gonocarpus tetragynus*, *Hypericum gramineum*.

- PCT 3376 'Southern Tableland Grassy Box Woodland' *E. melliodora* or *E. bridgesiana*, *E. blakelyi*, *M. urceolatus*, *L. strigosa*, *Acacia* spp., *H. laxiflora*, *Austrostipa scabra*, *Lomandra filiformis*, *M. stipoides* and *E. scaber*).

PCT 3373 and PCT 3376 which was recorded at 10 of the 13 plots, corresponds to the national and state listed CEEC known as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSC 2024, DCCEEW 2024b).

A full list of species common to each PCT is included in Appendix A. Dominant species at each of the monitoring plots is indicated in Table 8. The dominant species have been defined as being the top three species in each structural layer with the highest cover scores in 2023.

Table 8: Dominant Native Plant Species at Monitoring Plots in 2023

Plot (PCT)	Tree	Shrub	Grass & Grass-like	Forb	Fern	Other
R1 (3643)	*Eucalyptus agglomerata*, *E. sieberi*, *Acacia decurrens*	*Cassinia sifton*, *Exocarpos strictus*, *Hibbertia obtusifolia*	*Austrostipa densiflora*, *Entolasia stricta*, *Rytidosperma racemosum*	*Goodenia hederacea*, *Einadia hastata*, *Gonocarpus tetragynus*	Nil	*Hardenbergia violacea*
R2 (3486)	*E. eugenioides*, *E. globoidea*, *E. cinerea*	*C. sifton*, *Acacia, mearnsii*, *Lissanthe strigosa*	*Microlaena stipoides*, *Poa sieberiana*, *A. densiflora*	*G. tetragynus*, *Lagenophora stipitata*, *Opercularia diphylla*	*Cheilanthes sieberi*	*Nil*
R3 (3486)	*E. agglomerata*, *Allocasuarina littoralis*, *E. cinerea*	*Cassinia aculeata*, *C. sifton*, *Olearia viscidula*	*P. sieberiana*, *Rytidosperma tenuius*, *A. densiflora*	*Stypandra glauca*, *G. hederacea*, *Hydrocotyle laxiflora*	*C. sieberi*	*Billardiera scandens*
R4 (3373)	*E. melliodora*, *A. littoralis*, *E. blakelyi*	*C. sifton*, *L. strigosa*	*Carex inversa*, *R. tenuius*, *Juncus sarophorus*	*G. tetragynus*, *L. stipitata*, *O. diphylla*	Nil	Nil
RM1 (3376)	*E. blakelyi*, *E. sieberi*, *E. bridgesiana*	*A. mearnsii*, *Acacia obtusifolia*, *Acacia ulicifolia*	*Chloris truncata*	*Geranium solanderi*, *Einadia trigonos*, *Erodium crinitum*	Nil	Nil
RM2 (3376)	*E. melliodora*	*C. sifton*, *C. aculeata*, *Astroloma humifusum*	*Aristida vagans*, *A. densiflora*, *Eragrostis leptostachya*	*Gonocarpus tetragynus, G. hederacea, Euchiton involucratus*	*C. sieberi*	Nil
RM3 (3376)	Nil	*C. sifton*	*Juncus usitatus*, *Eragrostis benthamii*, *Rytidosperma fulvum*	*Wahlenbergia gracilis*	Nil	Nil
RM4 (3376)	*E. agglomerata*, *E. macrorhyncha*, *A. decurrens*	C. sifton, *C. aculeata*	*Austrostipa scabra* subsp. *falcata*,	*E. trigonos*	*C. sieberi*	Nil

Plot (PCT)	Tree	Shrub	Grass & Grass-like	Forb	Fern	Other
			M. stipoides, *R. racemosum*			
RM5 (3373)	Nil	*C. Sifton, C. aculeata*, *Kunzea parvifolia*	*M. stipoides*, *E. benthamii*, *J. usitatus*	*Hydrocotyle sibthorpioides*, *E. involucratus*	Nil	Nil
BG1 (3376)	*E. blakelyi*, *E. bridgesiana*	*C. sifton*, *L. strigosa*	*A. scabra* subsp. *falcata*, *Lomandra multiflora*, *Themeda triandra*	*H. sibthorpioides*, *G. tetragynus*, *O. diphylla*	Nil	Nil
BG2 (3376)	*E. blakelyi*, *E. agglomerata*, *A. littoralis*	*C. sifton*, *C. aculeata*	*A. scabra* subsp. *falcata*, *L. multiflora*, *A. densiflora*	*G. tetragynus*, *W. gracilis*, *S. glauca*	Nil	Nil
CR1 (3376)	*Acacia parramattensis*	*C. sifton*	*J. usitatus*, *Sporobolus creber*	*G. solanderi*, *Haloragis hetrophylla*	Nil	Nil
CR2 (3373)	*A. littoralis*, *E. blakelyi*, *A. parramattensis*	*C. sifton*, *O. viscidula*, *Cassinia uncata*	*M. stipoides*, *A. scabra* subsp. *falcata*, *R. racemosum*	*Veronica plebeia*, *Oxalis radicosa*, *G. teucrioides*	Nil	Nil

3.1.2 Retained Vegetation Plots

The retained vegetation monitoring plots are assessed against benchmark values for species richness and species cover of target PCT species in Figure 9 and Figure 10, respectively. Tables of analysed data used to create the Figures are included in Appendix B. The species richness of trees ranges from 2-3 and is below the benchmark at all plots but has not declined over the monitoring period. The species cover of trees ranges from 0.2-35% and is typically below benchmark except for R4 which has reached benchmark in 2023.

The species richness of shrubs ranges from 2-9 and is below benchmark but has increased over the monitoring period, particularly at R3 which is now almost at benchmark. The species cover of shrubs ranges from 0.3-85.4% and has noticeably increased over the monitoring period such that most retained vegetation plots are now within or well above benchmark. R3 has seen a significant rise in shrub cover, whilst shrubs at R2 remain low and below benchmark.

The species richness of grass and grass-like ranges from 3-6 and is below the benchmark at all plots. There has been a slight decrease in species richness for grass and grass-like species across the monitoring period. Grass and grass-like covers range from 0.6-30.8, with scores varying across the plots. R1 and R2 have increased, whilst R3 and R4 have decreased. R1 and R4 have consistently remained below benchmarks, whilst R2 has been within benchmark across the monitoring program. The cover of grass and grass-like has declined significantly at R3.

Forb species richness ranges from 5-13 and is below benchmark for all plots. There has been a slight decrease in species richness for forb species across the monitoring period. The cover of forbs ranges from 0.7-52.1, with scores varying across the plots. R1 has increased such that it is now within benchmark. R2 and R4 have been consistently below benchmarks with scores decreasing in 2023. R3 has also decreased significantly in 2023 but has remained within benchmark.

Fern species richness ranges from 0-1 and is below benchmark for all plots but has not changed over the monitoring period. Fern covers have ranged from 0-0.2 which is below benchmark for PCT 3486 plots, but within benchmark of nil for the other PCTs.

'Other' growth form species richness ranges from 0-2 and is below benchmark for all plots except for R1 in 2020. R1 recorded one less 'other' species in 2023, whilst R3 recorded one additional 'other' species in 2023. Other covers have ranged from 0-0.3 which is below benchmark for PCT 3486 plots, other PCTs having a benchmark of nil.

Slight decline in species richness in the ground layer growth forms may be explained by the increasing density in the shrub layer.

Figure 9: Native Species Richness for Retained Vegetation Plots

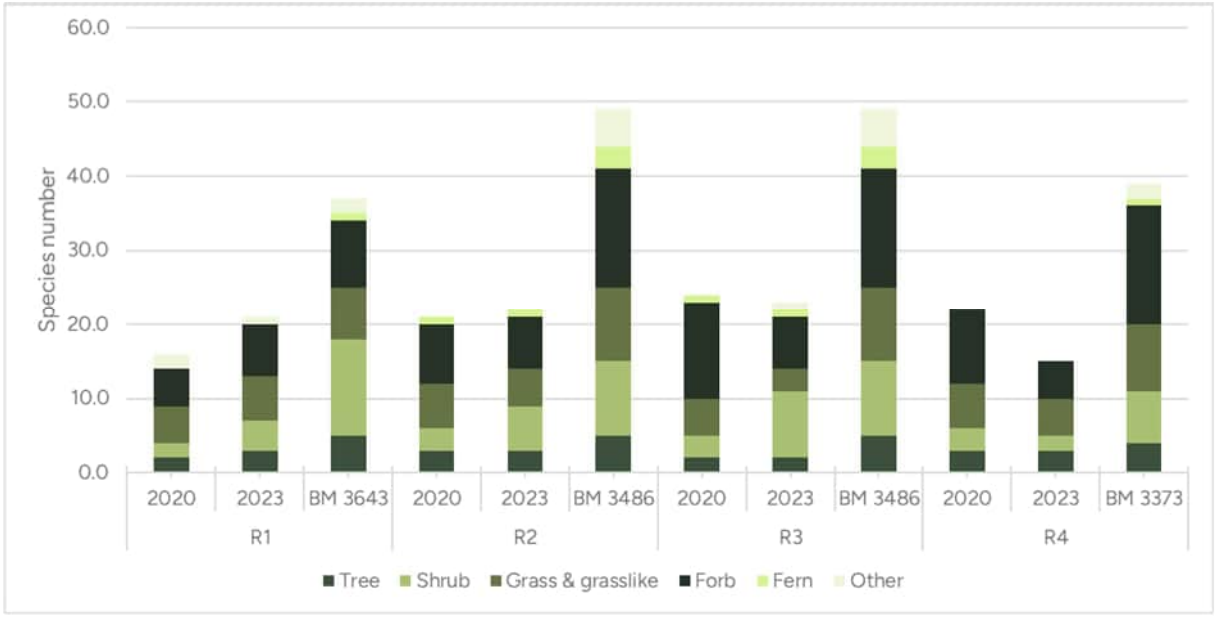
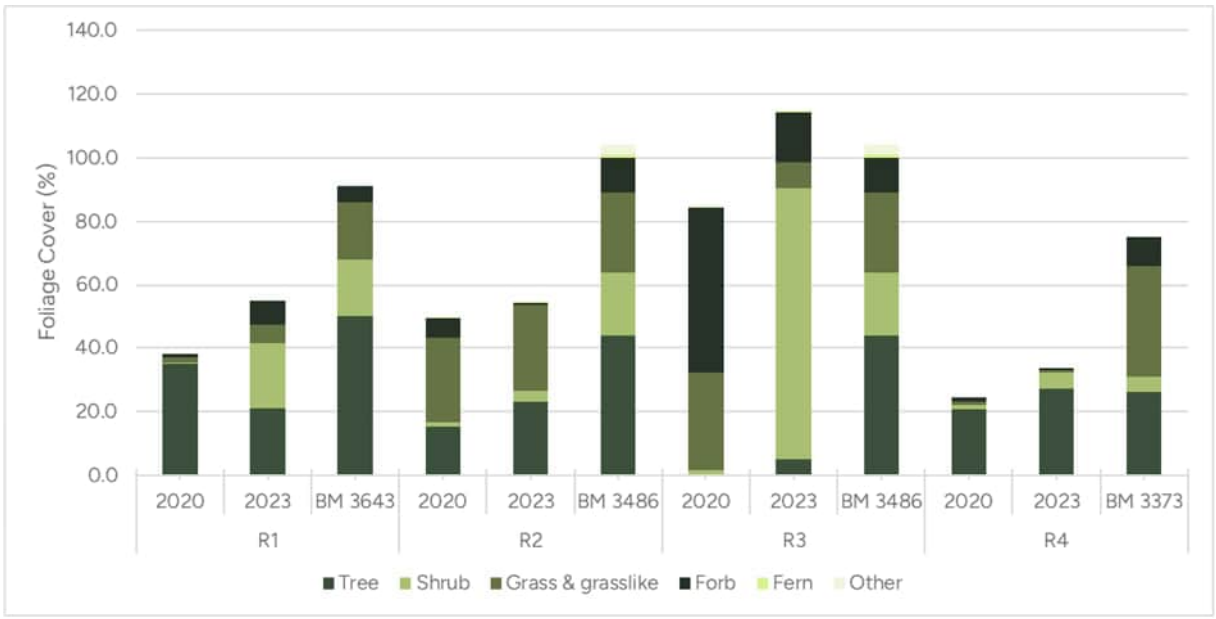


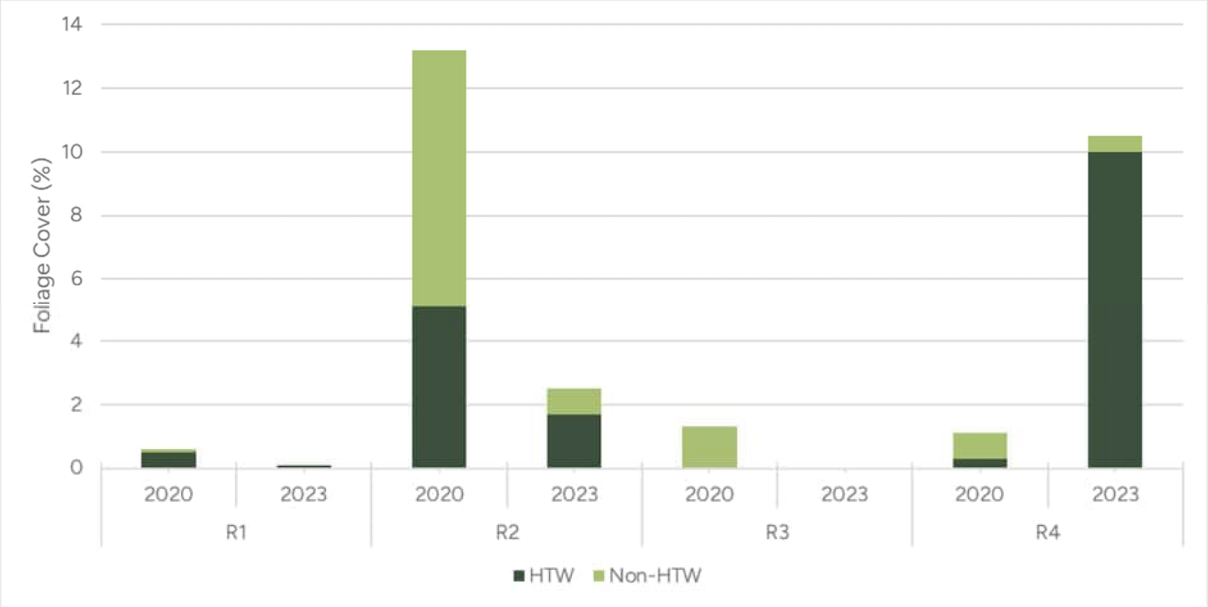
Figure 10: Native Species Cover for Retained Vegetation Plots



Exotic species covers for retained vegetation plots are represented in Figure 11, indicating cover of HTW and Non-HTW species. Across the monitoring period the HTW covers have ranged from 0-10% and the non-HTW covers have ranged from 0-8.1%. Weed covers were

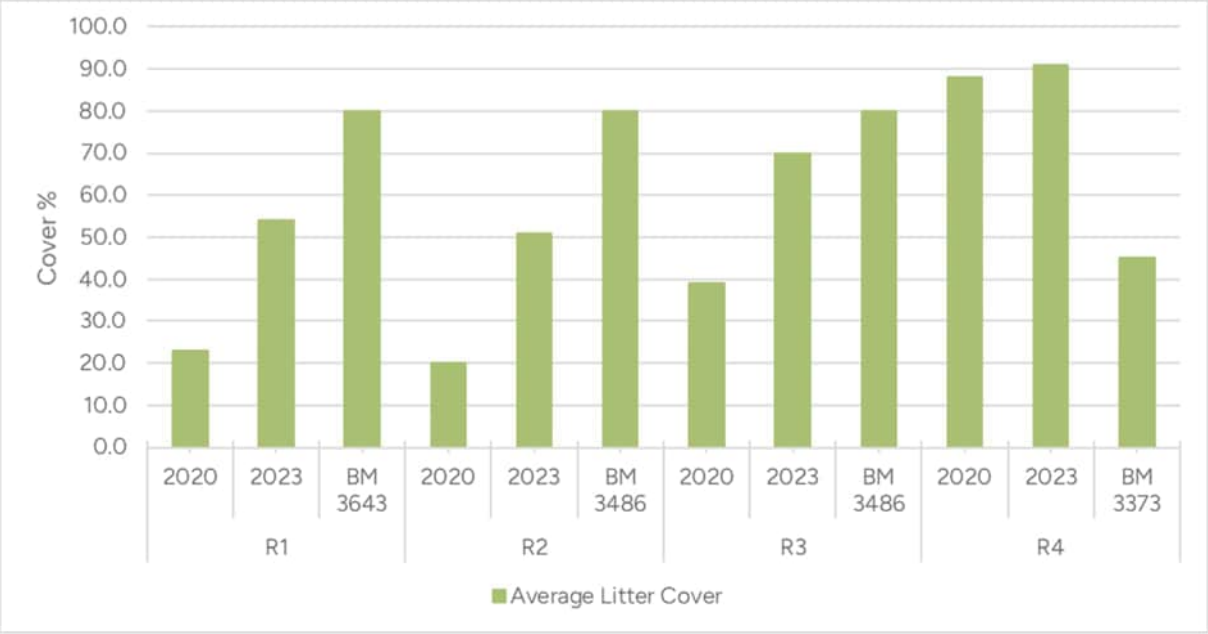
highest at R2 in 2020, but have significantly decreased in 2023, whilst weed covers have significantly increased at R4 in 2023.

Figure 11 Exotic Species Cover for Retained Vegetation Plots



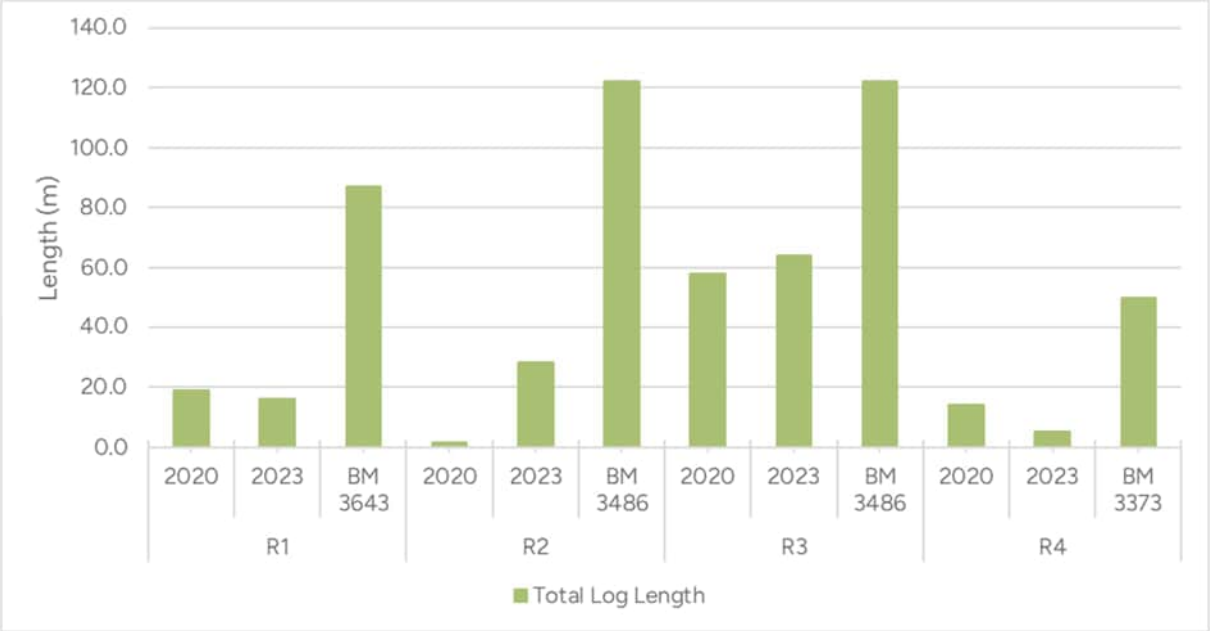
The retained vegetation monitoring plots are assessed against benchmark values for litter cover in Figure 12. Litter scores have ranged from 20-91% across the monitoring period. The data shows that litter scores have increased at all plots between 2020 and 2023. Most plots remain below benchmarks for litter, except for R4 which has remained well above benchmark across the monitoring period.

Figure 12: Litter Cover for Retained Vegetation Plots



The retained vegetation monitoring plots are assessed against benchmark values for total log length in Figure 13. The data shows that total log lengths have ranged from 1.5-64m across the monitoring period and are consistently below benchmark values. The total log lengths have decreased at R1 and R4 but have increased at R2 and R3.

Figure 13: Total Log Length for Retained Vegetation Plots



An assessment of vegetation integrity is provided in Figure 14. The graphs shows that composition improved or remained the same at R1 and R2 but declined at R3 and R4. Structure improved at all plots except R3. Function improved at R2 and R3 but declined at R1 and R4. Overall, the vegetation integrity, which is an indicator of vegetation condition, improved at R1 and R2 but declined at R3 and R4.

Figure 14: Vegetation Integrity Assessment for Retained Vegetation Plots

3.1.3 Rehabilitation Monitoring Plots

The rehabilitation monitoring plots are assessed against benchmark values for species richness and species cover in Figure 15 and Figure 16, respectively. Tables of analysed data used to create the Figures are included in Appendix B. The species richness of trees ranges from 0-3 and is below the benchmark at all plots but has not declined over the monitoring period. The species cover of trees ranges from 0-10% and is below benchmark

for all plots, having remained nil or decreased slightly at most plots except RM1 which increased slightly due to planting efforts.

The species richness of shrubs ranges from 0-3 and is below benchmark but has increased or remained the same over the monitoring period. The species cover of shrubs ranges from 0-45.2% and has noticeably increased over the monitoring period such that most rehabilitation monitoring plots are now within or well above benchmark.

The species richness of grass and grass-like ranges from 0-6 and is below the benchmark at all plots. There has been a slight increase in species richness for grass and grass-like species at most plots across the monitoring period, except for RM3 and RM5 which decreased slightly. Grass and grass-like covers range from 0-55.2%, with most plots remaining consistently below or declining to below benchmark in 2023. Grass and grass-like covers at RM1, RM2 and RM3 all increased across the monitoring period, with RM3 now within benchmark for species cover in 2023.

Forb species richness ranges from 1-8 and is below benchmark for all plots. There has been a slight decrease in species richness for forb species across the monitoring period, except for RM1 which increased. The cover of forbs ranges from 0.1-30.1%, with most plots being consistently below benchmark and experiencing an overall decline in cover over the monitoring period. The exception is at RM2 and RM3 where the cover of forbs has increased over the monitoring period such that RM2 is now well within benchmark.

Fern species richness ranges from 0-1 and is at or just below benchmark for all plots, having only changed slightly across the monitoring period (increase or decrease by one value at two plots). Fern covers have ranged from 0-0.5 which is at or above the benchmark of nil.

'Other' growth form species richness and cover has been consistently nil across the monitoring period and is below benchmark for all plots except RM5 which has a benchmark of nil.

Overall, the native species richness and cover has increased at RM1 due to the plot repositioning to the outer face of the amenity bund which has been planted with native species. The remaining plots have only seen slight changes to species richness, but cover has increased, particularly in the shrub layers which is likely due to increased rainfall and cessation of slashing practises. Sifton Bush *Cassinia sifton* has become prolific within the passive rehabilitation areas.

Figure 15: Native Species Richness for Rehabilitation Monitoring Plots

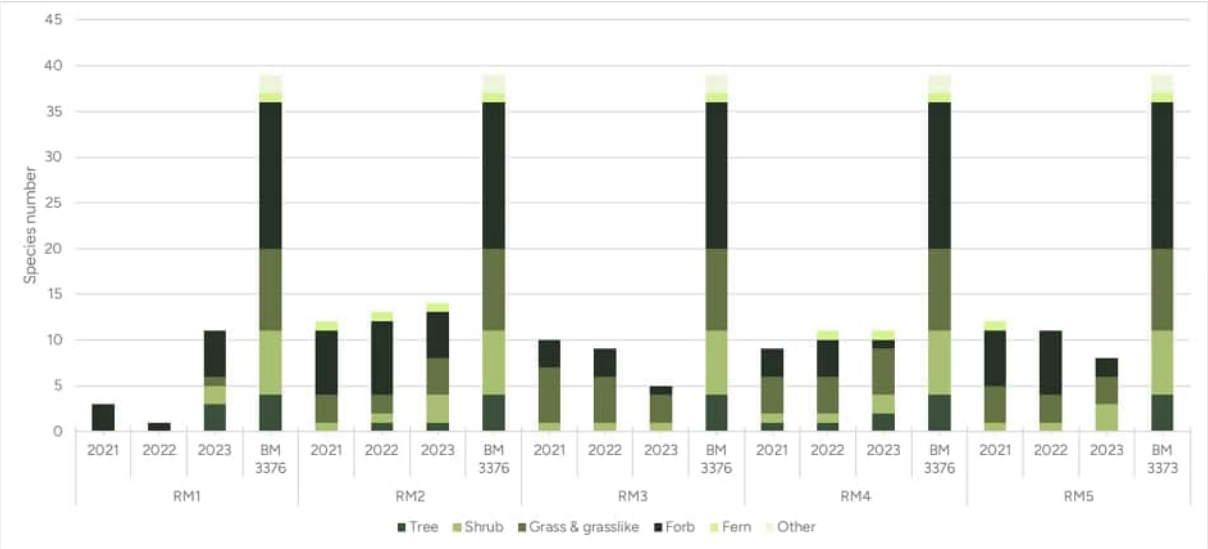
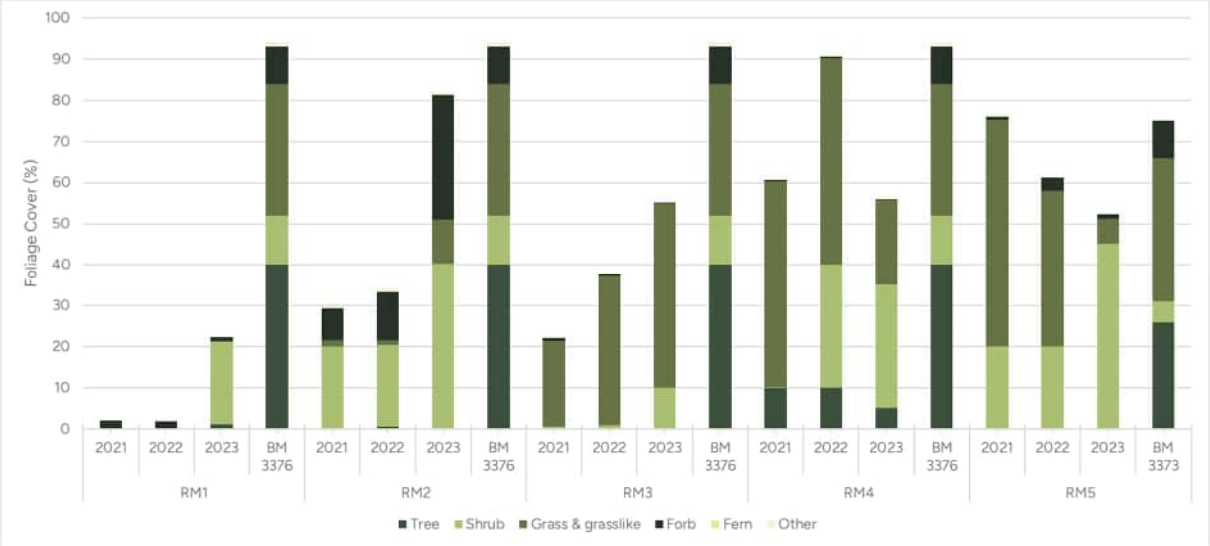
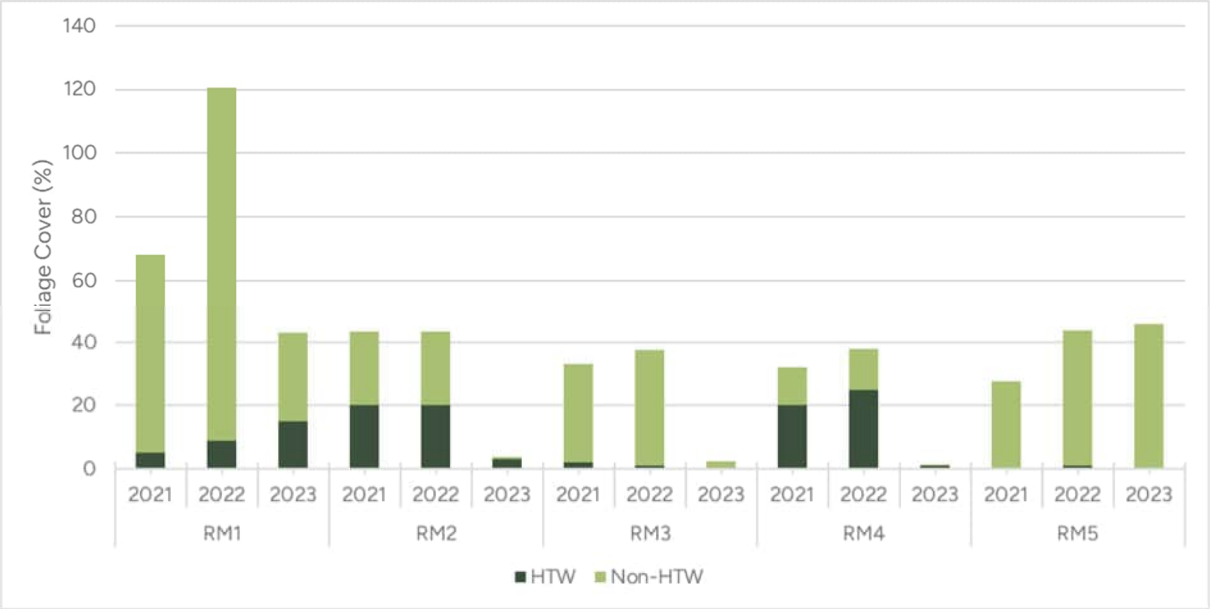


Figure 16: Native Species Cover for Rehabilitation Monitoring Plots



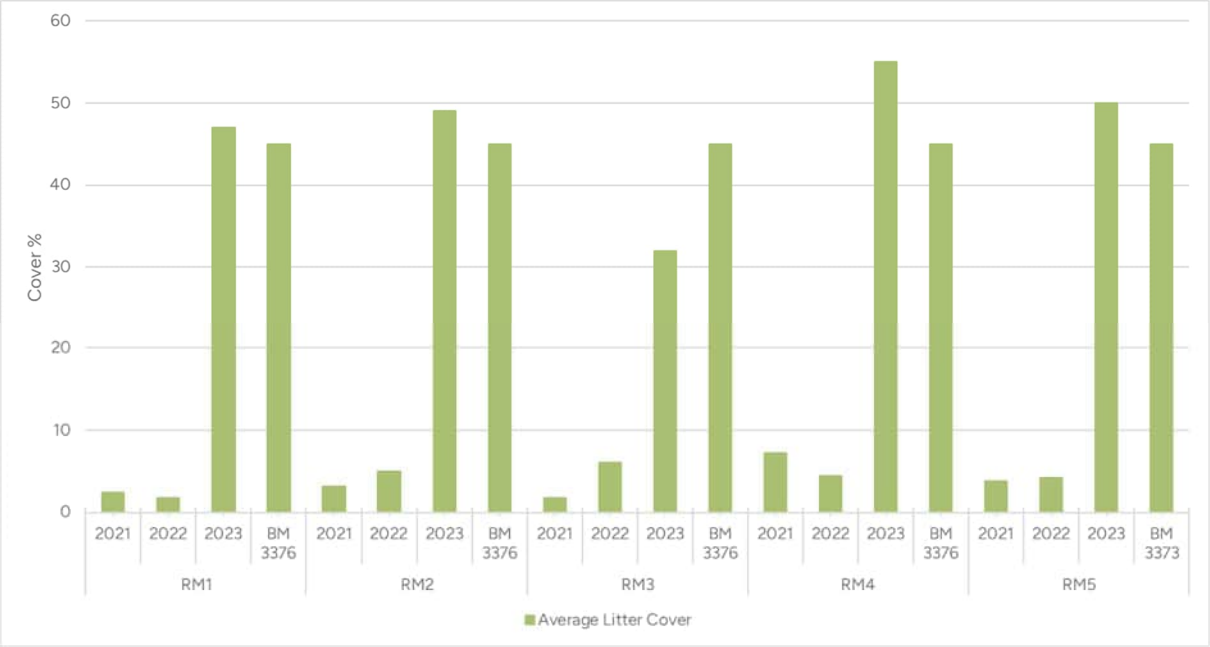
Exotic species covers for rehabilitation monitoring plots are represented in Figure 17, indicating cover of HTW and Non-HTW species. Across the monitoring period the HTW covers have ranged from 0.1-25% and the non-HTW covers have ranged from 0.5-111.17%. Weed covers were highest at RM1 in 2022 but have significantly decreased in 2023 (mostly due to plot relocation). Weed covers have decreased at most plots in 2023, except for RM5 which experience a slight increase in weeds.

Figure 17: Exotic Species Cover for Rehabilitation Monitoring Plots



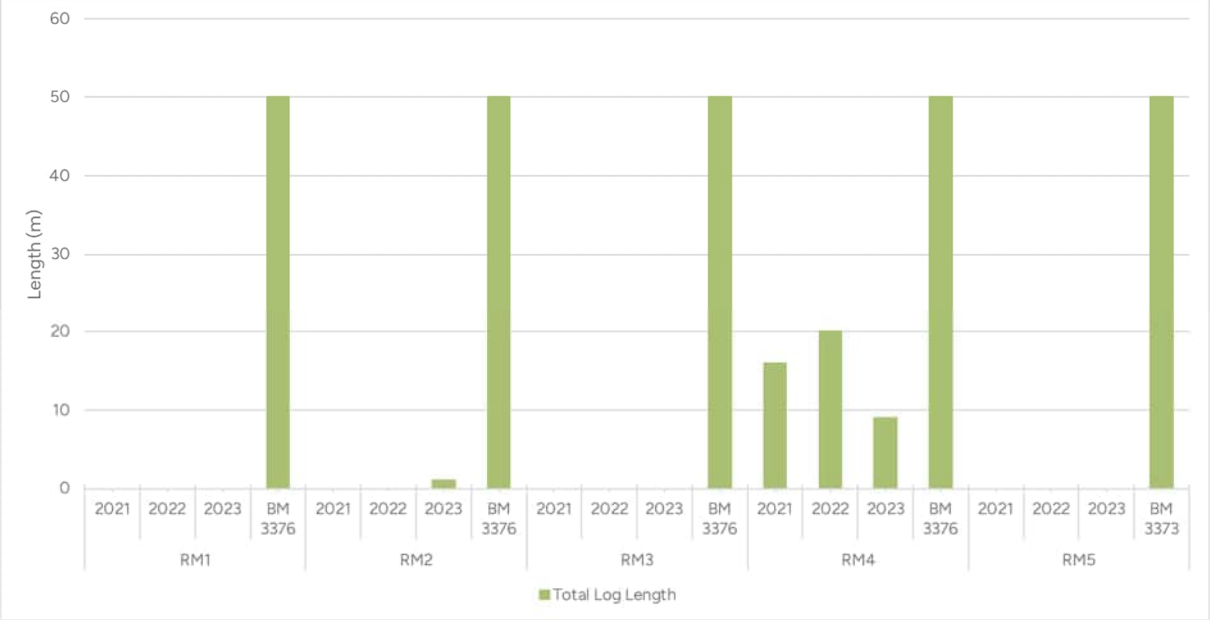
The rehabilitation monitoring plots are assessed against benchmark values for litter cover in Figure 18. Litter scores have ranged from 1.8-55% across the monitoring period. The data shows that litter scores have increased at all plots between 2020 and 2023. Most plots are now above benchmarks for litter, except for RM3 which is just below benchmark.

Figure 18: Litter Cover for Rehabilitation Monitoring Plots



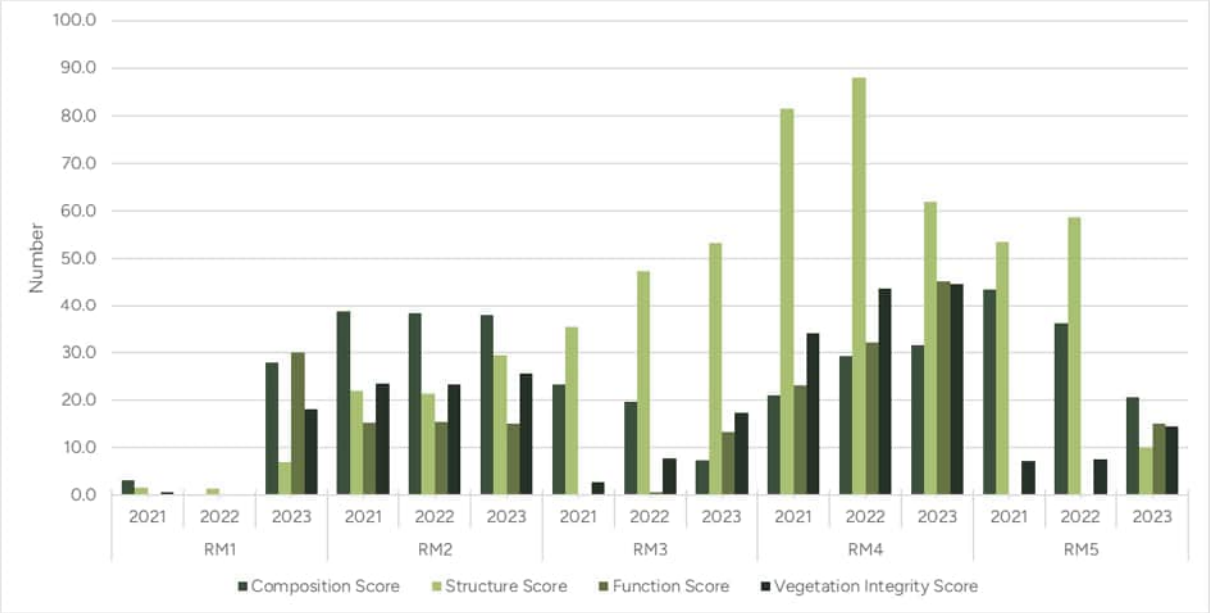
The rehabilitation monitoring plots are assessed against benchmark values for total log length in Figure 19. The data shows that total log lengths have ranged from 0-20m across the monitoring period and are consistently below benchmark values.

Figure 19: Total Log Length for Rehabilitation Monitoring Plots



An assessment of vegetation integrity for rehabilitation monitoring plots is provided Figure 20. The graph shows that composition improved or remained the same at RM1, RM2 and RM4 but declined at RM3 and RM5. Structure improved at all plots except RM4 and RM5. Function improved all plots. Overall, the vegetation integrity, which is an indicator of overall vegetation condition, improved at all plots.

Figure 20: Vegetation Integrity Assessment for Rehabilitation Monitoring Plots



3.1.4 Box-Gum Monitoring Plots

The Box-Gum monitoring plots are assessed against benchmark values for species richness and species cover in Figure 21 and Figure 22, respectively. Tables of analysed data used to create the Figures are included in Appendix B. The species richness of trees ranges from 2-4 and is below the benchmark at all plots having declined slightly over the monitoring period. Similarly, the species cover of trees ranges from 6-15.2% and is below benchmark for all plots and has decreased at all plots over the monitoring program. It is thought that some storm damage may have contributed to the decline in tree diversity and cover at these plots.

The species richness of shrubs ranges from 1-2 and is below benchmark but has increased or remained the same over the monitoring period. The species cover of shrubs ranges from 20.2-60% which has consistently been well above the benchmark.

The species richness of grass and grass-like ranges from 5-9 and has typically been below the benchmark, except for BG1 which is now within benchmark in 2023. There has been a slight increase in species richness for grass and grass-like species at BG1 across the monitoring period, but BG2 has decreased slightly. Grass and grass-like covers range from 1.3-55.6%, with most plots remaining consistently below or declining to below benchmark in 2023.

Forb species richness ranges from 2-11 and is below benchmark for all plots. There has been a slight increase in species richness for forb species at BG1 across the monitoring period, but BG2 has decreased. The cover of forbs ranges from 0.3-7.7%, being consistently below benchmark and experiencing an overall decline in cover over the monitoring period.

Fern species richness ranges from 0-1 and has typically been below benchmark for all plots. Fern covers have ranged from 0-0.1 which is at or above the benchmark of nil.

'Other' growth form species richness and cover has been consistently nil across the monitoring period and is below benchmark.

Overall, the native species richness and cover at the Box-Gum monitoring plots has remained or fallen below benchmark and has varied slightly throughout the survey period. An increase in the shrub layer appears to have affected ground cover species diversity and covers at the Box-Gum monitoring plots.

Figure 21: Native Species Richness for Box-Gum Monitoring Plots

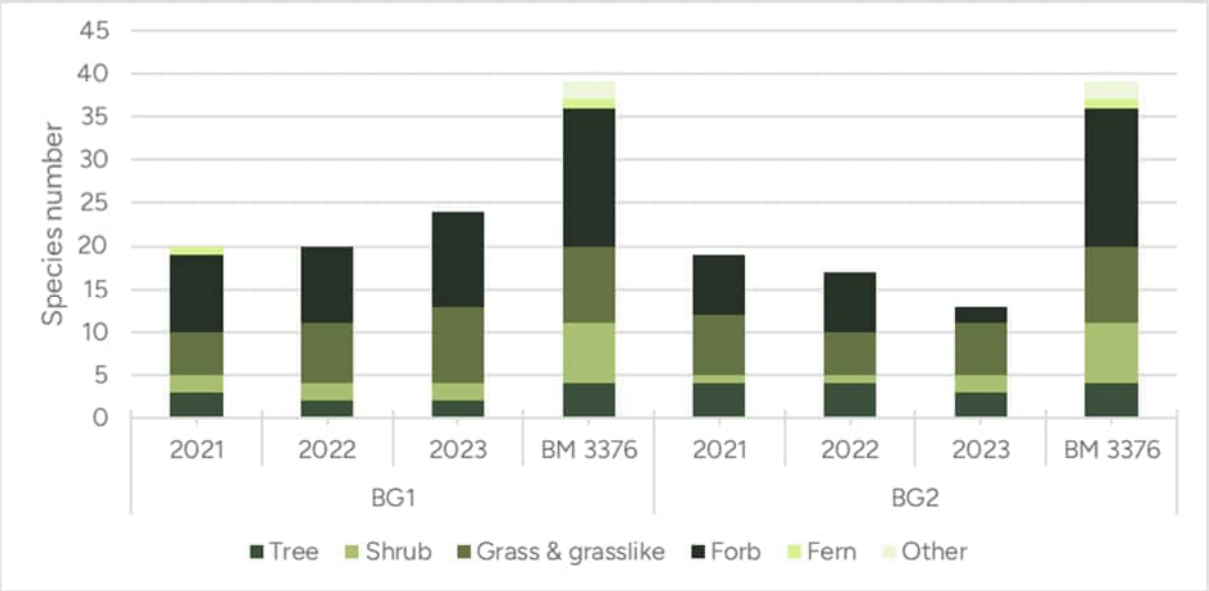
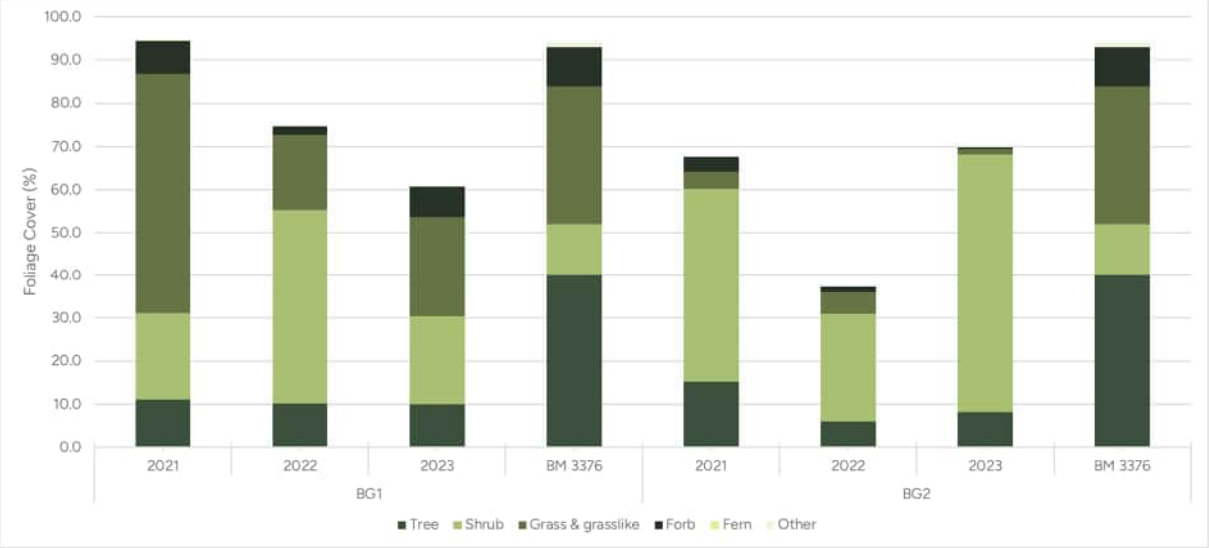
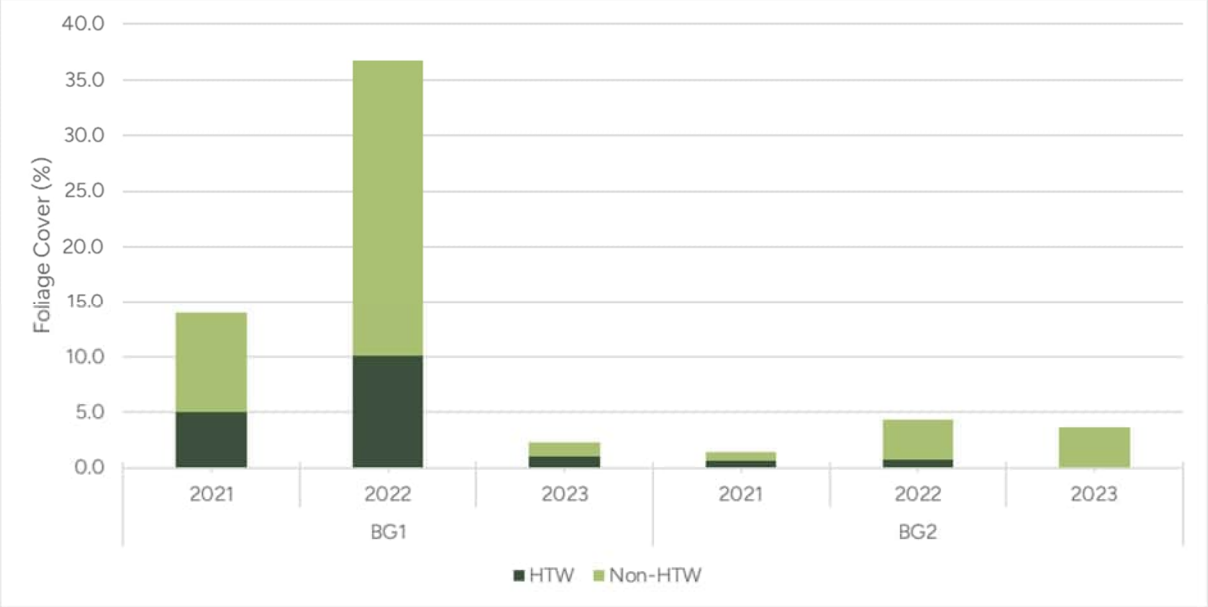


Figure 22: Native Species Cover for Box-Gum Monitoring Plots



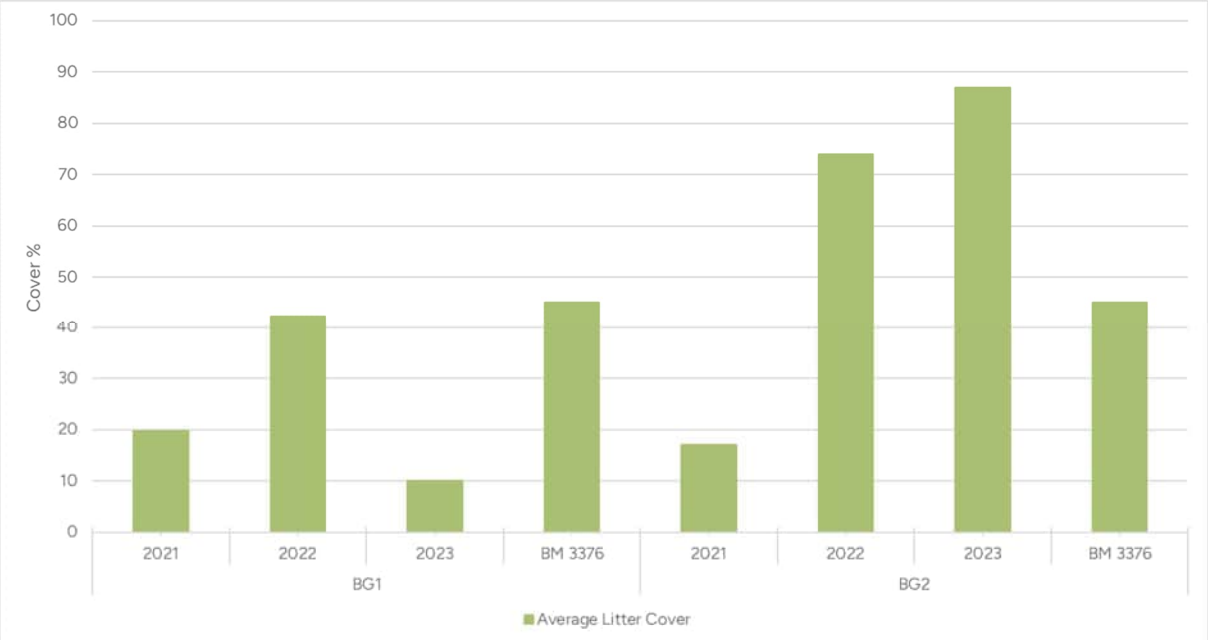
Exotic species covers for Box-Gum monitoring plots are represented in Figure 23, indicating cover of HTW and Non-HTW species. Across the monitoring period the HTW covers have ranged from 0.1-10.1% and the non-HTW covers have ranged from 0.8-26.6%. Weed covers were highest at BG1 in 2022, but have significantly decreased in 2023, whilst weed covers have remained low at BG2.

Figure 23: Exotic Species Cover for Box-Gum Monitoring Plots



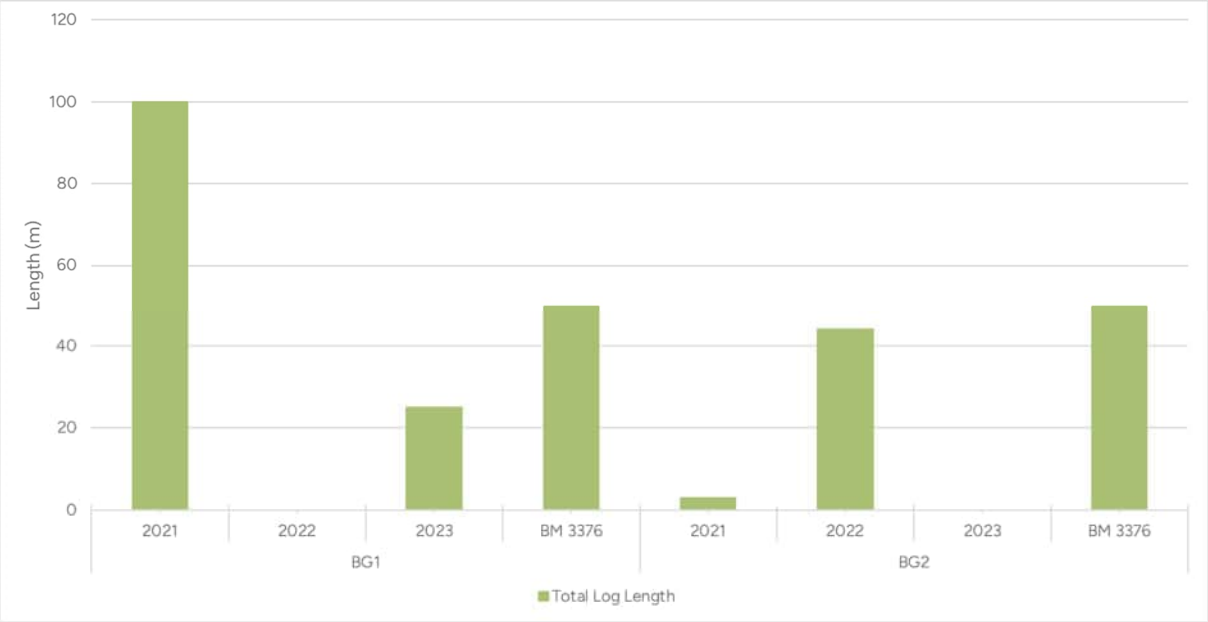
The Box-Gum monitoring plots are assessed against benchmark values for litter cover in Figure 24. Litter scores have ranged from 10-87% across the monitoring period. The data shows that overall litter scores have decreased at BG1 but increased at BG2 between 2020 and 2023. BG1 is below benchmark whilst BG2 has been consistently above benchmark. The ground litter may be affected by surface water flows at BG1 as there is a nearby drainage channel and evidence of sheet erosion was noted in 2023.

Figure 24: Litter Cover for Box-Gum Monitoring Plots



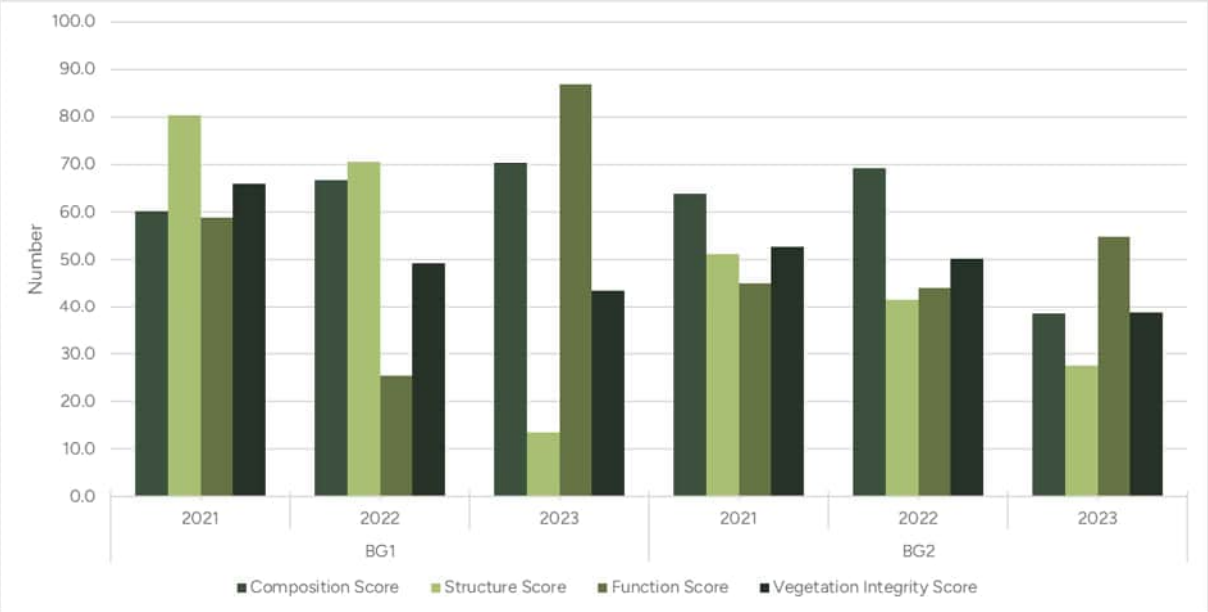
The Box-Gum monitoring plots are assessed against benchmark values for total log length in Figure 25. The data shows that total log lengths have fluctuated substantially, ranging from 0-100m across the monitoring period and more recently scores are below benchmark values.

Figure 25: Total Log Length for Box-Gum Monitoring Plots



An assessment of vegetation integrity for Box-Gum monitoring plots is provided in Figure 26 . The graph shows that composition increased at BG1 but decreased at BG2. Structure has decreased, whilst function has increased at both plots. Overall, the vegetation integrity, which is an indicator of vegetation condition, declined slightly at the Box-Gum monitoring plots.

Figure 26: Vegetation Integrity Assessment for Box-Gum Monitoring Plots



3.1.5 Core Riparian Plots

The core riparian monitoring plots are assessed against benchmark values for species richness and species cover in Figure 27 and Figure 28, respectively. Tables of analysed data used to create the Figures are included in Appendix B. The species richness of trees has consistently ranged from 1-3 over the monitoring period and is below the benchmark at both core riparian plots. The species cover of trees has been consistently below benchmark, ranging from 5-27%, but has shown an increase at both plots over the monitoring program.

The species richness of shrubs has consistently ranged from 1-3 and is below benchmark. The species cover of shrubs ranges from 0.1-39.5% and has risen significantly over the monitoring period such that both plots are now well above the benchmark.

The species richness of grass and grass-like ranges from 2-6 and has remained below the benchmark. There has been a slight increase in species richness for grass and grass-like at CR2 across the monitoring period, but CR1 remains unchanged. Grass and grass-like covers range from 3.5-40.6%, with a substantial increase noted across the monitoring period, such that CR2 is now within benchmark.

Forb species richness ranges from 1-4 and is below benchmark for both core riparian plots. There has been a slight decrease in species richness for forb species at CR2 across the monitoring period, but CR1 remains unchanged. The cover of forbs ranges from 0.1-1.7%, being consistently below benchmark and experiencing and slight increase in cover over the monitoring period.

The 'fern' and 'other' growth form species richness and cover has been consistently nil at both core riparian plots across the monitoring period and is below benchmark.

Overall, the native species richness and cover at the core riparian monitoring plots has improved over the monitoring period, such that some structural layers are now within benchmark. Like the other monitoring locations there was a notable increase in the cover of the shrub layer since the previous monitoring event.

Figure 27: Native Species Richness for Core Riparian Plots

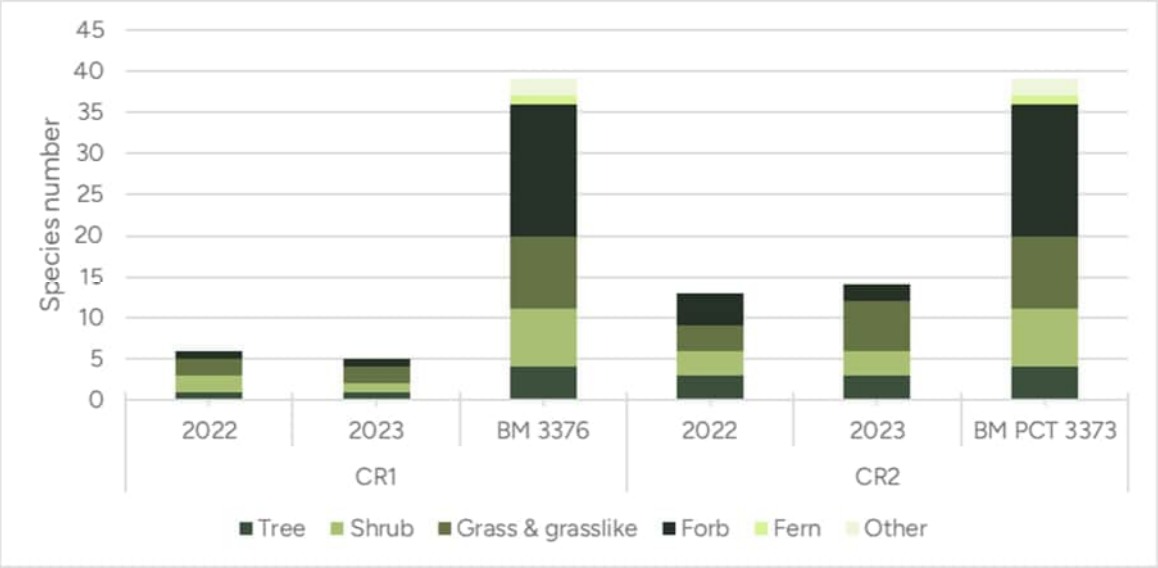
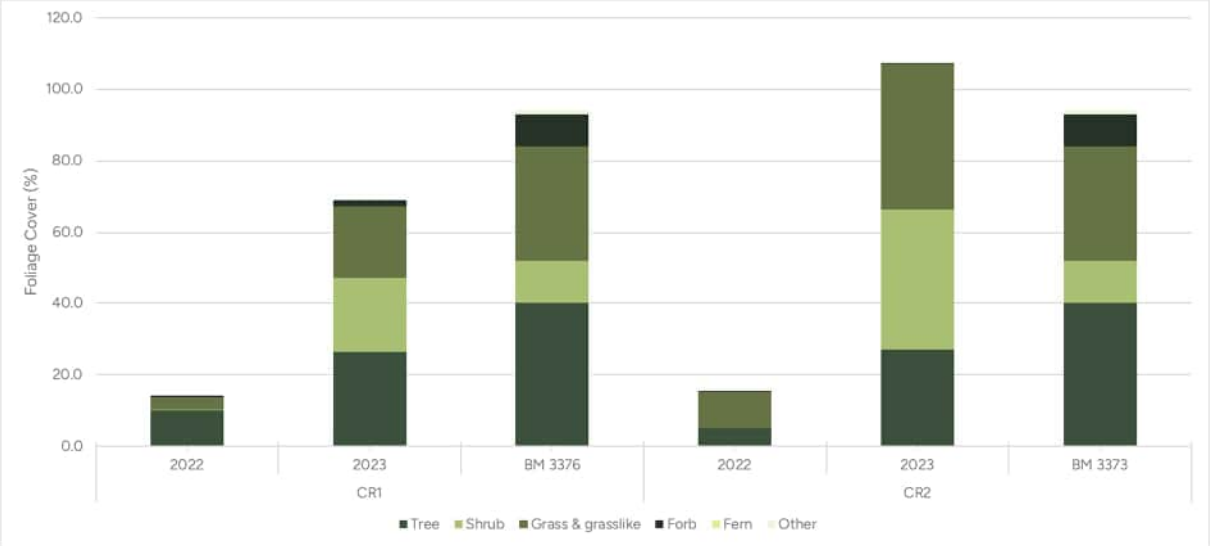
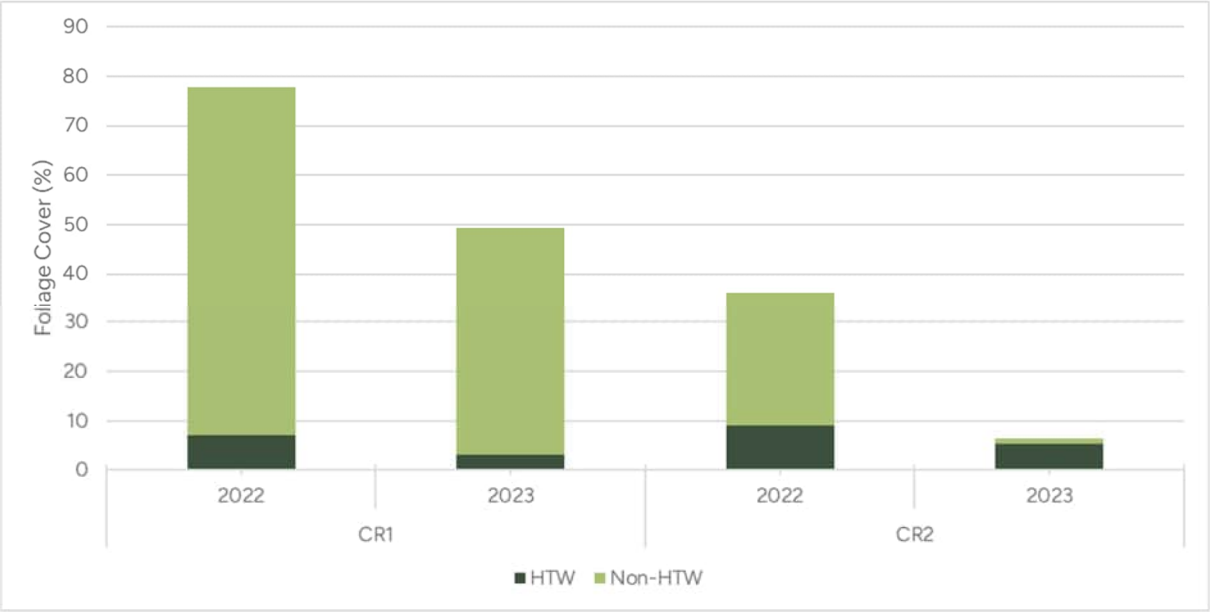


Figure 28: Native Species Cover for Core Riparian Plots



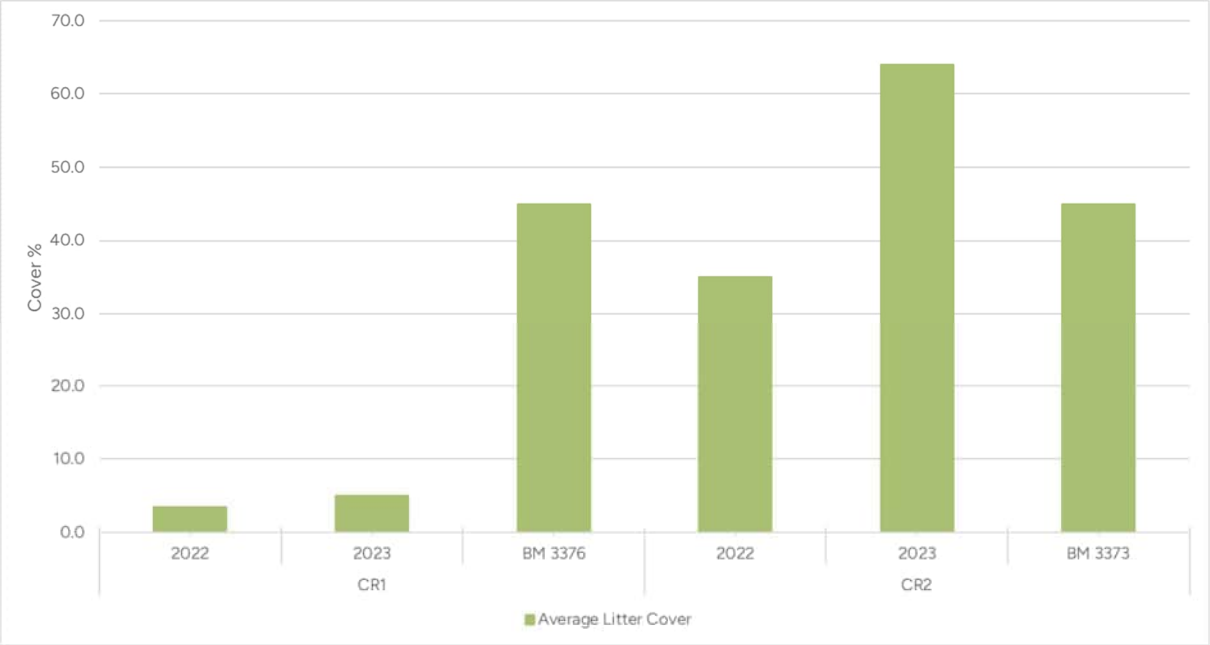
Exotic species covers for core riparian plots are represented in Figure 29, indicating cover of HTW and Non-HTW species. Across the monitoring period the HTW covers have ranged from 3.2-9.1% and the non-HTW covers have ranged from 1.1-70.8%. Weed covers were highest at CR1 in 2022 but have decreased at both core riparian plots in 2023.

Figure 29: Exotic Species Cover for Core Riparian Plots



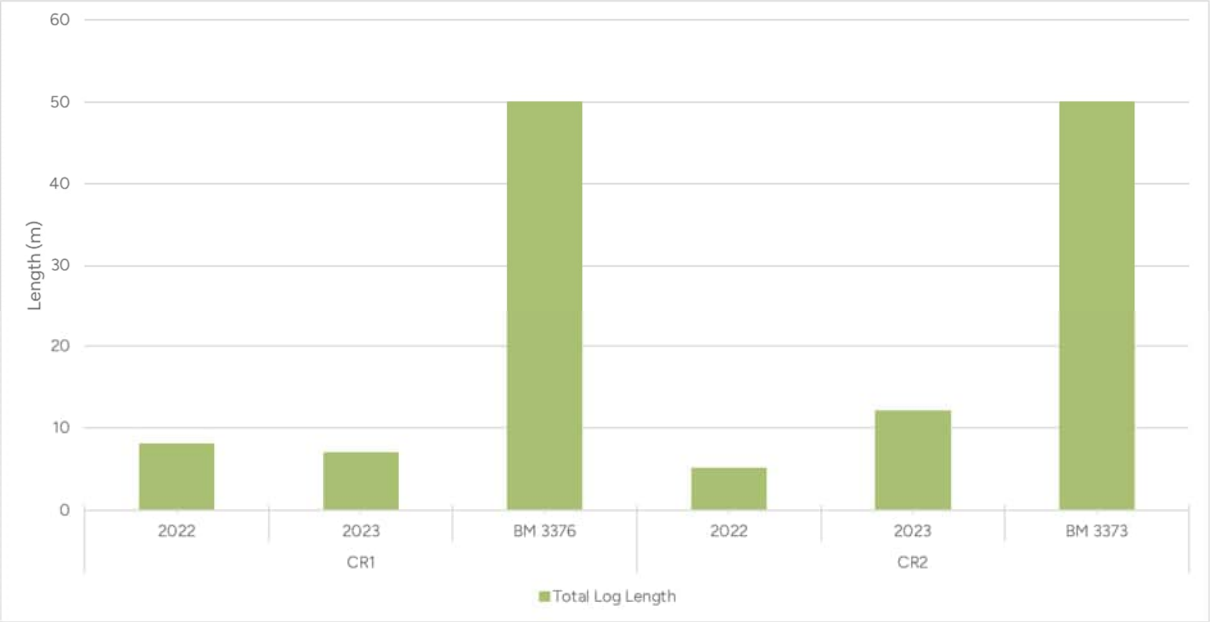
The core riparian monitoring plots are assessed against benchmark values for litter cover in Figure 30. Litter scores have ranged from 3.4-64% across the monitoring period. The data shows that overall litter scores have increased, such that CR2 is now well within benchmark. However, litter cover remains low and below benchmark at CR1.

Figure 30: Litter Cover for Core Riparian Plots



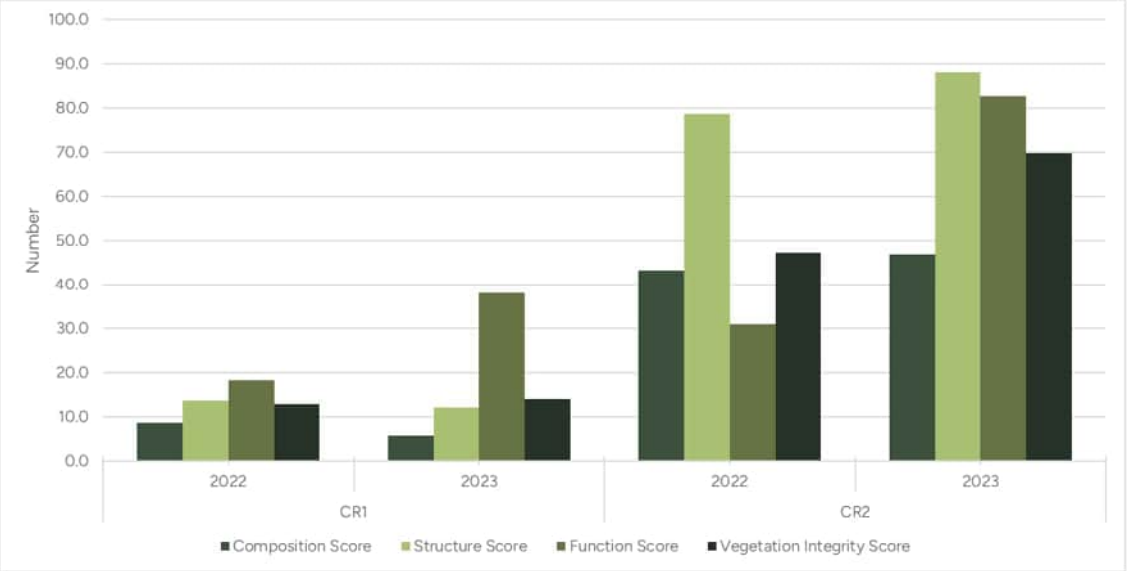
The core riparian monitoring plots are assessed against benchmark values for total log length in Figure 31. The data shows that total log lengths have remained below benchmark and have not changed much, ranging from 5-12m across the monitoring period.

Figure 31: Total Log Length for Core Riparian Plots



An assessment of vegetation integrity for core riparian monitoring plots is provided in Figure 32. The graph shows that composition and structure decreased slightly at CR1 but increased slightly at CR2, whilst function increased notably at both plots. Overall, the vegetation integrity, which is an indicator of vegetation condition, increased at the core riparian monitoring plots.

Figure 32: Vegetation Integrity Assessment for Retained Vegetation Plots



3.2 Fauna Monitoring Results

A total of 47 fauna species were recorded during the 2023 monitoring surveys at the retained vegetation plots (R1, R2, R3, R4), including one reptile, two crustacean, four frog, 14 mammal, and 26 bird species. A summary of fauna species composition per plot is included in Table 9. A complete fauna species list in included in Appendix C.

Table 9: Fauna Species Composition per Monitoring Plot

Fauna group	R1	R2	R3	R4
Total number of birds	12	15	12	12
Total number of Crustacean	0	2	0	0
Total number of frogs	2	1	2	4
Total number of mammals	3	10	5	2
Total number of reptiles	1	1	0	1
Total native	18	26	19	18
Total exotic	0	3	0	1
Total threatened species	0	2	0	0

One threatened species and one potential threatened species were recorded:

- Large Bent-winged Bat *Miniopterus orianae oceanensis*, listed as vulnerable under the BC Act
- Potential record only for the Squirrel Glider *Petaurus norfolcensis*, listed as vulnerable under the BC Act

The following four exotic pest species were recorded:

- Common Myna *Acridotheres tristis*
- Cat *Felis catus*
- European Rabbit *Oryctolagus cuniculus*
- Fox *Vulpes vulpes*

3.3 Nest Box Monitoring

A total of 59 nest boxes were inspected during the winter monitoring event (see Appendix A for complete nest box inventory). Key results are summarised as follows:

- 11 nest boxes were occupied by native fauna, including: eight boxes occupied by either Sugar Gliders or Squirrel Gliders *Petaurus spp*. (six boxes had young), two boxes occupied by Brushtail Possum *Trichosurus vulpecula*, one box contained a deceased Wood Duck *Chenonetta jubata*.
- One nest box contained what appears to be an active Wood Duck nest, containing a feather nest with medium - large fresh eggs.
- 47 of the 59 nest boxes contained nesting material, identified as being a mix of glider nests (leaf material), wood duck nest (bark and leaves with fragments of eggs) and bird nests (sticks and feathers).
- Seven nest boxes were recorded as having chew marks on the entrance, ranging from severe to slight chew marks.
- Three nest boxes were recorded as having pests (inactive wasp nests).
- Five nest boxes require maintenance including:
    - One requiring the removal of an inactive wasp nest.
    - One box needs tightening or replace attachment on the tree.
    - One microbat box needs to be replaced on to a new tree due to a snapped tree branch.
    - Two boxes need to be replaced due to deterioration.

3.4 Hoary Sunray Monitoring

All populations previously mapped by Umwelt (2013) were identified as still present and within roughly the same bounds of the previous mapping, although population extent appears to have reduced in 2023.

Results of the population count, patch size and a population estimate for the plot are included in Table 10. An extrapolation of the plot results estimates the population size at 213,078 plants, which is a significant reduction from the 2020 estimate which has been recalculated as 15,490,172 plants. However, these are likely over-estimates as some areas within the larger patches contained no plants, or very few plants. Increased sampling plots would result in better estimates.

All Hoary Sunray monitoring data, including notes on disturbance and general health, is included in Appendix E. Generally, conditions at most Hoary Sunray monitoring plots appeared to be dry in 2023 with light grazing and weediness recorded at all plots. The overall health of the vegetation was poor or moderate and Sifton Bush was noted as representing competition around many plots.

Table 10: Hoary Sunray Counts and Extrapolated Population Estimate

Plot ID	Number per 1m^2	Patch area (m^2)	Population estimates
HS1	1.5	7566.5	11349.7
HS2	0.3	2440.1	616.1
HS3	0.0	18454.0	0.0
HS4	0.0	53811.8	0.0
HS5	0.0	169143.2	0.0
HS6	4.5	9664.0	43487.9
HS7	5.3	8764.4	46013.2
HS8	0.0	21942.2	0.0
HS9	0.8	130011.2	97508.4
HS10	0.0	28452.8	0.0
HS11	0.8	18803.7	14102.8
Average/Total	**1.2**	**469,053.9**	**213,078.1**

3.5 Rehabilitation Inspection

3.5.1 General Observations

General observations were made at all monitoring plots in 2023 and are included in Appendix B. Natural regeneration was observed at most plots, but for some areas only a very low level of regeneration was occurring. Most of the open paddock areas (eg RM2, RM3, RM5) which are being monitored for natural regeneration are regenerating with very high abundance and cover of Sifton Bush *Cassinia sifton* (see Photo 1), which appears to be resulting in suppression of other native species, including the Hoary Sunray, as well as forming a potential bushfire hazard and limiting access to the monitoring plots. Due to earthworks at RM1 natural regeneration was not occurring, but tree and shrub planting was evident.

Native species cover and diversity varied across the plots but was generally lower at the rehabilitation monitoring plots, particularly in the canopy layer. General vegetation health was overall moderate to good, but generally lower at the rehabilitation monitoring plots. Weeds occur at most plots but were generally lower in 2023 than other years of monitoring. Plots with higher weeds include R4, RM1, RM5 and CR1. Main problematic weeds were Serrated Tussock (see Photo 2), African Lovegrass, Blackberry (see Photo 3) and Sweet Vernal Grass (see Photo 4). The core riparian plot CR2 did not have a high cover of weeds within the plot but Serrated Tussock and Blackberry were noted as highly abundant along the adjacent creek line.

No threatened or significant species were noted at the vegetation monitoring plots. Overall, the Hoary Sunray was less abundant across the Holcim land than previous years. Feral animals recorded at the site in 2023 were mainly made via animal scat observations and include Rabbit/Hare (recorded at most sites), Feral Honeybees (recorded at R3) and European Fox (recorded at RM1 and BG1). Potential rabbit warrens were also noted at RM4 and CR2.

Severe creek erosion was observed at R4 and CR2, and minor sheet erosion was noted at RM1, RM2, RM4 and BG1. There was no evidence of recent fire at any of the plots and fuel loads were moderate at R1, R3, BG1, BG2 and CR2. Sifton Bush may also present a fire hazard at RM2, RM3 and RM5.

Signs of human disturbance include historic clearing at RM3, RM5, CR1, a disused track at RM1 and a small drainage bund at RM4. Signs of animal disturbance include Kangaroo/Wallaby/Rabbit grazing at most plots, with areas of bare ground from Kangaroo mobs at R1. Wombat burrows were noted at R3, BG2 and CR1 and possible rabbit warrens were noted at RM4 and CR2.

Other site management noted include:

- Erosion controls requiring ongoing maintenance at RM1 and CR2.
- Successfully established planting on western side of amenity bund at RM1, with recommendation for log emplacement.
- Perimeter BOA protection fencing successful at RM5/BG1.

Photo 1: Sifton Bush taking over previously cleared paddock areas at RM3

Photo 2: Serrated Tussock grass occurring around the active quarry at RM1

Photo 3: Evidence of successful Blackberry control in northeast of the Quarry

Photo 4 Sweet Vernel Grass in foreground at the southern portion of the BOA

Photo 5: Erosion occurring at R4 in the northeast of the site

3.5.2 Biodiversity Offset Area Observations

The areas of retained Box-Gum woodland vegetation within the BOA (ie 'Box-Gum Woodland (CEEC)' and 'Box-Gum Woodland derived Native Grassland (CEEC)' – see Figure 4) are generally in moderate to good condition and no immediate actions are necessary, other than spot control of high threat weeds, such as Serrated Tussock *Nassella trichotoma* and St John's Wort *Hypericum perforatum*. Open areas in the west of the BOA that appear to have been historically cleared (previously identified as derived native grassland) are naturally regenerating with *Eucalyptus* spp. and *Cassinia sifton* (see Photo 6). Evidence of planting was seen in the southeast of the BOA (Photo 7).

Other parts of the BOA were also generally in moderate to good condition, although control of high threat and priority weeds Serrated Tussock *Nassella trichotoma*, St John's Wort *Hypericum perforatum* and Blackberry *Rubus anglocandicans* is required as patches of these species occur particularly in the southeast portion of the BOA. In 2023 there was a significant increase in the cover and abundance of Sifton Bush *Cassinia sifton*, particularly in disturbed open paddocks. Although this species is native, in the Southern Tablelands it has become a weed of disturbed areas and degraded native pasture (DPI 2024). At present the Sifton Bush is outcompeting native species and may be contributing to a reduction in the Hoary Sunray population.

A program of slashing or brushcutting involving minimal disturbance to soils and other native plants, as well as tree planting should be implemented to reduce the cover of Sifton Bush.

No erosion was seen within the areas of the BOA that were inspected although erosion was seen along the southern edge of the BOA in previous surveys. Erosion inspections targeting areas of drainage should be undertaken by a qualified expert and erosion control measures implemented where required.

There were no other management issues noted at the BOA.

Photo 6: Regeneration in Box-Gum Woodland derived Native Grassland CEEC

Photo 7: Tree Plantings along eastern edge of southern BOA

4.0 Completion Criteria Assessment

An assessment of completion criteria from the RLMP is provided in Appendix F. The assessment determined the following:

- With respect to the amenity bund:
  - Four completion criteria are on track vegetation establishment, groundcover protection, weed and feral pest control, achievement of a sustainable ecosystem with trees.
  - Three are not met including presence of habitat features, recruitment of natives and fencing.
- With respect to the HMA:
  - Two completion criteria were unable to be assessed, being the completion criteria in relation to fencing of the HMA, cattle exclusion.
  - three are on track for completion, being nest box usage, weed and feral pest control, natural regeneration.
- With respect to the core riparian corridors:
  - two completion criteria are not met due to a lack revegetation and natural regeneration at CR1.
  - two are on track for completion, being nest box usage, weed and feral pest control.
  - one could not be assessed (cattle exclusion).

5.0 Discussion and Recommendations

5.1 Vegetation Monitoring

5.1.1 Floristic Analysis

Floristic analysis against the new PCT classifications (DPE 2022) has shown that most plots correspond to PCT 3373 or PCT 3376 which are forms of the CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSC 2024, DCCEEW 2024b). Two of the retained vegetation plots have been found to correspond better with the common PCT's being PCT 3486 at R2 and R3 and PCT 3643 at R1. It is recommended that comparison to PCTs is repeated at each monitoring event to ensure vegetation is representative of the correct PCT.

5.1.2 Retained Vegetation Plots

Retained vegetation plots have maintained a good tree canopy over the monitoring program, as well as a shrub layer that has increased in cover and diversity, which in turn has seen some lower scores and slight decreases in the grass, forb, fern, and other growth forms (particularly at the plots that are within more forested areas, being R3 and R4). Natural regeneration is occurring, cover and abundance of natives is good, overall health is moderate to good and weed covers are low at most plots. Some of the cover and abundance scores are within benchmark of the respective PCTs at the retained vegetation plots.

No threatened or significant species were recorded during the rehabilitation inspections. However, potential habitat (native vegetation and hollow-bearing trees) is present for species known to occur at the site (the Squirrel Glider, Speckled Warbler and threatened species of bats).

Feral animals recorded at the retained vegetation sites include Rabbit/Hare, Fox, and Feral Honeybee. Erosion was minimal at most sites, however, R4 is being affected by erosion of a nearby drainage channel. No recent fire was recorded, and fuel loads were thought to be moderate at R1 and R3 and low at the other sites. Signs of disturbance were minor and include animal (Kangaroo/Wallaby, Rabbit, Wombat) activity and grazing.

Follow up actions for these sites include feral animal control at all sites and weed removal and erosion control at R4. The increased density of the shrub layer indicates that an ecological burn may be considered for larger bushland areas over the coming years (in the vicinity of R3).

5.1.3 Rehabilitation monitoring sites

Rehabilitation monitoring sites have a low cover and diversity of trees, high cover of shrubs which has significantly increased since the past survey (due to Sifton Bush), low to moderate cover and diversity in the grass, forb, fern, and other layers. Natural regeneration is low, and weeds are low, but RM1 and RM5 may benefit from minor weed control. These areas are below benchmark for the respective PCT and would benefit from Sifton Bush control, followed by native tree planting. The total length of logs is low at most rehabilitation sites and log emplacement could be considered where feasible.

No threatened or significant species were recorded at the rehabilitation inspections. Feral animals recorded at the retained vegetation sites include Rabbit/Hare and Fox. Erosion was minimal at all sites, but sediment fencing requires ongoing maintenance at RM1. No recent fire was recorded, and fuel loads were thought to be low at all rehabilitation monitoring sites. Dense Sifton Bush was noted as a potential fuel source at RM2, RM3 and RM5.

Signs of human disturbance include past clearing, disused track (RM1) and drainage ditch (RM4). Signs of disturbance by animals include Kangaroo/Wallaby, Rabbit grazing, with possible rabbit warrens at RM4. Weed control is required, particularly at RM1 and RM5. Tree plantings appear to have successfully established at RM1 and fencing is in good condition at the BOA (RM5).

Follow up actions for the rehabilitation sites include feral animal control, weed control, Sifton Bush control, native tree planting, log emplacement and maintenance of sediment control devices (RM1 only).

5.1.4 Box-Gum Monitoring sites

Box-Gum monitoring sites have undergone a slight decrease on canopy condition due to storm activity, but shrub diversity and cover have improved slightly, and grass, forb, fern, and other growth forms have decreased only slightly. Natural regeneration is occurring, cover and abundance of natives is good, overall health is moderate to good and weed covers are low. Some of the cover and abundance scores are within benchmark of the respective PCTs at the Box-Gum monitoring sites.

No threatened or significant species were recorded at the rehabilitation inspections. Feral animals recorded at the Box-Gum monitoring sites include Rabbit/Hare and Fox. Minor sheet erosion was noted at BG1 due to proximity to a small drainage line. No recent fire was recorded, and fuel loads were thought to be moderate. Signs of disturbance were minor and include animal (Kangaroo/Wallaby, Rabbit, Wombat) activity and grazing. Fencing is in good condition at these sites. Overall, the vegetation integrity has declined slightly at the Box-Gum monitoring sites, but this is likely due to natural factors at the monitoring site locations such as storm damage, drainage, and animal disturbances.

Follow up actions for the Box-Gum monitoring sites include feral animal control and minor weed control.

5.1.5 Core riparian sites

Overall, the native species richness and cover at the core riparian monitoring sites has improved over the monitoring period, such that some structural layers are now within benchmark. Tree cover and diversity at CR1 remains low and natural regeneration in minimal. Like the other monitoring locations there was a notable increase in the cover of the shrub layer since the previous monitoring event.

No threatened or significant species were recorded at the rehabilitation inspections. Feral animals recorded at the core riparian monitoring sites include Rabbit/Hare. Bank erosion was noted at both locations, being more severe at CR2. No recent fire was recorded, and fuel loads were thought to be low to moderate. Signs of disturbance include past clearing and include animal (Kangaroo/Wallaby, Rabbit, Wombat) activity and grazing.

Follow up actions for the core riparian sites include feral animal control, weed control, native tree planting and erosion control.

5.2 Fauna monitoring

Fauna surveys at retained vegetation monitoring sites detected a good assemblage of native species at the retained vegetation sites, being one reptile, two crustacean, four frogs, 11 mammals, and 26 birds. Spotlighting surveys detected three arboreal mammals (Sugar Glider, Brushtail Possum, and a possible Squirrel Glider), two macropods (Eastern Grey Kangaroo, Swamp Wallaby), three frogs (Brown-striped Frog, Eastern Dwarf Frog and Peron’s Tree Frog), one bird (White-faced Heron) and three feral mammals (Fox, Cat, and Rabbit). Bat detectors returned five microchiropteran bats including one threatened species, and it is thought that three of the bat detectors had technical issues at sites R1, R3 and R4

as they returned no results. Infrared cameras recorded the White-faced Heron, Magpie Lark, Eastern Grey Kangaroo, Wombat and Fox.

Feral pest monitoring is recommended due to records of rabbits, foxes, and cats. The aim of the feral pest monitoring would be to determine whether there are large numbers or dens/burrows occurring on site and to implement control (shooting or baiting) where necessary and in liaison with the appropriate government departments and neighbouring property owners.

5.3 Nest Box monitoring

Nest box inspections found that most nest boxes showed evidence of usage (50 of 59), with 10 being occupied by live fauna during the survey. In regard to target species usage: the Squirrel Glider boxes were generally occupied by Sugar Gliders or their nesting materials; the Brushtail and Ringtail Possum boxes showed evidence of possum usage but were predominantly being used by birds (mostly Wood Duck); the bat boxes showed no evidence of usage; the Owlet Nightjar boxes all appeared to be used by gliders; and the Rosella boxes showed evidence of glider and bird usage. In relation to maintenance one box requires pest removal, one requires tightening or new attachment, one requires transfer to a new tree and two need to be replaced due to deterioration.

It is recommended best practice for nest box installation includes painting the exterior of the box for a protective coat to extend the life of the box and durability against the elements. The interior of the box should never be painted and should be left as it is – raw untreated wood (Nest Box Australia, 2023). The boxes can be finished in either oil (decking oil, linseed oil), varnish or paint. Nest Boxes Australia recommends a good quality exterior water-based paint such as Dulux Weathershield, or a water based decking oil such as Intergrain in a Merbau colour. Two to three coats are recommended to ensure that the box is protected for several years (Nest Box Australia, 2023).

Orientation is also crucial when installing the nest boxes. Microbats prefer a north to north-westerly aspect, while birds and mammals prefer the entrance of the nest box to face in an easterly direction, ranging from northeast to southeast. Furthermore, mammals such as gliders and possums tend to prefer a more closed or sheltered aspect (eg dense overhanging foliage), whereas birds prefer a more open aspect (fauNature 2011).

Nest box monitoring indicates a high rate of usage by native fauna and general good condition of most nest boxes. Removal of pests and ongoing monitoring of the boxes, particularly along Joarimin Creek, is recommended to prevent further impacts on the native fauna using the boxes. It is recommended that one of the boxes is repositioned and one is relocated to a new tree.

5.4 Hoary Sunray

Overall, the Hoary Sunray population is in moderate health with a large population estimated, however estimates are significantly lower than the previous estimate in 2020. This may be due to climatic conditions or competition with native shrubs. Most plots showed recent evidence of light grazing and weeds, as well as possible competition with surrounding native shrubs (*Cassinia sifton* and *Leptospermum* sp.).

General health was poor to moderate with leaf browning and vegetation/ground layers appearing dry. It is recommended that populations are re-surveyed next year and that a remapping/map-refining exercise is incorporated so that more accurate population estimates can be made. Additional survey sites could also be incorporated. A careful control program for Sifton Bush will likely also assist recovery/maintenance of the population of Hoary Sunray.

6.0 Conclusion and Actions Summary

The 2023 ecological monitoring of Holcim quarry has collected data with respect to:

- Condition of vegetation and fauna assemblages in areas of retained vegetation.
- Progress of passive and active rehabilitation.
- Usage and condition of nest boxes.
- Counts and condition of populations of the Hoary Sunray.

Overall, the vegetation was in moderate to good condition across the site with two key management issues being the abundance of high threat weeds and Sifton Bush. Rehabilitation areas require particular attention regarding Sifton Bush control, and it is recommended that a program of slashing/brushcutting is undertaken combined with native tree planting.

Fauna results show a good assemblage of native fauna species persists within the areas of retained vegetation. Three pests identified for targeted management rabbit, cat, and fox. The Hoary Sunray population appeared to be in decline, and it is though that the climatic conditions, combined with over-abundance of Sifton Bush could be causing this decline. Climatic conditions were generally hotter and drier leading up to the survey, although good rainfall was seen close to the survey timing.

Additional surveys recommended for 2024 include a follow-up Hoary Sunray survey and ongoing surveys of the amenity bund rehabilitation (RM1). Ecological monitoring should continue in accordance with the summary in Section 1.3. The next monitoring event would therefore be required in 2024 and will include:

- Nest box monitoring
- Rehabilitation monitoring at the:
  - Amenity bund (RM1)
  - HMA (RM2 and RM3)
  - BOA revegetation areas (RM5)
  - Core riparian area (CR1 and R2)
- Box-Gum woodland monitoring (BG1 and BG2)
- Hoary Sunray monitoring (HS1-HS11)

The 2023 monitoring saw the last schedule survey of rehabilitation monitoring of the BOA, therefore surveys of RM4 may cease.

In response to the findings of the 2023 ecological monitoring the recommended site management actions for 2024 include:

- Ongoing weed maintenance
- Sifton Bush control program in consultation with a local bush regeneration specialist
- Tree planting
- Targeted pest surveys and ongoing pest control
- Nets box maintenance
- Erosion control, particularly along creeks and drainage lines
- Consider bushfire management of large patches of forest in consultation with bushfire consultant with experience undertaking ecological burns

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Appendix A PCT Profile and Benchmark Data

Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table A-1: PCT 3373 Goulburn Tableland Box-Gum Grassy Forest

Plant Community Type ID (PCT ID)	3373
VCA Type ID	0
PCT Name	Goulburn Tableland Box-Gum Grassy Forest
PCT Scientific Name	
Authority	Eastern NSW PCT Classification
Classification Type	Quantitative
Classification Confidence Level	High
Vegetation Formation	Grassy Woodlands;
Vegetation Class	Southern Tableland Grassy Woodlands;
Vegetation Description	A mid-high to tall dry sclerophyll grassy open forest to woodland of northern parts of the Southern Tablelands, occurring from Canberra and Queanbeyan north to Pejar and east to Durran Durra and Canyonleigh, with a northern outlier at Golspie. It is found in landscape positions with moderately deep soil profiles, particularly footslopes of gently undulating low hills, on a wide range of substrates including sedimentary (sandstone, arenite, greywacke, shale), acid volcanic (ignimbrite, rhyolite) and granitic rocks. This PCT is found at elevations of 600-850 metres asl with mean annual rainfall of 650-800 mm. Remnants of this community often have a long history of disturbance and the tree canopy may be sparse to very sparse, commonly including *Eucalyptus melliodora* and occasionally with *Eucalyptus macrorhyncha*, *Eucalyptus blakelyi* or *Eucalyptus dives*. A very sparse shrub stratum commonly includes scattered *Lissanthe strigosa*, *Pimelea curviflora*, *Melichrus urceolatus* or *Hibbertia obtusifolia*, while the ground layer is predominantly grassy and commonly includes *Themeda triandra*, *Microlaena stipoides*, *Poa sieberiana*, *Elymus scaber* and *Aristida ramosa*, with occasional high cover of *Rytidosperma laeve*. Common forbs include *Lomandra filiformis*, *Lomandra multiflora* subsp. *multiflora*, *Goodenia hederacea*, *Hydrocotyle laxiflora*, *Oxalis perennans*, *Chrysocephalum apiculatum*, *Tricoryne elatior*, *Gonocarpus tetragynus* and *Hypericum gramineum*. In lower landscape positions subject to cold air drainage this community may be replaced by PCT 3338, while on stony dry hills it commonly grades into PCT 3747.
Other Diagnostic Features	
IBRA Bioregion(s)	South Eastern Highlands;
IBRA Comments	
IBRA Sub-region(s)	Bungonia; Crookwell; Monaro; Murrumbateman;
NSW Landscape(s)	
LGA(s)	GOULBURN MULWAREE; QUEANBEYAN-PALERANG REGIONAL; UPPER LACHLAN SHIRE; YASS VALLEY;
Elevation Min(m)	615.2
Elevation Median(m)	698.5
Elevation Max(m)	839.5
Annual Rainfall Min(mm)	648
Annual Rainfall Median(mm)	698
Annual Rainfall Max(mm)	776
Annual Mean Temperature Min (deg.C)	11.28
Annual Mean Temperature Median(deg.C)	12.36

Annual Mean Temperature Max(deg.C)	13.18
Upper Stratum Species	
Mid Stratum Species	
Ground Stratum Species	
Diagnostic Species	
Emergent Species	
Tree Growth Form Group Species	*Eucalyptus melliodora , Eucalyptus macrorhyncha , Eucalyptus blakelyi , Eucalyptus dives , Eucalyptus mannifera , Eucalyptus bridgesiana , Acacia decurrens , Eucalyptus rubida , Eucalyptus rossii , Acacia dealbata , Acacia melanoxylon , Eucalyptus cinerea , Eucalyptus pauciflora , Allocasuarina littoralis , Eucalyptus amplifolia , Acacia parramattensis , Allocasuarina luehmannii , Eucalyptus tereticornis , Eucalyptus eugenioides , Eucalyptus goniocalyx , Eucalyptus polyanthemos , Eucalyptus radiata , Eucalyptus sclerophylla , Eucalyptus viminalis*
Shrub Growth Form Group Species	*Melichrus urceolatus , Lissanthe strigosa , Pimelea curviflora , Hibbertia obtusifolia , Bossiaea buxifolia , Dillwynia sericea , Brachyloma daphnoides , Astroloma humifusum , Cassinia sifton , Acacia genistifolia , Cassinia aculeata , Daviesia latifolia , Daviesia genistifolia , Acacia mearnsii , Acrotriche serrulata , Pultenaea procumbens , Indigofera australis , Pultenaea microphylla , Acacia deanei , Cryptandra amara , Daviesia mimosoides , Dillwynia phylicoides , Pultenaea subspicata , Acacia gunnii , Daviesia leptophylla , Exocarpos cupressiformis , Exocarpos strictus , Gompholobium huegelii , Leucopogon virgatus , Acacia rubida , Acacia ulicifolia , Cassinia longifolia , Daviesia ulicifolia , Hibbertia riparia , Leucopogon fraseri , Persoonia linearis , Rubus parvifolius , Acacia brownii , Acacia cognata , Acacia dawsonii , Acacia falciformis , Acacia implexa , Acacia paradoxa , Acacia terminalis , Calytrix tetragona , Cassinia laevis , Cassinia uncata , Grevillea lanigera , Hibbertia cistoidea , Kunzea parvifolia , Leptospermum continentale , Leptospermum myrtifolium , Leucopogon attenuatus , Leucopogon fletcheri , Leucopogon juniperinus , Olearia viscidula , Pimelea linifolia , Pomaderris andromedifolia , Pultenaea ferruginea , Rhytidosporum procumbens , Styphelia triflora*
Grass & Grass-like Growth Form Group Species	*Lomandra filiformis , Themeda triandra , Microlaena stipoides , Lomandra multiflora subsp. multiflora , Poa sieberiana , Elymus scaber , Aristida ramosa , Rytidosperma laeve , Austrostipa scabra , Dichelachne micrantha , Rytidosperma pallidum , Poa meionectes , Rytidosperma racemosum , Austrostipa densiflora , Echinopogon ovatus , Panicum effusum , Rytidosperma monticola , Luzula densiflora , Luzula flaccida , Rytidosperma tenuius , Schoenus apogon , Carex inversa , Lepidosperma laterale , Aristida jerichoensis , Juncus subsecundus , Rytidosperma pilosum , Austrostipa mollis , Aristida vagans , Echinopogon caespitosus , Juncus filicaulis , Lomandra longifolia , Poa labillardierei var. labillardierei , Rytidosperma auriculatum , Eragrostis benthamii , Lepidosperma gunnii , Rytidosperma caespitosum , Austrostipa rudis , Carex breviculmis , Chloris truncata , Dichelachne inaequiglumis , Dichelachne sieberiana , Eragrostis leptostachya , Juncus usitatus , Panicum simile , Rytidosperma penicillatum , Rytidosperma setaceum , Austrostipa pubinodis , Austrostipa semibarbata , Bothriochloa macra , Cynodon dactylon , Lomandra micrantha subsp. tuberculata , Lomandra obliqua , Rytidosperma carphoides , Rytidosperma erianthum , Rytidosperma nudiflorum*
Forb Growth Form Group Species	*Goodenia hederacea , Gonocarpus tetragynus , Hydrocotyle laxiflora , Hypericum gramineum , Chrysocephalum apiculatum , Oxalis perennans , Tricoryne elatior , Dianella revoluta , Bossiaea prostrata , Cymbonotus lawsonianus , Opercularia aspera , Einadia nutans , Hovea linearis , Wahlenbergia stricta , Solenogyne dominii , Galium gaudichaudii , Acaena echinata , Daucus glochidiatus , Microseris lanceolata , Stylidium graminifolium , Acaena ovina , Coronidium scorpioides , Crassula sieberiana , Leptorhynchos squamatus , Asperula conferta , Geranium solanderi , Laxmannia gracilis , Plantago gaudichaudii , Plantago varia , Ajuga australis , Calocephalus citreus , Opercularia hispida , Scleranthus biflorus , Bulbine bulbosa , Chrysocephalum semipapposum , Dichondra repens , Euchiton sphaericus , Rumex brownii , Veronica plebeia , Wahlenbergia communis , Wahlenbergia luteola , Acaena novae-zelandiae , Leucochrysum albicans , Opercularia diphylla , Plantago debilis , Senecio quadridentatus , Stackhousia monogyna , Wahlenbergia gracilis , Arthropodium fimbriatum , Brachyscome ciliaris , Eryngium ovinum , Hackelia suaveolens , Oxalis exilis , Vittadinia muelleri , Wahlenbergia graniticola , Asperula scoparia , Craspedia variabilis , Dianella longifolia , Drosera peltata , Euchiton involucratus , Euchiton japonicus , Poranthera microphylla , Sebaea ovata , Senecio prenanthoides , Thysanotus tuberosus , Veronica calycina , Viola betonicifolia , Vittadinia cuneata , Brachyscome rigidula , Caladenia carnea , Eriochilus cucullatus , Goodenia pinnatifida , Haloragis heterophylla , Lagenophora stipitata , Microtis unifolia , Oreomyrrhis eriopoda , Podolepis jaceoides , Pterostylis reflexa , Senecio tenuiflorus , Swainsona sericea , Triptilodiscus pygmaeus , Velleia paradoxa , Arthropodium minus , Arthropodium strictum , Asperula ambleia , Burchardia umbellata , Caesia parviflora , Caladenia tentaculata , Calotis anthemoides , Calotis scabiosifolia , Cynoglossum australe , Dianella caerulea , Diuris sulphurea , Dysphania pumilio , Einadia hastata , Galium ciliare , Geranium retrorsum , Helichrysum rutidolepis , Hydrocotyle sibthorpioides , Isoetopsis graminifolia , Lagenophora gracilis , Mitrasacme serpyllifolia , Oxalis chnoodes , Oxalis*

	radicosa , Plantago hispida , Pterostylis nana , Pterostylis truncata , Ranunculus lappaceus , Scleranthus diander , Senecio diaschides , Solenogyne gunnii , Stypandra glauca , Thelymitra circumsepta , Trachymene incisa subsp. incisa , Wahlenbergia littoricola , Wahlenbergia multicaulis , Xerochrysum bracteatum , Xerochrysum viscosum
Fern Growth Form Group Species	*Cheilanthes sieberi subsp. sieberi , Cheilanthes austrotenuifolia*
Other Growth Form Group Species	*Hardenbergia violacea , Glycine clandestina , Desmodium varians , Thysanotus patersonii , Glycine tabacina , Billardiera scandens , Convolvulus angustissimus , Amyema miquelii , Cassytha pubescens , Convolvulus erubescens , Muellerina eucalyptoides*
Median Native Species Richness per plot	37
Height Class (Walker & Hopkins 1990)	
Variation And Natural Disturbance	
Fire Regime	
Landscape Position	
Lithology	
Landform Pattern	
Landform Element	
Is PCT Derived?	
PCT derived from these communities	
PCT derived community comments	
Pre-European Extent	45446
Pre-European Extent Accuracy	
Pre-European Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
Current Extent	3589
Current Extent Accuracy	
Current Extent Comments	Calculated from State Vegetation Type Map (SVTM) extant PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
PCT Percent Cleared	92.1
% accuracy (of PCT % cleared estimate)	
PCT Percent Cleared Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing and extant PCT maps C1.1.M1 and Inland Multinomial Modelling. Values are condition weighted SVTM % cleared estimates (see DPE 2022 Eastern NSW PCT % Cleared Calculation Technical notes). There may be a discrepancy between the calculated % cleared values and displayed values due to rounding.
PCT associated with TEC	Has associated TEC
TEC List	Listed BC Act,CE: White Box - Yellow Box - Blakelyâ€™s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (Part) ; Listed EPBC Act,CE: White Box-Yellow Box-Blakelyâ€™s Red Gum Grassy Woodland and Derived Native Grassland (Part) ;
TEC Comments	(Comment TEC1) Relates to the NSW White Box - Yellow Box - Blakelyâ€™s Red Gum Grassy Woodland TEC. (Comment TEC2) May relate to the Commonwealth White Box-Yellow Box-Blakelyâ€™s Red Gum Grassy Woodland TEC where it meets condition criteria as per section 4 of the Listing Advice.

Adequacy of plot sampling	None
Total Number of Replicates	85
Number of Primary Replicates	56
Number of Secondary Replicates	29
Pre-European Mapped Or Modelled	
Current Extent Mapped Or Modelled	
Classification source	
Citations	Connolly, D. et al., in prep.
Full Reference Details	Connolly, D., Binns, D., Turner, K., Hager, T., Lyons, M., Magarey, E. (in prep.) A revised classification of Plant Community Types for eastern New South Wales. NSW DPIE, Parramatta;
Profile Source	R4.145;
PCT Definition Status	Approved

Table A-2: Default Benchmark Data PCT 3373

Plant Community Type ID(PCT ID)	3373
Classification Confidence Level	High
PCT Name	Goulburn Tableland Box-Gum Grassy Forest
PCT Scientific Name	
Vegetation Class	Southern Tableland Grassy Woodlands
Vegetation Formation	Grassy Woodlands
IBRA Bioregion Code	SEH
IBRA Bioregion(s)	South Eastern Highlands
Benchmark Calculation Level	Class/IBRA
PCT Benchmark Variation	monthly average, following AVERAGE RAINFALL year
Rainfall Threshold	560 - 846
Default Benchmark Condition	Yes
Tree richness	4
Shrub richness	7
Grass & grass - like richness	9
Forb richness	16
Fern richness	1
Other richness	2
Tree cover	26
Shrub cover	5
Grass & grass - like cover	35
Forb cover	9
Fern cover	0
Other cover	0
No.of large trees(per 0.1ha)	50
Litter cover	45
Total length of fallen logs	3
Large Tree Threshold Size	50
PCT Benchmarks Comments	Composition-Structure Benchmark : Class/IBRA | Function: Logs-Class; Litter-Class; Large Trees-Formation
PCT Benchmarks Reference Site	
Benchmark source	Multiple methods
Benchmark Confidence	Composition: High | Structure: Moderate | Function: Logs-Moderate; Litter-Moderate; Large Trees-Moderate
PCT Benchmark Status	Approved
PCT Definition Status	Approved

Table A-3: PCT 3376 Southern Tableland Grassy Box Woodland

Plant Community Type ID (PCT ID)	3376
VCA Type ID	0
PCT Name	Southern Tableland Grassy Box Woodland
PCT Scientific Name	
Authority	Eastern NSW PCT Classification
Classification Type	Quantitative
Classification Confidence Level	Medium
Vegetation Formation	Grassy Woodlands;
Vegetation Class	Southern Tableland Grassy Woodlands;
Vegetation Description	A tall sclerophyll woodland with a dry shrub layer that is patchy to absent and a mid-dense, grassy groundcover, widespread in the low hills of the drier parts of the Southern Tablelands between Bredbo and Rylstone. The canopy almost always includes Box eucalypts (*Eucalyptus melliodora* or *Eucalyptus bridgesiana*), occasionally associated with *Eucalyptus blakelyi* which may be locally prominent in lower parts of the landscape. The shrub layer is sparse to absent with occasional, scattered *Melichrus urceolatus*, *Lissanthe strigosa* or various Acacia species. The mid-dense ground layer typically includes grasses, forbs, graminoids and some twiners, very frequently including *Hydrocotyle laxiflora*, *Austrostipa scabra*, *Lomandra filiformis*, *Microlaena stipoides* and *Elymus scaber*. The PCT primarily occurs in the Bredbo, Canberra, Goulburn and Boorowa areas, with more scattered occurrences extending north to Bathurst, Orange and Rylstone. It occurs on granite, volcanic and sedimentary substrates in cold, dry environments with a mean annual rainfall typically below 760 mm. While widespread, this PCT primarily occurs in small, often disturbed patches with a long history of grazing. It is not closely related floristically to nearby PCTs, however it grades into PCT 3373 which has a more diverse shrub layer and some subtle differences in canopy species. *Eucalyptus macrorhyncha*, *Eucalyptus dives*, *Bossiaea buxifolia*, *Dillwynia sericea* and *Brachyloma daphnoides* are only occasional in PCT 3373 however collectively represent a suite of species that are rare in this PCT. In the Boorowa area, PCT 3376 grades into PCT 3400 which are both grassy woodlands featuring *Eucalyptus melliodora* and *Eucalyptus blakelyi*. This represents the transition from the colder environment of the tablelands (PCT 3376) to the woodlands of the lower elevation, warmer climate of the South-west Slopes (PCT 3400).
Other Diagnostic Features	
IBRA Bioregion(s)	NSW South Western Slopes; South East Corner; South Eastern Highlands; Sydney Basin;
IBRA Comments	
IBRA Sub-region(s)	Capertee Valley; Inland Slopes; South East Coastal Ranges; Bathurst; Bondo; Bungonia; Crookwell; Hill End; Monaro; Murrumbateman; Oberon; Orange; Wollemi;
NSW Landscape(s)	
LGA(s)	BATHURST REGIONAL; BLAYNEY; CABONNE; GOULBURN MULWAREE; HILLTOPS; LITHGOW CITY; MID-WESTERN REGIONAL; QUEANBEYAN-PALERANG REGIONAL; SNOWY MONARO REGIONAL; SNOWY VALLEYS; UPPER LACHLAN SHIRE; YASS VALLEY;
Elevation Min(m)	311.9
Elevation Median(m)	684.1
Elevation Max(m)	1028.1
Annual Rainfall Min(mm)	574
Annual Rainfall Median(mm)	687
Annual Rainfall Max(mm)	918
Annual Mean Temperature Min (deg.C)	10.55
Annual Mean Temperature Median(deg.C)	12.44

Annual Mean Temperature Max(deg.C)	14.06
Upper Stratum Species	
Mid Stratum Species	
Ground Stratum Species	
Diagnostic Species	
Emergent Species	
Tree Growth Form Group Species	*Eucalyptus melliodora , Eucalyptus blakelyi , Eucalyptus bridgesiana , Eucalyptus rossii , Acacia dealbata , Eucalyptus macrorhyncha , Eucalyptus mannifera , Eucalyptus rubida , Allocasuarina verticillata , Eucalyptus dives , Eucalyptus polyanthemos , Brachychiton populneus , Eucalyptus nortonii , Eucalyptus pauciflora , Eucalyptus tereticornis , Acacia decurrens , Acacia parramattensis , Allocasuarina littoralis , Eucalyptus amplifolia , Callitris endlicheri , Eucalyptus albens , Eucalyptus camaldulensis , Eucalyptus cinerea , Eucalyptus dalrympleana , Eucalyptus sieberi , Eucalyptus viminalis*
Shrub Growth Form Group Species	*Melichrus urceolatus , Lissanthe strigosa , Pimelea curviflora , Hibbertia obtusifolia , Bossiaea buxifolia , Cassinia sifton , Astroloma humifusum , Cryptandra amara , Dillwynia sericea , Acacia implexa , Acrotriche serrulata , Cassinia longifolia , Pultenaea microphylla , Acacia genistifolia , Cassinia quinquefaria , Acacia mearnsii , Daviesia genistifolia , Daviesia ulicifolia , Dodonaea viscosa , Exocarpos cupressiformis , Kunzea ericoides , Acacia deanei , Acacia rubida , Brachyloma daphnoides , Bursaria spinosa , Cassinia aculeata , Pultenaea procumbens , Rubus parvifolius , Acacia falciformis , Cassinia laevis , Daviesia leptophylla , Hibbertia riparia , Indigofera australis , Leucopogon fletcheri , Styphelia triflora , Acacia cardiophylla , Acacia dawsonii , Acacia paradoxa , Acacia ulicifolia , Acacia vestita , Calytrix tetragona , Cheiranthera linearis , Daviesia acicularis , Daviesia latifolia , Daviesia mimosoides , Dillwynia phylicoides , Hibbertia cistoidea , Hibbertia monogyna , Indigofera adesmiifolia , Leucopogon neoanglicus , Monotoca scoparia , Pultenaea ferruginea , Pultenaea subspicata , Pultenaea villosa , Rhytidosporum procumbens , Solanum linearifolium*
Grass & Grass-like Growth Form Group Species	*Austrostipa scabra , Lomandra filiformis , Microlaena stipoides , Elymus scaber , Themeda triandra , Bothriochloa macra , Panicum effusum , Poa sieberiana , Rytidosperma racemosum , Carex inversa , Aristida ramosa , Lomandra multiflora subsp. multiflora , Rytidosperma carphoides , Schoenus apogon , Juncus filicaulis , Austrostipa bigeniculata , Austrostipa densiflora , Rytidosperma auriculatum , Rytidosperma pilosum , Dichelachne micrantha , Luzula densiflora , Rytidosperma laeve , Chloris truncata , Poa labillardierei var. labillardierei , Rytidosperma erianthum , Rytidosperma pallidum , Carex breviculmis , Rytidosperma caespitosum , Enneapogon nigricans , Eragrostis benthamii , Juncus subsecundus , Aristida jerichoensis , Lepidosperma laterale , Poa meionectes , Rytidosperma monticola , Carex appressa , Cymbopogon refractus , Cynodon dactylon , Lomandra bracteata , Lomandra longifolia , Rytidosperma setaceum , Sorghum leiocladum , Austrostipa rudis , Dichelachne sieberiana , Eragrostis brownii , Eragrostis leptostachya , Rytidosperma penicillatum , Rytidosperma tenuius , Sporobolus creber , Aristida vagans , Austrostipa mollis , Bothriochloa decipiens var. decipiens , Dichanthium sericeum , Dichelachne crinita , Dichelachne rara , Digitaria brownii , Echinopogon ovatus , Eragrostis parviflora , Juncus homalocaulis , Lachnagrostis filiformis , Luzula flaccida , Rytidosperma bipartitum , Rytidosperma fulvum , Aristida behriana , Austrostipa gibbosa , Austrostipa setacea , Carex tereticaulis , Cyperus gracilis , Deyeuxia quadriseta , Dichanthium tenue , Dichelachne hirtella , Dichelachne inaequiglumis , Dichelachne parva , Eragrostis elongata , Eragrostis trachycarpa , Isolepis cernua , Juncus gregiflorus , Juncus usitatus , Luzula meridionalis , Luzula ovata , Sporobolus elongatus , Tricostularia pauciflora , Typha domingensis*
Forb Growth Form Group Species	*Hydrocotyle laxiflora , Oxalis perennans , Chrysocephalum apiculatum , Gonocarpus tetragynus , Acaena ovina , Rumex brownii , Solenogyne dominii , Tricoryne elatior , Cymbonotus lawsonianus , Hypericum gramineum , Crassula sieberiana , Geranium solanderi , Einadia nutans , Asperula conferta , Plantago varia , Triptilodiscus pygmaeus , Goodenia hederacea , Wahlenbergia communis , Vittadinia muelleri , Euchiton involucratus , Dichondra repens , Bulbine bulbosa , Daucus glochidiatus , Leptorhynchos squamatus , Vittadinia cuneata , Plantago gaudichaudii , Senecio quadridentatus , Wahlenbergia stricta , Eryngium ovinum , Acaena echinata , Arthropodium minus , Wahlenbergia gracilis , Euchiton sphaericus , Arthropodium fimbriatum , Bossiaea prostrata , Chrysocephalum semipapposum , Cotula australis , Goodenia pinnatifida , Microtis unifolia , Oxalis radicosa , Calocephalus citreus , Galium gaudichaudii , Scleranthus biflorus , Hackelia suaveolens , Dianella longifolia , Dianella revoluta , Drosera peltata , Euphorbia drummondii , Haloragis heterophylla , Leucochrysum albicans , Stackhousia monogyna , Xerochrysum viscosum , Veronica calycina , Veronica plebeia , Ajuga australis , Euchiton japonicus , Opercularia aspera , Opercularia diphylla , Oxalis exilis , Wahlenbergia luteola , Laxmannia gracilis , Lythrum hyssopifolia , Microseris lanceolata , Oreomyrrhis eriopoda , Sebaea ovata , Aphanes australiana , Burchardia umbellata , Dysphania pumilio , Epilobium billardierianum , Euphorbia dallachyana , Geranium retrorsum , Scleranthus diander , Thelymitra circumsepta , Wahlenbergia graniticola , Brachyscome rigidula , Calotis lappulacea , Cynoglossum australe ,*

	Plantago hispida , Ranunculus lappaceus , Solenogyne gunnii , Stuartina muelleri , Swainsona sericea , Vittadinia gracilis , Acaena novae-zelandiae , Alternanthera nana , Erodium crinitum , Hypoxis hygrometrica , Isoetopsis graminifolia , Oxytes brachypoda , Thysanotus tuberosus , Ammobium craspedioides , Arthropodium milleflorum , Calotis anthemoides , Calotis scabiosifolia , Coronidium scorpioides , Craspedia variabilis , Einadia hastata , Hovea linearis , Lagenophora gracilis , Microtis parviflora , Opercularia hispida , Plantago debilis , Podolepis jaceoides , Pterostylis mutica , Pterostylis nana , Stellaria pungens , Thelymitra pauciflora , Viola betonicifolia , Wahlenbergia multicaulis , Zornia dyctiocarpa var. dyctiocarpa , Alternanthera sp. A , Arthropodium strictum , Brachyscome angustifolia , Brachyscome ciliaris , Brachyscome multifida , Brachyscome ptychocarpa , Caesia parviflora , Caladenia tentaculata , Centipeda cunninghamii , Cymbonotus preissianus , Desmodium rhytidophyllum , Diuris sulphurea , Einadia trigonos , Galium ciliare , Galium leiocarpum , Gnaphalium indutum , Goodenia elongata , Hydrocotyle algida , Hydrocotyle foveolata , Isotoma axillaris , Lepidium pseudohyssopifolium , Mentha diemenica , Myriophyllum crispatum , Polygala japonica , Poranthera microphylla , Portulaca oleracea , Ranunculus pumilio , Rumex dumosus , Rutidosis leptorrhynchoides , Scutellaria humilis , Senecio diaschides , Senecio prenanthoides , Senecio tenuiflorus , Solanum pungetium , Spiranthes australis , Swainsona monticola , Urtica incisa , Velleia paradoxa , Vittadinia triloba , Wahlenbergia gracilenta , Xerochrysum bracteatum
Fern Growth Form Group Species	*Cheilanthes sieberi subsp. sieberi , Cheilanthes austrotenuifolia , Ophioglossum lusitanicum , Asplenium flabellifolium*
Other Growth Form Group Species	*Desmodium varians , Glycine tabacina , Convolvulus erubescens , Glycine clandestina , Convolvulus angustissimus , Clematis microphylla , Kennedia prostrata , Amyema pendula , Amyema miquelii , Thysanotus patersonii , Hardenbergia violacea , Glycine microphylla , Xanthorrhoea concava*
Median Native Species Richness per plot	34
Height Class (Walker & Hopkins 1990)	
Variation And Natural Disturbance	
Fire Regime	
Landscape Position	
Lithology	
Landform Pattern	
Landform Element	
Is PCT Derived?	
PCT derived from these communities	
PCT derived community comments	
Pre-European Extent	452899
Pre-European Extent Accuracy	
Pre-European Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
Current Extent	31900
Current Extent Accuracy	
Current Extent Comments	Calculated from State Vegetation Type Map (SVTM) extant PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
PCT Percent Cleared	92.96
% accuracy (of PCT % cleared estimate)	
PCT Percent Cleared Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing and extant PCT maps C1.1.M1 and Inland Multinomial Modelling. Values are condition weighted SVTM % cleared estimates (see DPE 2022 Eastern NSW PCT % Cleared Calculation Technical notes). There may be a discrepancy between the calculated % cleared values and displayed values due to rounding.

PCT associated with TEC	Has associated TEC
TEC List	Listed BC Act,CE: White Box - Yellow Box - Blakelyâ€™s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (Part) ; Listed EPBC Act,CE: White Box-Yellow Box-Blakelyâ€™s Red Gum Grassy Woodland and Derived Native Grassland (Part) ;
TEC Comments	(Comment TEC1) Relates to the NSW White Box - Yellow Box - Blakelyâ€™s Red Gum Grassy Woodland TEC. (Comment TEC2) May relate to the Commonwealth White Box-Yellow Box-Blakelyâ€™s Red Gum Grassy Woodland TEC where it meets condition criteria as per section 4 of the Listing Advice.
Adequacy of plot sampling	None
Total Number of Replicates	187
Number of Primary Replicates	110
Number of Secondary Replicates	77
Pre-European Mapped Or Modelled	
Current Extent Mapped Or Modelled	
Classification source	
Citations	Connolly, D. et al., in prep.
Full Reference Details	Connolly, D., Binns, D., Turner, K., Hager, T., Lyons, M., Magarey, E. (in prep.) A revised classification of Plant Community Types for eastern New South Wales. NSW DPIE, Parramatta;
Profile Source	R6.97;
PCT Definition Status	Approved

Table A-4: Default Benchmark Data PCT 3376

Plant Community Type ID(PCT ID)	3376
Classification Confidence Level	Medium
PCT Name	Southern Tableland Grassy Box Woodland
PCT Scientific Name	
Vegetation Class	Southern Tableland Grassy Woodlands
Vegetation Formation	Grassy Woodlands
IBRA Bioregion Code	SEH
IBRA Bioregion(s)	South Eastern Highlands
Benchmark Calculation Level	Class/IBRA
PCT Benchmark Variation	monthly average, following AVERAGE RAINFALL year
Rainfall Threshold	560 - 846
Default Benchmark Condition	Yes
Tree richness	4
Shrub richness	7
Grass & grass - like richness	9
Forb richness	16
Fern richness	1
Other richness	2
Tree cover	26
Shrub cover	5
Grass & grass - like cover	35
Forb cover	9
Fern cover	0
Other cover	0
No.of large trees(per 0.1ha)	50
Litter cover	45
Total length of fallen logs	3
Large Tree Threshold Size	50
PCT Benchmarks Comments	Composition-Structure Benchmark : Class/IBRA | Function: Logs-Class; Litter-Class; Large Trees-Formation
PCT Benchmarks Reference Site	
Benchmark source	Multiple methods
Benchmark Confidence	Composition: High | Structure: Moderate | Function: Logs-Moderate; Litter-Moderate; Large Trees-Moderate
PCT Benchmark Status	Approved
PCT Definition Status	Approved

Table A-5: PCT 3486 Wollondilly-Shoalhaven Slopes Grassy Open Forest

Plant Community Type ID (PCT ID)	3486
VCA Type ID	0
PCT Name	Wollondilly-Shoalhaven Slopes Grassy Open Forest
PCT Scientific Name	
Authority	Eastern NSW PCT Classification
Classification Type	Quantitative
Classification Confidence Level	High
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation);
Vegetation Class	Central Gorge Dry Sclerophyll Forests;
Vegetation Description	A tall dry grass/shrub sclerophyll open forest of upper slopes of the gorges of the mid Shoalhaven and mid Wollondilly River (and tributaries). This PCT is known primarily from Wombeyan Caves south to Bungonia and Jockeys Point, on soils derived from Abercrombie Formation sediments and from Barrallier Ignimbrite, at elevations of 400-850 metres asl and with mean annual rainfall of 650-850 mm. The tree stratum commonly includes *Eucalyptus macrorhyncha*, with occasional *Eucalyptus bridgesiana* or rarely *Eucalyptus cinerea*, *Eucalyptus melliodora* or *Eucalyptus eugenioides*. Shrubs are sparse to patchy and commonly include *Lissanthe strigosa*, *Olearia viscidula*, *Bursaria spinosa*, *Hibbertia obtusifolia*, and occasional scattered tall *Acacia falciformis*. The ground layer is often grassy, almost always including *Microlaena stipoides*, very frequently with *Echinopogon ovatus*, and commonly including *Poa sieberiana*, *Austrostipa rudis* and *Elymus scaber*. Forbs include very frequent tall clumps of *Lomandra longifolia* and a diverse suite of small forbs that commonly includes *Hydrocotyle laxiflora*, *Lomandra filiformis*, *Cheilanthes sieberi* subsp. *sieberi*, *Hypericum gramineum*, *Veronica plebeia*, *Dichondra repens*, *Geranium solanderi*, *Plantago debilis*, *Desmodium varians*, *Gonocarpus tetragynus*, *Goodenia hederacea* and *Oxalis perennans*. This community may be replaced by PCT 3483 on lower, warmer gorge slopes, or by PCT 3643 on exposed, rocky upper slopes and crests with shallow to skeletal soils.
Other Diagnostic Features	
IBRA Bioregion(s)	South Eastern Highlands;
IBRA Comments	
IBRA Sub-region(s)	Bungonia; Kanangra;
NSW Landscape(s)	
LGA(s)	GOULBURN MULWAREE; QUEANBEYAN-PALERANG REGIONAL; UPPER LACHLAN SHIRE; WINGECARRIBEE;
Elevation Min(m)	334.2
Elevation Median(m)	644.2
Elevation Max(m)	849.2
Annual Rainfall Min(mm)	675
Annual Rainfall Median(mm)	731
Annual Rainfall Max(mm)	829
Annual Mean Temperature Min (deg.C)	11.44
Annual Mean Temperature Median(deg.C)	12.87
Annual Mean Temperature Max(deg.C)	14.69

Upper Stratum Species	
Mid Stratum Species	
Ground Stratum Species	
Diagnostic Species	
Emergent Species	
Tree Growth Form Group Species	*Eucalyptus consideniana , Eucalyptus globoidea , Eucalyptus mannifera , Eucalyptus moluccana , Eucalyptus nortonii , Eucalyptus sieberi , Notelaea longifolia , Eucalyptus macrorhyncha , Eucalyptus bridgesiana , Eucalyptus melliodora , Eucalyptus cinerea , Acacia decurrens , Eucalyptus eugenioides , Eucalyptus dives , Eucalyptus blakelyi , Casuarina cunninghamiana subsp. cunninghamiana , Eucalyptus tereticornis , Eucalyptus viminalis , Acacia melanoxylon , Acacia parramattensis , Allocasuarina littoralis , Eucalyptus amplifolia , Eucalyptus blaxlandii , Eucalyptus bosistoana , Eucalyptus rossii , Eucalyptus rubida , Brachychiton populneus*
Shrub Growth Form Group Species	*Lissanthe strigosa , Olearia viscidula , Bursaria spinosa , Hibbertia obtusifolia , Acacia falciformis , Melichrus urceolatus , Melicytus dentatus , Cassinia laevis , Pimelea curviflora , Cassinia aculeata , Cassinia uncata , Lomatia myricoides , Acacia deanei , Bossiaea buxifolia , Brachyloma daphnoides , Indigofera australis , Persoonia linearis , Pittosporum undulatum , Rubus parvifolius , Acrotriche serrulata , Astroloma humifusum , Cassinia quinquefaria , Notelaea neglecta , Bossiaea foliosa , Cassinia cunninghamii , Cassinia longifolia , Exocarpos cupressiformis , Exocarpos strictus , Pultenaea microphylla , Acacia filicifolia , Acacia genistifolia , Acacia gunnii , Acacia implexa , Acacia mearnsii , Acacia stricta , Acacia ulicifolia , Astroloma pinifolium , Coronidium elatum , Coronidium oxylepis , Cryptandra amara , Daviesia leptophylla , Hakea dactyloides , Hibbertia pedunculata , Jacksonia scoparia , Kunzea ericoides , Leptomeria drupacea , Leptospermum continentale , Leptospermum multicaule , Leptospermum polygalifolium , Leucopogon fraseri , Leucopogon lanceolatus , Melaleuca parvistaminea , Ozothamnus diosmifolius , Persoonia mollis , Pittosporum multiflorum , Polyscias sambucifolia , Pomaderris angustifolia , Pultenaea pedunculata*
Grass & Grass-like Growth Form Group Species	*Microlaena stipoides , Lomandra filiformis , Echinopogon ovatus , Lomandra longifolia , Poa sieberiana , Elymus scaber , Austrostipa rudis , Rytidosperma laeve , Lomandra multiflora subsp. multiflora , Rytidosperma racemosum , Themeda triandra , Aristida ramosa , Dichelachne micrantha , Carex inversa , Rytidosperma pilosum , Entolasia stricta , Lepidosperma gunnii , Poa meionectes , Bothriochloa macra , Dichelachne inaequiglumis , Echinopogon caespitosus , Luzula densiflora , Cymbopogon refractus , Austrostipa densiflora , Austrostipa scabra , Carex breviculmis , Carex incomitata , Dichelachne rara , Juncus subsecundus , Panicum effusum , Poa labillardierei var. labillardierei , Dichelachne parva , Dichelachne sieberiana , Digitaria diffusa , Echinopogon cheelii , Lepidosperma laterale , Lomandra confertifolia , Lomandra glauca , Rytidosperma caespitosum , Rytidosperma erianthum , Rytidosperma longifolium , Rytidosperma monticola , Rytidosperma pallidum , Rytidosperma penicillatum , Schoenus apogon , Aristida vagans , Austrostipa blackii , Austrostipa mollis , Carex appressa , Chloris truncata , Cyperus gracilis , Dichelachne crinita , Digitaria brownii , Echinopogon mckiei , Entolasia marginata , Eragrostis brownii , Eragrostis leptostachya , Juncus filicaulis , Lomandra micrantha subsp. tuberculata , Luzula meridionalis , Paspalidium distans , Rytidosperma setaceum , Rytidosperma tenuius , Schoenus maschalinus*
Forb Growth Form Group Species	*Hydrocotyle laxiflora , Veronica plebeia , Hypericum gramineum , Dichondra repens , Plantago debilis , Geranium solanderi , Gonocarpus tetragynus , Goodenia hederacea , Oxalis perennans , Acaena echinata , Senecio prenanthoides , Stellaria pungens , Wahlenbergia stricta , Dianella revoluta , Poranthera microphylla , Wahlenbergia gracilis , Euchiton japonicus , Acaena novae-zelandiae , Einadia nutans , Euchiton sphaericus , Viola betonicifolia , Daucus glochidiatus , Solenogyne gunnii , Viola hederacea , Ajuga australis , Brachyscome angustifolia , Euchiton involucratus , Galium gaudichaudii , Rumex brownii , Vittadinia cuneata , Bossiaea prostrata , Cymbonotus lawsonianus , Dichondra sp. Inglewood , Einadia hastata , Einadia trigonos , Lagenophora stipitata , Mentha diemenica , Opercularia aspera , Opercularia diphylla , Plantago varia , Senecio hispidulus , Senecio quadridentatus , Arthropodium milleflorum , Asperula conferta , Galium leiocarpum , Lagenophora gracilis , Opercularia hispida , Oxalis exilis , Senecio tenuiflorus , Solanum prinophyllum , Solanum pungetium , Stylidium graminifolium , Urtica incisa , Wahlenbergia communis , Wahlenbergia luteola , Dianella longifolia , Euphorbia drummondii , Galium leptogonium , Hackelia suaveolens , Pomax umbellata , Ranunculus lappaceus , Wahlenbergia gracilenta , Arthropodium minus , Brachyscome rigidula , Craspedia variabilis , Crassula sieberiana , Desmodium gunnii , Hovea linearis , Opercularia varia , Oreomyrrhis eriopoda , Scleranthus biflorus , Solenogyne dominii , Stypandra glauca , Veronica calycina , Xerochrysum bracteatum , Xerochrysum viscosum , Acaena anserovina , Acaena ovina , Acianthus collinus , Acianthus fornicatus , Acianthus pusillus , Alternanthera nana , Arthropodium sp. South-east Highlands , Asperula scoparia , Brachyscome scapigera , Brachyscome spathulata , Brunoniella australis , Caesia parviflora , Chrysocephalum semipapposum , Coronidium scorpioides , Corybas hispidus , Cynoglossum australe , Dianella caerulea , Dysphania pumilio , Epilobium billardierianum , Eriochilus cucullatus , Geranium potentilloides , Geranium retrorsum , Gonocarpus micranthus , Helichrysum rutidolepis , Hypoxis hygrometrica , Laxmannia gracilis , Oxalis radicosa , Plantago gaudichaudii , Pseuderanthemum variabile , Pterostylis decurva , Pterostylis grandiflora , Pterostylis longifolia , Pterostylis obtusa , Rhodanthe anthemoides ,*

	Senecio diaschides , Senecio minimus , Stackhousia viminea , Teucrium corymbosum , Tricoryne elatior , Veronica gracilis , Vittadinia gracilis
Fern Growth Form Group Species	*Cheilanthes sieberi subsp. sieberi , Asplenium flabellifolium , Cheilanthes austrotenuifolia , Adiantum aethiopicum , Pteridium esculentum , Lindsaea linearis , Pyrrosia rupestris*
Other Growth Form Group Species	*Desmodium varians , Clematis glycinoides , Glycine clandestina , Glycine tabacina , Billardiera scandens , Clematis aristata , Hardenbergia violacea , Convolvulus angustissimus , Glycine microphylla , Thysanotus patersonii , Amyema miquelii , Cassytha glabella , Cassytha melantha , Cassytha pubescens , Clematis microphylla , Convolvulus erubescens , Geitonoplesium cymosum*
Median Native Species Richness per plot	42
Height Class (Walker & Hopkins 1990)	
Variation And Natural Disturbance	
Fire Regime	
Landscape Position	
Lithology	
Landform Pattern	
Landform Element	
Is PCT Derived?	
PCT derived from these communities	
PCT derived community comments	
Pre-European Extent	14513
Pre-European Extent Accuracy	
Pre-European Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
Current Extent	5770
Current Extent Accuracy	
Current Extent Comments	Calculated from State Vegetation Type Map (SVTM) extant PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
PCT Percent Cleared	60.24
% accuracy (of PCT % cleared estimate)	
PCT Percent Cleared Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing and extant PCT maps C1.1.M1 and Inland Multinomial Modelling. Values are condition weighted SVTM % cleared estimates (see DPE 2022 Eastern NSW PCT % Cleared Calculation Technical notes). There may be a discrepancy between the calculated % cleared values and displayed values due to rounding.
PCT associated with TEC	No associated TEC
TEC List	
TEC Comments	
Adequacy of plot sampling	None
Total Number of Replicates	43
Number of Primary Replicates	31

Number of Secondary Replicates	12
Pre-European Mapped Or Modelled	
Current Extent Mapped Or Modelled	
Classification source	
Citations	Connolly, D. et al., in prep.
Full Reference Details	Connolly, D., Binns, D., Turner, K., Hager, T., Lyons, M., Magarey, E. (in prep.) A revised classification of Plant Community Types for eastern New South Wales. NSW DPIE, Parramatta;
Profile Source	R4.62;
PCT Definition Status	Approved

Table A-6: Default Benchmark Data PCT 3486

Plant Community Type ID(PCT ID)	3486
Classification Confidence Level	High
PCT Name	Wollondilly-Shoalhaven Slopes Grassy Open Forest
PCT Scientific Name	
Vegetation Class	Central Gorge Dry Sclerophyll Forests
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
IBRA Bioregion Code	SEH
IBRA Bioregion(s)	South Eastern Highlands
Benchmark Calculation Level	Class/IBRA
PCT Benchmark Variation	monthly average, following AVERAGE RAINFALL year
Rainfall Threshold	588 - 886
Default Benchmark Condition	Yes
Tree richness	5
Shrub richness	10
Grass & grass - like richness	10
Forb richness	16
Fern richness	3
Other richness	5
Tree cover	44
Shrub cover	20
Grass & grass - like cover	25
Forb cover	11
Fern cover	1
Other cover	3
No.of large trees(per 0.1ha)	122
Litter cover	80
Total length of fallen logs	3
Large Tree Threshold Size	50
PCT Benchmarks Comments	Composition-Structure Benchmark : Class/IBRA | Function: Logs-Formation/IBRA; Litter-Class/IBRA; Large Trees-Formation
PCT Benchmarks Reference Site	
Benchmark source	Multiple methods
Benchmark Confidence	Composition: High | Structure: Moderate | Function: Logs-Low; Litter-High; Large Trees-Low
PCT Benchmark Status	Approved
PCT Definition Status	Approved

Table A-7: PCT 3643 Bungonia Tableland Silvertop Ash-Stringybark Forest

Plant Community Type ID (PCT ID)	3643
VCA Type ID	0
PCT Name	Bungonia Tableland Silvertop Ash-Stringybark Forest
PCT Scientific Name	
Authority	Eastern NSW PCT Classification
Classification Type	Quantitative
Classification Confidence Level	High
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation);
Vegetation Class	South East Dry Sclerophyll Forests;
Vegetation Description	A dry shrubby sclerophyll open forest of rocky hills and ranges of the south-east Central Tablelands and adjacent north-east Southern Tablelands, from Joadja and Barrallier south to Durran Durra and Larbert in the catchments of the upper Wollondilly and Shoalhaven rivers. Non-standard plots also suggest a western outlier on Collector Hill. This PCT predominantly occurs on sedimentary and metasedimentary substrates of low to intermediate fertility, including margins of sandstone and shale, at elevations of 550-900 metres asl, in locations receiving 650-900 mm mean annual rainfall. A tall, sparse to mid-dense tree canopy is very frequently dominated by *Eucalyptus sieberi*, commonly with *Eucalyptus agglomerata*, with a small tree layer that very frequently includes patchy to scattered *Allocasuarina littoralis*. Smaller shrubs are sparse, with *Persoonia linearis* almost always present, *Hibbertia obtusifolia* very frequent, and *Acacia terminalis*, *Podolobium ilicifolium*, *Melichrus urceolatus* and *Lomatia ilicifolia* occasional. The ground layer often includes a high cover of rock and leaf litter, with sparse low plants almost always including *Goodenia hederacea*, very frequently with *Lomandra obliqua* and *Pomax umbellata*. Common species include *Billardiera scandens*, *Lomandra filiformis*, *Entolasia stricta*, *Microlaena stipoides*, *Lomandra multiflora* subsp. *multiflora* and *Stypandra glauca*, with occasional *Xanthorrhoea concava*. This PCT grades into a variety of other communities across its range, including PCT 3373 on adjacent footslopes in the Goulburn area, and PCT 3737 in the Mayfield area when moving from rocky hills to lower Cainozoic gravel deposits.
Other Diagnostic Features	
IBRA Bioregion(s)	South Eastern Highlands; Sydney Basin;
IBRA Comments	
IBRA Sub-region(s)	Bungonia; Crookwell; Monaro; Burragorang; Ettrema;
NSW Landscape(s)	
LGA(s)	GOULBURN MULWAREE; QUEANBEYAN-PALERANG REGIONAL; SHOALHAVEN; UPPER LACHLAN SHIRE; WINGECARRIBEE;
Elevation Min(m)	572
Elevation Median(m)	703.2
Elevation Max(m)	906
Annual Rainfall Min(mm)	684
Annual Rainfall Median(mm)	753
Annual Rainfall Max(mm)	904
Annual Mean Temperature Min (deg.C)	11.28
Annual Mean Temperature Median(deg.C)	12.52
Annual Mean Temperature Max(deg.C)	13.68

Upper Stratum Species	
Mid Stratum Species	
Ground Stratum Species	
Diagnostic Species	
Emergent Species	
Tree Growth Form Group Species	*Eucalyptus sieberi , Allocasuarina littoralis , Eucalyptus agglomerata , Eucalyptus globoidea , Eucalyptus rossii , Eucalyptus punctata , Eucalyptus mannifera , Acacia parramattensis , Eucalyptus piperita , Eucalyptus cinerea , Eucalyptus dives , Eucalyptus macrorhyncha , Eucalyptus sclerophylla , Acacia decurrens , Corymbia gummifera , Eucalyptus goniocalyx , Eucalyptus radiata , Brachychiton populneus , Eucalyptus eugenioides , Eucalyptus smithii*
Shrub Growth Form Group Species	*Persoonia linearis , Hibbertia obtusifolia , Acacia terminalis , Podolobium ilicifolium , Melichrus urceolatus , Lomatia ilicifolia , Rhytidosporum procumbens , Platysace ericoides , Monotoca scoparia , Brachyloma daphnoides , Hibbertia empetrifolia subsp. empetrifolia , Phyllanthus hirtellus , Hakea dactyloides , Daviesia leptophylla , Platysace lanceolata , Acacia falciformis , Acacia obtusifolia , Cassinia aculeata , Leucopogon lanceolatus , Acacia ulicifolia , Pimelea linifolia , Amperea xiphoclada , Banksia spinulosa , Astroloma humifusum , Gompholobium minus , Ozothamnus diosmifolius , Persoonia laurina , Persoonia mollis , Acacia gunnii , Lissanthe strigosa , Bossiaea obcordata , Petrophile pedunculata , Dillwynia sieberi , Gompholobium huegelii , Acacia brownii , Aotus ericoides , Bossiaea buxifolia , Coronidium waddelliae , Lomatia silaifolia , Cryptandra amara , Dillwynia sericea , Persoonia levis , Pomaderris lanigera , Acacia elongata , Acacia paradoxa , Daviesia latifolia , Exocarpos cupressiformis , Gompholobium aspalathoides , Leptomeria acida , Leucopogon muticus , Olearia viscidula , Pultenaea linophylla , Pultenaea microphylla , Tetratheca thymifolia , Acacia buxifolia , Acacia longifolia , Acacia obtusata , Acacia rubida , Acacia suaveolens , Cassinia sifton , Cassinia uncata , Choretrum pauciflorum , Coronidium oxylepis , Daviesia mimosoides , Exocarpos strictus , Gompholobium inconspicuum , Indigofera australis , Leucopogon virgatus , Mirbelia platylobioides , Olearia microphylla , Philotheca salsolifolia , Platylobium formosum , Platysace linearifolia , Pomaderris andromedifolia , Pomaderris delicata , Pultenaea scabra , Acacia decora , Acacia genistifolia , Acacia implexa , Acacia jonesii , Acacia leucolobia , Acacia uncinata , Boronia algida , Boronia rubiginosa , Bursaria spinosa , Calytrix tetragona , Cassinia cunninghamii , Cassinia quinquefaria , Cryptandra spinescens , Daviesia acicularis , Daviesia corymbosa , Daviesia genistifolia , Daviesia ulicifolia , Dodonaea multijuga , Gompholobium uncinatum , Goodenia ovata , Hakea sericea , Hibbertia circumdans , Hibbertia linearis , Hibbertia monogyna , Hovea purpurea , Isopogon anemonifolius , Leptospermum polygalifolium , Leptospermum trinervium , Leucopogon attenuatus , Lomatia ilicifolia x silaifolia , Melichrus procumbens , Monotoca elliptica , Olearia stellulata , Phyllota squarrosa , Pimelea curviflora , Podolobium scandens , Polyscias sambucifolia , Pomaderris ferruginea , Pomaderris intermedia , Prostanthera saxicola , Pultenaea subspicata , Styphelia angustifolia , Tetratheca bauerifolia , Tetratheca ericifolia*
Grass & Grass-like Growth Form Group Species	*Lomandra obliqua , Entolasia stricta , Lomandra filiformis , Microlaena stipoides , Lomandra multiflora subsp. multiflora , Lepidosperma gunnii , Rytidosperma pallidum , Austrostipa rudis , Poa sieberiana , Lomandra glauca , Lepidosperma urophorum , Lomandra longifolia , Lepidosperma laterale , Lomandra cylindrica , Dichelachne inaequiglumis , Caustis flexuosa , Lomandra gracilis , Aristida ramosa , Austrostipa mollis , Lomandra micrantha subsp. tuberculata , Austrostipa densiflora , Deyeuxia quadriseta , Echinopogon caespitosus , Lepidosperma filiforme , Poa meionectes , Rytidosperma monticola , Rytidosperma pilosum , Rytidosperma racemosum , Aristida calycina , Aristida jerichoensis , Aristida vagans , Austrostipa pubinodis , Deyeuxia monticola , Dichelachne parva , Echinopogon ovatus , Poa labillardierei var. labillardierei , Austrostipa pubescens , Austrostipa semibarbata , Carex appressa , Cyathochaeta diandra , Deyeuxia nudiflora , Dichelachne micrantha , Gahnia microstachya , Lachnagrostis filiformis , Lomandra confertifolia , Poa cheelii , Rytidosperma fulvum , Rytidosperma laeve , Rytidosperma tenuius , Schoenus ericetorum , Themeda triandra*
Forb Growth Form Group Species	*Goodenia hederacea , Pomax umbellata , Stypandra glauca , Dianella revoluta , Gonocarpus tetragynus , Patersonia sericea , Poranthera microphylla , Hovea linearis , Opercularia diphylla , Patersonia glabrata , Opercularia aspera , Helichrysum leucopsideum , Lagenophora stipitata , Patersonia longifolia , Stylidium graminifolium , Hypericum gramineum , Dampiera purpurea , Opercularia varia , Lagenophora gracilis , Viola hederacea , Gonocarpus teucrioides , Goodenia bellidifolia , Stackhousia monogyna , Coronidium scorpioides , Hybanthus monopetalus , Laxmannia gracilis , Opercularia hispida , Oxalis perennans , Scaevola ramosissima , Veronica plebeia , Wahlenbergia gracilis , Xerochrysum bracteatum , Bossiaea prostrata , Caesia parviflora , Comesperma sphaerocarpum , Coopernookia barbata , Hydrocotyle laxiflora , Oxalis exilis , Poranthera ericifolia , Stackhousia viminea , Thysanotus tuberosus , Viola betonicifolia , Arrhenechthites mixta , Boronia nana var. hyssopifolia , Brachyscome decipiens , Brachyscome spathulata , Caladenia carnea , Chiloglottis diphylla , Dianella caerulea , Dichondra repens , Drosera auriculata , Einadia hastata , Euchiton japonicus , Galium leiocarpum , Gonocarpus humilis , Leptorhynchos squamatus , Lobelia gibbosa , Mitrasacme pilosa , Podolepis hieracioides , Pterostylis parviflora , Pterostylis pedunculata , Pterostylis revoluta , Senecio prenanthoides ,*

	Solanum pungetium , Trachymene incisa subsp. incisa , Wahlenbergia gracilenta , Wahlenbergia stricta , Xanthosia pilosa , Xerochrysum viscosum
Fern Growth Form Group Species	*Pteridium esculentum , Cheilanthes sieberi subsp. sieberi , Lindsaea linearis*
Other Growth Form Group Species	*Billardiera scandens , Xanthorrhoea concava , Hardenbergia violacea , Cassytha pubescens , Xanthorrhoea resinosa , Amyema congener subsp. congener , Cassytha melantha , Clematis aristata , Comesperma volubile , Glycine clandestina , Glycine tabacina , Kennedia prostrata , Macrozamia communis , Marsdenia rostrata , Thysanotus patersonii*
Median Native Species Richness per plot	27
Height Class (Walker & Hopkins 1990)	
Variation And Natural Disturbance	
Fire Regime	
Landscape Position	
Lithology	
Landform Pattern	
Landform Element	
Is PCT Derived?	
PCT derived from these communities	
PCT derived community comments	
Pre-European Extent	74103
Pre-European Extent Accuracy	
Pre-European Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
Current Extent	39414
Current Extent Accuracy	
Current Extent Comments	Calculated from State Vegetation Type Map (SVTM) extant PCT map C1.1.M1 and Inland Multinomial Modelling. Values rounded to nearest hectare.
PCT Percent Cleared	46.81
% accuracy (of PCT % cleared estimate)	
PCT Percent Cleared Comments	Calculated from State Vegetation Type Map (SVTM) pre-clearing and extant PCT maps C1.1.M1 and Inland Multinomial Modelling. Values are condition weighted SVTM % cleared estimates (see DPE 2022 Eastern NSW PCT % Cleared Calculation Technical notes). There may be a discrepancy between the calculated % cleared values and displayed values due to rounding.
PCT associated with TEC	No associated TEC
TEC List	
TEC Comments	
Adequacy of plot sampling	None
Total Number of Replicates	80
Number of Primary Replicates	71

Number of Secondary Replicates	9
Pre-European Mapped Or Modelled	
Current Extent Mapped Or Modelled	
Classification source	
Citations	Connolly, D. et al., in prep.
Full Reference Details	Connolly, D., Binns, D., Turner, K., Hager, T., Lyons, M., Magarey, E. (in prep.) A revised classification of Plant Community Types for eastern New South Wales. NSW DPIE, Parramatta;
Profile Source	R2.11;
PCT Definition Status	Approved

Table A-8: Default Benchmark Data PCT 3643

Plant Community Type ID(PCT ID)	3643
Classification Confidence Level	High
PCT Name	Bungonia Tableland Silvertop Ash-Stringybark Forest
PCT Scientific Name	
Vegetation Class	South East Dry Sclerophyll Forests
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)
IBRA Bioregion Code	SEH
IBRA Bioregion(s)	South Eastern Highlands
Benchmark Calculation Level	Class/IBRA
PCT Benchmark Variation	monthly average, following AVERAGE RAINFALL year
Rainfall Threshold	626 - 953
Default Benchmark Condition	Yes
Tree richness	5
Shrub richness	13
Grass & grass - like richness	7
Forb richness	9
Fern richness	1
Other richness	2
Tree cover	50
Shrub cover	18
Grass & grass - like cover	18
Forb cover	5
Fern cover	0
Other cover	0
Total length of fallen logs	87
Litter cover	80
No. of large trees(per 0.1ha)	3
Large Tree Threshold Size	50
PCT Benchmarks Comments	Composition-Structure Benchmark : Class/IBRA | Function: Logs-Formation/IBRA; Litter-Formation/IBRA; Large Trees-Formation
PCT Benchmarks Reference Site	
Benchmark source	Multiple methods
Benchmark Confidence	Composition: High | Structure: Moderate | Function: Logs-Moderate; Litter-Low; Large Trees-Moderate
PCT Benchmark Status	Approved
PCT Definition Status	Approved

Appendix B Monitoring Plot Data

Lynwood Quarry, NSW

Ecological Monitoring 2023

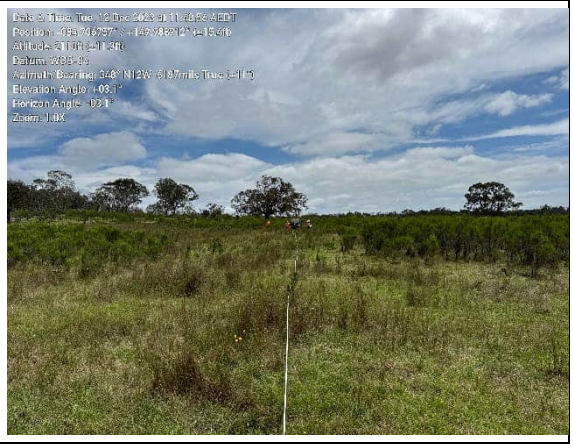
Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table B-1: Photo data for 2023

Site	Start Transect	End Transect
R1		
R2		
R3		

Site	Start Transect	End Transect
R4		
RM1		
RM2		
RM3		

Site	Start Transect	End Transect
RM4		
RM5		
BG1		
BG2		

Site	Start Transect	End Transect
CR1		
CR2		Error

Table B-2: Flora cover data for 2023

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
TG	*Acacia decurrens*	0.1	0	0	0	0	0	0	5	0	0	0	0	0
SG	*Acacia mearnsii*	0	3	0.1	0	20	0	0	0	0	0	0	0	0
SG	*Acacia obtusifolia*	0	0	0.1	0	0.2	0	0	0	0	0	0	0	0
TG	*Acacia parramattensis*	0	0	0	0	0	0	0	0	0	0	0	5	5
SG	*Acacia ulicifolia*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Non-HTW	*Aira caryophyllea*	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0
Non-HTW	*Aira cupaniana*	0	0	0	0	0	0	0	0	0.1	0	0	0	0
TG	*Allocasuarina littoralis*	0	0	0.1	4	0	0	0	0	0	0	0.1	0	2
Non-HTW	*Anthoxanthum odoratum*	0	0	0	0	0	0	0	0	45	0	3	0	0
GG	*Aristida vagans*	0.1	0	0	0.1	0	10	0	0	0	0.1	0	0	0
SG	*Astroloma humifusum*	0	0	0	0	0	0.1	0	0	0	0	0	0	0
GG	*Austrostipa densiflora*	5	1	0.1	0	0	0.5	0	0.5	0	0.1	0.2	0	0.1
GG	*Austrostipa scabra* subsp. *falcata*	0	0	0	0.1	0	0	0	15	0	1	0.5	0	5

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Non-HTW	*Avena fatua*	0	0	0	0	0	0	0	0	0	0	0	4	0
OG	*Billardiera scandens*	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Briza minor*	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Non-HTW	*Bromus molliformis*	0	0	0	0	0	0	0	0	0	0	0	1	0
FG	*Brunoniella australis*	0	0	0	0.1	0	0	0	0	0	0	0	0	0
GG	*Carex appressa*	0	0	0	0	0	0	0	0	0	0	0	0	0.1
GG	*Carex inversa*	0	0	0	0.2	0	0	0	0.1	0	0	0	0	0.4
SG	*Cassinia aculeata*	0	0	80	0	0	0.1	0	0.1	0.1	0	30	0	0
SG	*Cassinia longifolia*	0	0	1	0	0	0	0	0	0	0	0	0	0
SG	*Cassinia quinquefaria*	0	0.1	1	0	0	0	0	0	0	0	0	0	0
SG	*Cassinia sifton*	20	70	5	5	0	40	10	30	45	20	30	0.1	35
SG	*Cassinia uncata*	0	0.1	1	0	0	0	0	0	0	0	0	0	0.5
Non-HTW	*Centaurium erythraea*	0	0	0	0	0	0.1	0.1	0	0	0	0.1	0	0
EG	*Cheilanthes sieberi*	0	0.1	0.1	0	0	0.1	0	0.1	0	0	0	0	0
GG	*Chloris truncata*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Non-HTW	*Cirsium vulgare*	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Non-HTW	*Conyza bonariensis*	0	0.1	0	0.1	0.1	0	0.1	0	0	0.1	0	0	0.1
FG	*Cymbonotus lawsonianus*	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Cyperus congestus*	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1
FG	*Cyperus gracilis*	0	0	0	0	0	0	0	0	0	0.1	0	0	0
FG	*Einadia hastata*	2	0	0	0	0	0	0	0	0	0	0	0	0
FG	*Einadia trigonos*	0	0.1	0	0	0.2	0	0	0.2	0	0.1	0	0	0
Non-HTW	*Eleusine tristachya*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
GG	*Entolasia stricta*	0.5	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Eragrostis benthamii*	0	0	0	0	0	0	15	0	2	0.5	0.1	0	0
HTW	*Eragrostis curvula*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
GG	*Eragrostis leptostachya*	0	0	0	0	0	0.1	0	0	0	0	0	0	0
FG	*Erodium crinitum*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
TG	*Eucalyptus agglomerata*	20	0	30	0	0	0	0	8	0	0	5	0	0
TG	*Eucalyptus blakelyi*	0	0	0	8	0.5	0	0	0	0	5	5	0	20
TG	*Eucalyptus bridgesiana*	0	0	0	0	0.5	0	0	0	0	1	0	0	0
TG	*Eucalyptus cinerea*	0	3	5	0	0	0	0	0	0	0	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
TG	*Eucalyptus eugenioides*	0	5	0	0	0	0	0	0	0	0	0	0	0
TG	*Eucalyptus globoidea*	0	15	0	0	0	0	0	0	0	0	0	0	0
TG	*Eucalyptus macrorhyncha*	0	0	0	0	0	0	0	0.1	0	0	0	0	0
TG	*Eucalyptus melliodora*	0	0	0	15	0	0.1	0	0	0	0	3	0	0
TG	*Eucalyptus sieberi*	1	0	0	0	0.1	0	0	0	0	0	0	0	0
FG	*Euchiton involucratus*	0	0	0	0	0.1	0.1	0	0	0.1	0	0	0	0
FG	*Euchiton sphaericus*	0	0	0	0	0	0	0	0	0	0.1	0	0	0
SG	*Exocarpos strictus*	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Gamochaeta calviceps*	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Non-HTW	*Gamochaeta coarctata*	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0
Non-HTW	*Gamochaeta purpurea*	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0
FG	*Geranium solanderi*	0	0	0	0	0.5	0	0	0	0	0	0	0.1	0
FG	*Gonocarpus tetragynus*	0.2	0.1	0.1	0.2	0	20	0	0	0	0.2	0.2	0	0
FG	*Gonocarpus teucrioides*	0	0	0	0	0	0	0	0	0	0	0	0	0.1
FG	*Goodenia hederacea*	5	0	0.2	0	0	10	0	0	0	0	0	0	0
FG	*Haloragis hetrophylla*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
OG	*Hardenbergia violacea*	0.1	0	0	0	0	0	0	0	0	0	0	0	0
SG	*Hibbertia obtusifolia*	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Holcus lanatus*	0	0	0	0	0.1	0	1	0	0	0	0	30	0
FG	*Hydrocotyle laxiflora*	0	0	0.2	0	0	0	0	0	0	0	0	0	0
FG	*Hydrocotyle sibthorpioides*	0	0	0	0	0	0	0	0	1	0.2	0	0	0
FG	*Hypericum gramineum*	0	0	0.1	0.1	0	0.1	0	0	0	0	0	0	0
HTW	*Hypericum perforatum*	0	0.1	0	0	0	0	0.1	0	0.1	0	0.1	0	0
Non-HTW	*Hypochaeris radicata*	0	0.1	0	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2
SG	*Jacksonia scoparia*	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Juncus bufonius*	0	0	0	0	0	0	0	0	0	0.5	0	0	0
GG	*Juncus holoschoenus*	0	0	0	0	0	0	0	0	0.1	0	0	0	0
GG	*Juncus sarophorus*	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
GG	*Juncus usitatus*	0	0	0	0	0	0	30	0	0.1	0.5	0.1	10	0.1
GG	*Juncus vaginatus*	0	0	0	0	0	0	0	0	0	0	0.2	0	0
SG	*Kunzea parvifolia*	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0
Non-HTW	*Lactuca serriola*	0	0.1	0	0	0	0	0	0	0	0	0	0	0
FG	*Lagenophora stipitata*	0.1	0.1	0	0.2	0	0	0	0	0	0	0	0	0
SG	*Lissanthe strigosa*	0.1	0.2	0.1	0.2	0	0	0	0	0	5	0	0	0
Non-HTW	*Lolium perenne*	0	0	0	0	25	0	0	0	0	0	0	0.1	0
GG	*Lomandra filiformis* subsp. *coriacea*	0.1	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Lomandra filiformis* subsp. *filiformis*	0	0	0	0.1	0	0	0	0	0	0	0	0	0
GG	*Lomandra multiflora*	0	1	0	0	0	0	0	0	0	1	0.3	0	0
GG	*Lomandra obliqua*	0.1	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Microlaena stipoides*	0	20	0	0	0	0	0	4	4	0.5	0	0	30
Non-HTW	*Modiola caroliniana*	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0
HTW	*Nassella trichotoma*	0	1	0	10	0.1	0	0	1	0	1	0	0	4
SG	*Olearia phlogopappa*	0	0	0	0	0	0	0	0	0	0	0	0	0.2
SG	*Olearia viscidula*	0	0.1	2	0	0	0	0	0	0	0	0	0	4
Non-HTW	*Onopordum acanthium*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
FG	*Opercularia diphylla*	0.1	0.1	0.1	0.1	0	0	0	0	0	0.2	0	0	0
FG	*Oxalis perennans*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
FG	*Oxalis radicosa*	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
Non-HTW	*Paronychia brasiliana*	0	0	0	0	0.1	0	0	0.1	0	0.1	0	0	0.1
SG	*Persoonia linearis*	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Phalaris aquatica*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
FG	*Plantago gaudichaudii*	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Non-HTW	*Plantago lanceolata*	0	0.1	0	0	0	0	0.1	0	0	0	0	10	0
GG	*Poa sieberiana*	0	5	5	0	0	0	0	0	0	0	0	0	0
SG	*Pomaderris lanigera*	0	0	0.2	0	0	0	0	0	0	0	0	0	0
FG	*Poranthera microphylla*	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Richardia stellaris*	0	0	0	0	0.1	0	0	0	0	0	0	0	0
HTW	*Rubus anglocandicans*	0	0.5	0	0	0	0.1	0	0	0	0	0	3	0.3

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
HTW	*Rumex acetosella*	0.1	0.1	0	0	15	3	0	0.1	0.1	0	0	0.2	1
Non-HTW	*Rumex crispus*	0	0	0	0	0	0	0	0	0	0	0	0.2	0
GG	*Rytidosperma fulvum*	0	0	0	0	0	0.1	0.1	0	0	0.3	0.1	0	0
GG	*Rytidosperma racemosum*	0.2	0.1	0	0	0	0	0	1	0	0	0	0	5
GG	*Rytidosperma tenuius*	0	0	3	0.1	0	0	0	0	0	0	0	0	0
FG	*Senecio quadridentatus*	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Solanum chenopodioides*	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
Non-HTW	*Solanum nigrum*	0	0.1	0	0	0.1	0	0	0.1	0	0	0	0	0
Non-HTW	*Sonchus asper*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Non-HTW	*Sonchus olearceus*	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1
Non-HTW	*Spergularia rubra*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
GG	*Sporobolus creber*	0	0	0	0	0	0	0	0	0	0	0	0.1	0
FG	*Stypandra glauca*	0	0	15	0	0	0	0	0	0	0	0.1	0	0
GG	*Themeda triandra*	0	0	0	0	0	0	0	0	0	1	0	0	0
FG	*Tricoryne elatior*	0	0	0	0	0	0	0	0	0	0.2	0	0	0
Non-HTW	*Trifolium arvense*	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Trifolium repens*	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Non-HTW	*Verbena bonariensis*	0	0	0	0	0	0	0	0	0	0	0	0	0.1
FG	*Veronica plebeia*	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0.1
Non-HTW	*Vulpia bromoides*	0	0	0	0	2	0	1	0.1	0	0.2	0.2	0.1	0.2
Non-HTW	*Vulpia myuros*	0	0	0	0.1	0	0.2	0	0	0	0	0	0	0
FG	*Wahlenbergia communis*	0	0	0	0	0	0	0	0	0	0.1	0	0	0
FG	*Wahlenbergia gracilis*	0.1	0	0	0	0	0.1	0.1	0	0	0.1	0.1	0	0
FG	*Wahlenbergia stricta*	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0

Table B-3: Flora abundance data for 2023

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
TG	*Acacia decurrens*	1	0	0	0	0	0	0	1	0	0	0	0	0
SG	*Acacia mearnsii*	0	10	11	0	100	0	0	0	0	0	0	0	0
SG	*Acacia obtusifolia*	0	0	2	0	4	0	0	0	0	0	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
TG	*Acacia parramattensis*	0	0	0	0	0	0	0	0	0	0	0	10	7
SG	*Acacia ulicifolia*	0	0	0	0	1	0	0	0	0	0	0	0	0
Non-HTW	*Aira caryophyllea*	0	0	0	0	0	20	0	0	0	0	10	0	0
Non-HTW	*Aira cupaniana*	0	0	0	0	0	0	0	0	2	0	0	0	0
TG	*Allocasuarina littoralis*	0	0	3	13	0	0	0	0	0	0	2	0	12
Non-HTW	*Anthoxanthum odoratum*	0	0	0	0	0	0	0	0	6000	0	20	0	0
GG	*Aristida vagans*	1	0	0	11	0	1000	0	0	0	5	0	0	0
SG	*Astroloma humifusum*	0	0	0	0	0	5	0	0	0	0	0	0	0
GG	*Austrostipa densiflora*	50	6	10	0	0	20	0	30	0	10	10	0	1
GG	*Austrostipa scabra* subsp. *falcata*	0	0	0	3	0	0	0	500	0	30	20	0	100
Non-HTW	*Avena fatua*	0	0	0	0	0	0	0	0	0	0	0	100	0
OG	*Billardiera scandens*	0	0	5	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Briza minor*	0	0	0	0	0	20	0	0	0	0	0	0	0
Non-HTW	*Bromus molliformis*	0	0	0	0	0	0	0	0	0	0	0	20	0
FG	*Brunoniella australis*	0	0	0	2	0	0	0	0	0	0	0	0	0
GG	*Carex appressa*	0	0	0	0	0	0	0	0	0	0	0	0	1
GG	*Carex inversa*	0	0	0	30	0	0	0	1	0	0	0	0	50
SG	*Cassinia aculeata*	0	0	1000	0	0	1	0	1	1	0	3000	0	0
SG	*Cassinia longifolia*	0	0	2	0	0	0	0	0	0	0	0	0	0
SG	*Cassinia quinquefaria*	0	1	11	0	0	0	0	0	0	0	0	0	0
SG	*Cassinia sifton*	200	5000	10	500	0	2000	100	3000	2000	1000	3000	3	1000
SG	*Cassinia uncata*	0	2	4	0	0	0	0	0	0	0	0	0	1
Non-HTW	*Centaurium erythraea*	0	0	0	0	0	30	30	0	0	0	10	0	0
EG	*Cheilanthes sieberi*	0	3	2	0	0	10	0	1	0	0	0	0	0
GG	*Chloris truncata*	0	0	0	0	1	0	0	0	0	0	0	0	0
Non-HTW	*Cirsium vulgare*	0	3	0	0	0	0	0	0	0	0	0	0	4
Non-HTW	*Conyza bonariensis*	0	1	0	10	2	0	1	0	0	10	0	0	1
FG	*Cymbonotus lawsonianus*	0	4	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Cyperus congestus*	0	0	0	0	0	0	0	0	0	3	0	4	10
FG	*Cyperus gracilis*	0	0	0	0	0	0	0	0	0	2	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
FG	*Einadia hastata*	20	0	0	0	0	0	0	0	0	0	0	0	0
FG	*Einadia trigonos*	0	1	0	0	2	0	0	10	0	1	0	0	0
Non-HTW	*Eleusine tristachya*	0	0	0	0	4	0	0	0	0	0	0	0	0
GG	*Entolasia stricta*	20	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Eragrostis benthamii*	0	0	0	0	0	0	1000	0	20	30	2	0	0
HTW	*Eragrostis curvula*	0	0	0	0	5	0	0	0	0	0	0	0	0
GG	*Eragrostis leptostachya*	0	0	0	0	0	10	0	0	0	0	0	0	0
FG	*Erodium crinitum*	0	0	0	0	1	0	0	0	0	0	0	0	0
TG	*Eucalyptus agglomerata*	16	0	13	0	0	0	0	6	0	0	2	0	0
TG	*Eucalyptus blakelyi*	0	0	0	5	4	0	0	0	0	1	3	0	10
TG	*Eucalyptus bridgesiana*	0	0	0	0	3	0	0	0	0	1	0	0	0
TG	*Eucalyptus cinerea*	0	3	2	0	0	0	0	0	0	0	0	0	0
TG	*Eucalyptus eugenioides*	0	15	0	0	0	0	0	0	0	0	0	0	0
TG	*Eucalyptus globoidea*	0	5	0	0	0	0	0	0	0	0	0	0	0
TG	*Eucalyptus macrorhyncha*	0	0	0	0	0	0	0	2	0	0	0	0	0
TG	*Eucalyptus melliodora*	0	0	0	19	0	1	0	0	0	0	1	0	0
TG	*Eucalyptus sieberi*	4	0	0	0	3	0	0	0	0	0	0	0	0
FG	*Euchiton involucratus*	0	0	0	0	1	20	0	0	1	0	0	0	0
FG	*Euchiton sphaericus*	0	0	0	0	0	0	0	0	0	2	0	0	0
SG	*Exocarpos strictus*	10	0	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Gamochaeta calviceps*	0	0	0	10	0	0	0	0	0	0	0	0	0
Non-HTW	*Gamochaeta coarctata*	0	0	0	0	0	0	0	0	0	0	10	10	0
Non-HTW	*Gamochaeta purpurea*	0	0	0	0	0	10	0	0	0	1	0	0	0
FG	*Geranium solanderi*	0	0	0	0	20	0	0	0	0	0	0	5	0
FG	*Gonocarpus tetragynus*	10	10	10	10	0	1000	0	0	0	10	10	0	0
FG	*Gonocarpus teucrioides*	0	0	0	0	0	0	0	0	0	0	0	0	1
FG	*Goodenia hederacea*	100	0	50	0	0	200	0	0	0	0	0	0	0
FG	*Haloragis hetrophylla*	0	0	0	0	0	0	0	0	0	0	0	10	0
OG	*Hardenbergia violacea*	1	0	0	0	0	0	0	0	0	0	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
SG	*Hibbertia obtusifolia*	1	0	3	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Holcus lanatus*	0	0	0	0	2	0	50	0	0	0	0	3000	0
FG	*Hydrocotyle laxiflora*	0	0	50	0	0	0	0	0	0	0	0	0	0
FG	*Hydrocotyle sibthorpioides*	0	0	0	0	0	0	0	0	40	30	0	0	0
FG	*Hypericum gramineum*	0	0	2	2	0	20	0	0	0	0	0	0	0
HTW	*Hypericum perforatum*	0	2	0	0	0	0	1	0	1	0	1	0	0
Non-HTW	*Hypochaeris radicata*	0	10	0	10	20	20	50	20	10	5	10	20	10
SG	*Jacksonia scoparia*	0	2	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Juncus bufonius*	0	0	0	0	0	0	0	0	0	20	0	0	0
GG	*Juncus holoschoenus*	0	0	0	0	0	0	0	0	1	0	0	0	0
GG	*Juncus sarophorus*	0	1	0	50	0	0	0	0	0	0	0	0	0
GG	*Juncus usitatus*	0	0	0	0	0	0	3000	0	2	20	2	80	1
GG	*Juncus vaginatus*	0	0	0	0	0	0	0	0	0	0	4	0	0
SG	*Kunzea parvifolia*	0	0	0	0	0	2	0	0	1	0	0	0	0
Non-HTW	*Lactuca serriola*	0	1	0	0	0	0	0	0	0	0	0	0	0
FG	*Lagenophora stipitata*	11	5	0	40	0	0	0	0	0	0	0	0	0
SG	*Lissanthe strigosa*	2	3	2	9	0	0	0	0	0	20	0	0	0
Non-HTW	*Lolium perenne*	0	0	0	0	2000	0	0	0	0	0	0	1	0
GG	*Lomandra filiformis* subsp. *coriacea*	10	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Lomandra filiformis* subsp. *filiformis*	0	0	0	10	0	0	0	0	0	0	0	0	0
GG	*Lomandra multiflora*	0	100	0	0	0	0	0	0	0	50	10	0	0
GG	*Lomandra obliqua*	11	0	0	0	0	0	0	0	0	0	0	0	0
GG	*Microlaena stipoides*	0	2000	0	0	0	0	0	50	50	100	0	0	2000
Non-HTW	*Modiola caroliniana*	0	1	0	0	5	0	0	0	0	0	0	0	0
HTW	*Nassella trichotoma*	0	10	0	30	5	0	0	50	0	20	0	0	20
SG	*Olearia phlogopappa*	0	0	0	0	0	0	0	0	0	0	0	0	1
SG	*Olearia viscidula*	0	1	10	0	0	0	0	0	0	0	0	0	5
Non-HTW	*Onopordum acanthium*	0	0	0	0	0	0	0	0	0	0	0	1	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
FG	*Opercularia diphylla*	1	1	10	5	0	0	0	0	0	4	0	0	0
FG	*Oxalis perennans*	0	0	0	0	1	0	0	0	0	0	0	0	0
FG	*Oxalis radicosa*	0	0	0	0	0	0	0	0	0	1	0	0	10
Non-HTW	*Paronychia brasiliana*	0	0	0	0	2	0	0	10	0	1	0	0	1
SG	*Persoonia linearis*	0	0	1	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Phalaris aquatica*	0	0	0	0	0	0	0	0	0	0	0	10	0
FG	*Plantago gaudichaudii*	0	0	0	0	0	0	0	0	0	1	0	0	0
Non-HTW	*Plantago lanceolata*	0	20	0	0	0	0	20	0	0	0	0	2000	0
GG	*Poa sieberiana*	0	10	40	0	0	0	0	0	0	0	0	0	0
SG	*Pomaderris lanigera*	0	0	3	0	0	0	0	0	0	0	0	0	0
FG	*Poranthera microphylla*	11	0	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Richardia stellaris*	0	0	0	0	2	0	0	0	0	0	0	0	0
HTW	*Rubus anglocandicans*	0	10	0	0	0	1	0	0	0	0	0	1	10
HTW	*Rumex acetosella*	10	10	0	0	1000	100	0	10	2	0	0	30	100
Non-HTW	*Rumex crispus*	0	0	0	0	0	0	0	0	0	0	0	10	0
GG	*Rytidosperma fulvum*	0	0	0	0	0	1	2	0	0	10	2	0	0
GG	*Rytidosperma racemosum*	10	1	0	0	0	0	0	20	0	0	0	0	100
GG	*Rytidosperma tenuius*	0	0	2	10	0	0	0	0	0	0	0	0	0
FG	*Senecio quadridentatus*	0	5	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Solanum chenopodioides*	0	0	0	0	0	0	0	0	0	2	0	0	1
Non-HTW	*Solanum nigrum*	0	1	0	0	2	0	0	3	0	0	0	0	0
Non-HTW	*Sonchus asper*	0	0	0	0	0	0	0	0	0	0	0	1	0
Non-HTW	*Sonchus olearceus*	0	0	0	1	0	0	0	0	0	0	0	0	1
Non-HTW	*Spergularia rubra*	0	0	0	0	0	0	0	0	0	0	0	10	0
GG	*Sporobolus creber*	0	0	0	0	0	0	0	0	0	0	0	1	0
FG	*Stypandra glauca*	0	0	20	0	0	0	0	0	0	0	1	0	0
GG	*Themeda triandra*	0	0	0	0	0	0	0	0	0	5	0	0	0
FG	*Tricoryne elatior*	0	0	0	0	0	0	0	0	0	20	0	0	0
Non-HTW	*Trifolium arvense*	0	1	0	0	0	0	0	0	0	0	0	0	0
Non-HTW	*Trifolium repens*	0	0	0	0	0	0	0	0	10	0	0	0	0

GF/ HTW	Scientific Name	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Non-HTW	*Verbena bonariensis*	0	0	0	0	0	0	0	0	0	0	0	0	1
FG	*Veronica plebeia*	0	0	2	0	0	0	0	0	0	1	0	0	1
Non-HTW	*Vulpia bromoides*	0	0	0	0	200	0	10	10	0	10	20	1	10
Non-HTW	*Vulpia myuros*	0	0	0	2	0	50	0	0	0	0	0	0	0
FG	*Wahlenbergia communis*	0	0	0	0	0	0	0	0	0	1	0	0	0
FG	*Wahlenbergia gracilis*	1	0	0	0	0	2	1	0	0	5	1	0	0
FG	*Wahlenbergia stricta*	0	5	0	2	0	0	0	0	0	0	0	0	0

Table B-4: Tree stem data for 2023

DBH (cm)	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
>80	0	0	0	1	0	0	0	0	0	0	0	0	1
50 to 79	1	0	3	2	0	0	0	0	0	3	1	0	2
30 to 49	9	5	18	4	0	0	0	1	0	4	2	0	7
20 to 29	9	8	3	10	0	0	0	0	0	0	1	0	5
10 to 19	8	5	8	12	0	0	0	3	0	0	15	1	5
5 to 9	2	2	2	13	0	0	0	2	0	0	20	1	5
Tree stem <5cm DBH	18	49	120	34	14	0	0	8	0	2	73	14	30
No Large Trees (>50cm DBH)	1	0	3	3	0	0	0	0	0	3	1	0	3

Table B-5: Litter data for 2023

Transect interval	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Litter cover (%) at 5m	60	25	80	95	50	50	40	55	40	75	90	60	95
Litter cover (%) at 15m	30	35	90	90	40	40	25	40	75	90	95	10	15
Litter cover (%) at 25m	35	50	75	95	50	35	40	50	40	50	80	50	75
Litter cover (%) at 35m	60	95	55	85	25	60	25	70	60	60	95	20	60
Litter cover (%) at 45m	85	50	50	90	70	60	30	60	35	95	75	35	75
Average Litter cover (%)	54	51	70	91	47	49	32	55	50	74	87	35	64

Table B-6: Log length data for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Log Length (m)	16	28	64	5	0	1	0	9	0	44	0	5	12

Table B-7: Fauna and General observation data for 2023

Site	Fauna observations	General observation notes
R1	Kangaroo (scats), Friarbird, Eastern Rosella, Pied Currawong, White-naped Honeyeater	• Natural regeneration present, including Eucalypts, but minimal. • Native species cover and diversity generally appears low in ground and shrub layer. • General health appears moderate to good. Not much understorey or ground layer, potentially due to rocky soil with patches of bare soil frequent.

Site	Fauna observations	General observation notes
		• Weed occurrence makes up most of the ground layer, including scattered Serrated Tussock Grass. • Threatened/significant species not recorded. • Feral animals not recorded. • Erosion not recorded. • Fire evidence not recorded; management may be required. Ground is dry with moderate litter and logs. • Disturbance signs include areas of bare ground from where Kangaroos lie down, plus signs of past logging (tree stumps) • Site management and successes not recorded.
R2	Sunskink, Eastern Rosella, Magpie	• Natural regeneration present, including Eucalypt regeneration. • Native species cover and diversity not recorded. • General health is moderate with poor tree health and outcompeting by Sifton Bush noted. • Weed occurrence has increased with Blackberry, St Johns Wort and Serrated Tussock • Threatened/significant species not recorded. • Feral animals noted include evidence of the Rabbit (droppings) • Erosion not recorded. • Fire evidence not recorded, slight-moderate fuel loads, management not required. • Disturbance signs include Kangaroos. • Site management and successes not recorded.
R3	Wombats, Kangaroos, White-naped Honeyeater	• Natural regeneration present, including Eucalypts and She-oaks. • Native species cover and diversity not recorded. • General health of vegetation is good, with dense shrub layer dominated by *Cassinia* spp., habitat trees and logs also abundant. • Weed occurrence is minimal. • Threatened/significant species not recorded. • Feral animals noted include a honey bee nest in a dead tree. • Erosion not recorded. • Fire evidence notes as over five years ago. Vegetation and soil is very dry with moderate leaf litter therefore fire management may be required. • Disturbance signs include evidence of wombats (burrows) and Kangaroos. • Site management and successes not recorded.
R4	Eastern Sign-bearing Froglet, Pied Currawong, White-throated Honeyeater. An unattended raptor nest was also noted in a large Yellow Box.	• Natural regeneration present, including juvenile Eucalypts and She-oaks. • Native species cover and diversity not recorded. • General health is moderate to good, but ground layer is affected by erosion. • Weed occurrence includes increased cover of Serrated Tussock, with some Thistles and Fleabane • Threatened/significant species not recorded. • Feral animals not recorded. • Erosion is severe and occurring in proximity to the plot including channel erosion and undercutting (see photo) at drainage line. This is causing sheet erosion within the plot area. • Fire evidence not recorded. Open woodland with moderate litter, but overall light fuel loads therefore management not likely required here. • Disturbance signs include heavy grazing of grasses by Kangaroos. • Site management and successes not recorded
RM1	Magpie-lark, Crimson Rosella, Gallah, Welcome Swallow, Eastern Grey Kangaroo, Australian Raven, Magpie, Corellas, Grey-shrike Thrush, Nankeen Kestrel.	• Natural regeneration not occurring but tube stock and seeding evident. • Native species cover and diversity noted as low due to recent establishment, no need for planting at this time. • General health moderate to good, with steep slope (25 degree), high winds and nearby paddock weeds, noted as potential hinderance to rehabilitation success. • Weed occurrence is low to moderate including Serrated Tussock, African Lovegrass, with Blackberry nearby. • Threatened/significant species not recorded.

Site	Fauna observations	General observation notes
		• Feral animals noted including rabbits and foxes. • Erosion was noted including minor rills (5-10cm). • Fire evidence not recorded, and fuel levels are low. Fuel management not required at this location. • Disturbance signs include an old disused track within plot and signs of native animal grazing (Kangaroos) • Site management and successes include erosion control noted at eastern side of amenity bund, but sediment fencing/erosion controls requiring maintenance. Planting appears successful with eucalypts, acacias, and grasses. Neighbouring fencing noted. Consider log emplacement (pinned down) for habitat and erosion control.
RM2	Superb Fairywren, Magpie Lark, Nankeen Kestrel, Nosy Miner, Pied Currawong, Kangaroo, Wallaby, Rabbit, Hare, Olive-back Oriole, Striated Pardalote, Grey Fantail. Domestic dogs barking at neighbouring house.	• Natural regeneration present, including shrubs (mainly Sifton Bush) and ground layer species. Canopy regeneration appears to be absent from plot. • Native species cover and diversity generally limited in the canopy layer, therefore tree planting should be considered for this area. • General health is moderate, but species diversity appears to be low in open areas. • Weed occurrence is minor, including Blackberry. • Threatened/significant species not recorded. • Feral animals noted include minor evidence of rabbits/hares (scats). • Erosion was noted including minor sheet erosion scattered throughout area. • Fire evidence not recorded. Fuel loads thought to be low due to limited litter and logs, but dense Sifton Bush can present as a fire hazard. Sifton Bush control should be considered for fire management and to improve ecological diversity. • Disturbance signs including grazing by native and feral animal species (Wallaby, Kangaroo, rabbit/hare) • Site management and successes not recorded
RM3	Welcome Swallow, Magpie Lark, Superb Fairy wren, Australian Raven, Corella, Silvereye.	• Natural regeneration present, including shrubs (mainly Sifton Bush) and ground layer species. Canopy regeneration is poor, but one Eucalypt was recorded in the plot. • Native species cover and diversity generally poor, recommend Sifton Bush control and tree planting. Paddock areas are being overtaken by *Cassinia sifton*. Upslope vegetation appears to be dominated by *E. mannifera*, *E. bridgesiana*, *E. sieberi*, *E. blakelyi* with *Cassinia sifton*. • General health of the vegetation is low to moderate with Sifton Bush overtaking paddocks and native species diversity low. • Weed occurrence is low, with some Cats-ear noted. • Threatened/significant species not recorded. • Feral animals noted include rabbit/hare (scats). • Erosion not recorded. • Fire evidence not recorded. Fuel loads thought to be low due to limited litter and logs, but dense Sifton Bush can present as a fire hazard. Sifton Bush control should be considered for fire management and to improve ecological diversity. • Disturbance signs including historic clearing and grazing by kangaroos and wallabies. • Site management and successes not recorded.
RM4	Grey Fantail, Magpie lark, Magpie, Wallaby, Kangaroo, Rabbit, Wombat burrows, Spotted Marsh Frog, Rufous Whistler.	• Natural regeneration present, including Eucalypts and Acacias, but minimal. • Native species cover and diversity generally moderate, with some potential to regenerate passively, though grasses noted as dominant. • General health of the vegetation is moderate to good with some regeneration occurring. • Weed occurrence is noted including Serrated Tussock Grass and a low occurrence of common annual weeds. • Threatened/significant species not recorded. • Feral animals noted include rabbits, evidenced by scats and warrens (possibly inactive). • Erosion was noted as minor sheet erosion near the bund. • Fire evidence not recorded. Fuel loads low, management not likely required. • Disturbance signs include a small man-made bund, potentially for drainage and native/feral animal grazing throughout the plot. • Site management and successes not recorded

Site	Fauna observations	General observation notes
RM5	White-throated Treecreeper, Grey Fantail, Kangaroo, Wallaby.	• Natural regeneration present, in understorey and ground layer, but appears absent in canopy. Paddock areas are being taken over by Sifton Bush. • Native species cover and diversity generally poor particularly in canopy layer. • General health is low to moderate. Plot being taken over by Sifton Bush hindering regeneration of other species. • Weed occurrence is high for exotic perennial grass. • Threatened/significant species not recorded. • Feral animals not recorded. • Erosion not recorded, but it is possible that there is a small drainage line through the plot. • Fire evidence not recorded. Fuel loads thought to be low due to limited litter and logs, but dense Sifton Bush can present as a fire hazard. Sifton Bush control should be considered for fire management and to improve ecological diversity. • Disturbance signs including historic clearing and grazing by kangaroos and wallabies. • Site management noted include protection fencing of the general area.
BG1	Magpie, Rufous Whistler, Wallaby, Kangaroo, Magpie Lark	• Natural regeneration present, low in canopy layer but moderate in shrub and ground layers. • Native species cover and diversity not recorded, no planting needed. • General health moderate to good, but the trees appear over mature and juvenile trees are limited. • Weed occurrence is low with some thistles and patches of Serrated Tussock throughout. • Threatened/significant species not recorded. • Feral animals noted include evidence of rabbit/hare and fox (scats). • Erosion noted in nearby drainage line, with evidence of sheet erosion noted at the plot. • Fire evidence not recorded. Fuel loads are moderate with dry logs, stags, and leaf litter present. Fire management may be required, and ecological burn could be beneficial to improve the diversity in the understorey. • Disturbance signs were minimal with possible native wildlife grazing. • Site management noted include environmental protection fencing.
BG2	Kangaroo, Wallaby, Wombat, Willy Wagtail, Grey Fantail. Habitat connectivity and suitability may be affected by proximity to Hume Highway.	• Natural regeneration present, especially in the canopy (Eucalypts) • Native species cover and diversity low in ground layer but high in shrub layer. • General health of vegetation is good with high levels of regeneration occurring. • Weed occurrence is not recorded. • Threatened/significant species not recorded. • Feral animals not recorded. • Erosion not recorded. • Fire evidence not recorded. Moderate fuel loads due to leaf litter, fire management may be required. • Disturbance signs include potential for native animal grazing due to evidence of Kangaroos, Wallabies and Wombats. • Site management and successes not recorded.
CR1	Red-browed Finch, Pied Cormorant, Common Eastern Froglet, Skink, Sign-bearing Froglet, Striped Marsh Frog, Spotted Marsh Frog.	• Natural regeneration present, mostly in the understorey and ground layer, but a few juvenile eucalypts were also recorded. • Native species cover and diversity is noted as low in the canopy layer, therefore planting native trees would be beneficial. • General health of the vegetation is moderate. • Weed occurrence is noted including exotic perennial grasses, common annual weeds and Blackberry. • Threatened/significant species not recorded. • Feral animals were not recorded. • Erosion was noted including minor sheet erosion and bank erosion. Areas of bare ground were noted. • Fire evidence not recorded, fuel loads generally low to moderate and fire management not likely to be required here. • Disturbance signs include natural grazing (Wombat hole?) and historic clearing. • Site management and successes not recorded.

Site	Fauna observations	General observation notes
CR2	Noisy Friarbird, Magpie lark, Sign-bearing Froglet, Silvereye, Spotted Marsh Frog, Grey Fantail, Willie Wagtail, Pied Currawong.	• Natural regeneration present, including canopy. • Native species cover and diversity generally good with no immediate need for planting. • General health of vegetation is moderate to good with regeneration and some weeds. • Weed occurrence is noted including abundant Serrated Tussock and Blackberry. A targeted program of Blackberry and Serrated Tussock control is recommended along the creek. • Threatened/significant species not recorded. • Feral animals noted include rabbits evidenced by scats and warrens. Rabbit control should be considered. • Erosion is severe in this area, being mainly concentrated along the creek and including bank and channel erosion. Erosion control is required. • Fire evidence not recorded. Fuel loads are low to moderate. Fire management may be required. • Disturbance signs recorded include natural grazing by kangaroos and wallabies. • Site management noted include some erosion controls that appear to be underway outside the plot and closer to the road. Additional widespread erosion control is recommended.

Table B-8: Species Richness analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Tree	3	3	3	3	3	1	0	3	0	2	4	1	3
Shrub	4	7	12	2	3	4	1	2	3	2	2	1	4
Grass & grasslike	6	6	3	6	1	4	3	5	4	9	7	2	7
Forb	7	7	7	6	5	5	1	1	2	12	3	2	3
Fern	0	1	1	0	0	1	0	1	0	0	0	0	0
Other	1	0	1	0	0	0	0	0	0	0	0	0	0
HTW	1	4	0	1	3	2	1	2	2	1	1	2	3
Non-HTW	0	8	0	5	10	6	6	4	4	8	6	14	9
TOTAL WEED SPECIES	1	12	0	6	13	8	7	6	6	9	7	16	12

Table B-9: Species Cover analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Tree	21.1	23	35.1	27	1.1	0.1	0	13.1	0	6	13.1	5	27
Shrub	20.3	73.6	90.7	5.2	20.3	40.3	10	30.1	45.2	25	60	0.1	39.7
Grass & grasslike	6	27.2	8.1	0.7	0.1	10.7	45.1	20.6	6.2	5	1.5	10.1	40.7
Forb	7.6	0.7	15.8	0.8	1	30.3	0.1	0.2	1.1	1.6	0.4	0.2	0.3
Fern	0	0.1	0.1	0	0	0.1	0	0.1	0	0	0	0	0
Other	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
HTW	0.1	1.7	0	10	15.2	3.1	0.1	1.1	0.2	1	0.1	3.2	5.3
Non-HTW	0	0.8	0	0.5	27.8	0.7	2.5	0.5	45.4	1.3	3.6	46.1	1.1
TOTAL WEED SPECIES	0.1	2.5	0	10.5	43	3.8	2.6	1.6	45.6	2.3	3.7	49.3	6.4

Table B-10: Target Species Richness analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Target PCT	3643	3486	3486	3373	3376	3376	3376	3376	3373	3376	3376	3376	3373
Tree	3	3	2	3	3	1	0	2	0	2	3	1	3
Shrub	4	6	9	2	2	3	1	2	3	2	2	1	3

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Grass & grasslike	6	5	3	5	1	4	3	5	3	9	6	2	6
Forb	7	7	7	5	5	5	1	1	2	11	2	1	2
Fern	0	1	1	0	0	1	0	1	0	0	0	0	0
Other	1	0	1	0	0	0	0	0	0	0	0	0	0

Table B-11: Target Species Cover analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Target PCT	3643	3486	3486	3373	3376	3376	3376	3376	3373	3376	3376	3376	3373
Tree	21.1	23	5.1	27	1.1	0.1	0	5.1	0	6	8.1	5	27
Shrub	20.3	3.6	85.4	5.2	20.1	40.2	10	30.1	45.2	25	60	0.1	39.5
Grass & grasslike	6	27.1	8.1	0.6	0.1	10.7	45.1	20.6	6.1	5	1.3	10.1	40.6
Forb	7.6	0.7	15.8	0.7	1	30.3	0.1	0.2	1.1	1.4	0.3	0.1	0.2
Fern	0	0.1	0.1	0	0	0.1	0	0.1	0	0	0	0	0
Other	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0

Table B-12: Proportion of Target Species Richness analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Target PCT	3643	3486	3486	3373	3376	3376	3376	3376	3373	3376	3376	3376	3373
Tree	100.0	100.0	66.7	100.0	100.0	100.0	0	66.7	0	100.0	75.0	100.0	100.0
Shrub	100.0	85.7	75.0	100.0	66.7	75.0	100.0	100.0	100.0	100.0	100.0	100.0	75.0
Grass & grasslike	100.0	83.3	100.0	83.3	100.0	100.0	100.0	100.0	75.0	100.0	85.7	100.0	85.7
Forb	100.0	100.0	100.0	83.3	100.0	100.0	100.0	100.0	100.0	91.7	66.7	50.0	66.7
Fern	0	100.0	100.0	0	0	100.0	0	100.0	0	0	0	0	0
Other	100.0	0	100.0	0	0	0	0	0	0	0	0	0	0

Table B-13: Proportion of Target Species Cover analysis for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
Target PCT	3643	3486	3486	3373	3376	3376	3376	3376	3373	3376	3376	3376	3373
Tree	100.0	100.0	14.5	100.0	100.0	100.0	0	38.9	0	100.0	61.8	100.0	100.0
Shrub	100.0	4.9	94.2	100.0	99.0	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.5
Grass & grasslike	100.0	99.6	100.0	85.7	100.0	100.0	100.0	100.0	98.4	100.0	86.7	100.0	99.8
Forb	100.0	100.0	100.0	87.5	100.0	100.0	100.0	100.0	100.0	87.5	75.0	50.0	66.7
Fern	0	100.0	100.0	0	0	100.0	0	100.0	0	0	0	0	0
Other	100.0	0	100.0	0	0	0	0	0	0	0	0	0	0

Table B-14: VI score data for 2023

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
pct	3643	3486	3486	3373	3376	3376	3376	3376	3373	3376	3376	3376	3373
area	5	5	5	5	5	5	5	5	5	5	5	5	5
patchsize	100	100	100	100	100	100	100	100	100	100	100	100	100
conditionclass	R1_23	R2_23	R3_23	R4_23	RM1_23	RM2_23	RM3_23	RM4_23	RM5_23	BG1_23	BG2_23	CR1_23	CR2_23
zone	56	56	56	56	56	56	56	56	56	56	56	56	56

	R1	R2	R3	R4	RM1	RM2	RM3	RM4	RM5	BG1	BG2	CR1	CR2
easting	771155.1	772059.7	772844.6	773491.9	769915.4	773464.8	773741.8	770845.1	771706.9	769577.1	771851.8	771326.2	773062.9
northing	6154011	6155132	6155654	6156306	6157908	6155743	6155457	6153936	6153029	6154113	6152990	6154954	6153023
bearing	0	0	0	0	0	0	0	0	0	0	0	0	0
compTree	3	3	3	3	3	1	0	3	0	2	4	1	3
compShrub	4	7	12	2	3	4	1	2	3	2	2	1	4
compGrass	6	6	3	6	1	4	3	5	4	9	7	2	7
compForbs	7	7	7	6	5	5	1	1	2	12	3	2	3
compFerns	0	1	1	0	0	1	0	1	0	0	0	0	0
compOther	1	0	1	0	0	0	0	0	0	0	0	0	0
strucTree	21.1	23	35.1	27	1.1	0.1	0	13.1	0	6	13.1	5	27
strucShrub	20.3	73.6	90.7	5.2	20.3	40.3	10	30.1	45.2	25	60	0.1	39.7
strucGrass	6	27.2	8.1	0.7	0.1	10.7	45.1	20.6	6.2	5	1.5	10.1	40.7
strucForbs	7.6	0.7	15.8	0.8	1	30.3	0.1	0.2	1.1	1.6	0.4	0.2	0.3
strucFerns	0	0.1	0.1	0	0	0.1	0	0.1	0	0	0	0	0
strucOther	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
funLargeTrees	1	0	3	3	0	0	0	0	0	3	1	0	3
funHollowtrees	0	0	11	2	0	0	0	0	0	6	0	0	2
funLitterCover	54	51	70	91	47	49	32	55	50	74	87	35	64
funLenFallenLogs	16	28	64	5	0	1	0	9	0	44	0	5	12
funTreeStem5to9	1	1	1	1	0	0	0	1	0	0	1	1	1
funTreeStem10to19	1	1	1	1	0	0	0	1	0	0	1	1	1
funTreeStem20to29	1	1	1	1	0	0	0	0	0	0	1	0	1
funTreeStem30to49	1	1	1	1	0	0	0	1	0	1	1	0	1
funTreeStem50to79	1	0	1	1	0	0	0	0	0	1	1	0	1
funTreeRegen	1	1	1	1	1	0	0	1	0	1	1	1	1
funHighThreatExotic	0.1	1.7	0	10	15.2	3.1	0.1	1.1	0.2	1	0.1	3.2	5.3

Table B-15: BAM-C Outputs

Category	Plot	Year	Composition Score	Structure Score	Function Score	Vegetation Integrity Score
Retained Vegetation	R1	2020	49.8	49	64.6	54
Retained Vegetation	R1	2023	62.8	55	53.9	57.1
Retained Vegetation	R2	2020	58.3	49.3	26.9	42.6
Retained Vegetation	R2	2023	58.2	70.1	44.5	56.6
Retained Vegetation	R3	2020	61.6	90.5	78.9	76

Category	Plot	Year	Composition Score	Structure Score	Function Score	Vegetation Integrity Score
Retained Vegetation	R3	2023	50.6	76.2	92.4	70.9
Retained Vegetation	R4	2020	74.7	35	83.8	60.3
Retained Vegetation	R4	2023	46.9	41.5	80.3	53.9
Rehabilitation	RM1	2021	3	1.5	0	0.6
Rehabilitation	RM1	2022	0.2	1.3	0	0.2
Rehabilitation	RM1	2023	27.9	7	30	18
Rehabilitation	RM2	2021	38.7	22	15.1	23.4
Rehabilitation	RM2	2022	38.2	21.4	15.3	23.2
Rehabilitation	RM2	2023	37.9	29.4	15	25.6
Rehabilitation	RM3	2021	23.2	35.3	0	2.7
Rehabilitation	RM3	2022	19.6	47.3	0.5	7.6
Rehabilitation	RM3	2023	7.3	53.3	13.3	17.3
Rehabilitation	RM4	2021	21	81.4	23	34
Rehabilitation	RM4	2022	29.3	88	32.1	43.6
Rehabilitation	RM4	2023	31.6	61.9	45.1	44.5
Rehabilitation	RM5	2021	43.4	53.5	0.2	7.1
Rehabilitation	RM5	2022	36.1	58.6	0.2	7.5
Rehabilitation	RM5	2023	20.5	10	15	14.5
Box-Gum	BG1	2021	60.1	80.4	58.8	65.8
Box-Gum	BG1	2022	66.7	70.6	25.3	49.2
Box-Gum	BG1	2023	70.4	13.4	86.8	43.4
Box-Gum	BG2	2021	63.7	51.1	44.9	52.7
Box-Gum	BG2	2022	69.1	41.4	43.9	50.1
Box-Gum	BG2	2023	38.4	27.5	54.7	38.7
Core Riparian	CR1	2022	8.7	13.7	18.3	13
Core Riparian	CR1	2023	5.9	12.1	38.2	14
Core Riparian	CR2	2022	43.3	78.7	31	47.3
Core Riparian	CR2	2023	46.9	88	82.7	69.9

Appendix C Fauna Species List

Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table C-1: Fauna species list at Retained Vegetation Sites in 2023

Animal	Status	Scientific Name	Common Name	Observation Type	R1	R2	R3	R4
Bird	Exotic	*Acridotheres tristis*	Common Myna	Sighted		✓		
Bird	Native	*Colluricincla harmonica*	Grey Shrike-thrush	Sighted			✓	✓
Bird	Native	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike	Sighted		✓		✓
Bird	Native	*Cormobates leucophaea*	White throated Treecreeper	Sighted	✓		✓	✓
Bird	Native	*Corvus coronoides*	Australian Raven	Sighted	✓	✓		✓
Bird	Native	*Cracticus tibicen*	Australian Magpie	Sighted	✓	✓	✓	✓
Bird	Native	*Cracticus torquatus*	Grey Butcherbird	Sighted		✓		✓
Bird	Native	*Dacelo novaeguineae*	Laughing Kookaburra	Sighted			✓	✓
Bird	Native	*Egretta novaehollandiae*	White-faced Heron	Spotlighted, IR camera		✓		
Bird	Native	*Grallina cyanoleuca*	Magpie Lark	Sighted, IR camera	✓	✓	✓	✓
Bird	Native	*Gymnorhina tibicen*	Australian Magpie	Sighted		✓		
Bird	Native	*Hirundo neoxena*	Welcome Swallow	Sighted	✓			
Bird	Native	*Malurus cyaneus*	Superb Fairy-wren	Sighted		✓	✓	
Bird	Native	*Manorina melanocephala*	Noisy Miner	Sighted	✓	✓		✓
Bird	Native	*Melithreptus lunatus*	White-naped Honeyeater	Sighted			✓	
Bird	Native	*Ocyphaps lophotes*	Crested Pigeon	Sighted				✓
Bird	Native	*Pachycephala rufiventris*	Rufous Whistler	Sighted			✓	
Bird	Native	*Pardalotus punctatus*	Spotted Pardalote	Sighted	✓			
Bird	Native	*Philemon corniculatus*	Noisy Friarbird	Sighted	✓			
Bird	Native	*Platycercus elegans*	Crimson Rosella	Sighted		✓		
Bird	Native	*Platycercus eximius*	Eastern Rosella	Sighted	✓	✓		✓
Bird	Native	*Rhipidura albiscapa*	Grey Fantail	Sighted	✓	✓	✓	
Bird	Native	*Sericornis frontalis*	White-browed Scrubwren	Sighted	✓	✓	✓	
Bird	Native	*Strepera graculina*	Pied Currawong	Sighted	✓		✓	✓
Bird	Native	*Todiramphus sanctus*	Sacred Kingfisher	Sighted			✓	
Bird	Native	*Vanellus miles*	Masked Lapwing	Sighted		✓		
Crustacean	Native	*Cherax destructor*	Yabby	Spotlighted		✓		
Crustacean	Native	*Paratya australiensis*	Freshwater Shrimp	Spotlighted		✓		
Frog	Native	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	Heard	✓		✓	✓
Frog	Native	*Limnodynastes peronii*	Brown-striped Frog	Spotlighted/heard				✓
Frog	Native	*Litoria fallax*	Eastern Dwarf Frog	Spotlighted/heard				✓
Frog	Native	*Litoria peronii*	Peron's Tree Frog	Spotlighted/heard	✓	✓	✓	✓
Mammal	Native	*Chalinolobus gouldii*	Gould's Wattled Bat	Bat detector		✓		
Mammal	Native	*Chalinolobus morio*	Chocolate Wattled Bat	Bat detector		✓		
Mammal	Exotic	*Felis catus*	Cat	Spotlighted				✓
Mammal	Native	*Macropus giganteus*	Eastern Grey Kangaroo	Spotlighted, IR camera	✓	✓	✓	✓

Animal	Status	Scientific Name	Common Name	Observation Type	R1	R2	R3	R4
Mammal	Vulnerable	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	Bat detector		✓		
Mammal	Native	*Nyctophilus* sp.	Unidentified Long-eared Bat	Bat detector		✓		
Mammal	Exotic	*Oryctolagus cuniculus*	European Rabbit	Spotlighted		✓		
Mammal	Native	*Petaurus breviceps*	Sugar Glider	Spotlighted	✓	✓	✓	
Mammal	Native	*Petaurus* sp.	Potential Squirrel Glider	Spotlighted		✓		
Mammal	Native	*Trichosurus vulpecula*	Brushtail Possum	Spotlighted	✓		✓	
Mammal	Native	*Vespadelus vulturnus*	Little Forest Bat	Bat detector		✓		
Mammal	Native	*Vombatus ursinus*	Common Wombat	IR camera			✓	
Mammal	Exotic	*Vulpes vulpes*	Fox	Spotlighted, IR camera		✓		
Mammal	Native	*Wallabia bicolor*	Swamp Wallaby	Spotlighted			✓	
Reptile	Native	*Lampropholis* sp.	Sunskink	Sighted	✓	✓		✓

Appendix D Nest Box Inventory

Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table D-1: Result of Nest Box Inspection

Box ID	Box Type	Native Fauna Occupancy (Y/N)				Pests (Y/N)	Repair (Y/N)	Comment (species present, signs of use, repair etc.)	Photo/ video number
		Fauna	Nest	Eggs	Young				
JC-1-1	Squirrel Glider	Y	Y	N	Y	N	Y	Gliders (4+), potential young. Box deteriorating.	2:28
JC-1-2	Squirrel Glider	N	Y	N	N	N	N		2:52
JC-1-3	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	2:54
JC-1-4	Micro-Bat	N	N	N	N	N	N	Empty	2:50
JC-2-1	Brushtail Possum	N	Y	Y	N	N	N	Nest with medium-large eggs, feathers and leaves	1:50
JC-2-2	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	1:56
JC-2-3	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	2:14
JC-2-4	Micro-Bat	N	N	N	N	N	Y	Needs relocation to new tree, host tree has broken and fallen onto the ground	2:09
JC-2-5	Squirrel Glider	N	Y	N	N	N	Y	Leaf nest, box starting to deteriorate	2:00
JC-3-1	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	1:08
JC-3-2	Squirrel Glider	N	Y	N	N	Y	Y	Inactive wasp nest. Slight chew marks	1:06
JC-3-3	Squirrel Glider	Y	Y	N	N	N	N	Leaf nest, with Glider	1:12
JC-3-4	Micro-Bat	N	N	N	N	Y	Y	Inactive wasp nest, needs to be cleaned out	1:20
JC-4-1	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	12:48
JC-4-2	Squirrel Glider	Y	Y	N	Y	N	N	Leaf nest. Glider (x2)	12:42
JC-4-3	Brushtail Possum	N	Y	N	N	N	N	Fragments of egg shells, potentially a Wood Duck nest	12:43
JC-4-4	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	12:52
JC-4-5	Micro-Bat	N	N	N	N	N	N	Empty	12:57
JC-5-1	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	2:23
JC-5-2	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	2:29
JC-5-3	Squirrel Glider	Y	Y	N	Y	N	N	Multiple gliders in leaf nest, potential young	2:20
HMA-1-1	Brushtail Possum	N	Y	N	N	N	N	Leaf litter, eggshells. Old Wood Duck nest.	10:14
HMA-1-2	Squirrel Glider	Y	Y	N	Y	N	N	Multiple gliders in leaf nest with young	10:17
HMA-1-3	Squirrel Glider	Y	Y	N	Y	N	N	Multiple gliders in leaf nest with young	10:26
HMA-1-4	Ringtail Possum	N	N	N	N	N	N	Eggshell fragments	10:31
HMA-1-5	Micro-Bat	N	N	N	N	N	N	Empty	10:21

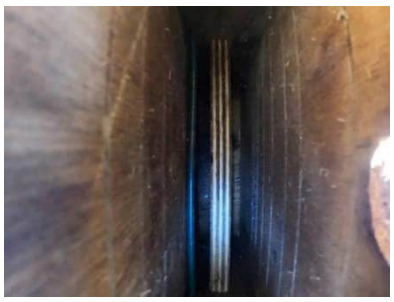
Box ID	Box Type	Native Fauna Occupancy (Y/N)				Pests (Y/N)	Repair (Y/N)	Comment (species present, signs of use, repair etc.)	Photo/ video number
		Fauna	Nest	Eggs	Young				
HMA-1-6	Owlet Nightjar	N	Y	N	N	N	N	Leaf Nest	10:18
HMA-1-7	Owlet Nightjar	N	Y	N	N	N	N	Nest with feathers	10:23
HMA-2-1	Squirrel Glider	Y	Y	N	Y	N	N	Multiple Gliders, few young, not much of a nest	9:49
HMA-2-2	Brushtail Possum	Y	Y	N	N	N	N	Wood Duck Nest with deceased duck	10:00
HMA-2-3	Rosella	N	Y	N	N	N	N	Chew marks on outside, wood duck nest inside	9:51
HMA-2-4	Owlet Nightjar	N	Y	N	N	N	N	Leaf Nest	9:57
HMA-2-5	Micro-Bat	N	N	N	N	N	N	Empty	9:52
HMA-3-1	Ringtail Possum	N	Y	N	N	N	N	Nest	8:52
HMA-3-2	Brushtail Possum	N	Y	N	N	N	N	Old fragments of eggshells	8:56
HMA-3-3	Brushtail Possum	Y	Y	N	N	N	N	Brushtail Possum	8:44
HMA-3-4	Owlet Nightjar	N	Y	N	N	N	N	Leaf nest, chew marks around outside	8:46
HMA-3-5	Rosella	N	Y	N	N	N	N	Leaf nest, chew marks around outside	8:50
HMA-4-1	Brushtail Possum	N	Y	N	N	N	N	Old eggshell fragments, leaf litter	4:02
HMA-4-2	Rosella	N	Y	N	N	N	Y	Leaf Nest. Needs to be tighter on tree (replace attachment). Chew marks	3:54
HMA-4-3	Squirrel Glider	N	Y	N	N	N	N	Leaf and feather nest	3:58
HMA-4-4	Micro-Bat	N	N	N	N	N	N	Empty	4:06
HMA-5-1	Owlet Nightjar	N	Y	N	N	N	N	Leaf nest	10:56
HMA-5-2	Micro-Bat	N	N	N	N	N	N	Empty	11:03
HMA-5-3	Rosella	N	Y	N	N	N	N	Leaf nest, chew marks	11:00
HMA-5-4	Squirrel Glider	N	Y	N	N	N	N	Leaf nest	10:37
HMA-6-1	Ringtail Possum	N	Y	N	N	N	N	Poor condition nest, old eggshell fragments	9:00
HMA-6-2	Brushtail Possum	N	Y	N	N	N	N	Old eggshell fragments	9:11
HMA-6-3	Ringtail Possum	N	Y	N	N	N	N	Leaf Litter, partial nest	9:09
HMA-6-4	Brushtail Possum	N	Y	N	N	N	N	Leaf litter, partial nest	9:06
HMA-12-2	Micro-bat	N	N	N	N	N	N	Empty	11:20
HMA-12-3	Possum/ Glider	N	Y	N	N	N	N	Leaf Nest	11:22
HMA-13-6	Possum/ Glider	Y	N	N	N	N	N	Glider, chew marks	11:23

Box ID	Box Type	Native Fauna Occupancy (Y/N)				Pests (Y/N)	Repair (Y/N)	Comment (species present, signs of use, repair etc.)	Photo/ video number
		Fauna	Nest	Eggs	Young				
HMA-13-5	Possum/ Glider	N	Y	N	N	N	N	Leaf nest	11:24
HMA-13-1	Possum/ Glider	N	Y	N	N	N	N	Leaf nest, spider web	11:29
HMA-13-2	Possum/ Glider	Y	N	N	N	N	N	Brushtail Possum	11:30
HMA-13-10	Possum/ Glider	N	Y	N	N	N	N	Leaf Nest	11:32
HMA-13-8	Possum/ Glider	N	Y	N	N	N	N	Bird nest	11:34
HMA-13-7	Possum/ Glider	N	Y	N	N	N	N	Leaf Nest	11:37

Table D-2: Photograph Thumbnails of Nest Box Inspections

		
JC-1-1	JC-1-2	JC-1-3
		
JC-1-4	JC-2-1	JC-2-2
	NA – Box not operational	
JC-2-3	JC-2-4	JC-2-5
		
JC-3-1	JC-3-2	JC-3-3
		
JC-3-4	JC-4-1	JC-4-2

		
JC-4-3	JC-4-4	JC-4-5
		
JC-5-1	JC-5-2	JC-5-3
		
HMA-1-1	HMA-1-2	HMA-1-3
		
HMA-1-4	HMA-1-5	HMA-1-6
		
HMA-1-7	HMA-2-1	HMA-2-2

		
HMA-2-3	HMA-2-4	HMA-2-5
		
HMA-3-1	HMA-3-2	HMA-3-3
		
HMA-3-4	HMA-3-5	HMA-4-1
		
HMA-4-2	HMA-4-3	HMA-4-4
		
HMA-5-1	HMA-5-2	HMA-5-3

		
HMA-5-4	HMA-6-1	HMA-6-2
		
HMA-6-3	HMA-6-4	HMA-12-3
		
HMA-12-3	HMA-13-1	HMA-13-2
		
HMA-13-5	HMA-13-6	HMA-13-7
		
HMA-13-8	HMA-13-10	

Appendix E Hoary Sunray Monitoring Plot Data

Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table E-1: Hoary Sunray Counts at (4m^2 plot) for 2023

Site ID	% cover estimate	Q1	Q2	Q3	Q4	Total
HS1	0.5	0	1	2	3	6
HS2	0.01	1	0	0	0.01	1.01
HS3	0	0	0	0	0	0
HS4	0	0	0	0	0	0
HS5	0	0	0	0	0	0
HS6	3	5	4	4	5	18
HS7	1	3	5	11	2	21
HS8	0	0	0	0	0	0
HS9	0.1	0	1	0	2	3
HS10	0	0	0	0	0	0
HS11	0.2	0	0	2	1	3

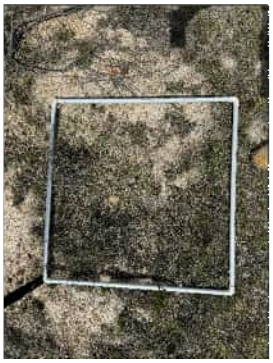
Table E-2: Hoary Sunray Health and Disturbance Impact Notes

Site ID	Erosion (Severity/Age)		Grazing (Severity/Age)		Weediness (Severity/Age)		General Health	General Notes
	Sv	Ag	Sv	Ag	Sv	Ag		
HS1	0	0	1	R	1	R	Moderate	Evidence of grazing. Sparse occurrence of HS in plot 3 surrounding area and few scattered around. Some Sifton Bush present and Leptospermum. Thin but healthy individuals.
HS2	0	0	1	R	1	R	Poor	Only couple found around plot area, very sparse. Browning-unhealthy. Evidence of native grazing. Sifton Bush around plot area.
HS3	0	0	1	R	1	R	None	Sparse few around plot, more found in plot. Evidence of native grazing. Sifton Bush and Leptospermum surrounding.
HS4	0	0	1	R	1	R	Poor	Some native grazing (scats). Few in adjacent area, none found in plot. Leptospermum surrounding.
HS5	0	0	1	R	1	R	Poor	Rocky outcrop. No HS in immediate area. Sifton Bush abundant. Some native grazing evident.
HS6	0	0	1	R	1	R	Moderate	Quite a few patches around plots and area. Not big clumps, no browning. Some native grazing evident.
HS7	0	0	1	R	1	R	Poor	Most HS in plot browning and not in best condition. Some native grazing (scats). Vegetation is dry. Sparse HS in adjacent areas.
HS8	0	0	1	R	1	R	Poor	Shaded area from Sifton Bush. Some regen eucalypts. Area dry, native grazing. None spotted in surrounding area.
HS9	0	0	1	R	1	R	Poor	Sifton Bush in area-potential to out compete. Not many in areas. Grazing of kangaroos. Past bloom, dying off. Potential shading.
HS10	0	0	1	R	1	R	Moderate	None found in plots. Some found adjacent, quite healthy condition. Some light native grazing (scats). Potentially dry weather impact. Surrounding HS not very dense.
HS11	1	NR	0	NR	1	R	Poor	Small clumps, few individuals, browning or dead. Extent reduced, recommend remapping. Dry season has potential impacts.
KEY: Health (indicated by vigour, leaf browning, size of clumps): Poor, moderate, good. Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe. Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)								

Table E-3: Photograph Thumbnails of Hoary Sunray Monitoring Plots

Site	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
HS1				
HS2				
HS3				
HS4				

Site	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
HS5				
HS6				
HS7				
HS8				

Site	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
HS9				
HS10				
HS11				

Appendix F Assessment of Completion Criteria

Lynwood Quarry, NSW

Ecological Monitoring 2023

Holcim Australia Pty Ltd

SLR Project No.: 630.V13844.00001

5 March 2024

Table F-1: Assessment of Revegetated Areas Preliminary Completion Criteria (applies to the Amenity Bund ie RM1)

Area	Objective / Performance Indicator	Preliminary Completion Criteria	Timing	Assessment
Planting or direct seeding areas	Vegetation has been established at the revegetation area and there are no additional works required to be undertaken to assist to meet the requirements of the rehabilitation management plan or any other management plan.	Ground cover comparable to surrounding environment and the establishment of revegetation is such that it no longer requires attention to assure its successful development (>3 years of growth).	Monitor annually until condition criteria achieved.	On track. Native vegetation was planted at the western side of Amenity Bund in 2022. Ground cover improvement likely to be required.
Amenity Bund and emplacement areas	Rehabilitated areas are stable.	Areas of exposed soils are revegetated to achieve cohesive ground cover using a native plant species mix compatible with the surrounding environment and erosion has stabilised and resembles natural processes.	Monitor annually until condition criteria achieved.	On track. Light erosion noted at RM1 plot. Ongoing erosion control required for the amenity bund.
Natural areas	The site is managing significant weed or feral animal infestations	No increase in weed and feral pest populations and monitoring indicates the absence of or decline in weed species. Weeds comprise no more than 15%.	Annual weed monitoring. When monitoring indicates weeds comprise no more than 15% monitoring can be amended to every 3 years. Every 7 years feral animal monitoring is undertaken.	On track. Weed covers overall declined in 2023. Evidence of feral animals recorded at each site (mainly Rabbits) but no evidence of major infestations (eg networks of active burrows). Ongoing weed control and feral animal management required.
Planting or direct seeding areas	The rehabilitated community is representative of the targeted vegetation community being PCT1330 - Yellow Box - Blakely's Red Gum grassy woodland on the	Revegetation is progressing towards a sustainable ecosystem and only requires maintenance that is consistent with the intended final land use. More than 56%	When monitoring indicates revegetation has established on disturbed areas and stratum has reached more than 56% established,	On track. Native vegetation was planted at the western side of Amenity Bund in 2022. Trees approximately 0.3-1m height.

Area	Objective / Performance Indicator	Preliminary Completion Criteria	Timing	Assessment
	tablelands, South Eastern Highlands Bioregion.	of established trees are healthy and growing and the rehabilitation is recognisable as PCT 1330.	healthy trees (1.5 to 2m in height) or approximately 10 years from planting.	
Habitat areas devoid of habitat features and accessible for log and rock placement.	Use cleared trees and boulders to create habitat features in accessible habitat management areas	All logs and boulders available for relocation have been placed in habitat areas that are accessible by machinery.	Monitor every 2 years with the intent to achieve completion within 10 years of clearing activities.	Not met. No evidence of habitat feature placement noted. No evidence provided. Stockpile of logs noted in HMA.
Areas where assisted natural regeneration is primary activity.	Monitoring has indicated that natural regeneration is occurring.	Signs of seeding occurring and signs of recruitment in all strata. Or evidence to demonstrate that the ecosystem will progress towards recruitment.	When monitoring indicates natural regeneration is establishing itself and weed coverage is <15% of the area to be regenerated.	Not met. Assisted natural regeneration areas found to require Sifton Bush control and tree planting.
Fencing, exclusion, and protection works	Rehabilitated areas signposted and fenced off from active quarry operations to prevent access.	All fences are in place, no barb wire exists in the internal fencing, signs are in place and gates are secured and operational. Internal fences that are no longer required are removed.	As completed and monitored annually for maintenance purposes.	Not met. No evidence of fencing of the amenity bund.

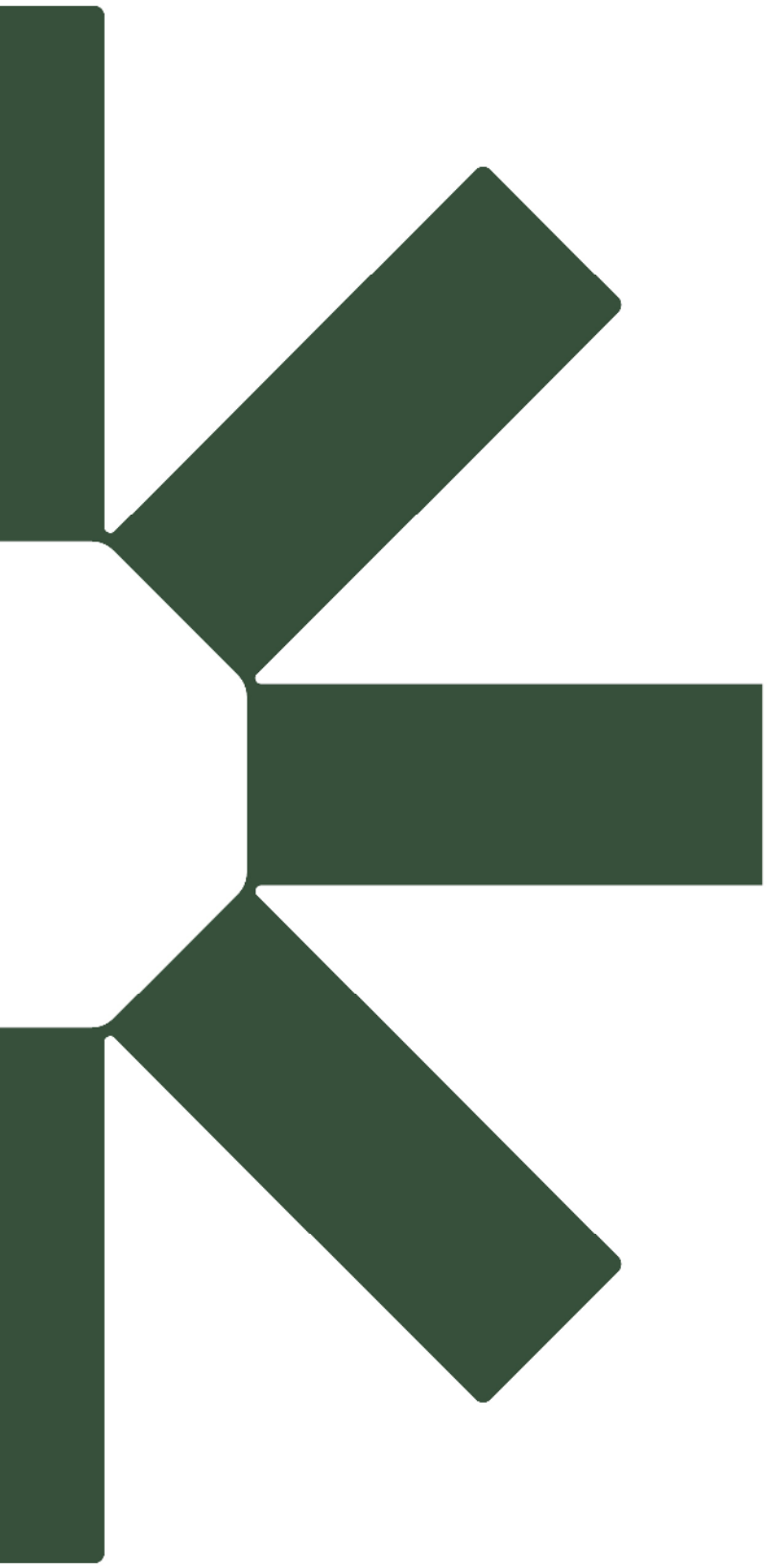
Table F-2: Assessment of Habitat Management Area Preliminary Completion Criteria (applies to the northern HMA ie RM2 and RM3)

Objective / Performance Indicator	Preliminary Completion Criteria	Timing	Assessment
The boundary of the HMA has been fenced and internal fencing has no barb wire.	HMA signposted and fenced off from active quarry operations to prevent access. Barb wire completely removed from internal fencing.	Within 5 years of implementing the Rehabilitation and Landscape Management Plan.	Not assessed. Fencing GIS data and photos required for HMA to allow comparison to management area boundaries. Evidence of fencing was noted at RM2 and RM3.
Cattle have been excluded from the area and appropriate signage erected.	Installation of fencing around the perimeter of the HMA to exclude cattle.	Within 6 months of implementing the Rehabilitation and Landscape Management Plan.	Not assessed. Fencing GIS data and photos required for HMA to allow comparison to management areas. No evidence of cattle noted in HMA during monitoring (2020-2023).
Nest boxes have been established, monitored and are being maintained.	Nest boxes are being utilised or show signs of use by native species. Each nest box installed should be in good structural condition and functioning in the landscape.	Completed within 5 years of clearing activities	On track, fourth year of nest box monitoring completed and good evidence of usage. Minor maintenance recommended.
The site is managing significant weed or feral animal infestations with a demonstrable reduction pre-construction.	Weed and pest inspections show no increase in weed population and monitoring indicates the absence of or decline in weed species.	Annual weed monitoring. When monitoring indicates weeds comprise no more than 15% monitoring can be amended to every 3 years. Every 7 years feral animal monitoring is undertaken.	On track. Weed reduction noted in 2023. Evidence of pests generally low. Pest control evidence provided.
Natural regeneration is occurring.	Signs of recruitment in all stratum or evidence to demonstrate that the ecosystem will progress towards recruitment. More than 56% of trees are healthy and growing and are recognisable as PCT 1330.	When monitoring indicates revegetation has established and no longer requires assistance.	Not met. Whilst natural regeneration was found to be occurring in all layers within parts of the HMA (eg around RM2), the lower more heavily grazed sections (eg around RM3, or the southeast end of the HMA) were found to require Sifton Bush control and planting of trees.

Table F-3: Assessment of Core Riparian Corridors Preliminary Completion Criteria (applies to the Core Riparian Corridors of Jaorimin Creek and Marulan Creek)

Objective / Performance Indicator	Preliminary Completion Criteria	Timing	Assessment
The required areas have been fenced to exclude cattle where required.	Installation of fencing around the perimeter of the corridor to exclude cattle	Within 6 months of implementing the Rehabilitation and Landscape Management Plan	Not assessed. Fencing GIS data and photos required for riparian corridor to allow comparison to management area boundaries. Evidence of fencing was noted at R2 in 2020 and CR2 in 2022.
Revegetation works have occurred along Jaorimin Creek south of the Main Southern Railway.	Signs of recruitment in all stratum or evidence to demonstrate that the ecosystem will progress towards recruitment. More than 56% of trees are healthy and growing.	When monitoring indicates revegetation has established on disturbed areas and stratum has reached more than 56% established, healthy trees (1.5m to 2m in height) or approximately 10 years from planting.	Not met. Rehabilitation monitoring commenced along Jaorimin Creek in 2022 with the establishment of CR1. No revegetation efforts were observed along the creek line.
Nest boxes along Jaorimin Creek have been established, monitored and are being maintained.	Nest boxes are being utilised or show signs of use by native species. Each nest box installed should be in good structural condition and functioning in the landscape	Completed within 5 years of clearing activities	On track, fourth year of nest box monitoring completed and good evidence of usage. Maintenance activities have been recommended.
The site is managing significant weed or feral animal infestations with a demonstrable reduction pre-construction.	Weed and pest inspections show no increase in weed population and monitoring indicates the absence of or decline in weed species	Annual weed monitoring. When monitoring indicates weeds comprise no more than 15% monitoring can be amended to every 3 years. Every 7 years feral animal monitoring is undertaken.	On track. Weed covers overall declined in 2023 (but still very high at CR1). Evidence of feral animals recorded at each site (mainly Rabbits) but no evidence of major infestations (eg networks of active burrows). Ongoing weed control and feral animal management required.
Monitoring has indicated that natural regeneration is occurring.	Signs of recruitment in all stratum or evidence to demonstrate that the ecosystem will progress towards recruitment. More than 56% of trees are healthy and growing and are recognisable as PCT 1330.	When monitoring indicates any revegetation has established and stratum has reached more than 56% establishment or approximately 10 years from any revegetation works.	Not met. Rehabilitation monitoring was established in 2022 along Jaorimin Creek (CR1) and Marulan Creek (CR2). Natural regeneration of native trees and shrubs were observed at CR2 however CR1 contained very little revegetation

Objective / Performance Indicator	Preliminary Completion Criteria	Timing	Assessment
			and will require assistance to meet criteria through revegetation works.



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