SUNNYBRIGHT ESTATE

Vegetation Management Plan

Bathurst Regional LGA, NSW

Prepared for Bathurst Regional Council

October 2017

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EXECUTIVE SUMMARY

Bathurst Regional Council (the proponent) propose to subdivide Sunnybright Estate on Lot 5 DP847225. The proposal is located within the suburb of Kelso, approximately 4km east of the Bathurst city centre, in the Bathurst Region Local Government Area (LGA), NSW. OzArk Environmental & Heritage Management Pty Ltd (OzArk) were commissioned by Bathurst Regional Council to complete a Vegetation Management Plan (VMP) to provide guidance on revegetation. The objectives of the VMP are to:

- Recreate an area of native vegetation that is representative of local plant communities and provides habitat for native fauna, including highly-mobile and threatened species such as the threatened Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*), other honeyeaters, lorikeets and arboreal marsupials.
- Ensure the native plantings and design of the open space is practical and enhances passive recreational opportunities for local residents.

The proposal will clear all vegetation and structures, except for land immediately surrounding the water reservoir and the north-eastern wind row, at Lot 5 DP847225. This will result in a loss of approximately 27ha of exotic vegetation and a mixture of trees, mainly consisting of planted Monterey Pine (*Pinus radiata*) and River Oak (*Casuarina cunninghamiana*). Around the water reservoir a proposed 1.5ha Sunnybright Estate Open Space will be established. This is where 1ha of revegetation will occur and is the focus of this VMP.

Habitat types for fauna present at Lot 5 DP847225 was limited due to existing and previous agricultural land use resulting in a highly disturbed exotic grassland. Currently, a pipeline is being constructed as part of the proposal. These disturbances have limited the potential habitat value of the study area for threatened and sensitive native species. The assessment of the study area has concluded mainly common, generalist fauna species with resilience to anthropogenic disturbances and modified landscapes will occur within the study area.

Overall the proposed Sunnybright Estate Open Space is expected to provide feeding habitat for native fauna to replace feeding habitat lost by the proposal. The revegetation effort will create a diversity of plant species, habitat types and food resources for fauna, which are currently not available at the subject site. The recommended plant list will ensure different plants are flowering across each season, to provide a year round food source to fauna. Creation of 1ha of native vegetation is expected to have a long term positive impact to native fauna than the non-native vegetation currently present at Sunnybright Estate.

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1.1 Background

Bathurst Regional Council (the proponent) propose to subdivide Sunnybright Estate on Lot 5 DP847225. The proposal is located within the suburb of Kelso, approximately 4km east of the Bathurst city centre, in the Bathurst Region Local Government Area (LGA), NSW. An open space is proposed to be established within the subdivision to enhance public amenity for future residents and replace trees and native vegetation which will be removed for the development.

OzArk Environmental & Heritage Management Pty Ltd (OzArk) was commissioned by Bathurst Regional Council to prepare a Vegetation Management Plan (VMP) for a proposed open space within the subdivision. The open space is intended to provide both habitat for birds and local wildlife as well as a passive recreational area for residents.

1.2 Terms

The following terms are used in this report to contextualise the proposal:

- *Sunnybright Estate Open Space*: and area of 1.5ha around the water reservoir where the proposed open space and habitat plantings will be established, and the focus of this VMP.
- *Subject site*: is the area directly affected by the proposal comprising approximately 27ha area of Lot 5 DP847225 which will be subdivided.
- *Study area*: includes the 'subject site' and additional areas to the east covering the entirety of Lot 5 DP847225 (referred to as Sunnybright Estate).

1.3 Site description

Boundaries of the subject site and study area are shown in **Figure 1-1**. The proposal consists of Stage 1 subdivision over the western portion of the study area into approximately 100 lots for medium density residential development across a 27ha area (**Figure 1-2**).

The proposal will clear all vegetation and structures within the subject site, except for land immediately surrounding the water reservoir and the north-eastern windrow planting along the eastern boundary of the subject site. The water reservoir itself will be retained. The eastern portion of the study area containing the dams will not be impacted by the proposal.

The proposed subdivision will require the clearing of existing vegetation within the subject site, except for that immediately surrounding the water reservoir and the north-eastern windbreak planting of predominantly Monterey Pine (*Pinus radiata*). Whilst the area is currently highly modified and does not contain intact native vegetation, the trees, grassland and dams do provide habitat for many native birds and other fauna. The area around the water reservoir which is proposed for the open space is intended to provide an opportunity to 'recreate' habitat for native fauna and to mitigate the impacts of the vegetation clearing for the subdivision.

1.4 Objective

The objectives of the vegetation management within the Sunnybright Estate Open Space are to:

- Recreate an area of native vegetation that is representative of local plant communities and provides habitat for native fauna, including highly-mobile and threatened species such as the threatened Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*), other honeyeaters, lorikeets and arboreal marsupials.
- Ensure the native plantings and design of the open space is practical and enhances passive recreational opportunities for local residents.

1.5 Approach

The VMP is required to consider both the habitat and the recreational objectives for the site. The VMP provides a recommended flora species list, planting density and arrangement, and guidance on management actions to achieve the objectives for the project.

Site features and existing environment, key reference sources and environmental datasets have been used to inform the VMP and to provide context for the plant selection and planting arrangement. The plant species are targeted to those that occur in local vegetation communities, and are also known food resources for fauna, including threatened species which are known to occur in the Bathurst region. The species also need to be practical for maintenance purposes and suitable to the local climate and soils.

1.6 Information sources

The VMP is informed by the following documents and information sources.

- *Subdivision tree survey 197 Limekilns Road Kelso* (Agile Arbor 2017), report prepared for Bathurst Regional Council, July 2017.
- *Fauna Impact Assessment: Sunnybright Estate* (OzArk, 2017), a fauna assessment for the proposal which assesses current habitat values, observed fauna species and impacts.
- *Planting to Conserve Threatened Nomadic Pollinators in NSW* (Eby, 2016), provides recommended plantings for food habitat resources for threatened native bird and bat pollinators, suited to different regional areas.
- *Planting for Wildlife: A Practical Guide to Restoring Native Woodlands*, provides information on restoring woodlands and plantings as habitat for wildlife.
- *A guide to managing Box Gum Grassy Woodlands* (Rawlings, Freudenberger, & Carr, 2010), which provides ecological information, guidelines and practical case studies on how to best manage and conserving box gum grassy woodlands.
- *Backyards for Wildlife: A Guide to Creating Habitats for Native Animals* (BRC, 2011).
- *Native Plants for Bathurst Gardens*, list prepared by Australian Plants Society Central West Group.
- NSW Bionet - Wildlife Atlas database and NSW standard Plant Community Types mapping (www.bionet.nsw.gov.au).
- Various communications and discussions with BRC project staff, August-October 2017.

Figure 1-1: Boundaries of the proposal

Figure 1-2: Proposed layout of the habitat plantings (Bathurst Regional Council, 2017)

2 Existing environment

2.1 Region and climate

The study area is located within the South Eastern Highlands bioregion which has a temperate climate characterised by warm summers and no dry season. Average climate statistics from the Bathurst Airport monitoring station show temperatures range from an average monthly maximum temperature of 28.6°C in January to an average monthly minimum temperature of 0.9°C in July. Average annual rainfall the highest in December 73.7mm and lowest in May with 33.3mm (Bureau of Meteorology, 2017). Severe winter frosts are a feature of the region and the plant selection will need to consist of species and planting stock that are resilient to these conditions.

2.2 Landscape context

The study area encompasses a hill top at the water reservoir situated at an elevation of 730m Australian Height Datum, and the surrounding slopes falling to an elevation of 700m Australian Height Datum at the southern boundary. The area addressed by the VMP is located on the hill which confers relatively harsh and exposed conditions subject to high winds and dry soils, and the need for suitable plants. The eastern portion of the study area contains farm dams, some of which are connected to tributaries of Raglan Creek, which flows into the Macquarie River. This area is outside of the proposed subdivision area for the current proposal.

2.3 Past land use

The study area has a land use history as one of many orchards located on the edge of Bathurst. The area was previously planted to fruit trees, however, currently only planted windbreaks, predominately Monterey Pine (*Pinus radiata*) and River Oak (*Casuarina cunninghamiana*) remain. Some *Eucalyptus* trees are scattered across the site. The orchard has now ceased and construction works have commenced in some areas for the subdivision (see **Plate 3-1**).

Plate 2-1: Monterey pine stands and vegetation clearing for pipeline construction, August 2017

2.4 Vegetation types

Review of aerial imagery shows there is little remnant native vegetation within the vicinity of the subject site. The site is surrounded by a mix of residential and industrial development and extensive areas of agricultural land. The riparian corridor of the Macquarie River is located approximately 2.8km to the west. This corridor contains aquatic habitat but is also mostly cleared of native woody vegetation.

The nearest areas of relatively intact woodland and forest occur on the slopes at the edge of the Bathurst valley, approximately 5km to the east, 10km to the south, 6km to the west and 8km to the north. Very small remnants exists closer to the subject site.

The following native Plant Community Types (PCTs) occur within a 10km radius of the subject site:

- PCT 351: Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion. This community is characterised by Brittle Gum (*Eucalyptus mannifera* subsp. *mannifera*) including Bundy (*Eucalyptus goniocalyx*) which currently occurs around the water reservoir.
- PCT 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, containing Yellow Box (*Eucalyptus mellidora*), Apple Box *Eucalyptus bridgesiana)*, and Blakely's Red Gum (*Eucalyptus blakelyi*).

This VMP includes a selection of species from these vegetation types, chosen to maximise habitat food resources for fauna. Species have also been selected in the context of the hilltop / upper slopes position of the planting site within the Bathurst Valley.

2.5 Habitat features

Fauna habitat features in the study area were assessed in August 2017 as part of the environmental assessment for the proposal (OzArk, 2017). The types of fauna habitat present at the site include the dams and riparian habitat, mature trees, grassland areas and man-made structures.

The existing dams on the eastern portion of the study area provide foraging flats and habitat for waterbirds, microbats and macropods, as well as habitat for aquatic species such as frogs (**Plate 3-2**). The proximity of the Macquarie River (approximately 3km to the west), is also an important habitat corridor that would attract many birds and other highly mobile fauna that may potentially also utilise habitat within the study area. The dams will be retained as part of the current subdivision proposal, and will complement the woodland habitat to be established on the hilltop.

Plate 2-2: One of the existing dams at the proposed Sunnybright Estate

Open grassland is also predominant habitat feature at the subject site generally, and large areas will be retained in eastern portion of the subject site as part of the current subdivision proposal. The grassland areas comprise mainly exotic species with some remnant native species including Climbing Saltbush (*Einadia nutans* subsp. *nutans*) and Wallaby Grass (*Rytidosperma sp.*) (OzArk, 2017). The open nature of these areas favours generalist ground-foraging fauna, including many common native birds such as Crested Pigeons (*Ocyphaps lophotes*) and White-winged Choughs (*Corcorax melanorhamphos*) (**Plate 3-3**). These and other birds (e.g. raptors and parrots) forage over the open areas and utilise nearby woodland habitat for roosting and nesting.

Plate 2-3: White-winged Choughs (*Corcorax melanorhamphos*) foraging in derived grassland

The planted windrows of large mature trees of Monterey Pine (*Pinus radiata*) (**Plate 3-4**), River Oak (*Casuarina cunninghamiana*) and scattered eucalypts will be retained along the eastern boundary of the subdivision site. The established trees around the water reservoir include Bundy (*Eucalyptus goniocalyx*) which is which is a locally-occurring woodland species, and some Yellow Gum (*Eucalyptus leucoxylon)* which is a planted non endemic species (Agile Arbor, 2017). These trees currently provide perching, foraging and refuge habitat for fauna at the site and should be retained.

The combination of farm dams, established large windrow trees, open grassland to be retained in the eastern portion of the study area and the proposed woodland plantings to be established under this VMP will provide a range of diverse habitat types in the area.

Plate 2-4: Wind rows of mature trees present at the study area

2.6 Fauna species

A fauna survey of the study area in August 2017 (OzArk, 2017) found a range of generalist fauna that are common in modified landscapes to be present.

- Australian Magpie (*Cracticus tibicen*).
- Crested Pigeon (*Ocyphaps lophotes*).
- Eastern Rosella (*Platycercus eximius*).
- Little Raven (*Corvus mellori*).
- Red Wattlebird (*Anthochaera carunculata*).
- Superb Fairy-wren (*Malurus cyaneus*).
- White-winged Chough (*Corcorax melanorhamphos*).
- Willie Wagtail (*Rhipidura leucophrys*).

The habitat that will be replanted in the Sunnybright Estate Open Space area will comprise a diversity of locally-occurring species that are not currently present at the subject site. This is expected to encourage a greater diversity of woodland birds and other species to visit the site, and ideally some of the potential threatened fauna listed in **Table 2-1** below.

Table 2-1: Threatened fauna species that may use habitat on site

Type	Common Name	Scientific Name	Status TSC Act (EPBC ACT)	Recorded within 10km
Amphibia	Yellow-spotted Tree Frog	*Litoria castanea*	Critically Endangered (Endangered)	Y
Aves	Spotted Harrier	*Circus assimilis*	Vulnerable	Y
Aves	Little Eagle	*Hieraaetus morphnoides*	Vulnerable	Y
Aves	Black Falcon	*Falco subniger*	Vulnerable	Y
Aves	Gang-gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable	Y
Aves	Barking Owl	*Ninox connivens*	Vulnerable	Y
Aves	Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered (Critically Endangered)	Y
Aves	Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Vulnerable	Y
Aves	Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Vulnerable	Y
Aves	Diamond Firetail	*Stagonopleura guttata*	Vulnerable	Y
Aves	Little Lorikeet	*Glossopsitta pusilla*	Vulnerable	N
Aves	Swift Parrot	*Lathamus discolor*	Endangered (Critically Endangered)	N
Insecta	Bathurst copper butterfly	*Paralucia spinifera*	Endangered (Vulnerable)	N
Mammalia	Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable (Vulnerable)	Y
Mammalia	Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Vulnerable	Y
Mammalia	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	N
Mammalia	Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	N

3 Vegetation management plan

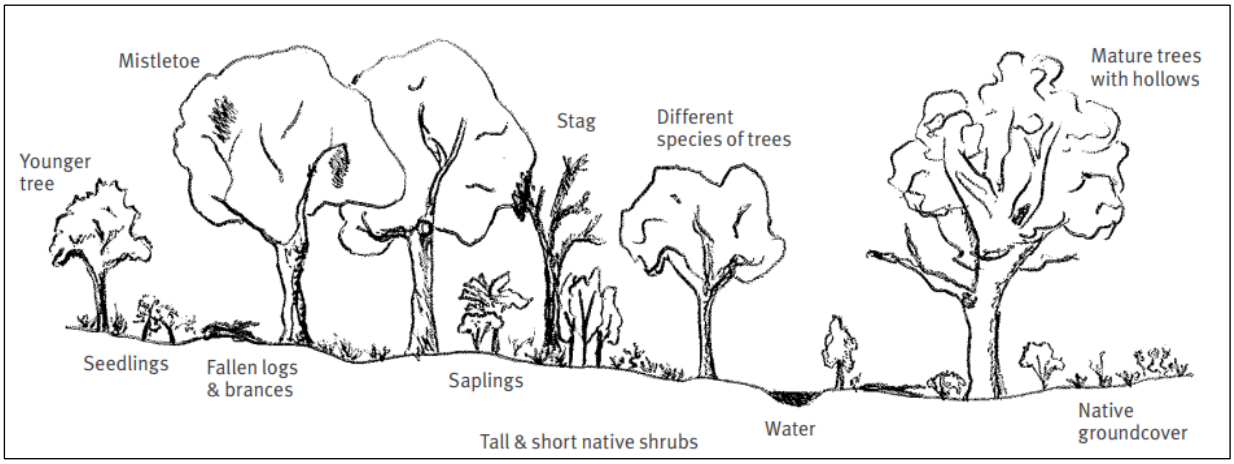
3.1 Overview

The aim of the VMP is to recreate an area of native vegetation within the proposed Sunnybright Estate to enhance local habitat for native fauna. The plantings will cover and area of 1.5ha, arranged in clumps interspersed with grassed areas to facilitate maintenance and use of the site as a public open space.

Native vegetation in a 'natural' condition typically contains a diversity of flora species, microhabitats and plant age classes such as shown in **Figure 3-1**. The plant selection for this project aims to provide similar diverse habitat, at a small-scale, with a diversity of plant growth forms and species. This diversity will enhance seasonal feeding resources for a wide range of fauna in an otherwise largely cleared part of the Bathurst valley.

Nectar-rich flowering plants will attract insects and nectivorous bats, honeyeaters, parrots and lorikeets. A diverse insect assemblage will in turn attract insectivorous woodland birds and microbats. Ideally, the habitat established on site will enhance feeding resources during seasonal bottle-necks (Eby, 2016) and encourage the threatened species listed in **Table 2-1** to use the site.

Figure 3-1: Example of diverse flora types present in a high quality vegetation community (Rawlings, Freudenberger, & Carr, 2010)



3.2 Species selection

A list of recommended species for planting is provided in **Table 3-1**. These species represent a range of abundant-flowering and nectar-producing plants occurring naturally in the native vegetation communities (see **section 2.4**) of the Bathurst region. Species have been selected to provide diverse flowering seasons, flower form, seeds and fruit type to enhance the availability of feeding resources throughout the year for a range of fauna. Plants species selection has also been guided by information contain in *Planting to Conserve Threatened Nomadic Pollinators in NSW* (Eby, 2016), the *Bathurst Regional Council Backyards for Wildlife* (BRC, 2011) and *Native Plants for Bathurst Gardens* species list prepared by Australian Plants Society Central West Group.

The recommended overstorey species for planting are outlined below, along with a general description of planting position at the site.

- Yellow box (*Eucalyptus melliodora*) can grow to a large tree up to 30m high and usually occurs on moderately fertile often sandy or alluvial soils. Over the long term this species develops hollows and can become a high value habitat tree for arboreal fauna. The species flowers prolifically in early spring and is a known feed tree for threatened honeyeaters (Eby, 2016). It is widely planted as part of habitat restoration projects across the Central Tablelands. Approximately 10 plants of this species are recommended be established as feature trees in the centre planting areas, well away (<20m) from the water reservoir to accommodate their potential large size over the long term.
- Bundy (*Eucalyptus goniocalyx*) is a tree to 15m high; bark persistent on trunk and branches, grey with whitish patches, fibrous-flaky, smooth above, grey, shedding in short ribbons. The species is widespread and abundant in open grassy or sclerophyll woodland on dry shallow soils on sloping sites. It has attractive round, grey-green juvenile leaves. This species was identified on the site near the water reservoir during the arborist's assessment (Agile Arbor, 2017). For consistency of appearance in the overstorey planting, additional plantings of this species are recommended to complement the Yellow Box trees. These can be planted upslope of the Yellow Box and closer to the water reservoir, as they are expected to grow into medium sized trees only.
- Brittle gum (*Eucalyptus mannifera*) could be also planted to provide summer flowering. This species is an attractive smooth-barked tree, with white trunk and grey or red patches shedding in short ribbons or plates, growing to 20m high. The tree has a relatively low fire-risk (being a smooth bark species) would provide an interesting visual contrast to the box trees.
- Drooping Sheoak (*Allocasuarina verticillata*) is recommended for the screening planting adjacent to the water reservoir. This species is widespread across south eastern Australia including the central tablelands and is a useful windbreak. It is a medium-sized tree up to 10m tall with pendulous foliage, small red flowers and cones with numerous seeds that provide food for many birds. The species is highly drought and frost tolerant, which is suited to the current site, and is preferred over River oak (*Casuarina cunninghamiana*) as it will not grow as large. Due to its shallow spreading roots and tendency to dominate other species, it is recommended to be planted in a narrow buffer around the water reservoir where it will provide effective screening.

Additional overstorey tree species that would be suitable include:

- Apple box (*Eucalyptus bridgesiana*) is a tree to 20m high; with persistent fibrous-flaky bark on trunk and larger branches, and smooth grey above, shedding in short ribbons. This species is widespread and frequent in the Bathurst region occurring in grassy woodland on drier sites, often on shallower soils on slopes. It is extremely cold tolerant.
- Red box (*Eucalyptus polyanthemos*) is a widespread and abundant canopy species, in grassy or sclerophyll woodland on light shallow soils of the tablelands south from Gulgong. This species grows to 20m and has variable smooth or persistent fibrous-flaky ('box') bark on lower trunk and larger branches, grey in colour with whitish patches.

Shrubs and ground stratum plants have been selected to provide year-round flowering, as best as possible, from species known to occur in local plant communities. Note that this VMP recommends planting of a limited number of *Lomandra longifolia* plants, and planting of this

species in distinct clumps only (not covering large areas). This is to ensure that this species does not overcrowd and dominate other shrub and groundcover species. A mix of dense ground cover areas, alternating with sparse and open groundcover areas (heavily mulched and with retained litter) is the preferred arrangement to maximise habitat diversity and forage opportunities for fauna.

Table 3-1 provides a list of plant options which could be used to revegetate the Sunnybright Estate Open Space, to provide flexibility on what can be sourced locally. Not all species have to be used, however, a greater diversity of species will provide a greater benefit to fauna. Additional species of shrubs and groundcover plants can be included if found in the local vegetation communities and available as provenance seedstock for this project.

Table 3-1: Recommended species list for Sunnybright Estate Open Space

Flowering Season	Upper Stratum	Mid stratum	Ground stratum
Spring	• Yellow Box (*Eucalyptus melliodora*) • Red Box (*Eucalyptus polyanthemos*)	• Silver Wattle (*Acacia dealbata*) • Egg and Bacon Pea (*Dillwynia sericea*) • Daphne Heath (*Brachyloma daphnoides*) • Heathy Bush Pea (*Pultenaea procumbens*) • Spider flower (*Grevillea arenaria*) • Austral indigo (*Indigofera autralis*) • Common Fringe Myrtle (*Calytrix tetragona)*	• Spiny-headed mat-rush (*Lomandra longifolia*) • Many flowered mat-rush (*Lomandra multiflora*) • Flax lily (Di*anella revoluta*) • Trigger plant (*Stylidium graminifolium*)
Summer	• Inland Scribbly Gum (*Eucalyptus rossii*) • Apple Box (*Eucalyptus bridgesiana*) • Brittle gum (*Eucalyptus mannifera*)	• Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • Hairy Geebung (*Persoonia rigida*) • Myrtle Teatree (*Leptospermum myrtifolium*)	• Forest Goodenia (*Goodenia hederacea*) • Blue Flax Lily (*Dianella revoluta*) • Kangaroo Grass (*Themeda triandra*) • Native Violet (*Viola betonicifolia*)
Autumn	• Bundy (*Eucalyptus goniocalyx*)	• Urn-heath (*Melichrus urceolatus*) • Native Fuchsia (*Correa reflexa*)	• Purple Wiregrass (*Aristia ramosa*)
Winter	• Mugga Ironbark (*Eucalyptus sideroxylon*) • *Drooping sheoak (Allocasuarina verticillata)*	• Ploughshare Wattle (*Acacia gunnii*) • Early Wattle (*Acacia genistifolia*) • Silver banksia (*Banksia marginata)*	• False Sarsaparilla (*Hardenbergia violacea*)

3.3 Plant Supply

Use of provenance seed stock for propagation of seedlings is required. Provenance seed by definition is sourced from local native vegetation and will ensure the plantings will retain any unique characteristics of local genetic populations, which may be important for their long-term survival. It is recommended for provenance stock to be from the Bathurst region in the first instance. If this is not practicable, then from the greater Central Tablelands region.

The FloraBank website provides useful resources and information on sourcing and collecting seed, propagating, and growing native species for revegetation projects (http://www.florabank.org.au/).

All plants supplied are to be in a healthy, disease free condition at the time of planting, free from root binding, j-rooting, root circling or other defects caused by poor nursery practices.

3.4 Planting arrangement

The planting design is segregated into discrete planting zones so that native species can be retained at a relatively high density between areas of maintained grass. This planting arrangement in clumps will facilitate maintenance and use of the site as a public open space. A mixture of plant species is recommended to be established in each of the planting zones. This will provide a diversity of habitat and lead to the development of a relatively natural appearance in the vegetation.

The planting is recommended to occur using predominantly tubestock seedlings. Tubestock seedlings should be planted in clusters of the same species; with a mixture of different upper, mid and ground stratum species in each garden bed. Trees are recommended to be planted towards the centre of each of the planting zones so that litter gradually accumulates within the planting zones and enhances the habitat values.

Table 3-2 shows specific plants to be planted at each of the seven garden bed shown in **Figure 1-2**. If one of these species cannot be obtained by the contractor, then an equivalent flowering season and stratum species listed in **Table 3-1** can be used instead. Overall the 0.18ha replanting area will contain the following number of tube-stock plants:

- At least 14 upper-stratum plants.
- An additional three Yellow Box (*Eucalyptus melliodora*) to be planted outside of the seven garden beds to provide connectivity between garden beds.
- At least 500 mid-stratum plants.
- At least 600 ground stratum plants.

In addition to this, at least 40 Drooping Sheoak (*Allocasuarina verticillata*) will be planted around the water reservoir with a narrow mulched garden bed. Within the mulched area the following ground stratum species will be planted around the Drooping Sheoak (*Allocasuarina verticillata*):

- 75- Many flowered mat-rush (*Lomandra multiflora*).
- 75 - Blue Flax Lily (*Dianella revoluta*).

Table 3-2: Number of tube-stock plants required per species for each garden bed

Garden Bed	Upper Stratum	Mid stratum	Ground stratum
Garden Bed 1	• 2 -Yellow Box (*Eucalyptus melliodora*) • 2 - Brittle gum (*Eucalyptus mannifera*)	• 15 - Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 20 - Spider flower (*Grevillea arenaria*) • 20 - Silver banksia (*Banksia marginata*) • 5 - Silver Wattle (*Acacia dealbata*) • 20- Egg and Bacon Pea (*Dillwynia sericea*)	• 33 - Spiny-headed mat-rush (*Lomandra longifolia*) • 33 - Flax lily (Di*anella revoluta*) • 30 - False Sarsaparilla (*Hardenbergia violacea*)
Garden Bed 2	• 2 – Brittle gum (*Eucalyptus mannifera*) • 2- Yellow Box (*Eucalyptus melliodora*)	• 15- Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 15- Spider flower (*Grevillea arenaria*) • 15 - Silver banksia (*Banksia marginata*) • 5 - Silver Wattle (*Acacia dealbata*) • 15 - Daphne Heath (*Brachyloma daphnoides*)	• 29 - Many flowered mat-rush (*Lomandra multiflora*) • 29 - Blue Flax Lily (*Dianella revoluta*) • 20 - Kangaroo Grass (*Themeda triandra*)
Garden Bed 3	• 2 - Apple Box (*Eucalyptus bridgesiana*) • 1 - Yellow Box (*Eucalyptus melliodora*)	• 10 - Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 15 - Spider flower (*Grevillea arenaria*) • 15 - Silver banksia (*Banksia marginata*) • 3 - Silver Wattle (*Acacia dealbata*) • 12 - Heathy Bush Pea (*Pultenaea procumbens*)	• 24 - Spiny-headed mat-rush (*Lomandra longifolia*) • 24 - Flax lily (Di*anella revoluta*) • 20 - False Sarsaparilla (*Hardenbergia violacea*)
Garden Bed 4	• 1 - Apple Box (*Eucalyptus bridgesiana*) • 1 - Yellow Box (*Eucalyptus melliodora*)	• 10 - Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 10 - Spider flower (*Grevillea arenaria*) • 10 - Silver banksia (*Banksia marginata*) • 5 - Native Fuchsia (*Correa reflexa*)	• 16 - Many flowered mat-rush (*Lomandra multiflora*) • 16 - Blue Flax Lily (*Dianella revoluta*) • 10 - Kangaroo Grass (*Themeda triandra*)
Garden Bed 5	• None	• 15- Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 20 - Spider flower (*Grevillea arenaria*) • 20 - Silver banksia (*Banksia marginata*) • 10 - Austral indigo (*Indigofera autralis*) • 15 - Native Fuchsia (*Correa reflexa*)	• 33 - Spiny-headed mat-rush (*Lomandra longifolia*) • 33 - Flax lily (Di*anella revoluta*) • 30 - False Sarsaparilla (*Hardenbergia violacea*)
Garden Bed 6	• None	• 15 - Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 20 - Spider flower (*Grevillea arenaria*) • 20 - Silver banksia (*Banksia marginata*) • 10 - Austral indigo (*Indigofera autralis*) • 10 - Native Fuchsia (*Correa reflexa*)	• 35 - Many flowered mat-rush (*Lomandra multiflora*) • 35 - Blue Flax Lily (*Dianella revoluta*) • 20 - Kangaroo Grass (*Themeda triandra*)
Garden Bed 7	• None	• 20 - Native blackthorn (*Bursaria spinosa subsp. lasiophylla*) • 25 - Spider flower (*Grevillea arenaria*) • 25 - Silver banksia (*Banksia marginata*) • 20 - Austral indigo (*Indigofera autralis*) • 20 - Heathy Bush Pea (*Pultenaea procumbens*)	• 46 -Spiny-headed mat-rush (*Lomandra longifolia*) • 46 -Flax lily (Di*anella revoluta*) • 40 - False Sarsaparilla (*Hardenbergia violacea*)

3.5 Planting methodology

The site preparation and planting methodology is informed by the publication, *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings, Freudenberger, & Carr, 2010).

Site Preparation

- Delineate area intended for native vegetation planting and areas for maintained grassland. The area dedicated to native vegetation is recommended to be largest area feasible on the site. This will be 0.18ha of the 1.5ha site (see **Figure 1-2**) to be dedicated to native plantings, to assist in increasing the viability for fauna use.
- Remove the Monterey Pine (*Pinus radiata*) from the immediate 1.5ha planting site and grind stumps. Native plantings are recommended to occur away from the area where the pines are removed, which can instead be used for the grassed areas.
- Spray the planting locations to kill all grasses and germinating seeds. Herbicide application is to be completed for a total of two (2) separate treatments with a minimum two (2) week period between treatments to combat existing weeds as well as to reduce the effective seed bank that may be present. Exercise caution of native species.

The use of chemicals is to meet the following requirements:

- Community notification of the spraying is to be undertaken on all Council owned or controlled land, in line with Council's Pesticide Use Notification Plan. As part of spraying works, Contractors will be required to submit a pesticide notification of spraying operations on Council's prescribed Pesticide Notification Form prior to the commencement of works. In addition, signs are to be erected near the application area immediately prior to spraying works and be removed immediately after application. The Pesticide Use Notification Plan is available on Council's website or can be provided upon request.
- The Contractor is to apply pesticides that are approved and registered by the Australian Pesticides & Veterinary Medicines Authority and in compliance with current Workplace Health and Safety Legislation requirements. In addition, any pesticides applied within or immediately adjacent to riparian zones must be registered for use in aquatic environments.
- The Contractor will be required to keep appropriate records of all pesticide applications in accordance with the requirements pertained within the *NSW Pesticides Regulation 2009*.
- Please note that contractors engaged to apply pesticide and herbicides are required to hold relevant qualifications for the use of chemicals as prescribed by the *Pesticides Act 1999* and only apply pesticides in accordance with the chemical manufacturer's directions.
- Establish planting holes using minimal impact approaches as far as practical, with hand-held equipment (which can be mechanised tools or diggers). Use of heavy machinery is to be avoided as far as practical to minimise damage to the soil profile and avoid soil compaction.
- Holes are to be dug across the proposed planting areas to a depth of 40-60cm, taking care to minimise damage to the roots of the established eucalyptus trees to be retained.

Planting the trees

- Planting is recommended to occur in autumn, after the heat of summer has past and prior to the onset of winter and damaging frosts. Do not plant in unsuitable weather conditions such as extreme heat, cold or wind.
- Seedlings are to be well-hardened off before plant for no less than 2 months to maximise chances of survival, after planting out.
- Before planting, soak the seedlings the day before planting.
- Ensure there are no weeds within one meter surround the planting location.
- Fill the hole with water (before the plant goes in) and allow to drain.
- Place water crystals and native fertiliser in the hole.
- Place the plant in the hole and backfill carefully. Create a dish shaped depression around the stem on the plant to assist with catching any rain.
- Install a weed mat, and corflute tree guard (minimum 450mm high with 200mm sides) with hardwood stake on each plant.
- Slowly water the newly planted plant, ensuring water is applied upslope from the plant, not directly onto the root area.
- Check that roots are not exposed following watering. Add more topsoil if necessary.
- Hardwood weed-free mulch is to be applied at a thickness of 100mm across the entire garden beds and in a 2m diameter around trees not located within a garden bed. Avoid heaping mulch against the plant as this can bring on stem rot and insect attack.

3.6 Contractor maintenance

The Contractor shall provide a 12 month maintenance and establishment period of the competed planting and landscaping works of the proposed Sunnybright Estate Open Space.

3.6.1 Native vegetation areas

During the establishment phase, maintenance will consist of regular watering of seedlings (as set out above), spot weed control and replacement of failed seedlings.

Watering and establishment

- Each plant is to be watered by irrigation drippers, once a week with 10L of water per plant. If the post-planting weather is unseasonably hot and dry, increase the watering rate in the first month to twice per week.
- If possible, water early in the morning or late in the evening to reduce evaporation.
- Less frequent deep soaking is better than more frequent light watering. A good soak encourages plants to develop strong, deep roots, which eventually reach the watertable. Shallow, light watering encourages roots to grow towards the surface, leaving them vulnerable to wind and dry periods.

Plant Replacement

- A success rate of 80% is expected for the planting program.
- Where the survival rate is below 80% at any site maintenance visit, it is the responsibility of the contractor to replace dead plants prior to the next monthly maintenance period or as per arrangements with Council.

3.6.2 Weed control

Weed control is to be undertaken by the contractor monthly. Use manual or chemical control to eliminate weeds from the entire planted beds and hand weed within tree guards.

Weed treatment is to be implemented only by personnel familiar with native species versus weeds. Impacts of weed treatment (such as herbicide spray drift or accidental treatment of native species that appear similar to weeds) will significantly reduce the effectiveness of revegetation and must be avoided. Use of qualified and appropriately experienced personnel is essential for this task.

During the weed monitoring, the contractor is also responsible for monitoring the success of any plantings. If individual plants are found to have failed, they are to be replanted during the appropriate planting season.

3.6.3 Weed mitigation

The site is located on land previously used as an orchard and the weed burden is high. An intensive weed control program will be required to enable planted native flora species to survive in competition with the already established weeds. The following actions are recommended to control weeds at the proposed Sunnybright Estate Open Space:

- All machinery associated with the proposal is not to travel over or be stored within the proposed Sunnybright Estate Open Space, unless it has been thoroughly cleaned and clear of all soil and plant material prior to entry.
- Implement regular weed control measures six months before planting and also following rain events. Ongoing monitoring of weeds should include removal of weeds before they set seed to prevent future weed outbreaks.
- If weeds are physically removed, mulch or plant a native in its place. Any unused areas can easily be colonised by more weeds if preventative measures are not taken.
- Weed control should follow recommended approaches for weed control in natural areas. Contractors or personnel involved in weed control programs should be trained or knowledgeable in natural vegetation management and minimal impact herbicide.

3.6.4 Maintained grass areas

Contractors are required to regularly mow the grassed areas.

3.6.5 Reporting & Monitoring

The initial monitoring and reporting requirements will be the responsibility of the contractor awarded the Sunnybright Estate subdivision. The contractor will cover the first 12 months of monitoring after completing revegetation of the proposed Sunnybright Estate Open Space. The contractor will report to Bathurst Regional Council the results from any monitoring.

3.7 Council maintenance

After the 12 month period, Bathurst Regional Council will take over management of the proposed Sunnybright Estate Open Space.

Bathurst Regional Council will have the same maintenance requirements as the contractor, however, at reduced frequencies. Weed and planting viability monitoring is only required every six months and also after rain events.

3.7.1 Native vegetation areas

Once established the native plantings will require minimal maintenance. This will include the following:

- Retention of dead plant material, sticks, litter and logs in the planting zones which will enhance the habitat values.
- Pruning of native shrubs is optional and can be beneficial, after flowering, if required for amenity or other purposes and can be effective for increasing the following season's flowering.
- Spot weed control in the planting areas to ensure native species dominate and outcompete weeds.
- Trim edges of grass areas and ensure exotic species do not encroach on the native plantings.
- Conduct annual check for pest animal species, including rabbits and foxes, which could shelter in dense vegetation or establish burrows or dens under logs. Control as required by qualified personnel.

4 Recommendations

4.1 Contactor qualifications

Contractors engaged to implement the VMP should have appropriate qualifications and experience in vegetation management, native vegetation restoration, herbicide use and weed control. Personnel or a supervisor with qualifications or experience in bush regeneration would be appropriate and desirable for the successful implementation of this VMP.

4.2 Opportunities to increase fauna habitat

Fauna habitat types can be increased at the proposed Sunnybright Estate Open Space by:

- **Installing nest boxes:** This will provide artificial hollows for roosting which is not currently present at the proposed Sunnybright Estate Open Space. Both bird and microbat nest boxes are recommended to be installed on mature trees. If nest boxes are installed, ensure the entrance contains a short spout of a hollowed tree to provide a natural looking entrance to the nest box. This design may encourage native fauna to inhabit the nest box over exotic species.
- **Staging planting of trees:** If possible, a range of different ages of tree tubestock could be planted. This would provide a diversity of age groups of trees, which is required for some fauna to inhabit an area.
- **Increase available habitat:** Additional Open Space areas will be established in Stage 2 of the Sunnybright Estate development. An opportunity for habitat connectivity may be possible along the established windrow planting to be retained along the eastern boundary of the subdivision site. This would value-add to the current proposal and provide additional habitat benefits by providing a safe path for the movement of fauna. These corridors are recommended to be set aside for the long-term and could be enhanced with further native species plantings in the future.

4.3 Monitoring and reporting

A monitoring protocol will need to be developed to record the success and activities for the project and to support BRC's operational and reporting requirements. A reporting template can be developed by the Contractor in conjunction with BRC.

The contractor will need to provide a brief report on the establishment works at each phase of implementation, and subsequently after each visit to the site for maintenance. This will include observations made, actions taken (e.g. weed control, replacement planting etc.) and outcomes, among other requirements. The use of a site map will facilitate accurate collection of information and report at this small site. GPS enabled device may also be useful but should not be necessary unless deemed more efficient for monitoring and reporting purposes.

5 Conclusion

OzArk was commissioned by Bathurst Regional Council to complete a Vegetation Management Plan (VMP) to provide guidance on revegetation of the 1.5ha proposed Sunnybright Estate Open Space. The proposed Sunnybright Estate Open Space will be revegetated to with a diversity of flowering plants from the Bathurst area to provide year round feeding habitat. It is expected that creation of even a small patch of native bushland will provide important feeding habitat for those fauna species currently residing on Lot 5 DP847225.

5.1 Limitations

The proposed Sunnybright Estate Open Space revegetation plan will not replace the same number of River Oaks (*Casuarina cunninghamiana*) impacted by the proposal. *Casuarinas* are a main food source to certain species of Cockatoo, however, there was no evidence of Cockatoos feeding on the River Oaks present at Sunnybright Estate (OzArk, 2017). Currently River Oaks are densely planted in three rows to act as a windbreak and does not emulate a native vegetation community. The close proximity to residential areas and lack of other habitat requirements including roosting and refuge habitat is contributing to these feed trees not being utilised. It is anticipated providing a lower number of feed trees amongst a diversity of different plants which provide other habitat requirements, including refuge habitat, will encourage Cockatoos to utilise proposed Sunnybright Estate Open Space.

The area available for revegetation is 1ha in a U-shape around the water reservoir, which will be subjected to edge effects. One common edge effect this revegetation effort is susceptible to is invasion by Noisy Miners (*Manorina melanocephala*). Noisy Miners are a type of native honeyeater which are considered a pest. They occupy edges of vegetation and their aggressive behaviour excludes other native birds of a similar size including the threatened Varied Sittella (*Daphoenositta chrysoptera*) and Black-chinned Honeyeater (*Melithreptus gularis gularis*) which are known to occur in the Bathurst LGA. To reduce the likelihood/abundance of Noisy Miners occupying the proposed Sunnybright Estate Open Space, the density of native shrubs to be planted has been increased from the recommended level. Shrubs are more suitable habitat for small birds such as Finches and Wrens and are not utilised by Noisy Miners.

While the amount of forgeable land will be reduced, the quality of forgeable land provided by the proposed Sunnybright Estate Open Space will be greatly increased. While the number of fauna which can be supported by the proposed Sunnybright Estate Open Space may not be the same as what can be supported by 27ha. The fauna which were recorded at Sunnybright Estate were all highly mobile birds which can easily relocate to adjacent agricultural land (OzArk, 2017).

5.2 Expected benefits

The proposed Sunnybright Estate Open Space will create woodland habitats with a native grass and shrub layer, which does not currently exist at Lot 5 DP847225. Creation of these two habitat functions, albeit in small quantities, will provide foraging and refuge habitat for local native birds such as the Red-browed Finch (*Neochmia temporalis*) and Red-rumped Parrot (*Psephotus haematonotus*).

The proposed Sunnybright Estate Open Space will have a diversity of native plant species and types, which will enable a diversity of different invertebrates to colonise the area. A diversity of

invertebrates is important for attracting a diversity of microbats and insectivorous birds such as the Black-faced Cuckoo-shrike (*Coracina novaehollandiae*), Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and Superb Fairy-wren (*Malurus cyaneus*).

Overall the amount of land available for fauna to feed will be reduced by the proposal. However, the diversity and quality of feeding habitat will improve. The proposed Sunnybright Estate Open Space will create new habitat niches for different species of native fauna to occupy and replace some of the feeding habitat used by existing fauna. Loss of 27ha of agricultural land for creation of 1ha of native vegetation is expected to have a long term positive impact to native fauna. Review of aerial imagery alone shows disturbed agricultural landscapes are a common landscape feature across the Bathurst region. Native vegetation is typically cleared to make room for additional agricultural land, creating a scarcity of native vegetation. Therefore increasing the importance of remaining native vegetation to provide habitat suitable for native fauna which do not thrive in agricultural landscapes. While 1ha of native vegetation is considered a small patch, it is still important habitat for fauna in an increasingly urbanised and ruralised landscape.

6 References

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Munro, N., & Lindenmayer, D. (2011). *A Practical Guide to Restoring Native Woodlands.* CSIRO Publishing.

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7 Useful links

AABR (Australian association of bush regenerators) http://www.aabr.org.au/index.php

Noxious weeds information kit http://www.bmcc.nsw.gov.au/councilservices/noxiousweeds

Australian Network for plant conservation http://www.anbg.gov.au/anpc/web.html

Australian Pesticides and Veterinary Medicine Authority (APVMA) Registered Products

Greening Australia Resources http://www.greeningaustralia.org.au/resources/resources

Office of Environment and Heritage Seed Collecting Conservation Management Notes
http://www.environment.nsw.gov.au/resources/cpp/SeedCollecting.pdf