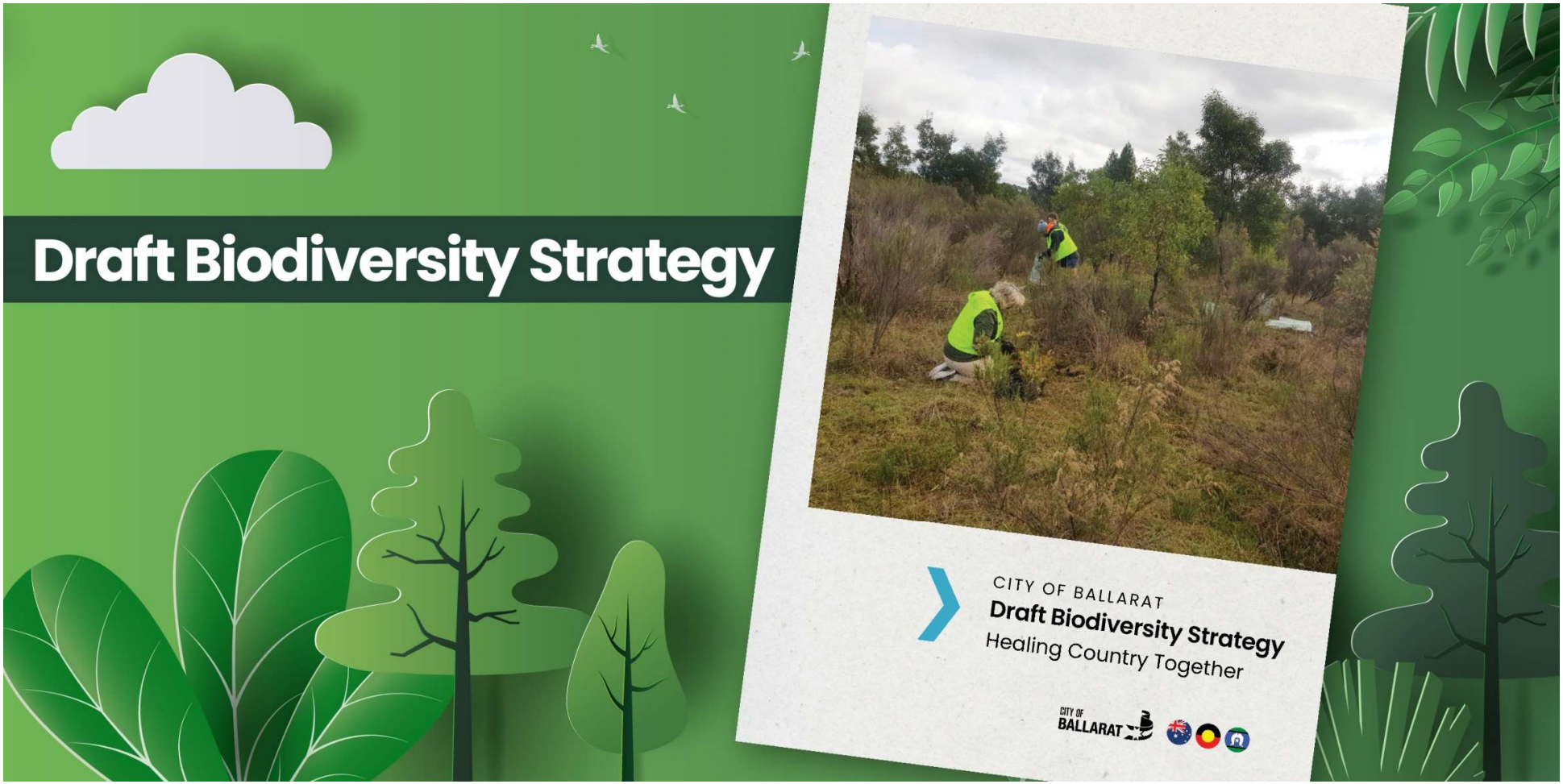

- **Background Science**

—

The City of Ballarat acknowledges the Traditional Custodians of the land we live and work on, the Wadawurrung and Dja Dja Wurrung People, and recognises their continuing connection to the land and waterways.

We pay our respects to their Elders past, present and emerging and extend this to all Aboriginal and Torres Strait Islander People.

—

1 Contents

Content prepared by:
Biosis 2023. Background information: City of Ballarat's Biodiversity Strategy. Report for Client City of Ballarat. Authors: H Sime & W Russell, Biosis Pty Ltd, Melbourne. Project no 38354

Understanding the science and history behind Ballarat's environment helps us understand how to prioritise, manage and act effectively for biodiversity. The following is a high-level summary of some key elements that influence biodiversity in Ballarat and region, however many more could be included.

2 Geology and Soil

Land to the west of the Ballarat region has an underlying geology of newer volcanics, a large proportion of which are basalt. Soils derived from volcanic underlying geologies (in this case, chromosol soils) are high value agricultural soils. As a result, these geologies correlate strongly with cleared vegetation and disturbed landscapes.

Land to the east of Ballarat has an underlying geology of comprising shale, sandstone and mudstone and is part of the Castlemaine Group – Lancefieldian. The soils derived from these underlying geologies are low nutrient and of little use for agriculture. As a result, the east of Ballarat supports a much higher proportion of native vegetation cover than the west.

The split between geologies to the east and west of Ballarat occurs at the Yarrowee River and correlates with borders between Bioregions and EVCs. Underlying geologies such as Ercildoun Granite and Granite-derived Colluvium occur sporadically throughout the newer volcanics dominated western Ballarat region. The outcrops are sparse and correlate with large patches of uncleared native vegetation, such as Mount Bolton.

As illustrated in Images 1 and 2 below:

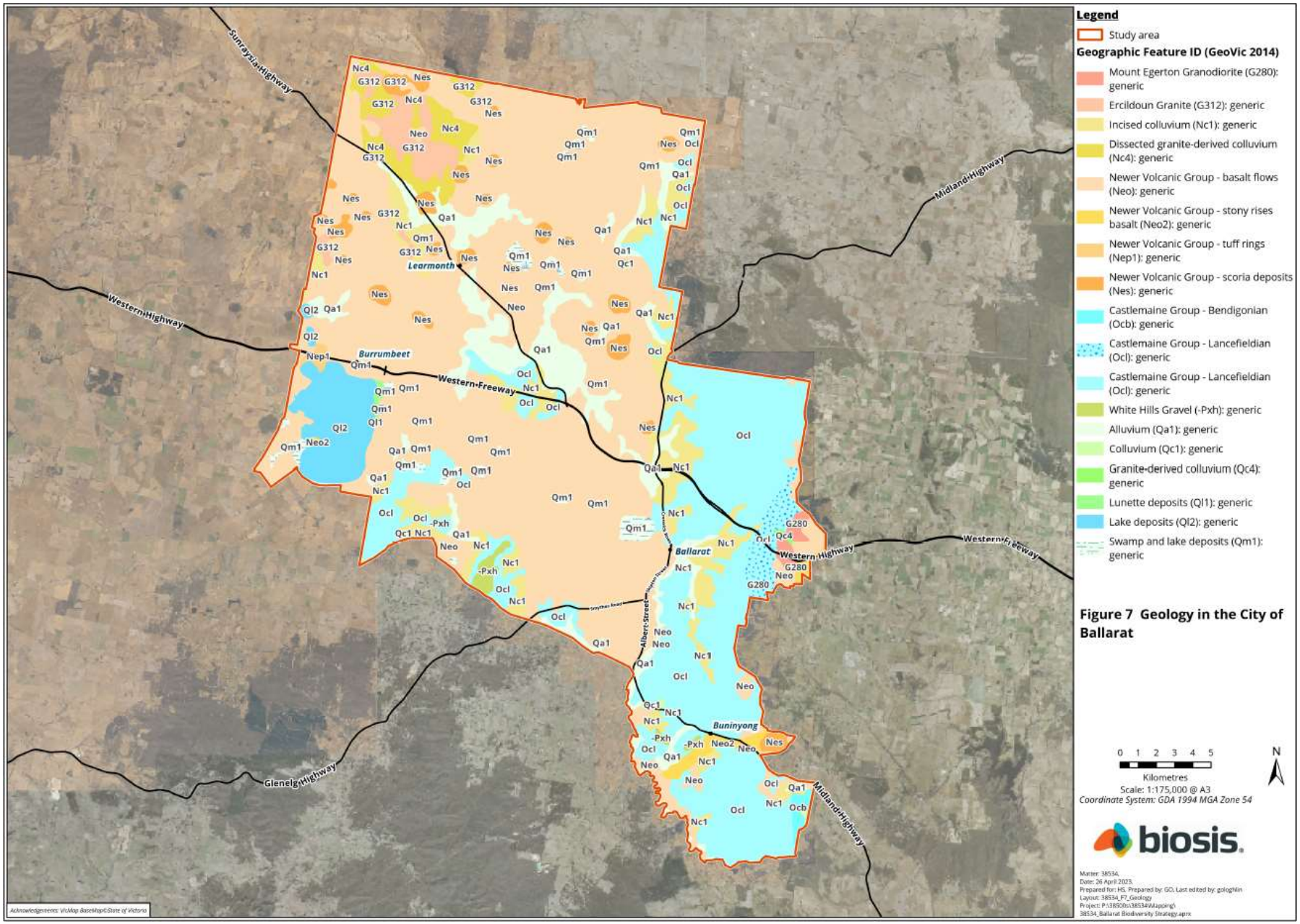

Image 1: Geology of Ballarat

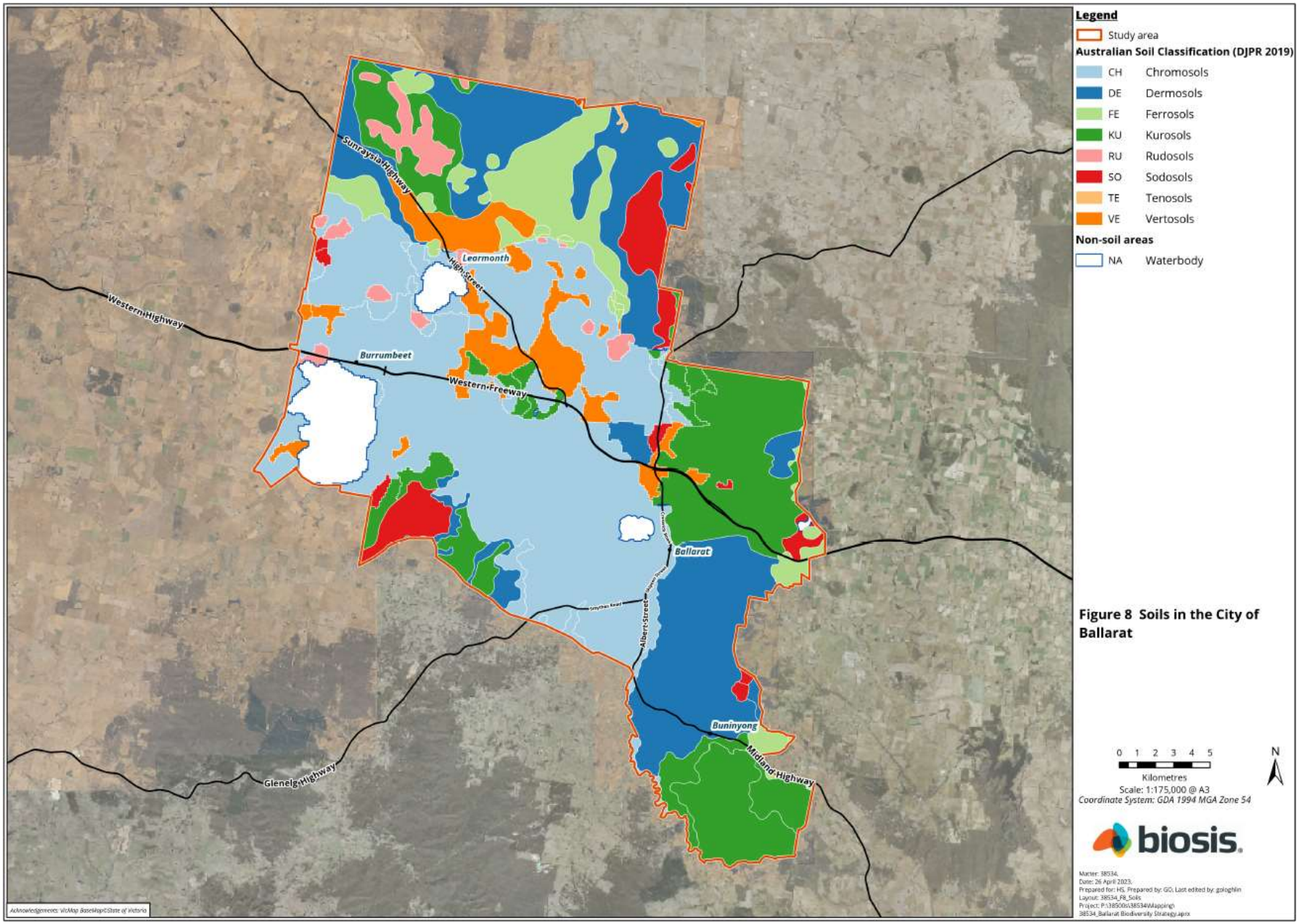

Image 2: Soils of Ballarat

3 Pre 1750s and 2005 Ecological Vegetation Classes

The City of Ballarat Local Government Area (LGA) occupies two Bioregions: The Central Victorian Uplands (CVU) and the Victorian Volcanic Plains (VVP). The location of each bioregion is driven by soils and underlying geology. The CVU bioregion occurs to the east of the Yarrowee River (with a few outcrops to the west) where underlying geologies are part of the Castlemaine Lancefieldian Group. Similarly, the Victorian Volcanic Plains bioregion is mapped to occur in line with Newer Volcanics geologies.

Vegetation within Bioregions is grouped into Ecological Vegetation Classes (EVCs) based on a combination of character species, lifeforms, and physical site characteristics. Pre-1750 EVCs have been modelled and mapped across the state of Victoria. These maps and models suggest that Plains Grassy Woodland EVC 55 was the dominant EVC west of the Yarrowee River prior to European colonisation in 1750. Heathy Dry Forest EVC 20 and Grassy Dry Forest EVC 22 are mapped as the most common pre 1750 EVCs east of the Yarrowee River.

The extent of EVCs across Victoria as of 2005 has also been mapped and modelled. This mapping suggests significant declines in the cover of all EVCs across the Ballarat region. Mapped EVCs within the CVU bioregion have reduced by 52% of the pre-1750 extent and by 91% in the VVP bioregion. Plains Grassy Woodlands in the VVP have been cleared more (in hectares) than any other EVC. However, the mapping suggests that several other EVCs in the VVP bioregion have shown a much greater reduction as a percentage of their pre-1750 extent.

As illustrated in Images 3 and 4 and Table 1 below:

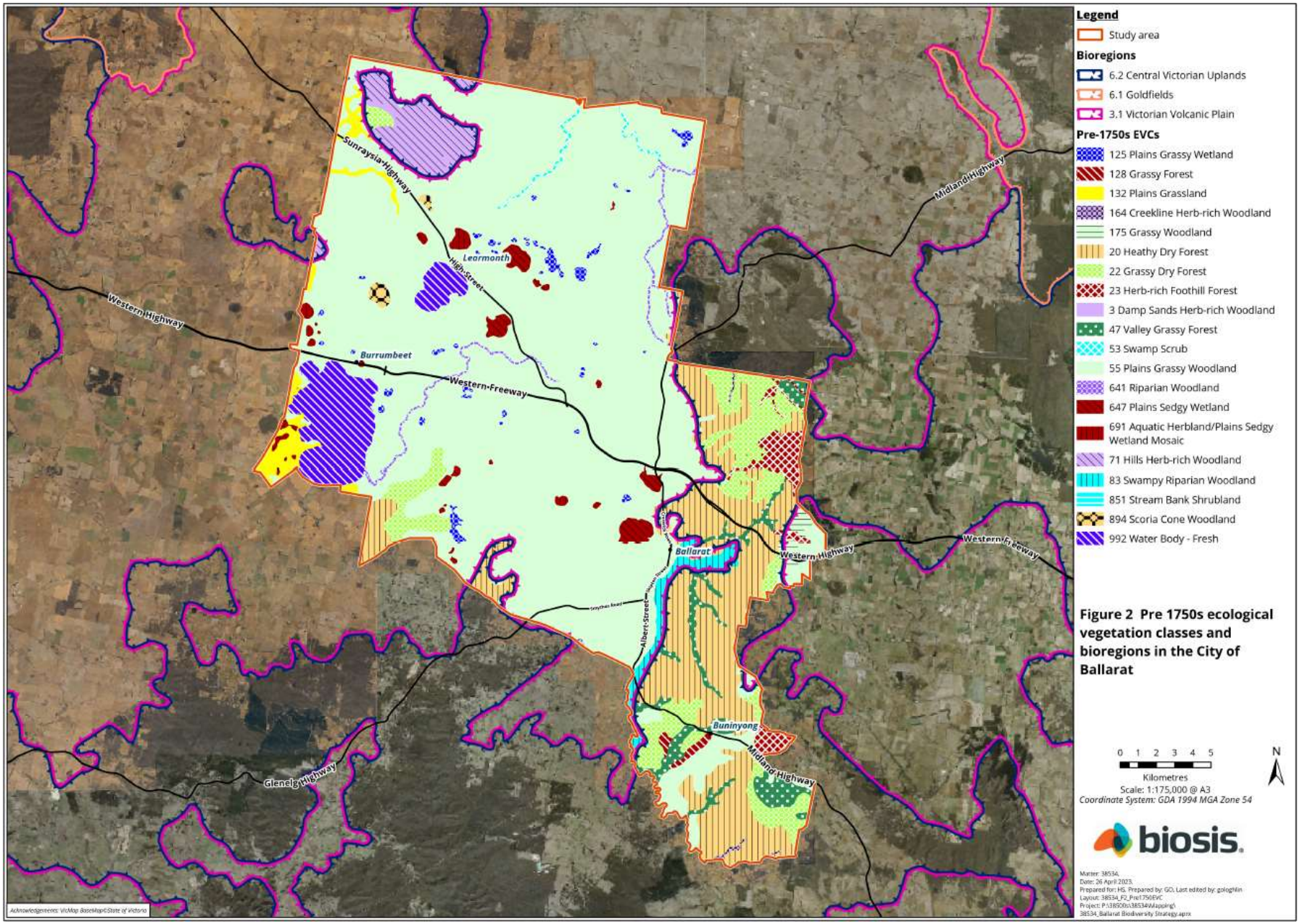

Figure 2 Pre 1750s ecological vegetation classes and bioregions in the City of Ballarat

Image 3: Pre-1750's EVC's and Bioregions of Ballarat

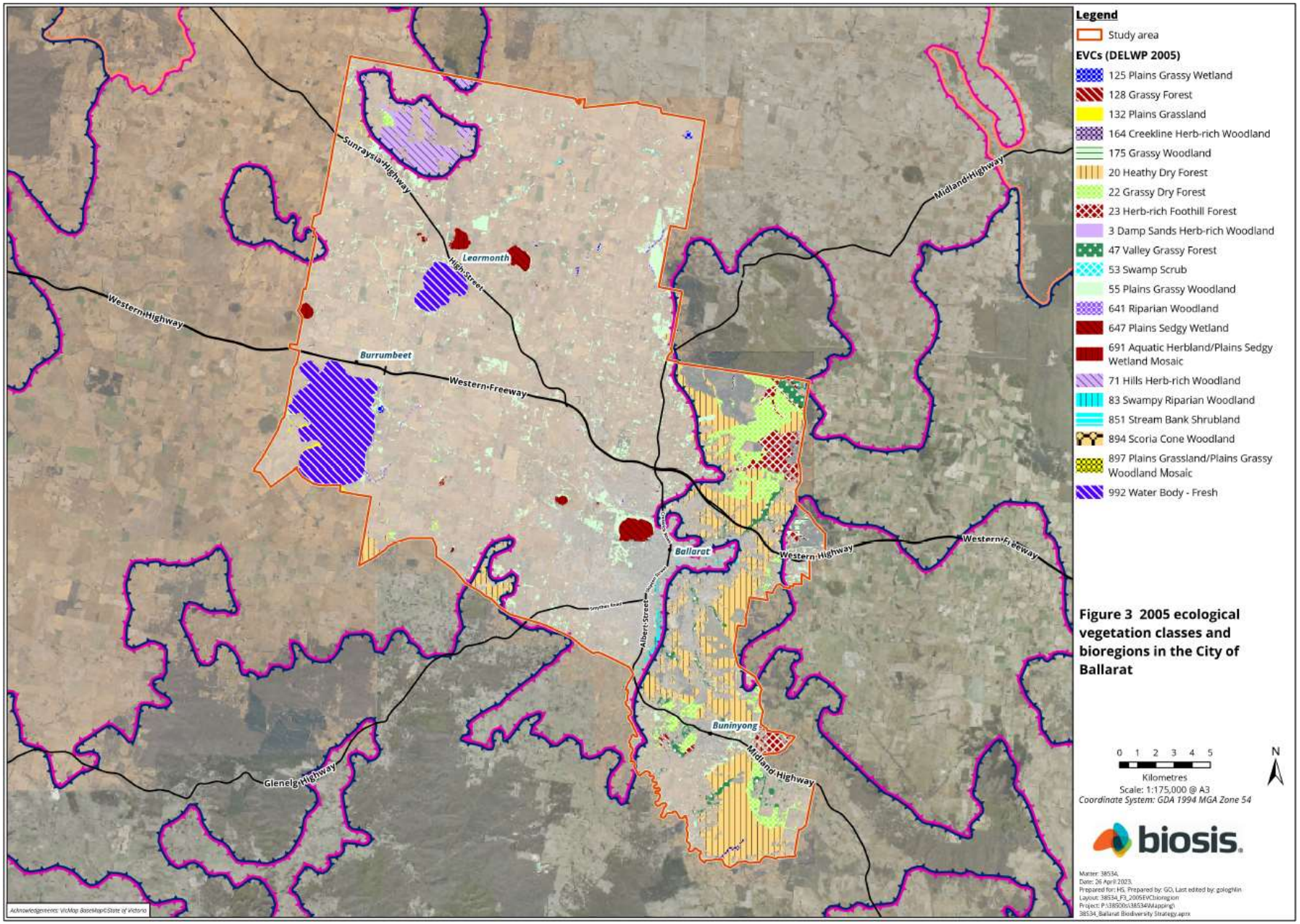

Figure 3 2005 ecological vegetation classes and bioregions in the City of Ballarat

Image 4: 2005's EVC's and Bioregions of Ballarat

Table 1: Reduction in EVC extents between 1750 and 2005 in the CVU and VVP

Ecological Vegetation Classes	Bioregion	Pre – 1750 extent (Ha)	2005 extent (Ha)	Reduction in extent (Ha)	Reduction as percentage of 1750 extent
Valley Grassy Forest	VVP	4.98	0.07	4.91	98.58
Scoria Cone Woodland	VVP	159.72	3.83	155.89	97.60
Grassy Dry Forest	VVP	763.64	50.63	713.00	93.36
Higher Rainfall Plains Grassy Woodland	VVP	46389.20	3338.31	43050.88	92.80
Heavier-soils Plains Grassland	VVP	1016.90	73.24	943.65	92.80
Plains Grassy Wetland	VVP	504.50	39.67	464.83	92.14
Swampy Riparian Woodland	VVP	793.51	104.69	688.82	86.81
Swamp Scrub	VVP	148.52	21.57	126.95	85.48
Riparian Woodland	VVP	381.51	55.61	325.90	85.42
Creekline Herb-rich Woodland	VVP	6.57	0.98	5.60	85.14
Damp Sands Herb-rich Woodland	VVP	3.94	0.60	3.33	84.74
Higher Rainfall Plains Grassy Woodland	CVU	1520.12	246.35	1273.77	83.79
Swampy Riparian Woodland	CVU	99.53	16.67	82.85	83.25
Grassy Forest	CVU	148.56	25.28	123.27	82.98
Stream Bank Shrubland	CVU	16.36	3.06	13.30	81.31
Plains Grassland/Plains Grassy Woodland Mosaic	VVP	10.78	2.62	8.16	75.67
Heathy Dry Forest	VVP	698.61	187.40	511.21	73.18
Grassy Woodland	VVP	270.76	77.27	193.49	71.46
Valley Grassy Forest	CVU	1589.04	497.12	1091.93	68.72
Hills Herb-rich Woodland	VVP	128.89	44.35	84.55	65.59
Grassy Woodland	CVU	43.78	16.68	27.11	61.91
Plains Sedgy Wetland	VVP	852.80	343.45	509.36	59.73
Herb-rich Foothill Forest	VVP	51.12	22.99	28.14	55.04
Hills Herb-rich Woodland	CVU	1921.09	902.58	1018.51	53.02

Ecological Vegetation Classes	Bioregion	Pre – 1750 extent (Ha)	2005 extent (Ha)	Reduction in extent (Ha)	Reduction as percentage of 1750 extent
Damp Sands Herb-rich Woodland	CVU	87.65	44.98	42.67	48.69
Grassy Dry Forest	CVU	3434.67	1780.68	1653.99	48.16
Heathy Dry Forest	CVU	8864.90	4672.32	4192.58	47.29
Stream Bank Shrubland	VVP	0.27	0.19	0.08	31.04
Creekline Herb-rich Woodland	CVU	60.49	41.80	18.68	30.89
Herb-rich Foothill Forest	CVU	914.13	650.76	263.37	28.81143298
Aquatic Herbland/Plains Sedgy Wetland Mosaic	VVP	215.10	172.03	43.07	20.02337429

4 Waterways and Wetlands

The City of Ballarat occurs within the management boundaries of three Catchment Management Authorities (CMAs): North Central CMA, Corangamite CMA and the Glenelg Hopkins CMA. The major river basins within each of the CMAs in the region are as follows:

- North Central CMA:
  - Loddon River
- Corangamite CMA:
  - Lake Corangamite
  - Barwon River
- Glenelg Hopkins CMA:
  - Hopkins River

Several major creeks and rivers occur within the Ballarat region including the Yarrowee River, Burrumbeet Creek, Creswick Creek, and Slaty Creek. Where native vegetation remains intact on the banks, creeks provide an opportunity for connectivity.

Lake Burrumbeet is the largest permanent freshwater body within the Ballarat region. It occurs in the west and is directly fed by Burrumbeet Creek. Lake Learmonth also occurs in the west. White Swan reservoir and Kirks reservoir are the only large open freshwater bodies to the east of Creswick Road (within the CVU bioregion). However, there are many more small creeks in the east of the region, perhaps due to the greater diversity in terrain than the flat VVP bioregion to the west.

Lake Wendouree is another important asst for the City of Ballarat. It is listed on the Directory of Important Wetlands in Australia and is a significant recreational lake (Corangamite Catchment management authority 2023). The Yarrowee river is a key tributary into the Leigh River and is one of the most important waterways in Ballarat, both due to its Ecological value and the successful revegetation and connectivity projects that have occurred. Winter swamp is another significant wetland within the Ballarat region. It supports populations of several threatened species.

As illustrated in Image 5 below:

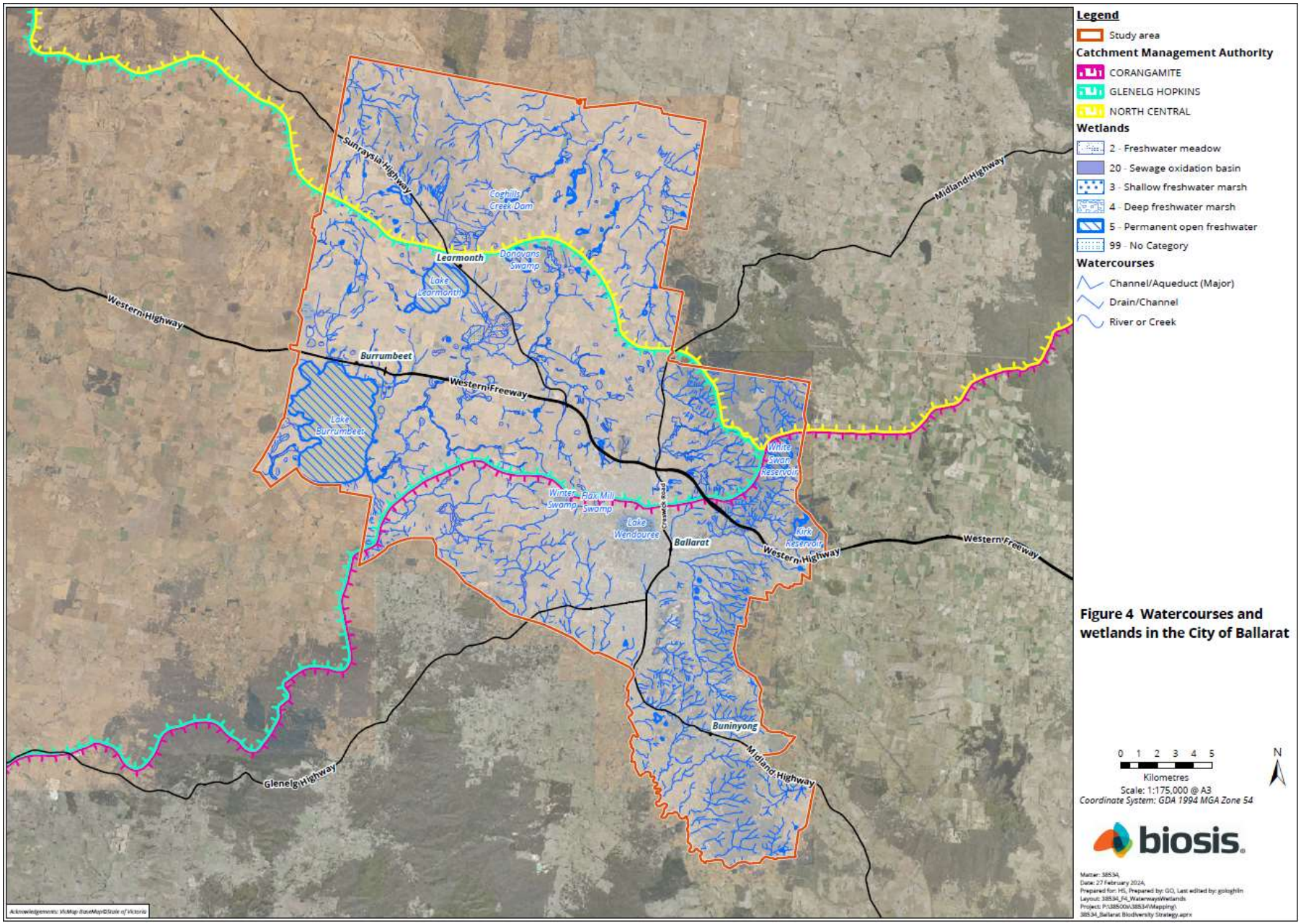

Figure 4 Watercourses and wetlands in the City of Ballarat

Image 5: Waterways, Wetlands and Catchment Management Authorities of Ballarat

5 Mapped Land Use

Exotic pastures are the most common type of land use mapped throughout the Ballarat region. The newer volcanic deposits of the VVP bioregion provide good soil conditions for agriculture. Majority of the Plains Grassy Woodlands mapped to occur throughout the region pre 1750 are now cleared and used for agriculture. Urban development, forestry, grazing and cropping are common land uses within the east of the Ballarat region.

Unlike grazing, exotic pasture and cropping paddocks are unlikely to continue to support native vegetation. High intensity activities such as paddock improvements (rock removal and fertiliser inputs) and tilling reduce the suitability of the land for supporting native Grassland and Grassy Woodland habitats. Grazing paddocks may still support native species if paddocks are adequately rested to allow native species to flower and produce seed.

As illustrated in Image 6 below:

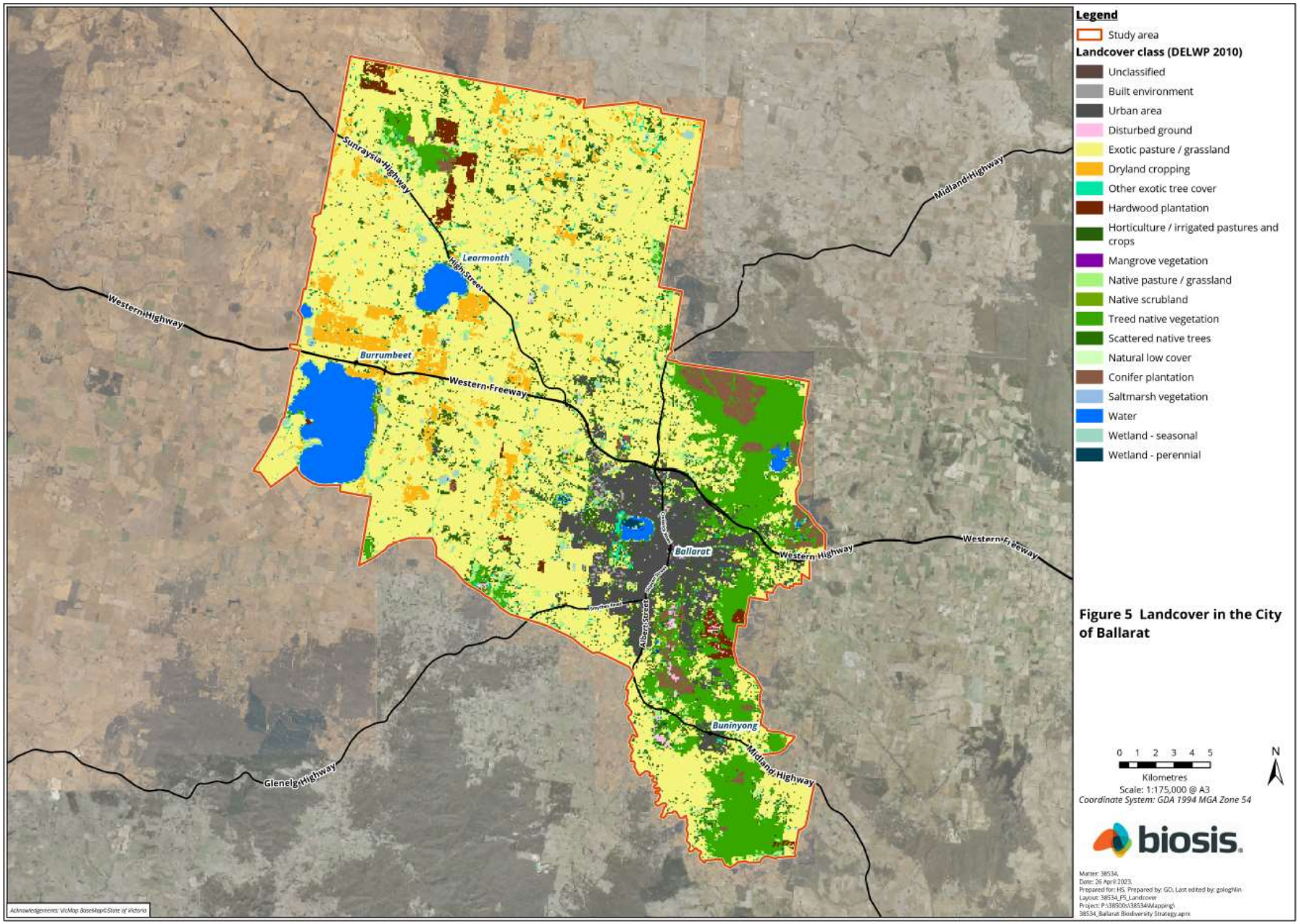

Figure 5 Landcover in the City of Ballarat

Image 6: Landcover in Ballarat

6 Crown Land and Significant Reserves

Thirteen state government reserves occur throughout the Ballarat region. These reserves play an important role in supporting biodiversity within the Ballarat region. These reserves predominantly occur in the east of the Ballarat region. There are no national parks within Ballarat. The State reserves found within Ballarat include:

- Ballarat North Bushland Reserve
- Brown Hill Scenic Reserve
- Buninyong H21 Bushland Reserve
- Durham Lead Bushland Reserve
- Flax Mill Swamp Wetland Reserve
- Haddon Common Bushland Reserve
- Howitt Street Trig Station Native Flora Reserve
- Long Point Bushland Reserve
- Mount Beckworth Scenic Reserve
- Mount Buninyong Scenic Reserve
- Tourello Stream Side Reserve
- Winter Swamp Native Flora Reserve
- Woowookarung Regional Park

As discussed in Section geology and soils the VVP's in the west of the Ballarat region have been predominantly cleared due to the high agricultural value of the land. As a result, crown land and reserves in this area are typically much smaller than the reserves in the east of the region.

The road reserves and creeks in the west are likely to harbour most of the remnant Grassland and Plains Grassy woodland remnants. These areas have been subject to less intense agriculture (such as light, infrequent grazing). Beyond the long stretches of road reserves and creeks, crown land consists of small, isolated pockets of land.

As illustrated in Image 7 below:

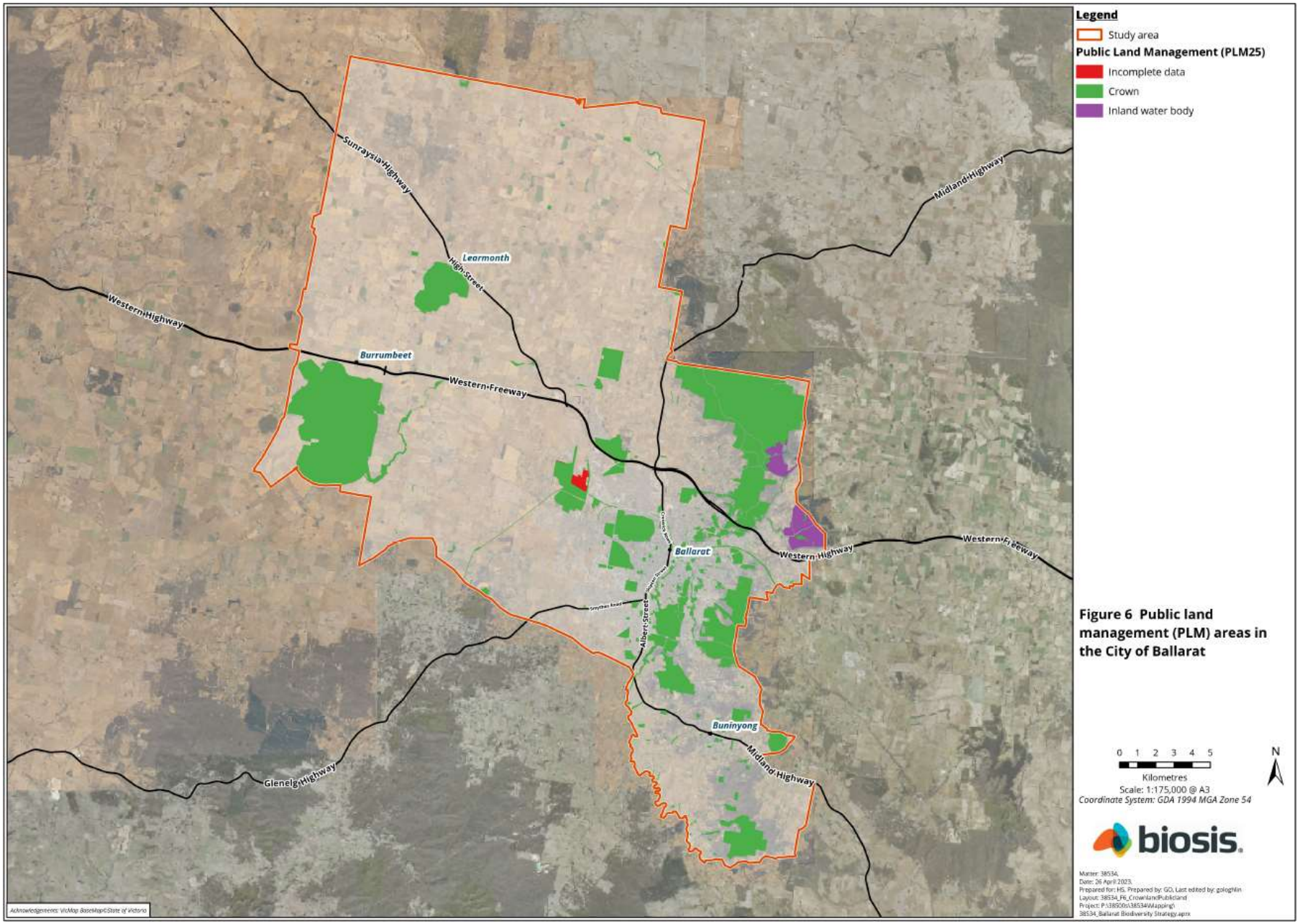

Figure 6 Public land management (PLM) areas in the City of Ballarat

Image 7: Crownland and Significant Reserves in Ballarat

7 Science Underpinning Biodiversity and Ecological Cycles

The climate is an important driver of ecological cycles for both fauna and flora. The Ballarat region climate is likely to change over the next 50 – 70 years, which will provide challenges for many of the local species as discussed in the Future Landscapes study. With decreases in average rainfall and increases in average temperatures, the amount of suitable land within the region will shrink. This will increase the importance of opportunities for connectivity between remnant patches of vegetation. Impacts of climate change can also be complex. For example, many plant species rely on temperature and rainfall cues to grow, flower and set seed. Understanding how changes to the climate effect species in the City of Ballarat is key to being able to effectively manage the risks.

Connectivity plays an important role in the preservation and enhancement of biodiversity and ecological values within the City of Ballarat. Where native flora and fauna have opportunities to move freely through large patches of vegetation, either directly or indirectly (through seeds or pollen, for example) they have more of an opportunity to diversify genetic pools and seek refuge from threats such as climate change. The document presents some of the current opportunities for connectivity within the Ballarat region.

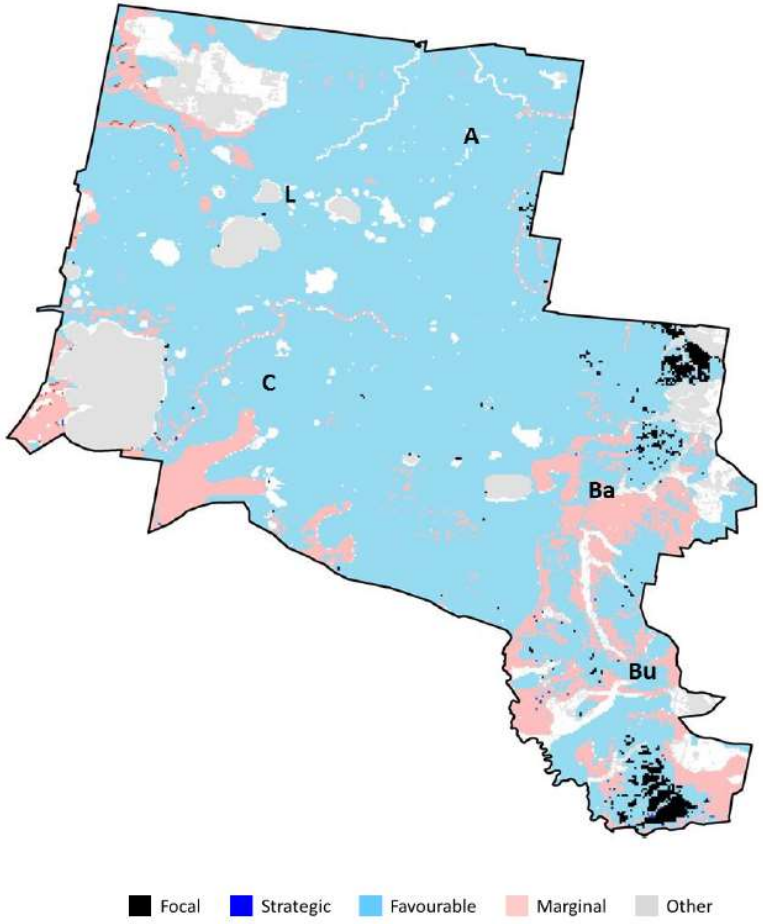

Fig. 6 Potential areas for the target ecosystems categorised into Focal (black), Strategic (dark blue), Favourable (light blue) and Marginal (rose) areas based on their strategic value for biodiversity conservation and the suitability of predicted future climate. Ecosystems not considered in the climate modelling are indicated in grey. The towns of Learmonth (L), Cardigan (C), Ascot (A), Ballarat (Ba) and Buninyong (Bu) are indicated.

8 Threatened flora recorded or predicted to occur within Ballarat

Recorded threatened flora

Twenty-two threatened flora species have been recorded within the City of Ballarat. Six of these species are listed as threatened on the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC). An additional 15 species are listed at threatened on the *Flora and Fauna guarantee Act* 1988 (FFG) and one is now considered extinct within Victoria. See Table for a list of the threatened flora species recorded within the Ballarat region.

Table 2 Threatened flora species recorded within the City of Ballarat

Conservation status		Scientific name	Common name
EPBC	FFG		
Vulnerable		*Amphibromus fluitans*	River Swamp Wallaby-grass
	Endangered	*Amphibromus sinuatus*	Wavy Swamp Wallaby-grass
	Endangered	*Billardiera scandens s.s.*	Velvet Apple-berry
	Endangered	*Bossiaea cordigera*	Wiry Bossiaea
	Endangered	*Cardamine lilacina s.s.*	Lilac Bitter-cress
	Critically Endangered	*Comesperma polygaloides*	Small Milkwort
	Critically Endangered	*Coronidium gunnianum*	Pale Swamp Everlasting
	Critically Endangered	*Cyperus concinnus*	Trim Flat-sedge
Endangered	Critically Endangered	*Dianella amoena*	Matted Flax-lily
	Critically Endangered	*Discaria pubescens*	Australian Anchor Plant
	Endangered	*Distichium capillaceum*	Fine Fringe-moss
	Endangered	*Diuris behrii*	Golden Cowslips
	Endangered	*Eucalyptus brookeriana*	Brooker's Gum
	Critically Endangered	*Eucalyptus yarraensis*	Yarra Gum
	Extinct	*Euphrasia collina* subsp. *speciosa*	Purple Eyebright
	Endangered	*Euphrasia scabra*	Rough Eyebright
Vulnerable	Vulnerable	*Glycine latrobeana*	Clover Glycine
	Vulnerable	*Goodenia lineata*	Grampians Goodenia
Endangered	Endangered	*Lepidium hyssopifolium s.s.*	Basalt Peppercress
	Endangered	*Levenhookia sonderi*	Slender Stylewort
Endangered	Critically Endangered	*Prasophyllum suaveolens*	Fragrant Leek-orchid
Endangered	Critically Endangered	*Senecio behrianus*	Stiff Groundsel

Threatened flora predicted to occur

There are also 13 threatened flora species predicted to occur within the City of Ballarat. These species have not been recorded within the region; however, there is potential habitat present, and it is possible that some of these species have not been recorded due to a lack of surveys in the appropriate areas. Potentially suitable habitat for each of the species in Table 7 is present within the study area. Many of these species may persist on private property where surveys have not been undertaken. An assessment of the likelihoods of occurrence and suitable habitat for each species can be found in Appendix A.

9 Threatened fauna recorded or predicted to occur within Ballarat

Recorded threatened fauna

Forty-three threatened fauna species have been recorded within the City of Ballarat. Of these species, 12 are listed under the EPBC Act, and 41 are listed under the FFG. Several species have not been recorded within the study area in the last century, potentially indicating local extinction, or loss of all suitable habitat. See Table 3 for a list of the threatened fauna species recorded within the Ballarat region.

Table 3: Threatened fauna species recorded within the City of Ballarat

Conservation status		Scientific name	Common name	Most recent database record
EPBC	FFG			
	Endangered	*Accipiter novaehollandiae*	Grey Goshawk	2019
	Vulnerable	*Actitis hypoleucos*	Common Sandpiper	2018
	Vulnerable	*Anseranas semipalmata*	Magpie Goose	2019
Critically Endangered	Critically Endangered	*Anthochaera phrygia*	Regent Honeyeater	1981
	Vulnerable	*Ardea alba modesta*	Eastern Great Egret	2019
	Critically Endangered	*Ardea intermedia plumifera*	Plumed Egret	2018
	Critically Endangered	*Ardeotis australis*	Australian Bustard	1954
	Vulnerable	*Aythya australis*	Hardhead	2019
	Vulnerable	*Biziura lobata*	Musk Duck	2019
Critically Endangered	Critically Endangered	*Calidris ferruginea*	Curlew Sandpiper	2010
Endangered		*Callocephalon fimbriatum*	Gang-gang Cockatoo	1991
Endangered	Endangered	*Calyptorhynchus banksii graptogyne*	Red-tailed Black-Cockatoo (south-eastern)	1896
Endangered	Endangered	*Dasyurus maculatus maculatus (SE mainland population)*	Spot-tailed Quoll	2006
Endangered		*Dasyurus viverrinus*	Eastern Quoll	1882
	Endangered	*Engaeus merosetosus*	Western Burrowing Crayfish	2006

Conservation status		Scientific name	Common name	Most recent database record
EPBC	FFG			
	Critically Endangered	*Falco subniger*	Black Falcon	2019
	Endangered	*Gelochelidon macrotarsa*	Australian Gull-billed Tern	2013
	Endangered	*Grus rubicunda*	Brolga	2020
	Endangered	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	2019
	Vulnerable	*Hieraaetus morphnoides*	Little Eagle	2016
Vulnerable	Vulnerable	*Hirundapus caudacutus*	White-throated Needletail	2019
	Vulnerable	*Hydroprogne caspia*	Caspian Tern	2018
	Endangered	*Ixobrychus dubius*	Australian Little Bittern	2017
	Vulnerable	*Lewinia pectoralis*	Lewin's Rail	2018
Vulnerable	Vulnerable	*Litoria raniformis*	Growling Grass Frog	2019
	Vulnerable	*Lophoictinia isura*	Square-tailed Kite	2019
Endangered	Endangered	*Macquaria australasica*	Macquarie Perch	1970
	Vulnerable	*Neophema elegans*	Elegant Parrot	1886
	Critically Endangered	*Ninox connivens*	Barking Owl	1989
	Vulnerable	*Ninox strenua*	Powerful Owl	2018
Critically Endangered	Critically Endangered	*Numenius madagascariensis*	Eastern Curlew	1985
	Vulnerable	*Ornithorhynchus anatinus*	Platypus	1991
	Vulnerable	*Oxyura australis*	Blue-billed Duck	2019
	Vulnerable	*Phascogale tapoatafa*	Brush-tailed Phascogale	1991
	Endangered	*Pseudemoia pagenstecheri*	Tussock Skink	2004
	Endangered	*Pseudophryne bibronii*	Brown Toadlet	1978
Vulnerable	Vulnerable	*Pteropus poliocephalus*	Grey-headed Flying-fox	2010
	Vulnerable	*Spatula rhynchotis*	Australasian Shoveler	2019
	Endangered	*Stictonetta naevosa*	Freckled Duck	2019
Vulnerable	Vulnerable	*Synemon plana*	Golden Sun Moth	2011
	Endangered	*Tringa glareola*	Wood Sandpiper	2010
	Endangered	*Tringa nebularia*	Common Greenshank	2018

Conservation status		Scientific name	Common name	Most recent database record
EPBC	FFG			
	Endangered	*Tringa stagnatilis*	Marsh Sandpiper	2016

Threatened fauna predicted to occur

Based on database records and available habitat within and adjacent to the study area, 38 threatened fauna species are predicted to currently occur within the City of Ballarat. Many of these species may inhabit private property where surveys have not been undertaken. Several of these species do not have current database records but are predicted to occur based on available habitat and records surrounding the study area. An assessment of the likelihoods of occurrence and suitable habitat for each species can be found in Appendix B.

Migratory species

A total of 20 bird species considered to be Migratory under the EPBC Act have been recorded, or predicted to occur within the study area, and are listed in Appendix B. Most of these migratory birds are wetland species, which may visit the study area seasonally, or during periods of suitable rainfall and inundation. While many of the species may visit the study area regularly, or may be resident, the study area is unlikely to provide important habitat for an ecologically significant proportion of any of these species.

Table 4: Migratory fauna species recorded or predicted to occur within the study area

Scientific name	Common name	Most recent record
Migratory species		
Gallinago hardwickii	Latham's Snipe	2019
Plegadis falcinellus	Glossy Ibis	2018
Hirundapus caudacutus	White-throated Needletail	2019
Apus pacificus	Fork-tailed Swift	1985
Hydroprogne caspia	Caspian Tern	2018
Charadrius bicinctus	Double-banded Plover	2018
Numenius madagascariensis	Eastern Curlew	1985
Limosa lapponica	Bar-tailed Godwit	PMST
Tringa glareola	Wood Sandpiper	2010
Actitis hypoleucos	Common Sandpiper	2018
Tringa nebularia	Common Greenshank	2018
Tringa stagnatilis	Marsh Sandpiper	2016
Calidris ferruginea	Curlew Sandpiper	2010
Calidris ruficollis	Red-necked Stint	2018
Calidris acuminata	Sharp-tailed Sandpiper	2015
Calidris pugnax	Ruff	2010

Calidris melanotos	Pectoral Sandpiper	PMST
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	2010
Myiagra cyanoleuca	Satin Flycatcher	2005

10 Threatening processes faced by threatened species

Australia's endangered species are threatened by several cumulative and increasing threats such as invasive weeds and pests, climate change and natural disasters (DCCEEW 2022, Biosis 2018b). A key threat facing threatened flora and fauna within the city of Ballarat is habitat loss and fragmentation (Biosis 2020).

Expansive land clearance on the VVP (in the west of the region) has resulted in the widespread loss of Grassy Woodland and Grassland habitats to intensive agriculture. As a result of this historical clearance, many flora and fauna species endemic to this habitat are listed as threatened, such as the Striped Legless Lizard *Delma impar.* Habitats for threatened species in these areas now persist as small, fragmented islands. Connectivity between these islands is limited due to the inhospitable agricultural landscape. Even though there is a greater cover of native vegetation in the east of the region, it is still negatively impacted by fragmentation caused by large roads and housing developments (Biosis 2020).

Climate change also poses a risk to threatened species within the region. Ecosystems in the east of the region, including Riparian forests and Dry forests will be adversely impacted by modelled reductions in rainfall and area of suitable habitat (Deakin University 2016).

Degradation of waterways is also seen as a threat to biodiversity and threatened flora within the City of Ballarat (Biosis 2018b). Weed invasions are often concentrated along watercourses where native species struggle to outcompete introduced species such as Blackberry *Rubus anglocandicans.* Aquatic pest animals such as European Carp *Cyprinus carpio* can significantly degrade water quality, outcompete, or prey on native species. Degradation of the waterways and surrounding vegetation reduces the amount of land available to threatened species that occur in wetland and waterway habitats. Of the 38 threatened fauna species predicted to occur within the City of Ballarat, 24 rely on wetlands and waterways as key habitat.

Loss of large hollow-bearing trees through agricultural clearing and urbanization reduces roosting and nesting habitat for a range of native birds, bats, and arboreal mammals. Scattered hollow-bearing trees within agricultural landscapes and riparian areas allow threatened species such as Little Eagle *Hieraaetus morphnoides* and Grey Goshawk *Accipiter novaehollandiae* to persist in otherwise degraded habitat. Introduction of pest bird species, such as Common myna *Acridotheres tristis*, can cause significant competition for hollows and other roosting and nesting habitat.

11 Threatened Ecological Communities predicted to occur within Ballarat

Ecological Communities are unique groupings of flora and fauna that are determined by environmental factors such as soil and climate (Department of Climate Change, Energy, the Environment and Water 2022). Ecological communities that are at risk of becoming extinct are considered Threatened Ecological Communities (TECs). Threats to these communities include clearance of native vegetation, invasive species and climate change. As a result, many of the threats faced by TECs and threatened species within the City of Ballarat are shared.

Five EPBC Act listed TECs are predicted to occur by the Protected Matters Search Tool within the City of Ballarat:

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain.
- Grey Box *Eucalyptus microcarpa* Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.
- Natural Temperate Grassland of the Victorian Volcanic Plain.
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Two FFG Act listed TECs are also predicted to occur within the Ballarat Region:

- Western (Basalt) Plains Grasslands Community.
- Western Basalt Plains (River Red Gum *Eucalyptus camaldulensis*) Grassy Woodland Floristic Community 55-04.

Each of the TECs listed above apart from Grey Box *Eucalyptus microcarpa* Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Derived Native Grassland are likely to be present within the study area. They are all predicted to occur within the VVP bioregion to the west of the Ballarat region. No TECs are predicted to occur within the Heathy Dry and Riparian Forests in the CVU Bioregion to the east.

It is very difficult to determine the extent or quality of native grasslands and grassy woodlands within an agricultural landscape from aerial imagery. As a result, it is considered very likely that each of the TECs predicted to occur within the City of Ballarat are present. They are most likely to occur along roadsides, railways and in paddocks that have not been improved or cropped. These areas tend to support higher quality vegetation and are more likely to fulfil the key diagnostic characters of each of the TECs.

Table 1: Threatened Ecological communities predicted to occur within the City of Ballarat

Community Name	Conservation status	Source	Description
National significance			
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically endangered	PMST	This community supports an open Eucalypt *Eucalyptus spp.* woodland with a predominantly grassy understorey. It is restricted to the Victorian Volcanic Plain and occurs on clay soils under a variety of different annual rainfall amounts. This community can persist as a derived grassland where the tree canopy has been cleared (as evidenced by the presence of tree stumps and fallen logs). Key diagnostic characteristics of this community include: a canopy typically dominated by River Red Gum *Eucalyptus camaldulensis,* an understorey dominated by native species with at least one native grass and one native herb. Contra indicative species include several species that have affinities with wetland and semi-

Community Name	Conservation status	Source	Description
			arid ecological communities. This community is most likely to occur where Plains Grassy Woodland EVCs are mapped, particularly along roadsides where the vegetation is less disturbed and more likely to support the diagnostic characteristics. While Plains Grassy Woodland habitat may be present within paddocks, they may be dominated by weeds and missing the native diversity required to be considered a part of this threatened community.
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	PMST	The high annual rainfall of the Ballarat region makes it largely unsuitable for Grey Box *Eucalyptus microcarpa.* This species generally occurs in drier environments to the north and west of Ballarat, and also in low rainfall areas between Ballarat and Melbourne.. A key diagnostic characteristic of this community is that the dominant canopy species is Grey Box. As a result, it is not likely that this threatened community is present within the study area.
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically endangered	PMST	This is a highly variable community with changes in vegetation cover and species richness commonly occurring between different seasons and from year to year. It's distribution is limited to the Victorian Volcanic Plain Bioregion where it occurs on Basalt soils. Vegetation composition is typically dominated by native grasses with at least one native grass genera present. Where the cover of native grasses is less than 50% the community must have 50% cover of native forbs during spring-summer. If these covers are not present, the vegetation is not considered part of the threatened community. This TEC could be present and extensive throughout the west of the region where the landscape has been largely cleared. Previously cleared and previously / currently grazed properties may still support more than 50% cover of one of the four native grass genera required to consider the vegetation part of the ecological community. Where paddocks have been improved or cropped, it is unlikely (but not impossible) that this TEC remains.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically endangered	PMST	This community applies to isolated, freshwater wetlands that are typically seasonally inundated. Woody cover is typically absent to sparse and the vegetation is dominated by wetland herbs. The herbaceous species present within this community are typically absent from the dry adjoining grasslands and woodlands. Species richness may vary greatly depending on the rainfall however at least one native wetland forb must be present once the community is inundated and at least 50% of the total cover should be dominated by native species. This community can occur at a range of scales, including small depressions within paddocks and is therefore likely to occur throughout many of the higher quality paddocks throughout the west of the region. The seasonality of the community may protect it from the impacts of grazing and allow it to persist in previously / currently grazed areas.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically endangered	PMST	While White Box *Eucalyptus albens* and Blakely's Red Gum *E. blakelyi* are not expected to occur within the Ballarat region (due to the high rainfall), Yellow Box *E. melliodora* is more likely to be present. While it is not a widespread species within the region, the TEC may be present in the few areas the species has been recorded or where the species existed pre-1750. It consists of more than 50% cover of native species in the ground layer and is typically species rich with native grasses, herbs and scattered shrubs. There must be at least 12 native species in the understorey (excluding grasses) to qualify as this

Community Name	Conservation status	Source	Description
			community. This means the TEC is only likely to occur in the highest quality remnants. To support 12 understorey species (excluding grasses) a remnant patch of vegetation is unlikely to have been frequently disturbed by agriculture or recently/ historically heavily grazed. While this community may occur within the City of Ballarat, it's extent is likely to be very reduced compared to the other TECs.
State significance			
Western (Basalt) Plains Grasslands Community	Threatened		This community is similar to the EPBC Act listed Natural temperate grassland community. It typically occurs on long-uncultivated properties where perennial native plants dominate. Grasslands that do not meet the definition of an EPBC Act listed grassland, but still support suitable species and structure are likely to be this community.
Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04	Threatened		This community is very similar to the EPBC Act listed Grassy Eucalypt Woodland of the VVP. It consists of an open woodland of River Red Gum and a middle layer of shrubs. The community is predicted to occur across the basalt plains as scattered remnants. It is likely to be widespread throughout the City of Ballarat. Patches of vegetation that do not fulfil the key diagnostic characteristics of the EPBC Act listed Woodland but have some suitable species and structure are more likely to be this community.

Many of the threatened species and communities that occur or are predicted to occur within Ballarat occur within the widely cleared agricultural landscape to the west. Given the long history of intensive agriculture, it is difficult to predict the distribution of remaining threatened species and communities. This is also complicated by the vast amount of private land in this area that has not been surveyed for endangered species. Land in the west can still provide opportunities for threatened flora and fauna to persist, despite the extensive clearing. Roadsides, railway reserves and cemeteries are some examples of areas that may still support habitat suitable for these threatened species and their communities.

Landowner incentives could be used in conjunction with education in order to encourage protection and restoration of important ecological values on private land. Values such as the critically endangered Seasonal Herbaceous Wetland Community occur predominantly on private land and are being cleared at accelerating rates due to shifts in agricultural activities. If landholders were made more aware of the importance of these wetlands and provided with the support to protect and enhance them, the rate of loss may decrease. Although there is a higher proportion protected under public ownership, this is equally applicable for the bushland on the east of Ballarat which relies on connectivity through private land.

12 Appendix

Table 6: Abbreviations and symbols relevant to these Appendix's.

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
CR	Critically endangered	
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State listings (FFG Act)		
x	Extinct	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
cr	Critically endangered	
e	Endangered	
v	Vulnerable	
t	Threatened	
P	Protected (public land only)	

Appendix A: Listed Flora Species

The following table includes threatened flora species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST. Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur. A proportion of the flora habitat descriptions have been reproduced with permission from the Royal Botanic Gardens Victoria (RBGV 2020).

Table 7: Threatened flora species recorded or predicted to occur within 5 km of Ballarat

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
National significance								
Amphibromus fluitans	River Swamp Wallaby-grass	VU		2006	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	**Medium**	One recent record of this species occurs within the City of Ballarat. While the record of this species occurs within Heathy Dry Forest, it may also occur in several Riparian forest ecosystems along the Yarrowee River.
Caladenia ornata	Ornate Pink-fingers	VU	e		PMST	Heathy and grassy woodlands.	**Medium**	There are no records of this species within the city of Ballarat. *Caladenia* species can be difficult to find if they are not flowering. As a result, it is difficult to discount the presence of the species. However, it is unlikely to have persisted in the presence of sheep grazing in the east of the region. A historical record of the species in the Brisbane Ranges National Park occurs in Heathy dry Forest, which is extensively mapped throughout the east of the Ballarat region.
Dianella amoena	Matted Flax-lily	EN	cr	2012	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	**Recorded**	Three records of this species have been made within the City of Ballarat (two recent and one historical). This species can go dormant, making it difficult to find outside of the flowering season. As a result, *Dianella amoena* may be more extensive throughout the region than the three records suggest. Records outside the City of Ballarat are predominantly located along roadsides and railways in Plains Grassy Woodland where minimal disturbance has occurred. This species is most likely to occur

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
								along roadsides and in small un-grazed remnants in the west of the region.
Dodonaea procumbens	Trailing Hop-bush	VU			PMST	Sandy or clay soils in low-lying, winter-wet areas in grasslands, woodlands, and low-open forest.	**Low**	No recent or historical records of this species occur within the City of Ballarat. Records closes to the Ballarat region occur in Paddy's Ranges State Park and north of Cressy. These records are found within the vicinity of creeks in a mixture of vegetation classes. This species is readily observable / identifiable all year, especially when flowering and in seed. Records would be expected within the Ballarat Region if it were present.
Eucalyptus aggregata	Black Gum	VU	v		PMST	Riparian woodland, primarily on floodplains but occasionally extending up adjacent lower slopes.	**Negligible**	No recent or historical records of this species occur within the City or Ballarat. The closest record occurs in Daylesford, however this record is from 1965. Otherwise, the species is restricted to the Woodend-Gisborne area.
Eucalyptus crenulata	Buxton Gum	EN	e	2012		Alluvial soils in seasonally inundated depressions along river flats; records away from Buxton and Yering in the northeast are likely to be introductions.	**N/A**	Any records of this species within the Ballarat region are likely to be planted species. Ballarat is well outside the species' natural range.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Glycine latrobeana	Clover Glycine	VU	v	2011	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	**Recorded**	One recent record of the species occurs within the study area in Herb-rich Foothill Forest. The species is occurs in relatively high numbers to the south of the Ballarat region (around Meredith). Several local records occur within Heathy and Grassy dry forests, which are extensive throughout the east of the region. The species is also expected to occur within the Grassland and Grassy woodland habitats in the west of the region. However, the species most commonly occurs in high quality remnants, which are likely restricted due to clearance for agriculture.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	e		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	**Medium**	No records of this species occur within the City of Ballarat and the closest records to the study area are 10km away. Potentially suitable habitat is likely to be present within the region, particularly in the west on the VVP. The species is difficult to tell apart from other *Lachnagrostis,* which could be the reason for the absence of records.
Lepidium aschersonii	Spiny Peppercress	VU	e		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	**Low**	No recent or historical records of the species occur within the City of Ballarat and most records occur far from the region.
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	e	2018	PMST	Basalt plains grassland and woodland communities.	**Recorded**	One recent record of this species occurs within the City of Ballarat in Plains Grassy Woodland on the banks of a wetland. This species may occur more widely than the single record suggests, as there is still potentially suitable habitat in the west of the region in Grassland and Grassy woodland refuges.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Leucochrysum albicans subsp. tricolor	White Sunray	EN	e		PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	**Medium**	No recent or historical records of this species occur within the City of Ballarat. Many species records occur to the south west of the Ballarat region, predominantly along roadsides. Grassland and Grassy woodland habitats are present within the Ballarat region and may provide suitable habitat for this species. The species is easily observable and identifiable when flowering. Therefore, records would be expected where the species is present.
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR	cr		PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	**Medium**	No recent or historical records within the City of Ballarat. Plains Grassy Woodland remnants on the VVP could provide suitable habitat for the species. It may persist on private property where disturbance is minimal and vegetation surveys have not yet been undertaken.
Prasophyllum suaveolens	Fragrant Leek-orchid	EN	cr	2018	PMST	Open, species rich grasslands dominated by Themeda triandra on poorly draining red-brown soils in western Victoria.	**Recorded**	Many recent records of this species potentially from Plains Grassy Woodland remnants near Miner's Rest. Potentially suitable habitat, similar to that in which the current records occur, is widespread throughout the west of the region. The species may be more widespread than the restricted records currently suggest.
Pterostylis chlorogramma	Green-striped Greenhood	VU	e		PMST	Heathy woodland; more specific habitat requirements are poorly known.	**Medium**	No recent or historical records within the City of Ballarat. Closest record is from 1981 in Heathy Dry Forest of Enfield State Park. Heathy Dry Forest occurs within the east of the region and may support the species. Orchids can be dormant majority of the year and only become observable and

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
								identifiable during the flowering season. This can make them difficult to find and may be the reason for the absence of records.
Rutidosis leptorhynchoides	Button Wrinklewort	EN	e		PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	**Medium**	No recent or historical records within the City of Ballarat. There may be some suitable habitat remaining along roadsides (refuges from intense agriculture and grazing) that still support the species. *Rutidosis* can be difficult to observe when it is not flowering, particularly if the plants dieback. This could be a reason for the absence of records.
Senecio behrianus	Stiff Groundsel	EN	cr	2007	PMST	Specific habitat requirements of this species are poorly understood, but they are known to occur in seasonally inundated habitats on clay soils.	**Recorded**	Five recent records occur within the City of Ballarat in a large wetland. Many other locations with similar habitat occur throughout the study area that may support the species.
Senecio macrocarpus	Large-headed Fireweed	VU	cr		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	**Medium**	No recent or historical records within the City of Ballarat. Suitable habitat may persist on private land or in roadsides with moderate to high quality remnant vegetation in the west of the region.
Senecio psilocarpus	Swamp Fireweed	VU			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	**Low**	No recent or historical records. While swamps on volcanic clays may occur throughout the west of the Ballarat region, herb-rich swamps may be rare due to the history of extensive clearance and grazing.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Thelymitra matthewsii	Spiral Sun-orchid	VU	e		PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	**Low**	No recent or historical records. Most records in Victoria occur in the Grampians or in heathlands and heathy woodlands around Anglesea. Due to the distance between these records and the Ballarat region and the lack of records, the species is unlikely to be present.
Xerochrysum palustre	Swamp Everlasting	VU	cr		PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	**Medium**	No recent or historical records. Suitable sedgy swamp habitats occur alongside creeks in the west of the region. This species is obvious when flowering and records would be expected if it were present.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
State significance								
Acacia boormanii	Snowy River Wattle		e	2012		Restricted mostly to open-forest on rocky slopes and along banks of the Snowy River and its tributaries, with outlying populations at Mt Typo and Gapsted in the Myrtleford area.	**N/A**	Records of this species within the region are well outside the natural range of this species and likely to have been planted.
Acacia howittii	Sticky Wattle		v	2019		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	**N/A**	Records of this species within the region are well outside the natural range of this species and likely to have been planted.
Amphibromus sinuatus	Wavy Swamp Wallaby-grass		e	2008		Confined to permanent swamps in cool sites.	**Recorded**	Three historical and one recent record of the species within the City of Ballarat at Lake Burrumbeet and Flax Mill swamp. Similar open water bodies occur sporadically throughout the region and provide additional suitable habitat for this species.
Billardiera scandens s.s.	Velvet Apple-berry		e	1875		Common in heathland, woodland and forests from near sea level to the subalps.	**Medium (recorded historically)**	One historical (1875) record of the species within the Ballarat region. Heathland habitat in the east of the region may provide suitable habitat for the species. While it is possible that this species is confused with the Common Apple-berry, more recent records would be expected if this species was widespread throughout the Ballarat region.
Bossiaea cordigera	Wiry Bossiaea		e	1998		Moist habitats in heathland, heathy woodland and open-forest.	**Medium (recorded historically)**	Two historical records within the City of Ballarat. Suitable moist, open-forest habitat may be present in some sections along the Yarrowee river.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Cardamine lilacina s.s.	Lilac Bitter-cress		e	2009		Subalpine woodland and various alpine habitats.	**Recorded**	Two recent records within the City of Ballarat. The records occur on Mount Buninyong in Herb-rich Foothill Forest. This vegetation type is limited throughout the Ballarat region.
Comesperma polygaloides	Small Milkwort		cr	1992		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	**High (recorded historically)**	One historical record of the species occurs near the Slattery Creek within an agricultural landscape. The species is small and could persist in higher quality, less frequently grazed paddocks where some native grassland persists. It is not likely to persist in paddocks where improvements and fertilizers have been used.
Coronidium gunnianum	Pale Swamp Everlasting		cr	2011		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	**Recorded**	One recent and one historical record within the City of Ballarat. Potentially suitable habitat occurs in the west of the region, particularly along roadsides and other less intensely cleared habitats.
Cyperus concinnus	Trim Flat-sedge		cr	1853		Seasonally wet areas.	**Low (historically recorded)**	One historical (1853) record within the Ballarat region. Given the age of this record and the lack of any recent records, it is unlikely that this species remains within the City of Ballarat.
Discaria pubescens	Australian Anchor Plant		cr	1998		Grassy open woodlands and forests in the east of the State, and along stream and river valleys west of Melbourne.	**Medium (historically recorded)**	Two historical records within the region. Grassy Woodland habitats persist along roadsides and railways reserves. Many records surrounding the City of Ballarat occur along streams and creeks. Creeks and streams within the Ballarat region may still provide suitable habitat for this species.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Diuris behrii	Golden Cowslips		e	2008		Grasslands, open grassy woodlands and Box Ironbark Forests.	**Recorded**	Many recent records within the Ballarat region. Many records occur in Grassy Woodland along roadsides and in a cemetery. Therefore, the species may occur in any moderate to high quality Plains Grassy Woodland habitat that remains within the region.
Eucalyptus brookeriana	Brooker's Gum		e	2015		Moist forest communities in valleys and on hills and ridges, often in association with E. obliqua.	**Recorded**	Many recent records occur throughout the Creswick Regional park area.
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum		e	2007		Damp forest communities. Restricted to South Gippsland and the Otway Ranges.	**N/A**	Records of this species within the region are well outside the natural range of this species and likely to have been planted.
Eucalyptus yarraensis	Yarra Gum		cr	2019		Valley flats and along stream on soils subject to periodic inundation or waterlogging.	**Recorded**	Many recent records occur throughout the Creswick Regional park area and to the south of the region in the Enfield state Park area. This is a prolific species in the region.
Euphrasia scabra	Rough Eyebright		e	1770		Grassy woodlands and clearings in subalpine woodlands or sclerophyll forests.	**Low (historically recorded)**	One historical (1770) record within the region. The habitat requirements are no longer present or at least extensive throughout the region.
Goodenia lineata	Grampians Goodenia		v	2006		Heathland on sandy soils.	**Recorded**	One recent record from Grassy Dry Forest in the Nerrina Historic area. The apparent re-discovery of the species within the Ballarat region suggests the species may be relatively widespread,
Levenhookia sonderi	Slender Stylewort		e	2014		Lowland areas in seasonally damp grounds and drying swamps.	**Recorded**	One recent record in a Grassy Dry Forest. More suitable habitat is present within the Ballarat region.
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle		e	2012		Near coastal heath/scrub, rocky coast and foothill outcrops.	**N/A**	Records of this species within the region are well outside the natural range of this species and likely to have been planted.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Melaleuca halmaturorum	Salt Paperbark		e	2009		In Victoria mostly fringing salt lakes in the north-west (where becoming rare), with an isolated near-coastal occurrence on saline ground at Tyrendarra, near Portland.	**N/A**	Records of this species within the region are well outside the natural range of this species and likely to have been planted.

Appendix B: Listed Fauna Species

The following table includes a list of threatened fauna species that have potential to occur within the study area. The list of threatened species is sourced from the VBA and PMST. Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur.

Table 8: Threatened fauna species recorded or predicted to occur within Ballarat

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
National significance									
Aphelocephala leucopsis	Southern Whiteface	VU			PMST	Open forests and woodlands with a grassy and/or shrubby understorey.	**Medium**	Recent records in woodland habitat at Mount Beckworth. Suitable woodland habitat throughout the study area.	Woodlands and open forests with a grassy and/or shrubby understorey, particularly at Mount Beckworth.
Stagonopleura guttata	Diamond Firetail	VU	v		PMST	Open forests and woodlands with a grassy ground layer.	**Medium**	Recent records in woodland habitat at Mount Beckworth. Suitable woodland habitat throughout the study area.	Woodlands and open forests with a grassy and/or shrubby understorey, particularly at Mount Beckworth.
Lissolepis coventryi	Swamp Skink, Eastern Mourning Skink	EN	e		PMST	Densely vegetated swamps and associated watercourses, and adjacent wet heaths, sedgelands and saltmarshes.	**Medium**	Historic records from Ballarat and Enfield region. Cryptic species, unlikely to be recorded without targeted surveys. Some potentially suitable vegetated wetland habitat within the study area.	Wetlands and watercourses with adjacent vegetation, particularly in southern extent of the study area.
Pedionomus torquatus	Plains-wanderer	CR	cr		PMST	Native grassland with a sparse, open structure.	**Negligible**	Study area is outside the species current range. Species extent within	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
								Victoria is limited to northern arid grasslands.	
Rostratula australis	Australian Painted-snipe	EN	cr		PMST	Shallows of well-vegetated freshwater wetlands.	**Medium**	Widespread but rare species, rarely recorded within Victoria. Recent observation at Merrin Merrin Swamp, approx. 7 km from the Study Area. Some suitable well-vegetated wetland habitat within the study area. Species may occasionally visit during suitable seasonal conditions.	Wetlands with shallow banks and dense emergent and fringing vegetation. Winter Swamp and some sections of Lake Burrumbeet may provide suitable habitat.
Botaurus poiciloptilus	Australasian Bittern	EN	cr		PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	**Medium**	Several historic records within the study area. Some suitable well-vegetated wetland habitat within the study area.	Wetlands with shallow banks and dense emergent and fringing vegetation. Winter Swamp and some sections of Lake Burrumbeet may provide suitable habitat.
Falco hypoleucos	Grey Falcon	VU	v		PMST	Lightly timbered plains and Acacia scrub.	**Negligible**	Species is largely restricted to semi-arid inland regions. May occasionally visit the study area during periods of inland drought, but is unlikely to regularly inhabit it. No local records.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	EN	e	1896		Desert Stringybark, Brown Stringybark and Buloke woodlands.	**Negligible**	Study area is outside the species normal range. Species extent within Victoria is largely restricted to forests in the south-west of the state.	
Callocephalon fimbriatum	Gang-gang Cockatoo	EN		1991	PMST	S Vic to E NSW. Forests and woodlands from coast to alpine areas. Autumn-winter dispersal from highlands to lower elevations. Forages in eucalypts, acacias and some exotic garden trees and shrubs, including Hawthorns.	**High**	Records in forested areas of Mount Helen and Nerrina. Some suitable foraging habitat throughout the study area, including Hawthorn hedgerows in agricultural land. Species likely to pass through and forage within the study area occasionally when migrating between highlands to core foraging habitat within the Grampians National Park.	Forests, woodlands, well-treed urban areas and rural areas containing Hawthorns.
Lathamus discolor	Swift Parrot	CR	cr		PMST	A range of forests, woodlands and well-treed urban areas supporting nectar-producing tree species. Box-ironbark forest regularly used as foraging habitat. Species breeds in Tasmania, overintering in mainland Australia.	**Medium**	Species is likely to pass through the study area when migrating between Tasmania and core foraging habitat in Box-Ironbark forests north of the study area, around Maryborough, Castlemaine and Bendigo. Few records and minimal suitable foraging habitat within the study area. Species is unlikely to	Forests, woodlands, well-treed urban areas containing flowering trees.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
								regularly utilise habitat within the study area.	
Hirundapus caudacutus	White-throated Needletail	VU	v	2019	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	**High**	Several recent local records. Species is highly mobile and widely distributed across eastern Australia. Species is likely to fly over the study area, but rarely uses terrestrial habitat.	Species rarely utilises terrestrial habitat but is likely to utilise the airspace above the study area regularly.
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	VU			PMST	Non-breeding migrant to Australia. Inhabits estuarine mudflats, beaches and mangroves. Common in coastal areas around Australia. Social birds and are often seen in large flocks and in the company of other waders. Generally concentrated in coastal habitats, but may occur widely across continent during migration passage.	**Low**	Minimal suitable habitat. No local records. Species is primarily costal. May occasionally fly through the study area during migratory movements.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Numenius madagascariensis	Eastern Curlew	CR	cr	1985	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, coastal lagoons and bays.	**Negligible**	No suitable habitat within study area. Species is largely restricted to coastal habitat.	
Calidris ferruginea	Curlew Sandpiper	CR	cr	2010	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Medium**	Several records at major wetlands within the study area. Suitable shallow wetlands with muddy and sandy shores throughout the study area.	Wetlands with shallow muddy or sandy margins, particularly Lake Wendouree, Lake Burrumbeet and Lake Learmonth.
Grantiella picta	Painted Honeyeater	VU	v		PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	**Medium**	Few records and minimal suitable habitat within the study area. Species may occasionally forage in forested areas and roadside reserved with flowering trees and mistletoes. Unlikely to regularly inhabit the study area.	Forests, woodlands, roadside reserves and patches of remnant native vegetation containing flowering trees and mistletoe.
Anthochaera phrygia	Regent Honeyeater	CR	cr	1981	PMST	A range of dry woodlands and forests dominated by nectar-producing tree species.	**Negligible**	Few records and minimal suitable habitat within the study area. Species is widely considered extinct throughout most of its former range within SW Victoria.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN	e	2006	PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	**Medium**	One record within study area from 2006 along Sunraysia Hwy at Mount Bolton. 2012 record from Paddys Ranges State Park, north-west of the study area. Minimal suitable habitat within the study area. Species is unlikely to persist in fragmented habitat in urban or agricultural landscapes. Small populations may persist in larger patches of forest, individuals may occasionally enter the study area from populations in larger forests surrounding the study area.	Forests, woodlands, and connected roadside reserves, particularly in the north-west extent of the study area around Mt Bolton and Mt Beckworth.
Dasyurus viverrinus	Eastern Quoll	EN		1882		The Eastern Quoll is a medium-sized carnivorous marsupial that once occupied a broad range of forest, woodland and grassland habitats in Victoria. The species is now restricted to Tasmania and is considered to be extinct from mainland Australia.	**Negligible**	Species is considered to be extinct from Mainland Australia.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Petauroides volans	Southern Greater Glider	EN	v		PMST	Wet and damp sclerophyll forest with large hollow-bearing trees.	**Negligible**	No records and no suitable habitat within the study area.	
Petaurus australis	Yellow-bellied Glider	VU			PMST	Sclerophyll forest with large hollow-bearing trees, prefers mature eucalypt dominated forest and woodland. Distributed along South-eastern Australia.	**Negligible**	No records and no suitable habitat within the study area.	
Pseudomys novaehollandiae	New Holland Mouse	VU	e		PMST	Coastal heathland, heathy woodland and dry sclerophyll forest.	**Negligible**	No records and no suitable habitat within the study area.	
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	e		PMST	Heathland, shrubland, sedgeland, heathy open forest and woodland; also exotic vegetation, such as blackberry thickets and rank grasses where native vegetation has been removed.	**Negligible**	No records and no suitable habitat within the study area.	
Pteropus poliocephalus	Grey-headed Flying-fox	VU	v	2010	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	**Low**	No permanent or temporary camps recorded within the study area. Few records from within the study area. Individuals are unlikely to fly from the closest nearby permanent camps (Bendigo, Geelong and Melbourne) to forage within the study area. Individuals may fly	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
								through the study area or forage occasionally when migrating, but are unlikely to inhabit it.	
Aprasia parapulchella	Pink-tailed Worm-Lizard	VU	e		PMST	Woodland and grassland with partially buried rocks.	**Negligible**	Study area is outside the species known range. Species is largely restricted to rocky woodland and grassland habitat in the greater Bendigo region.	
Delma impar	Striped Legless Lizard	VU	e		PMST	Natural temperate grassland, grassy woodland and exotic grassland.	**High**	Several records within the region. Suitable grassland habitat within the study area, particularly native grasslands and roadside vegetation north-west of Ballarat City. rarely recorded within an area without targeted surveys. Often recorded along remnant roadside grassland in agricultural land.	Native and exotic grasslands, particularly grasslands on cracking clay soil, with surface rock, and an open structure.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Litoria raniformis	Growling Grass Frog	VU	v	2019	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation. Prefers wetlands with emergent and floating vegetation, and low surrounding terrestrial vegetation. NOTE: Recent study identified two distinct subspecies within Vic. Subspecies within greater Ballarat region is *Litoria raniformis major*	**High**	Several recent records within the study area. Suitable habitat present at wetlands and waterways throughout the study area. Recent records at Winter Swamp, Winter Creek and Creswick Creek. Species is highly mobile and known to inhabit farm dams with suitable emergent vegetation, and low surrounding grassland and pasture. Species extent within the region likely to fluctuate depending on climate, with wetlands being abandoned and recolonised.	Still wetlands and slow-flowing waterways with emergent vegetation and surrounding low grasslands and pasture. Species known to inhabit Winter Swamp, Winter Creek, Creswick creek, and farm dams throughout the region.
Prototroctes maraena	Australian Grayling	VU	e		PMST	Adults inhabit cool, clear, freshwater streams.	**Low**	No local records. Minimal suitable stream habitat.	
Galaxias rostratus	Flat-headed Galaxias	CR	v		PMST	Still or slow-moving waters of rivers, billabongs, lakes and swamps.	**Low**	No local records. Study area is outside the species current range. Species is largely restricted to Murray-Darling river system.	
Galaxiella pusilla	Dwarf Galaxias	VU	e		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	**Negligible**	No local records. Study area is outside the species current range. Species restricted to wetlands east of Melbourne,	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
								between Daandenongs to Bairnsdale, and south-west Victoria around Portland.	
Maccullochella macquariensis	Trout Cod	EN	e		PMST	Streams characterised by a high abundance of large woody debris.	**Low**	No local records. Study area is outside the species current range. Species is largely restricted to Murray-Darling river system.	
Maccullochella peelii	Murray Cod	VU	e		PMST	A diverse range of stream habitats in the Murray-Darling basin; principally the main channels of rivers and their major tributaries.	**Low**	No local records. Study area is outside the species current range. Species natural distribution is the Murray-Darling river system, and was introduced to the Wimmera River, Yarra River, and several isolated lakes throughout Victoria.	
Macquaria australasica	Macquarie Perch	EN	e	1970		Streams with clear water and deep, rocky holes with abundant cover.	**Low**	No recent local records and few historic records from the study area. Minimal suitable habitat within the study area. Species natural distribution is Murray-Darling river system, and was introduced into the Yarra River, and several lakes and wetlands throughout Victoria.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Nannoperca obscura	Yarra Pygmy Perch	VU	v		PMST	Lakes, pools and slow-flowing streams with abundant aquatic vegetation.	**Low**	No local records. Species largely restricted to wetlands and river systems in southern Victoria, between the Barwon River and South Australian border.	
Synemon plana	Golden Sun Moth	VU	v	2011	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass.	**High**	Several recent records within the study area. Suitable grassland habitat throughout the study area. Majority of habitat within the study area is within private agricultural land, where the species is unlikely to be recorded without targeted surveys.	Native grassland supporting spear grasses and wallaby grasses, exotic grassland dominated by Chilean needle grass.
State significance									
Lewinia pectoralis	Lewin's Rail		v	2018		Swamps, dense riparian vegetation and saltmarsh.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly Lake Wendouree and Winter Swamp.
Ardeotis australis	Australian Bustard		cr	1954		Grassland, open dry woodlands of Mallee and mulga, arid heathland saltbush and bluebush.	**Negligible**	No recent records. Species is widely considered extinct from southern Victoria due to hunting, habitat loss and introduction of predators.	

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Grus rubicunda	Brolga		e	2020		Shallow freshwater and brackish wetlands with emergent vegetation for nest construction during the breeding season, larger wetlands during flocking season. Forages in crops, grassland and pasture. NOTE: Recent 2023 taxonomic changes to species name (Antigone rubicunda to Grus rubicunda), formally recognised by Birdlife Australia.	**High**	Numerous recent records within the study area. Suitable breeding and flocking habitat at wetlands throughout the study area. Records from Lake Burrumbeet, Winter Swamp and Lake Learmonth.	Shallow wetlands with emergent vegetation and surrounding grasslands, crops and pasture. Records from Lake Burrumbeet, Winter Swamp and Lake Learmonth.
Ardea intermedia plumifera	Plumed Egret		cr	2018		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Burrumbeet, Lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.
Ardea alba modesta	Eastern Great Egret		v	2019		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches. Breeds in trees standing in water.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Burrumbeet, Lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Ixobrychus dubius	Australian Little Bittern		e	2017		Freshwater swamps, lakes and rivers with dense reedbeds, saltmarsh and coastal lagoons.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly Lake Wendouree and Winter Swamp.
Anseranas semipalmata	Magpie Goose		v	2019		Swamps, lakes, sewage ponds, flooded pasture, dams.	**Medium**	Several recent records within study area. Occasional visitor to wetlands and flooded crops throughout the greater Ballarat region, permanent populations. Recent records from Lake Wendouree and Winter Swamp.	Occasional visitor to swamps, lakes and flooded pasture within the study area, particularly Lake Wendouree and Winter Swamp.
Spatula rhynchotis	Australasian Shoveler		v	2019		Variety of wetlands, with a preferance for large, parmanent, freshwater lakes/swamps with dense fringing vegetation.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Burrumbeet, Lake Learmonth, Lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.
Stictonetta naevosa	Freckled Duck		e	2019		Large freshwater wetlands, generally with dense vegetation.	**High**	Several recent records within study area. Suitable habitat at wetlands throughout the study area, including Lake Burrumbeet, Lake Learmonth, Lake	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
								Wendouree and Winter Swamp.	
Aythya australis	Hardhead		v	2019		Deep freshwater swamps and wetlands, with abundant aquatic and terrestrial vegetation for roosting. Can occur in sheltered estuaries.	**High**	Suitable habitat throughout the study area. Numerous recent records at dams, lakes, reservoirs and swamps within the study area.	Wetlands with aquatic and surrounding terrestrial vegetation. Widespread throughout the study area.
Oxyura australis	Blue-billed Duck		v	2019		Open or densely vegetated wetlands.	**High**	Several recent records within the study area. Suitable wetland habitat throughout the study area. Species regularly recorded at lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.
Biziura lobata	Musk Duck		v	2019		Deep, permanent freshwater wetlands with areas of open water and patches of dense aquatic vegetation.	**High**	Several recent records within the study area. Suitable wetland habitat throughout the study area. Species regularly recorded at lake Wendouree and Winter Swamp.	Wetlands with dense surrounding vegetation, particularly major lakes and swamps.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Accipiter novaehollandiae	Grey Goshawk		e	2019		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	**Medium**	Several recent records within the study area, including within central Ballarat along Yarowee River, and forests surrounding Mount Clear. Suitable partially cleared agricultural land. All-white morph recorded within the study area.	Forests, woodlands, roadside reserves and patches of remnant native vegetation within pasture. Remnant riparian habitat along Yarowee River.
Hieraaetus morphnoides	Little Eagle		v	2016		Woodland and open areas. Rabbits are a key component of their diet. Nesting occurs in mature trees in open woodland or riparian vegetation.	**High**	Several recent records and suitable nesting and foraging habitat throughout the study area. Key food source of rabbits are common throughout the study area.	Woodlands and agricultural land with remnant vegetation. Species likely to utilise the majority of the study area.
Haliaeetus leucogaster	White-bellied Sea-Eagle		e	2019		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	**Medium**	Occasional visitor to large wetlands within the study area, including Lake Burrumbeet, Lake Wendouree and Lake Learmonth. Unlikely to regularly inhabit the study area.	Species occasionally recorded at large wetlands, including Lake Wendouree, Lake Learmonth, and Lake Burrumbeet.
Lophoictinia isura	Square-tailed Kite		v	2019		Eucalypt woodlands, open forest and partially cleared farmland.	**High**	Several recent records and suitable habitat within the study area.	Woodlands, open forest and partially cleared agricultural land with patches of remnant native vegetation. Regularly recorded at Nerrina forests.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Falco subniger	Black Falcon		cr	2019		Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Mostly hunts over open plains and undulating land with large tracts of low vegetation. Primarily occurs in arid and semi-arid zones in the north, north-west and west of Victoria, though can be forced into more coastal areas by droughts and subsequent food shortages.	**High**	Several recent records and suitable habitat within the study area. Uncommon but widespread within the region.	Woodlands and partially cleared agricultural land with patches of remnant native vegetation, particularly around wetlands.
Ninox connivens	Barking Owl		cr	1989		Eucalypt forests and woodlands.	**High**	Several records and suitable habitat throughout the study area. Recent 2015 and 2016 records listed on Atlas of Living Australia.	Forests and woodlands, particularly those at Mount Helen and Nerrina.
Ninox strenua	Powerful Owl		v	2018		Eucalypt forests and woodlands, well-treed urban areas.	**High**	Recent local records. Species is known to inhabit dense forested areas surrounding Ballarat. One pair regularly recorded in forest surrounding the Federation University campus at Mount Helen.	Forests and woodlands, particularly those at Mount Helen and Nerrina.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Neophema elegans	Elegant Parrot		v	1886		Woodlands, open woody grasslands, partially cleared farmlands and the fringes of clearings in forests, tree-lined watercourses and Mallee environments.	**Low**	No recent records, study area is outside the species main distribution al range. Species largely restricted to western edge of Victoria.	
Gelochelidon macrotarsa	Australian Gull-billed Tern		e	2013		Floodplains, saltmarsh, claypans and flooded pasture.	**Medium**	Single record from within the study area at Lake Burrumbeet. Study area falls outside the species usual distribution within the region, and contains minimal suitable habitat. Species may occasionally visit the study area to forage above flooded pasture.	Wetlands and seasonally flooded agricultural land. Particularly Lake Burrumbeet and surrounding pasture.
Hydroprogne caspia	Caspian Tern		v	2018		Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	**High**	Several recent records from Lake Burrumbeet.	Wetlands and seasonally flooded agricultural land. Particularly Lake Burrumbeet and surrounding pasture.
Tringa glareola	Wood Sandpiper		e	2010		Well-vegetated shallow freshwater wetlands with emergent aquatic plants and dense fringing vegetation.	**High**	Recorded at Lake Wendouree. Potentially suitable habitat at wetlands throughout the study area, including Winter Swamp.	Well-vegetated shallow wetlands, particularly Lake Wendouree and Winter Swamp.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Actitis hypoleucos	Common Sandpiper		v	2018	PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	**High**	Several recent records at Lake Wendouree and Lake Learmonth.	Wetlands with muddy margins, particularly Lake Learmonth.
Tringa nebularia	Common Greenshank		e	2018	PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	**High**	Suitable wetland habitat throughout the study area. Several recent records at major lakes and swamps.	Wetlands throughout the study area, including major lakes and swamps.
Tringa stagnatilis	Marsh Sandpiper		e	2016		Permanent or ephemeral wetlands, mudflats and saltmarshes in coastal and inland environments.	**High**	Suitable wetland habitat throughout the study area. Several recent records at major lakes and swamps.	Wetlands throughout the study area, including major lakes and swamps.
Phascogale tapoatafa	Brush-tailed Phascogale		v	1991		Drier sclerophyll forests and woodlands.	**Medium**	Suitable forest and woodland habitat within the study area, including wooded habitat around Creswick, Mount Helen, Mount Bolton and Mount Beckworth.	Large patches of dry forest and woodland, particularly those surrounding Creswick, Mount Helen, Mount Bolton and Mount Beckworth.
Ornithorhynchus anatinus	Platypus		v	1991		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	**High**	Several records at wetlands and waterways within the study area. Records from Yarowee River, Bo Peep Creek, Lake Learmonth and St Georges Lake.	Large waterbodies and major creeks, particularly those with sections that remain full throughout the year. Records from Lake Learmonth, St

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
									Georges lake, Yarowee Creek and Bo Peep Creek.
Pseudemoia pagenstecheri	Tussock Skink		e	2004		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	**High**	Several recent records throughout the study area. Suitable grassland and grassy woodland habitat throughout the study area, including fringes of agricultural land and roadside reserves.	Grasslands and open grassy woodlands, including roadside reserves.
Pseudophryne bibronii	Brown Toadlet		e	1978		A wide variety of woodland, forest and grassland habitats, where it shelters under leaf litter and other debris in moist soaks and depressions. Breeds in swamps and inundated habitats, and along creek lines.	**Medium**	Several records and suitable habitat throughout the study area. Species rarely recorded without targeted surveys.	Seasonally damp depressions, creeks and swamps in a variety of woodland, forest and grasslands with leaf litter and debris.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking	Key habitat within the study area.
		EPBC	FFG						
Engaeus merosetosus	Western Burrowing Crayfish		e	2006		Primarily occurring along creeklines within the Geelong to Ballarat region, this species has also been recorded from the upper reaches of the Werribee River and the upper reaches of the Loddon and Tullaroop drainages. Specimens have been collected from shallow burrows below rocks in dry creek beds and in deeper burrows on banks.	**High**	Several recent records and suitable habitat throughout the study area. Species is rarely seen even when present. Burrows are often recorded, but species-level identification is usually impossible without trapping or excavation of burrows.	Creeklines and permanent wetlands with soft banks for burrow construction.

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