City of Melville

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Modified Reserves (Bassendean Soils) Strategic Management Plan 2020-2025

June 2020

Executive Summary

The Modified Reserves (Bassendean soils) are located in multiple suburbs on the eastern and southern sides of the City of Melville. The seven reserves (Alec Lambert Park, Elizabeth Manion Park, Fred Johnson Reserve, Harry Baker Park, Hugh Corbett Park, Jim Ainsworth Park, Red Gum Park and Trevor Knowles) include 4.64 hectares of bushland that has been moderately isolated from other terrestrial bushland remnants for approximately 50-70 years.

These reserves were rated lowest in terms of their overall ecological value in the NAAMP due to their small size and modified condition, however they still hold significant conservation values for the Bassendean South and Central vegetation complex, individual species and for ecological linkages across the City of Melville.

Of the assets targeted for monitoring and management, the 2 assets of regional, state and/or national significance were:

- 1 ecological community
  - Bassendean Vegetation Complex – Central and South
- 1 bird species
  - *Calyptorhynchus banksii naso,* Forest red-tailed Black Cockatoo

The 65 native plant species recorded onsite represent approximately 14% of the species recorded in the City of Melville:

- three tree species are at very high risk of local extinction:
  - *Banksia grandis* (1 plant)
  - *Banksia ilicifolia* (5 plants)
  - *Banksia attenuata* (2 or less individuals each at Hugh Corbett and Jim Ainsworth)
  - *Banksia menziesii* (2 plants each at Hugh Corbett and Jim Ainsworth)

The 22 native animal species (7 reptiles, 13 bird and 2 mammal species) recorded onsite represent almost 9% of species recorded in the City of Melville. Of these:

- 1 reptile (*Pygopus lepidopodus,* Common Scaly-foot) persists on site and has been identified as at risk within the City of Melville as it persists in few reserves or in low numbers across our natural areas.
- 1 bird (*Calyptorhynchus banksii naso,* Forest red-tailed Black Cockatoo) is listed as vulnerable and of national significance that utilises the Modified Reserves (Karrakatta soils) for feeding, and as a linkage between larger remnants, but unlikely for breeding
- 2 birds (*Pardalotus striatus* Striated Pardalote and *Phylidonyris novaehollandiae* New Holland Honeyeater) persist on site and have been identified as at risk within the City of Melville as they persist in few reserves or in low numbers across our natural areas.
- 1 mammal (*Chalinolobus gouldii* Gould's Wattled Bat) is sensitive to habitat loss and fragmentation and has been identified as at risk within the City of Melville as they persist in few reserves or in low numbers across our natural areas.

Of the threats considered for targeted monitoring and management, the high impact threats directly affecting the reserves were:

- 4 weed species/categories
  - *Asparagus asparagoides,* Bridal Creeper
  - *Schinus terebinthifolius,* Brazilian Pepper
  - 9 very large tree weeds
  - 30 Woody weed species
- 1 plant pathogen

    - *Phytophthora cinnamomi*, Dieback
- 2 weather events
    - High Temperatures
    - Low Rainfall

The major priorities for management should be:

- Increasing the Banksia species populations in low numbers and at risk of local extinction
- Establishing native grasses on site for increasing significant reptile species habitat
- Maintaining canopy and large habitat trees for persistence of significant bat and bird species
- Maintaining Bassendean South and Central vegetation complex
- Managing the impacts of *Phytophthora cinnamomi* at Alec Lambert by continuing Phosphite applications to maintain populations of Dieback-susceptible species
- Removal of one occurrence of Bridal Creeper, 4 occurrences of Brazilian Pepper, 9 very large weed trees and 30 woody weeds identified
- Addressing physical disturbance threats on site including illegal dumping

Recommended Reference

The recommended reference for this document is:

Fowler, K (2020) *Modified Reserves (Bassendean Soils) Strategic Management Plan 2020-2025,* City of Melville, Perth.

Acknowledgements

Acknowledgement of the contribution of personnel from Ecoscape who conducted surveys and collected the data displayed and used in this management plan.

Acronyms and Definitions

ANZECC	Australian and New Zealand Environment and Conservation Council
DBH	Diameter at Breast Height
DEC	(WA) Department of Environment and Conservation
DEP	(WA) Department of Environmental Protection
DPaW	(WA) Department of Parks and Wildlife
EPBC Act	Environment Protection and Biodiversity Conservation Act
FCT	Floristic Community Type
ha	hectares
Melville	City (rather than suburb) unless specifically stated otherwise
NAAMP	Natural Areas Asset Management Plan
PEC	Priority Ecological Community (as defined and listed by DPaW)
WAPC	Western Australian Planning Commission

Table of Contents

1 Introduction

1.1 Background

The City of Melville's *Natural Areas Asset Management Plan* (NAAMP) provides a framework for:

- consistently prioritising assets and threats;
- a format for plans; and
- community involvement in managing specific reserves:
- the community can assist during the preparation of strategic reserve plans in:
- the identification and benchmarking of assets and threats; and
- quantifying objectives for threats and goals for assets (e.g. specific number of very high value plants of a species to be established onsite).
- the community can assist during the life of strategic plans in:
    - the identification and delineation of additional assets (including revegetation sites) and threats;
    - the monitoring of assets and threats; and
- on-ground works in the context of specific and measurable goals.

In accordance with the NAAMP framework, the Strategic Reserve Plans form part of the integrated set of documents. The Strategic Reserve Plan is structured with the major headings of assets and threats, whereby assets are maintained or enhanced by the management of threats (using the strategies and guidelines). Please refer to the NAAMP 2019 for figures summarising the strategic framework and how these documents work together to manage our natural areas and reserves.

1.2 Objectives

Under the framework of the NAAMP, the objectives of this and all City of Melville Strategic Reserve Plan/s are to:

- document:
  - the extent and/or abundance and condition of assets;
  - the present and potential level and extent of impacts of threats;
  - any changes evident in the assets and threats over time;
  - reserve-specific risk-based management priorities;
  - management strategies relevant to the specific reserve; and
- discuss:
  - reserve specific application of strategies and make reserve specific recommendation regarding the implementation of strategies.

1.3 Scope

The scope of this report was the bushland and native tree portions (totalling 4.64 hectares) of:

- Alec Lambert Park
- Elizabeth Manion Park
- Fred Johnson Reserve
- Harry Baker Park
- Hugh Corbett Park
- Jim Ainsworth Park
- Red Gum Park
- Trevor Knowles

These reserves are all highly modified natural areas, located on Bassendean soils on the west side of the City of Melville, as shown in Figure 1.

Figure 1 Location of Reserves included in Plan

2 Assets

2.1 Overview

The City of Melville has committed to a strategic goal to 'contribute to the maintenance and enhancement of biodiversity for the preservation of our natural flora and fauna'.

The values of assets are reviewed periodically as they will occasionally change (e.g. the significance of an occurrence of a species may be downgraded if it is recorded in more reserves over time with additional targeted surveys). A change in the value of an asset is applicable to that asset in all natural areas in the City of Melville, including in reserves with current endorsed strategic reserve management plans.

Assets are used as indices where they are significant and/or vulnerable to loss or degradation without targeted action.

2.2 Reserve Assets

2.2.1 Bush Forever

Bush Forever Sites are properties listed as containing regionally significant bushland by the Government of Western Australia (2000). Bush Forever is not subject to ongoing revision and therefore the Bush Forever status of reserves is expected to remain unchanged for the foreseeable future. However under the NAAMP, Bush Forever status is considered in terms of:

- prioritising management resources between reserves, and
- managing sites and species within reserves to ensure reserves continue to meet the Bush Forever criteria for which they were listed.

None of the Modified Reserves (Bassendean Soils) were listed as Bush Forever Sites

2.2.2 Ecological Linkages

Ecological linkages can increase the effective size of flora populations, and increase available habitat for individual animals, and help maintain genetic diversity for animals and plants by providing connections between groups of animals and plants in isolated bushland remnants.

None of the Modified Reserves (Bassendean Soils) were included in

- Regional Linkages in Bush Forever (Government of Western Australia, 2000); or
- Perth Biodiversity Plan Regional Linkages; or
- Regional Greenways (Alan Tingay and Associates, 1998).
- NAAMP Ecological Linkages (City of Melville, 2019)

The bushland of the Modified Reserves (Bassendean Soils) has been moderately isolated from other terrestrial bushland remnants for at least 50 years, in some cases up to 70 years (for Alec Lambert and Jim Ainsworth). Red Gum Park remains the only reserve closely connected to remnant bushland, being located across the road from North Lake in the City of Cockburn.

This long time since isolation has modified their condition from remnant, however also indicates the significant age of some of the individual species still present. Aerial photography between 1953 and 2020 is shown in Figure 2 to **Error! Reference source not found.**7.

Figure 2 Remnant Vegetation in 1953

Figure 3 Remnant Vegetation in 1974

Figure 4 Remnant Vegetation in 2020

2.3 Site Assets

2.3.1 Ecological Communities

Assets are prioritised on the basis of their highest level of significance when they are assessed against multiple datasets. The significance of vegetation can be assessed in terms of several classifications:

- **Vegetation Complexes** are a regional classification for the Swan Coastal Plain, Darling Scarp and Darling Plateau mapped by Heddle *et al.* (1980) on the basis of combinations of plants communities, soils and landforms. Plant communities may occur in more than one soil-landform combination but the relative proportions of plant communities vary between these (Government of Western Australia, 2000).
- **Floristic Community Types** (FCTs) are a regional classification for the Swan Coastal Plain and Darling Scarp defined in terms of groups of co-occurring plants by Gibson *et al*. (1995) and the DEP (1996). Whilst FCTs are distributed in more of a mosaic than vegetation complexes, the classifications are equivalent in dividing the region into a roughly equal number of classes. There are some associations between FCTs and vegetation complexes (i.e. some FCTs tend to occur in particular complexes), but there is **no** hierarchical relationship between them. No FCTs were inferred for the Modified Reserves because there were no detailed reference sites or species inventories to compare species presence/absence between vegetation associations.
- **Vegetation Types** are a local classification in the City of Melville mapped by Ecoscape (2018) in terms of dominant overstorey species. The general descriptions of vegetation types were applied to avoid issues with minor discrepancies in interpretation of boundaries.

The vegetation is regionally significant, with less than 10% of the Bassendean Central and South vegetation complex remaining uncleared compared to pre-European extent within the City of Melville (Zelinova, 2014). City of Melville is high urbanised and with little native vegetation represented overall, this increases the significance of even small areas of remnant vegetation.

The modified reserves are small and have little remnant vegetation remaining, therefore distinct ecological community types were hard to identify and extents were not recorded. The vegetation types recorded in each reserve are listed in Table 1.

Table 1 Vegetation Types across Modified Reserves (Bassendean Soils)

Associations	Dominant / Typical / Indicative species	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbet	Jim Ainsworth	Red Gum	Total
Banksia woodland	*Banksia menziesii* *Corymbia calophylla* *Eucalyptus marginata*	0.42							**0.42 ha**
Banksia woodland	*Banksia menziesii* *Banksia attenuata* *Nuytsia floribunda*			0.84					**0.84 ha**
Corymbia/Banksia woodland	*Corymbia calophylla* *Banksia attenuata*				1.03				**1.03 ha**
Eucalyptus woodland	*Eucalyptus sp.* *Allocasuarina fraseriana*		0.96						**0.96 ha**
Scattered *Eucalyptus*	*Corymbia calophylla* *Eucalyptus marginata*					0.35	0.53	0.49	**1.37 ha**
Total		**0.42 ha**	**0.96 ha**	**0.84 ha**	**1.03 ha**	**0.35 ha**	**0.53 ha**	**0.49 ha**	**4.62 ha**

The vegetation does not meet the criteria for a Threatened Ecological Community under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as the

Banksia Woodland occurrences are less than 1 hectare in size and not in 'Pristine' condition or 'Excellent' condition.

The ecological communities for which objectives apply in the Modified Reserves (Bassendean Soils) are listed in Table 2.

Table 2 Ecological Community Sites

Vegetation Association	Vegetation Complex	Floristic Community Types	Vegetation Types
Banksia attenuata / Banksia menziesii woodland	Bassendean Central and South vegetation complex **High Significance** Less than 10% pre-european extent remaining	Not Determined	Eucalyptus and Banksia species on upland areas **Low Significance** Multiple occurrences in Melville

2.3.2 Fauna Habitat

Very large trees are important habitat sites for a number of resident and migratory birds and bats onsite:

- many birds rely on tree hollows (Birdlife Australia, 2013);
- roost sites (in tree hollows and under flaking/rough bark) are a critical habitat requirement for bats (Hosken, 1996); and
- The size of trees is one of the critical factors in determining the likelihood of hollow formation in trees (Gibbons & Lindenmayer, 2002).

The density of very large trees in bushland areas in the Modified Reserves (Bassendean Soils) is compared to other reserves in Melville in Table 3.

Table 3 Numbers of Very Large Trees per Hectare in Modified Reserves

Species	Modified Reserves	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (Infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Central (modified) (2 reserves)	Central (2 reserves)
Live Native	<1	2	8	6	12	17	18	4	3	1	2	5	6
Dead	<1	0	1	<1	0	2	3	0	<1	0	0	0	<1
Total	**<1**	**2**	**9**	**6**	**13**	**19**	**21**	**4**	**3**	**1**	**2**	**5**	**6**

The density of habitat trees in the Modified Reserves was low compared to other reserves in the City of Melville.

The fauna habitat for which objectives apply are listed in Table 4, which reflects that the number of very large trees was not previously benchmarked for the Modified Reserves, and that it is assumed they have been maintained.

Table 4 Fauna Habitat Sites Indices

Values	Habitat Sites	Trees / Hectare 2014	Trees / Hectare 2019	Assets 2014-2019
Medium Very Large Trees	Live Native Tree	No Data	<1	Maintained (assumed unchanged)
	Dead Tree		<1	

The locations of the very large dead trees and live native trees (trunk diameter at breast height greater than 60 cm) are shown in Appendix 3.

The numbers of very large trees by species are listed in Table 5. The majority of very large trees were weed species rather than native species.

Table 5 Numbers of Very Large Native Trees by Species

Reserve (Bassendean)		**Alec Lambert Park**	**Elizabeth Manion Park**	**Fred Johnson Park**	**Harry Baker Park**	**Hugh Corbet Park**	**Jim Ainsworth Reserve**	**Red Gum Park**	**Species Total Count**
Species									
Native Trees	*Agonis flexuosa*				2				**2**
	Corymbia calophylla	1	2	1	1		13	5	**23**
	Eucalyptus gomphocephala		1		1				**2**
	Eucalyptus sp.		14		8	1			**23**
	Eucalyptus marginata			3	3	3	2	1	**12**
	Total Native Trees	**1**	**17**	**4**	**15**	**4**	**15**	**6**	**62**
	Dead Trees							1	**1**
Weed Trees	*Ficus* sp.		1						**1**
	Pinus pinaster	1							**1**
	Corymbia citriodora	1	1		4		2		**8**
	Eucalyptus cladocalyx		10	7					**17**
	Eucalyptus salmonophloia		8						**8**
	Eucalyptus botryoides		6			1			**7**
	Total Weed Trees	**2**	**36**	**7**	**4**	**1**	**2**		**52**
	Species Total Count	**3**	**53**	**11**	**19**	**5**	**17**	**7**	**116**

2.3.3 Wetlands

Wetlands are defined in Schedule 5 of the *Environmental Protection Act 1986* as areas 'of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary'.

There are no wetland indices for the Modified Reserves (Bassendean Soils). The reserves contain no wetland sites identified in the DPaW's *Geomorphic Wetlands Swan Coastal Plain* dataset, based on the mapping of Hill *et al.* (1996).

2.3.4 Heritage

There are no heritage indices for the Modified Reserves (Bassendean Soils) as there were no heritage sites listed on:

- The National Heritage List;
- WA Aboriginal Sites Register;
- the WA Heritage Register; or
- the City of Melville's Municipal Heritage Inventory.

2.3.5 Community Interest

Revegetation sites can be a focus for community interest as these are visible manifestations of natural area management, and the public is often directly involved in their proposal or implementation.

There is a community group at Red Gum Park, Kardinya, who undertake revegetation works and maintenance. There have also been native plantings undertaken by Oberthur Primary School students at Elizabeth Manion Park as part of the Urban Forest Strategy. There are no bird/bat boxes in the Modified Reserves (Bassendean soils).

Table 6 Community Interest Sites

Community Interest Sites	Alec Lambert Park	Elizabeth Manion Park	Fred Johnson Park	Harry Barker Park	Hugh Corbet Park	Jim Ainsworth Reserve	Red Gum Park	Total
Local Native Plantings		X					X	**0**
Closed Tracks								**0**
Bird / Bat Boxes								**0**

The community interest sites for which objectives apply are listed in Table 7.

Table 7 Community Interest Site Indices

Values	Community Interest Sites	Completion Criteria Met 2008-2017	Completion Criteria Met 2017-2020	Assets 2017-2020
Medium Revegetation Sites **Medium**	Local Native Plantings	No data	Planting sites maintained	Assets maintained
	Bird/Bat Boxes	None	None	Change Not Assessable

2.3.6 Reference

Reference sites provide opportunities for long-term monitoring and research. There are no reference indices for the Modified Reserves (Bassendean Soils) as no reference sites have been established.

2.4 Species

2.4.1 Native Flora

The Modified Reserves (Bassendean soils) support 65 native plants, approximately 14% of species recorded in natural area reserves in the City of Melville. In the 2017 surveys the flora inventory for each reserve was:

- 26 species in Alec Lambert
- 33 species in Elizabeth Manion
- 31 species in Fred Johnson
- 31 species in Harry Baker
- 6 species in Hugh Corbett
- 6 species in Jim Ainsworth
- 4 species in Red Gum Park

The flora inventory is included in Table 34 in Appendix 1.

Plants in the Modified Reserves (Bassendean soils) are to be managed as similar but independent populations due to the highly fragmented nature and distance between reserves (assuming a lack of interbreeding through dispersal of seed or pollen). Reserves within 5-20km of each could be considered part of a meta-population (Young, Broadhurst, Byrne, Coastes, & Yates, 2005) and be managed for overall viability of the species across those reserves, with sub-populations on each site also requiring monitoring.

The indices for plants are listed in Table 8.

Table 8 Plant Indices

Values	Plants	Status 2015	Status 2016	Assets 2015-2017
Medium Present in many Melville reserves, but in low abundance or decline	*Banksia grandis*	Assumed present	1 plant	4 species Maintained
	Banksia ilicifolia		5 plants	
Low Present in many Melville reserves, but in low abundance or decline	*Banksia attenuata*		43 plants	
	Banksia menziesii		90 plants	

Plants at High Risk of Local Extinction

Banksia trees (Table 10 below):

- *Banksia grandis,* Bull Banksia:
  - Only one individual recorded in the Modified Reserves (Bassendean soils)
- *Banksia ilicifolia,* Holly-leaved Banksia:
  - Only 5 individuals recorded in the Modified Reserves (Bassendean soils)
- *Banksia attenuata,* Candle-stick Banksia:
  - Only 1 and 2 individuals respectively recorded in Hugh Corbet Park and Jim Ainsworth, although more highly represented across other reserves within the Modified Reserves (Bassendean soils).
  - Only 9 individuals recorded at Alec Lambert Park which has a known dieback infestation
- *Banksia menzeisii*, Firewood Banksia:
  - Only 2 individuals recorded in Hugh Corbet Park and Jim Ainsworth Reserve, although more highly represented across other reserves within the Modified Reserves (Bassendean soils).

The Modified Reserves (Bassendean soils) support a small proportion of Banksia trees compared with other City of Melville reserves, with the exception of Fred Johnson Park. See below for a comparison to other City of Melville reserves in Table 10.

Table 9 Number of Banksia Trees in Modified Reserves (Bassendean soils)

Species	Alec Lambert Park	Elizabeth Manion Park	Fred Johnson Park	Harry Barker Park	Hugh Corbet Park	Jim Ainsworth Reserve	Red Gum Park	Total Species Count
Banksia attenuata	9		25	6	1	2		**43**
Banksia grandis				1				**1**
Banksia ilicifolia				5				**5**
Banksia menziesii	27	3	41	15	2	2		**90**
Banksia prionotes								**0**
Total Species Count	**36**	**3**	**66**	**27**	**3**	**4**	**0**	**139**

Table 10 Number of Banksia Trees in City of Melville Reserves

Species	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (Infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Modified Reserves (11 reserves)	Central (2 reserves)	Total (35 reserves)
Banksia attenuata	16	578	28	22	>26*	98	7	2218	110	10	68	207	**3388**
Banksia grandis	5	6	0	5	13	1	0	7	24	3	1	4	**69**
Banksia ilicifolia	6	138	16	22	1	0	0	4	0	0	5	1	**193**
Banksia littoralis	0	23	0	0	0	4^	0	0	91	140	0	0	**258**
Banksia menziesii	48	694	152	78	>74*	177	40	1529	202	20	141	180	**3335**
Banksia prionotes	0	0	52^	0	0	168	0	0	0	0	15	0	**235**
Total	**75**	**1439**	**248**	**127**	**114**	**448**	**47**	**3758**	**427**	**173**	**230**	**392**	**7478**

All trees counted except where * indicates only trees with trunk >30 cm diameter counted
^assumed planted

Plants at Moderate Risk of Local Extinction

Banksia trees (**Error! Reference source not found.** in Appendix 3):

- *Banksia attenuata,* Slender Banksia and *Banksia menziesii,* Firewood Banksia:
  - are both susceptible to dieback, and have been recorded in Alex Lambert Park which has a known dieback infestation;

Plants Extinct or Not Confirmed Onsite

No plants were confirmed extinct. The focus of the 2017 flora survey was increasing the flora inventory as many of these reserves had not previously been comprehensively surveyed.

Native Species to be Managed as Weeds

A number of species native to Western Australia have been planted, some of which do not naturally occur onsite. Detailed planting records were not available and a comprehensive audit of plantings was not conducted, but it is noted that introducing different forms of species, as well as non-local species, can also result in negative impacts in terms of hybridization and competition, especially for significant isolated populations of native species targeted for monitoring and management.

The species that naturally occur on the Swan Coastal Plain, but could possibly be introduced as plantings into the Modified Reserves (Bassendean soils) is listed in Table 11.

Table 11 Native Coastal Plain Plants possibly introduced/of dubious origin to Reserves

Species	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett
Callitris preissii	1	1		
Hibbertia cuneiformis	1			
Melaleuca lanceolata	1			
Agonis flexuosa	1		1	1
4	**4**	**1**	**1**	**1**

2.4.2 Native Fauna

The 22 native animal species (7 reptiles, 13 bird and 2 mammal species) recorded onsite represent almost 9% of species recorded in the City of Melville. The fauna recorded in 2017 in the Modified Reserves (Karrakatta soils) is listed in Appendix 2.

Mammals

Two native mammals (both bat species) were confirmed in the Modified Reserves (Karrakatta soils) in 2017. 1 mammal indicator species is listed in Table 15 below and requires ongoing monitoring.

Table 12 Mammal Indices

Values	Birds	Status Pre-2017	Status 2017	Assets 2017
Low Bushland dependent species recorded in more than 2 Melville reserves	*Chalinolobus gouldii* Gould's Wattled Bat	Assumed Present	Confirmed Present	1 species Maintained

Reptiles and Amphibians

Each reserve is a separate management and monitoring unit for reptiles and amphibians. Each reserve is likely to support independent resident populations without the potential for unassisted re-colonisation if extinction occurs in an individual reserve. Most reptile species are sedentary and of low mobility, suggesting that they may have limited capacity to move between patches of habitat isolated by clearing or land-use (Wilson & Valentine, 2009).

7 native reptile species were confirmed in the Modified Reserves (Bassendean soils) in 2017, 5 skinks and 2 lizard species. Skinks are relatively persistent in urban bushland as they are the only reptiles whose diversity is not correlated with the size of remnants on the Swan Coastal Plain (How & Dell, 2000). The Western Bobtail lizard *Tiliqua rugosa rugosa* was recorded at Fred Johnson, which had the highest diversity of reptile species recorded at it out of the Modified Reserves (Bassendean soils).

Table 13 Reptilel Indices

Values	Birds	Status Pre-2017	Status 2017	Assets 2017
Low At-risk species in City of Melville	*Pygopus lepidopodus* Common Scaly-foot	Assumed Present	Confirmed Present	1 species Maintained

Birds

The Modified Reserves (Bassendean soils) are spatially distant from one another, however will be treated as a single management and monitoring unit for birds. In urban environments areas of low overall habitat cover, the degree of connectivity may influence

species richness to a greater extent than small differences in patch size, and species persistence may depend upon the occurrence of several populations and dispersal between them (Wilson & Valentine, 2009).

Of the 13 native bird species confirmed in the Modified Reserves (Karrakatta soils), 3 are listed as indicator species in
Table 14.

Table 14 Bird Indices

Values	Birds	Status Pre-2017	Status 2017	Assets 2017
Very High Matter of National Environmental Significance under EPBC Act 1999 (vulnerable)	*Calyptorhynchus banksii naso* Forest Red-tailed Black-Cockatoo	Assumed Present	Confirmed Present	1 species Maintained
Low Bushland dependent species recorded in more than 2 Melville reserves	*Phylidonyris novaehollandiae* New Holland Honeyeater	Assumed Present	Confirmed Present	2 species Maintained
	Pardalotus striatus Striated Pardalote	Assumed Present	Confirmed Present	

Striated Pardalote and New Holland Honeyeater are both bushland dependent birds that have been identified as being at risk within the City of Melville, due to being recorded in few reserves or in low numbers across the City. Striated Pardalote are dependent on large habitat trees and adequate canopy cover in order to persist (Pizzey & Knight, 2012). New Holland Honeyeaters are at the lower end of sensitivity to habitat loss and fragmentation due to urbanisation, of the bushland dependent birds in Perth (Davis, Gole, & Dale Roberts, 2012).

Calyptorhynchus banksii naso, Forest red-tailed Black-Cockatoo, is listed as vulnerable, and evidence of these birds utilising the Modified Reserves (Karrakatta soils) for feeding, and as a linkage between larger remnants was confirmed.

- Sites such as these may form part of a valuable network of habitat remnants providing food resources, especially given the potential for removal of historical pines throughout Melville. It may also be important for the survival of the Cockatoos that reserves are not only retained, but also that native vegetation is maintained in good condition (Gole, 2003).
- Non-breeding feeding habitat is particularly important within 6 km of roost sites (DEC, 2012) and there are confirmed roost sites at Wireless Hill (Ardross), Piney Lakes (Winthrop) and Shirley Strickland Oval (Ardross).
- These birds are granivores, so a dominant overstorey of Eucalypts, Banksia and Sheoaks represents a significant food source; and
- Movement corridors with breaks of less than 4 km between other foraging, breeding and roosting sites are important to allow the birds to move between these areas. (Department of Sustainability, Environment, Water, Population and Communities, 2013).

The critical habitats for birds to be considered in revegetation are summarised in Table 15.

Table 15 Bird Habitat Considerations for Revegetation

Bird	Habitat				Diet			
	Breeds Onsite	Trees Only	Hollows	Bushland	Seed/Plants	Invertebrates	Nectar	Vertebrates
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo	N		X	X	X			
Phylidonyris novaehollandiae New Holland Honeyeater	?			X			X	
Pardalotus striatus Striated Pardalote	?		X	X		X		

? = Possibly but no existing records to confirm nesting

Invertebrates

There have been no systematic surveys for invertebrates in bushland in the City of Melville, and no records exist for invertebrates in the Modified Reserves (Bassendean soils).

3 Threats

3.1 Overview

The NAAMP identified the ten most significant threats to natural areas in the City of Melville and details the impacts they can have. These threats (with the exception of stormwater and reticulation, which are specific to small bushland remnants in an urban environment) align with major biodiversity threatening processes.

The significance of threats can be assessed in a similar manner to that used for assets as indicated in Figure 5.

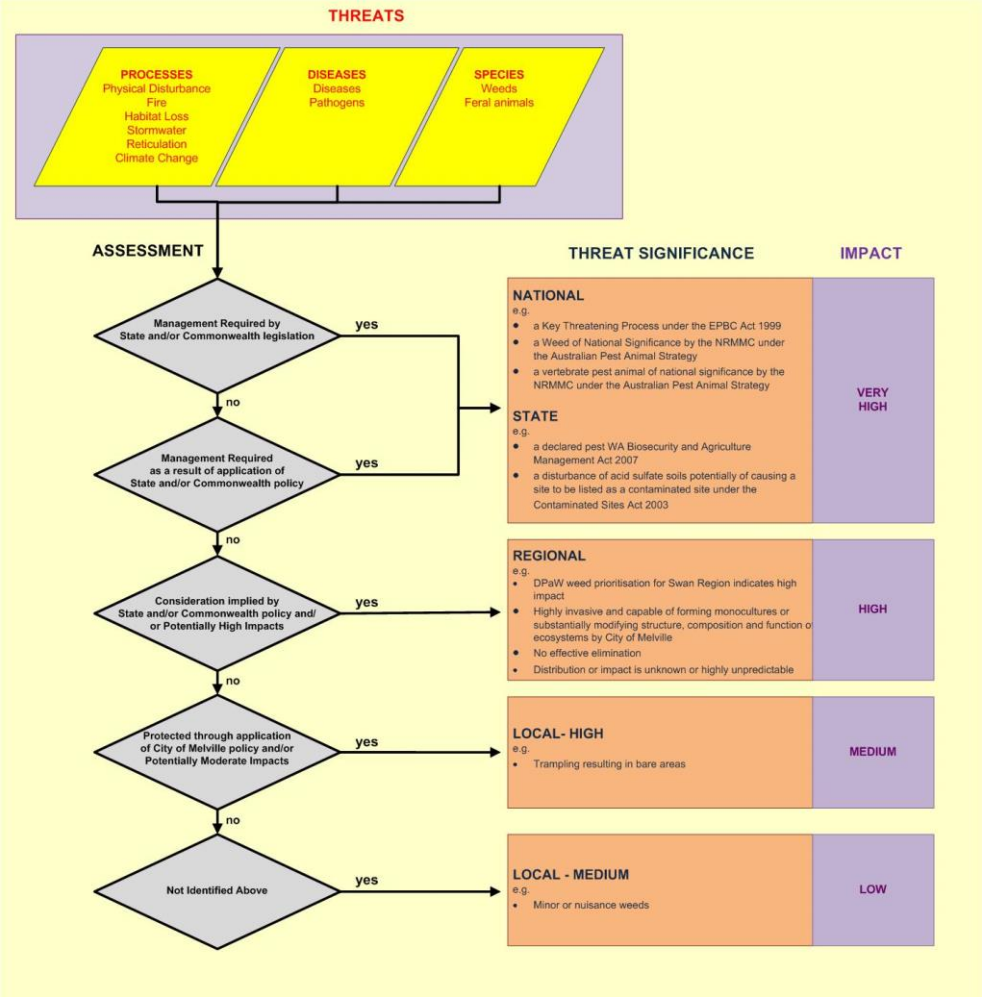

Figure 5 Assessment of Threats in Natural Areas

3.2 Physical Disturbance

There is limited data for physical disturbance available, but where there was little evidence of any disturbances onsite in 2017, an assumption was made that it was minimal for 2017-2020. There is evidence of informal bike track building in Fred Johnson Park, garden and other rubbish dumping occurrences, and informal tracks at several reserves.

Table 16 Physical Disturbance Indices

Impacts	Physical Disturbance	Disturbances 2008-2017	Disturbances 2017-2020	Threats
High Potential to substantially change ecosystem structure, composition or function	Clearing for utilities	No Data	Minimal	1 Threat Contained
Medium Potential to moderately change ecosystem structure, composition or function	Trampling		Moderate	2 Threats Contained 3 Threats Managed
	Sediment/Erosion		Minimal	
	Rubbish Dumping		Moderate	
	Tree Poisoning, Illegal Clearing, Firewood Collection		Minimal	
Medium Potentially costly remediation	Vandalism		Moderate	

3.3 Fire

An individual fire may not necessarily be a threat to the biodiversity, as the flora and fauna of the region has evolved in the context of, adapted to, and in part depends upon, fire. However modified fire regimes (characterised in terms of intensity, frequency, season and scale), especially in the context of external factors such as habitat fragmentation and climate change can lead to the decline and/or local extinction of species.

The two fire scenarios that were identified in the NAAMP as potential triggers for local extinctions of vulnerable species were:

- Large Fires (a fire burning more than one third of a reserve); and
- Repeat Fires (fires burning the same portions of a reserve within eight years).

Table 17 reflects that there was no evidence of large or repeat fires from 2017-2020.

Table 17 Fire Indices

Impacts	Fires	Extent of Fires 2008-2017	Extent of Fires 2017-2020	Threats
High Potential for local extinctions of ground dwelling species	Large fires	No data	0 ha	2 Threats Prevented
High Potential for local extinctions of trees and shrubs that regenerate only from seed stored on the plant	Repeated fires		0 ha	

3.4 Weeds

The 53 weed species recorded in the Modified Reserves (Bassendean Soils) are listed in Appendix 1. Most of the very high impact weeds have been prevented or contained, with the most widespread weeds being annual and perennial clumping grasses and other annual weeds.

The extents of weeds in 2017 (based on presence at 73 reference points in a grid with 30 metre spacing) are listed in Table 18, with distributions mapped in Appendix 4. The following assumptions were made in terms of trends:

- weeds were prevented if not observed in 2017 survey;
- weeds were contained if localised (< 50% of grid points in 2017 survey); and
- weeds were not assessable if widespread (>50% of grid points in 2017 survey).

Table 18 Weed Indices

Impact	Weeds	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum	Total	Threats
Very High	Arum Lily Blackberry Golden Dodder Lantana Madeira Vine Narrowleaf Cottonbush One Leaf Cape Tulip Tamarisk Willows Asparagus Fern Paterson's Curse Soldiers	0%								12 weeds Prevented
	Bridal Creeper			<50%						1 weed Contained
	Brazilian Pepper	<50%		<50%						2 weeds Contained
	Very Large Trees	2	36	7	4	1	2	0	52	
	Perennial Clumping Grass	>50%	>50%	>50%	<50%				Widespread	1 weed Not assessable Contained in 1 reserve
High	Giant Grasses	0%								1 weed prevented
	Annual Clumping Grass	>50%	>50%	>50%	>50%				Widespread	1 weed Not assessable
	Perennial Running Grass	<50%		<50%	<50%				Localised	3 weeds Contained
	Clumping Geophytes			<50%	<50%				Localised	
	Shrubs and Trees	<50%	<50%	<50%	<50%		<50%	<50%	Localised	
Medium	Perennial Weeds	<50%	>50%	<50%	>50%				Widespread	2 reserves Not Assessable 2 reserves Contained
Low	Annual Weeds	>50%	>50%	<50%	>50%				Widespread	1 weed Not Assessable

A site-based approach should be applied to prioritising woody weeds for removal with a focus on shrub and tree weeds in the vicinity of key assets, as well as removing shrub and tree weed species in low numbers. The number of individual weed plants of selected weeds are indicated in Table 19.

Table 19 Number of Plants in 2017 of Selected Weeds

Impact	Weeds	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum	Total
Very High	Brazilian Pepper	3		2					**5**
	Very Large Trees	2	36	7	4	1	2		**52**
High	Shrubs and Trees	9	10	12	1		3	1	**36**
	Total	**14**	**46**	**21**	**5**	**1**	**5**	**1**	**93**

3.5 Habitat Loss

Habitat loss has been mapped in two ways, based on weed coverage and percentage bare ground. This method has been used instead of bushland condition rating as it is more quantitative in its assessment.

The extent of weed coverage is indicated in Table 20. The distribution of total weed cover at each grid point is shown in Figure 6

Table 20 Cover of All Weeds Combined

Category	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
0%	0%	0%	0%	0%	No Data		
1-5%	78%	11%	0%	8%			
6-25%	11%	33%	59%	50%			
26-100%	11%	56%	41%	42%			
Total	**100%**	**100%**	**100%**	**100%**			

The extent of bare ground is categorised in Table 21. The distribution of total bare ground is shown in Figure 20.

Table 21 Bare Ground Cover

Category	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
0%	0%	0%	0%	0%	No Data		
1-5%	11%	0%	41%	0%			
6-25%	89%	89%	59%	33%			
26-100%	0%	11%	0%	67%			
Total	**100%**	**100%**	**100%**	**100%**			

The habitat loss indices are listed in

Table 22.

Table 22 Habitat Loss Indices

Impact	Habitat Loss	% of Reserve Pre-2017	% of Reserve 2017	Threat Pre 2017-2017
Medium Process of moderate ecosystem function modification • Reduced natural regeneration • Increased fire or erosion risk	Weed Cover > 25%	No Data	38%	Change Not Assessable
Low Process of low ecosystem function modification • Reduced natural regeneration • Increased fire or erosion risk	Bare Ground > 25%		20%	

Figure 6 Cover of All Weeds Combined for each reserve

Figure 20 Cover of Bare Ground for each reserve

3.6 Feral Animals

Feral animal populations are not surveys for abundance, but presence/absence can be determined based on sightings or evidence through the City's feral animal control program and surveys, as indicated in Table 23.

Table 23 Feral Animal Records

Feral Animal		Status 2017	Status 2020
Mammals	*Oryctolagus cuniculus,* Rabbits	Not Present	Assumed Not Present
	Vulpes vulpes, Foxes		
	Felis catus, Feral Cats		
	Mus musculus, House Mice		
	Rattus norvegicus, Brown Rat		
	Rattus rattus, Black Rat		
Birds	*Streptopelia chinensis,* Spotted Dove	Confirmed Present	Assumed Present
	Trichoglossus haematodus, Rainbow Lorikeet		
Insects	*Apis mellifera,* Feral Honeybee	Not Present	Assumed Not Present

Oryctolagus cuniculus, rabbits, were not recorded in 2017. *Vulpes vulpes,* foxes, are assumed absent although foxes could pass through these reserves, but they are likely too small to utilise for creation of dens. *Felis catus,* cats, were not recorded although there is possibility of domestic cats using local reserves.

The indices for feral animals are only for those species for which some control is practical and effective. The indices are listed in Table 24, with an occurrence defined as specific sightings of dens, warrens, hives or animals.

Table 24 Feral Animal Indices

Impact	Feral Animal	Occurrences 2008-2017	Occurrences 2017 - 2020	Threat 2017-2020
Very High Key Threatening Process under the EPBC Act 1999	*Oryctolagus cuniculus*, Rabbit	No Data	Absent	Assumed Prevented
	Vulpes vulpes, Fox			
	Felis catus, Feral Cat			
High Competition with native birds for hollows and food (impact level variable)	*Apis mellifera,* Honeybee			

3.7 Diseases and Pathogens

Phytophthora cinnamomi, Dieback, is a microscopic water mould that weakens or kills the plants by reducing or stopping the movement of water and nutrients within the plant (Dieback Working Group, 2000), and 'is one of the major threats to the biodiversity of Western Australia's ecosystems' (DEC, 2010).

Whilst no recent dieback mapping has been undertaken in any of these reserves, Alec Lambert was identified as being infested with some protectable vegetation by Glevan Consulting (2010), and the rest were deemed 'un-protectable' and were recommended to be managed as if they were infested (on the basis that either the vegetation was severely degraded or contained no Dieback disease indicating species to determine whether an infestation was present).

Armillaria luteobubalina, Honey Fungus, is an indigenous parasitic mushroom that is widespread in south west Western Australia that causes decay in roots and stems that can result in the death of the host plant (Shearer, 1994). Whilst no targeted surveys have been undertaken, it is assumed to be absent from the Modified Reserves (Bassendean soils).

- no occurrences of *Armillaria luteobubalina* have been documented in the City;

- there were also no opportunistic observations of patches of dead susceptible plants, or the parasitic mushroom itself; and
- it occurs most frequently in coastal dunes, and forests east of the Darling Scarp, and rarely occurs in the acidic sands of the Bassendean Dune system (Shearer, 1994).

The diseases and pathogens for which objectives apply are listed in Table 25.

Table 25 Disease and Pathogen Indices

Impact	Diseases and Pathogens	Extent 2011	Extent 2017	Threat 2017-2020
Very High Key Threatening Process under the EPBC Act 1999	*Phytophthora cinnamomi* Dieback	Alec Lambert 100% infestation	Assumed unchanged	Assumed Contained
Medium Native species capable of moderate modification of structure and composition of flora by killing multiple species	*Armillaria luteobubalina* Honey Fungus	No Data	Assumed Absent	Assumed Prevented

3.8 Stormwater

There are no stormwater discharge points into the reserves.

There are no water quality indices for which objectives apply in the Modified Reserves (Bassendean soils) as these only apply in bushland where the stormwater is discharged into an open waterbody. Any erosion/sedimentation associated with the stormwater outlets is monitored as a physical disturbance and would be discussed in Section 3.2 if applicable.

3.9 Reticulation

There is reticulated lawn adjacent to bushland in Alec Lambert, Elizabeth Manion, Harry Baker, Hugh Corbett, Jim Ainsworth and Red Gum Park, however there have been no reported instances of additional water being applied to the bushland. The indices for reticulation are listed in Table 26, with an occurrence defined as specific sightings of excessive drift or leaking.

Table 26 Reticulation Indices

Impact	Water Sources	Occurrences 2008 - 2017	Occurrences 2017 - 2020	Threat 2017-2020
Low Alteration of Surface Water Flows	Overspray / leakages from reticulation	No Data	No Data	Assumed Contained

3.10 Acid Sulfate Soils

Acid Sulfate Soil (ASS) reactions can potentially occur where:

- excavations are dug below the minimum level of the watertable; and/or
- groundwater extraction results in oxidation of soils previously permanently saturated by lowering the minimum level of the watertable.

The Modified Reserves (Bassendean soils) fall mostly into moderate risk category for the occurrence of ASS (NAAMP, 2019).

There is no evidence of any ASS reactions previously occurring in the Modified Reserves (Karrakatta soils), and no documented excavations or groundwater extraction has occurred, as reflected in Table 27.

Table 27 Acid Sulfate Soil Indices

Impact	Potential Initiation of ASS Reactions	Occurrences 2008 - 2017	Occurrences 2017 - 2020	Threat 2017-2020
Very High An occurrence of could result in the reserve being listed as a contaminated site under the Contaminated Sites Act 2003	Excavations below the minimum level of the watertable	No Data	0	Assumed Prevented
	Groundwater extraction resulting in lowering of minimum level watertable		No Data	

3.11 Climate Change

The climate trend is for hotter and drier weather. During the period 2008-2019 average annual rainfall has shown to be decreasing and mean annual temperature has shown to be increasing for nearby Perth Airport, as shown in **Error! Reference source not found.** (Bureau of Meteorology 2020).

In 2017 when the surveys were undertaken, August and September were wetter than in 2008 and 2019 years, however April, May and Jun were particularly dry months compared to other years, which may have had an impact on the flora species recorded in the surveys.

Climate Data- Perth Airport (9021)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual total
Rainfall													
Monthly Total 2008	0.0	39.6	16.2	135.0	59.8	170.0	213.6	19.0	66.8	33.8	69.0	5.4	828.2
Monthly Total 2017	39.8	89.8	19.8	0.0	57.0	54.8	181.8	149.2	81.2	26.0	1.8	28.2	729.4
Monthly Total 2019	5.8	0.8	4.8	35.2	12.4	175.0	101.0	117.2	31.8	23.4	15.0	2.2	524.6
Temperature													
Monthly mean 2008	33.8	32.7	30.0	24.3	22.7	19.7	17.9	19.4	20.5	24.1	23.9	28.6	24.8
Monthly mean 2017	32.0	30.3	28.3	27.5	22.9	21.5	18.1	18.8	20.8	23.2	30.0	30.6	25.3
Monthly mean 2019	31.3	32.2	31.0	26.0	22.5	19.6	19.3	20.2	23.1	24.7	29.8	33.9	26.1

No objectives apply to containing or preventing climate change as extreme weather events as the threat can only be addressed indirectly through management of impacts to assets.

4 Management

4.1 Review of Management 2008-2020

4.1.1 Key Performance Indicators

On-ground works were undertaken including maintenance, weed control, plantings and removal of illegal dumpings, although most were not fully documented. There was no previous management plan for Modified Reserves (Bassendean soils), so no audit of these works was undertaken.

4.2 Management Objectives 2020-2025

4.2.1 Leading Indicators

Leading indicators are associated with changes in the density / abundance / extent / occurrences of threats. The levels of acceptable changes are determined in the framework established in the NAAMP as summarised in Table 28 and applied in Table 29 and Table 30.

Table 28 Tiered Objectives for Threats and Associated Leading Indicators

Objective	Leading Indicator	Applicable When
Prevent	• Prevent introduction to or occurrence of	• Threat absent from reserve • Unplanned Introduction Possible
Eliminate	• reduce rate of density / abundance / extent (Eventual complete removal, but in short term may only reduction of numbers or prevention of seed set onsite)	• Large discrepancy between current and potential impact • Potential impact high • Elimination feasible
Contain	• Stop, restrict, or reduce rate of spread or frequency of occurrence	• Moderate discrepancy between current and potential impact • Potential but not current impact high • Elimination not feasible
Manage	• Limit negative impacts on assets	• Small discrepancy between current and potential impact • Threat “naturalised” or near maximum extent • No information on density/abundance/extent
None	• Not Applicable	• Threat absent from reserve • Only Planned Introduction Possible

Table 29 Objectives for Weed Species

Objective	Impact	Weed Species / Group	2017 Extent	Comments
Prevent	Very High	Arum Lily Blackberry Golden Dodder Lantana Madeira Vine Narrowleaf Cottonbush One Leaf Cape Tulip Tamarisk Willows Asparagus Fern Paterson’s Curse Soldiers	0%	Not Present Onsite
	High	Giant Grasses		
Eliminate	Very High	Brazilian Pepper	6	Eliminate 4 plants at Alec Lambert and 2 plants at Fred Johnson
		Bridal Creeper	1	Eliminate 1 plant at Fred Johnson
		Very Large Trees	9	Elimination of large trees in low numbers at Alec Lambert and Fred Johnson
	High	Trees and Shrubs	30	Eliminate 30 woody weeds: Alec Lambert

				• *Acacia iteaphylla* • *Agave Americana* • *Grevillea robusta* • *Olea europaea* • *Pelargionium capitatum* • *Pinus pinaster* Elizabeth Manion • *Acacia baileyana* • *Acacia iteaphylla* • *Acacia longifolia* • *Leptospermum laevigatum* • *Olea europaea* Fred Johnson • *Acacia iteaphylla* • *Acacia longifolia* • *Acacia podalyriifolia* • *Chamelaucium uncinatum* • *Leptospermum laevigatum* Harry Baker • *Acacia iteaphylla* Jim Ainsworth • *Acacia iteaphylla* • *Agave Americana* Red Gum • *Acacia podalyriifolia* (Maps of locations in Appendix 4)
Contain	Very High	Perennial Clumping Grasses	>50%	Elimination not feasible in short to medium term
	High	Clumping Geophytes	<50%	
		Annual Clumping grasses	>50%	
		Perennial Running Grass	<50%	
Manage	Very High	Very Large Trees	43	Manage very large weed trees in Elizabeth Manion Park, Harry Baker, Hugh Corbett and Jim Ainsworth, elimination not feasible in short term
	Medium	All other perennial weeds	>50%	Focus in terms of asset protection – revegetation sites
	Low	All other annual weeds	>50%	

Table 30 Objectives for all other Threats

Objective	Impact	Threat	Comments
Prevent	Very High	Acid Sulfate Soil	Monitoring required as groundwater extraction proposed
		Ferals (Foxes)	Absent - occasional incursion may occur and remove/eliminate with 10 working days of observations, before they permanently establish
		Ferals (Rabbits)	
		Ferals (Cats)	Absent - occasional incursion may occur and remove/eliminate with 10 working days of observations, before they permanently establish Also manage threat indirectly through revegetation - increase vegetation cover to aid small vertebrates evade predation
	High	Fires (large and repeat)	Prevent fires that burn more than one third of bushland or in the same portion of bushland, in consultation with Department of Fire and Emergency Services
	High	Ferals (Bees)	Absent – remove/eliminate with 10 working days of observations, before they permanently establish
	Medium	Diseases and Pathogens (Honey Fungus)	Assumed absent - never recorded in the City of Melville Apply appropriate hygiene standards for on-ground works to prevent introduction
Contain	Very High	Habitat Loss	Limit fragmentation of bushland (e.g. by paths, trampling, bike tracks) within reserves and increase native vegetation cover
	Medium	Physical Disturbance	Manage public access and trampling through the provision of paths and use of soft barriers (such as plantings) and hard barriers (such as fences). Remove disturbance activities such as informal tracks and illegal dumping.
Manage	Very High	Diseases and Pathogens (Dieback)	Manage impacts directly through Phosphite applications, signage, public education and revegetation with non-susceptible species as required.
		Climate Change	Manage through: • revegetation if mass plant deaths occur or are likely. • prioritisation of removal of high water use weeds (especially weed trees and shrubs) • maintenance of soil moisture through maintenance of canopy and thick leaf litter
	High	Ferals (Birds)	Monitor population numbers and record impacts. Install only bird and bat boxes that limit use by ferals
	Low	Ferals (Mice)	Assumed absent but could be present in adjacent urban areas. Manage indirectly through revegetation to offset seed predation
		Reticulation	Manage through maintenance and operation of reticulation to avoid drift or leaks into bushland

4.2.2 Lagging Indicators

Lagging indicators are associated with changes in the density / abundance / extent / occurrences of assets. The levels of acceptable change are determined in the framework established in the NAAMP as summarised in Table 31 and applied in Table 32 Goals for Species

Goal	Priority	Asset	Comments
Enhance	Medium	*Banksia grandis*	Increase the population from 1 to 10 plants in Harry Baker
		Banskia ilicifolia	Increase the population from 5 to 10 plants in Harry Baker
	Low	*Banksia attenuata*	Increase the population to 10 plants in Hugh Corbett and Jim Ainsworth
		Banksia menzeisii	Increase the population to 10 plants in Hugh Corbett and Jim Ainsworth
		Banksia sp.	Opportunity to introduce Banksia species at Red Gum Park
		Austrostipa compressa	Opportunity to introduce native grasses to Fred Johnson to increase habitat for reptiles
Maintain	Low	*Banksia attenuata*	Trees susceptible to dieback, and likely requires Phosphite treatments to be retained onsite in Alec Lambert with active dieback infestation.
		Banksia menziesii	
		Chalinolobus gouldii	Resident bat. Maintain habitat in the form of very large habitat trees and insect attracting vegetation.
		Pygopus lepidopodus	Resident legless lizard. Maintain habitat in the form of low vegetation and dense grasses
		Pardalotus striatus	Resident birds requiring tree hollows for breeding. Maintain habitat in the form of very large habitat trees.
		Phylidonyris novaehollandiae	Resident birds not requiring tree hollows for breeding. Maintain habitat in the form of overstorey/canopy cover.
Monitor	High	*Calyptorhynchus banksii naso*	Bird species utilising the site for feeding. Maintain habitat in the form of food tree species.
	Low	*Tiliqua rugosa rugosa*	Monitor Bobtail lizard at Fred Johnson to ensure persistence on site
Confirm		*Christinus marmoratus*	Confirm whether marbled gecko is present on site
		Platycercus zonarius	Confirm whether Ringneck Parrot is present on site

Table 33 Goals for Sites

Goal	Priority	Asset	Comments
Enhance	High	Bassendean – Central and South Vegetation Complex	Enhance vegetation complex (less than 10% pre-european extent remaining in City of Melville) by managing threats and enhancing Banksia species as above.
Maintain	Medium	Revegetation Sites – existing plantings	Maintain revegetation and community interest sites across reserves
		Habitat Sites - very large live native trees	Assets that are expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.

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Table 31 Tiered Goals for Assets and Associated Lagging Indicators

Goal	Lagging Indicator	Applicable When
Enhance	Increase in either • extent • density • numbers or • occurrences	Asset can be enhanced and • occurs in only one reserve and/or • at risk of local extinction and/or • minimal cost (e.g. incorporated in revegetation program) and/or • reduces operational costs (e.g. reduces requirements for on-

		going for threat management)
Maintain	No decrease in either • extent • density • numbers or • occurrences	Asset can be maintained and • the asset occurs in a number of reserves and/or • not a risk of local extinction and/or • occurs in only one reserve but insufficient knowledge/resources to enhance
Confirm	Decrease in: • number of assets for which their presence is uncertain	Asset significant and • historic but no recent records in reserve and/or • potential to be in reserve based on habitat and/or proximity of other records
Monitor	No indices for management effectiveness	Assets that cannot be maintained by actions within City of Melville boundaries or for which no quantifiable indices exist and: • for which reserves are not critical component of habitat (e.g. highly mobile/wide roaming and/or infrequent/irregular visitors to the City of Melville) • there is a risk of local extinction from processes that cannot be mitigated by the City of Melville (e.g. climate change, some pathogens)

Table 32 Goals for Species

Goal	Priority	Asset	Comments
Enhance	Medium	*Banksia grandis*	Increase the population from 1 to 10 plants in Harry Baker
		Banskia ilicifolia	Increase the population from 5 to 10 plants in Harry Baker
	Low	*Banksia attenuata*	Increase the population to 10 plants in Hugh Corbett and Jim Ainsworth
		Banksia menzeisii	Increase the population to 10 plants in Hugh Corbett and Jim Ainsworth
		Banksia sp.	Opportunity to introduce Banksia species at Red Gum Park
		Austrostipa compressa	Opportunity to introduce native grasses to Fred Johnson to increase habitat for reptiles
Maintain	Low	*Banksia attenuata*	Trees susceptible to dieback, and likely requires Phosphite treatments to be retained onsite in Alec Lambert with active dieback infestation.
		Banksia menziesii	
		Chalinolobus gouldii	Resident bat. Maintain habitat in the form of very large habitat trees and insect attracting vegetation.
		Pygopus lepidopodus	Resident legless lizard. Maintain habitat in the form of low vegetation and dense grasses
		Pardalotus striatus	Resident birds requiring tree hollows for breeding. Maintain habitat in the form of very large habitat trees.
		Phylidonyris novaehollandiae	Resident birds not requiring tree hollows for breeding. Maintain habitat in the form of overstorey/canopy cover.
Monitor	High	*Calyptorhynchus banksii naso*	Bird species utilising the site for feeding. Maintain habitat in the form of food tree species.
	Low	*Tiliqua rugosa rugosa*	Monitor Bobtail lizard at Fred Johnson to ensure persistence on site
Confirm		*Christinus marmoratus*	Confirm whether marbled gecko is present on site
		Platycercus zonarius	Confirm whether Ringneck Parrot is present on site

Table 33 Goals for Sites

Goal	Priority	Asset	Comments
Enhance	High	Bassendean – Central and South Vegetation Complex	Enhance vegetation complex (less than 10% pre-european extent remaining in City of Melville) by managing threats and enhancing Banksia species as above.
Maintain	Medium	Revegetation Sites – existing plantings	Maintain revegetation and community interest sites across reserves
		Habitat Sites - very large live native trees	Assets that are expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.

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Appendix 1 Flora Inventory

Table 34 Native Flora Inventory

Species	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
Acacia cyclops			1	1			
Acacia lasiocarpa		1					
Acacia pulchella			1				
Acacia saligna	1		1			1	
Adenanthos cygnorum	1	1	1	1	1		
Agonis flexuosa		1		1			
Allocasuarina fraseriana		1	1	1			
Allocasuarina humilis			1				
Anigozanthos manglesii		1					
Arnocrinum preissii			1				
Astartea scoparia				1			
Banksia attenuata	1		1	1	1	1	
Banksia dallanneyi			1				
Banksia grandis				1			
Banksia ilicifolia	1			1			
Banksia menziesii	1	1	1	1	1	1	
Bossiaea eriocarpa	1						
Burchardia congesta	1		1				
Casuarina obesa		1	1				
Conostylis aculeata	1	1	1	1			
Corymbia calophylla	1	1	1	1		1	1
Crassula colorata	1		1				
Dampiera linearis		1		1			
Dasypogon bromeliifolius		1	1	1			
Daviesia triflora			1				
Desmocladus flexuosus	1		1	1			
Dianella revoluta	1						
Eucalyptus gomphocephala		1		1			
Eucalyptus marginata	1	1	1	1	1	1	1
Ficinia nodosa		1					
Gompholobium tomentosum	1	1	1	1			
Grevillea sp.			1				
Haemodorum paniculatum			1				
Hakea prostrata	1						
Hardenbergia comptoniana		1	1				
Hemiandra pungens		1					
Hibbertia hypericoides	1		1				
Hibbertia subvaginata				1			
Hypocalymma robustum		1	1				
Jacksonia furcellata	1		1	1			
Jacksonia sternbergiana		1	1				

Species	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
Kunzea glabrescens	1		1				
Laxmannia squarrosa			1				
Lechenaultia floribunda				1			
Lepidosperma calcicola		1					
Lepidosperma pubisquameum	1	1	1	1			
Lyginia barbata	1	1	1	1			
Macrozamia fraseri	1	1	1				1
Melaleuca pauciflora			1				
Melaleuca preissiana		1		1			
Melaleuca seriata	1	1	1	1			
Melaleuca systena		1					
Nuytsia floribunda			1	1			
Patersonia occidentalis		1					
Persoonia saccata			1				
Petrophile linearis			1	1			
Phlebocarya ciliata	1	1		1			
Pimelea rosea	1						
Schoenus pedicellatus				1			
Stirlingia latifolia	1		1				
Synaphea spinulosa subsp. spinulosa			1				
Trachymene pilosa			1				
Tricoryne elatior				1			
Xanthorrhoea brunonis		1		1			
Xanthorrhoea preissii		1		1	1	1	1
65	**25**	**30**	**40**	**31**	**5**	**6**	**4**

Table 35 Weed Inventory

Species	Common Name	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
Acacia baileyana	Cootamundra wattle		1					
Acacia iteaphylla	Flinders Range wattle	1	1	1	1		1	
Acacia longifolia	Sydney Golden Wattle		1	1				
Acacia podalyriifolia	Queensland Silver Wattle			1				1
Agave americana	Century Plant	1					1	
Anagallis arvensis	Pimpernel			1	1			
Asparagus asparagoides	Bridal Creeper			1				
Asparagus plumosus	Feathered asparagus fern							1
Avena barbata	Bearded Oat	1	1	1	1			
Banksia sp.						1		
Brassica tournefortii	Mediterranean Turnip			1				
Briza maxima	Blowfly Grass		1	1	1			
Bromus diandrus	Great Brome		1	1	1			
Casuarina cunninghamiana							1	
Cenchrus clandestinus	Kikuyu Grass				1			
Chamelaucium uncinatum	Geraldton Wax		1	1				
Conyza bonariensis	Flaxleaf Fleabane	1	1	1				
Corymbia citriodora	Lemon Scented Gum	1					1	
Corymbia ficifolia	Flowering Gum					1		
Cynodon dactylon	Couch	1		1	1			
Disa bracteata		1		1				
Ehrharta calycina	Perennial Veldt Grass	1	1	1	1			
Ehrharta longiflora	Annual Veldt Grass	1	1	1	1			
Eriobotrya japonica	Loquat					1		
Eucalyptus botryoides	Southern Mahogany		1			1		
Eucalyptus cladocalyx	Sugar Gum		1	1	1			
Eucalyptus sp.	Eucalyptus		1		1	1		
Euphorbia peplus	Petty Spurge		1	1	1			
Euphorbia terracina	Geraldton Carnation Weed	1		1				
Fumaria capreolata	Whiteflower Fumitory	1	1	1	1			
Gazania linearis				1				
Gladiolus caryophyllaceus	Wild Gladiolus		1	1	1			
Grevillea robusta	Silky oak	1						
Hibbertia stricta	Erect Guinea Flower			1				
Hordeum leporinum	Barley Grass		1	1				
Hypochaeris glabra	Smooth Catsear	1	1	1	1			
Ipomoea cairica	Coast Morning Glory		1					
Lactuca serriola	Prickly Lettuce	1		1	1			

Species	Common Name	Alec Lambert	Elizabeth Manion	Fred Johnson	Harry Baker	Hugh Corbett	Jim Ainsworth	Red Gum
Lagurus ovatus	Hare's Tail Grass		1	1	1			
Leptospermum laevigatum	Coast Teatree		1	1				
Lolium multiflorum	Italian Ryegrass			1				
Melaleuca viminalis	Weeping bottlebrush					1		1
Melaleuca viminea	Bottlebrush						1	
Olea europaea	Olive	1	1					
Orobanche minor	Lesser Broomrape		1	1	1			
Pelargonium capitatum	Rose Pelargonium	1		1				
Pinus pinaster	Pinaster Pine	1						
Schinus terebinthifolius	Brazilian Pepper Tree	1		1				
Solanum nigrum	Black Berry Nightshade	1						
Sonchus oleraceus	Common Sowthistle	1	1	1	1			
Trifolium sp. indet.	Clover		1					
Ursinia anthemoides	Ursinia	1	1	1				
Vulpia sp.					1			
53		**21**	**26**	**33**	**20**	**6**	**5**	**3**

Appendix 2 Fauna Inventory

Occurrence code	Description
1	Observed - species was observed, number shows how many individuals were observed
S	Sign-positive evidence of species recorded at site (e.g. chewed nuts, scats, burrows)
R	Recorded - species was recorded on acoustic device and identified from call signature
L	Likely - the species is known to occur in the area and, based on habitat and connectivity to surrounding habitat, is expected to be present at times in the reserve
P	Possible - the species is known to occur in the region, however, no current records exist for the immediate area and/or habitat available is poor or poorly connected to other areas
U	Unlikely - no current records for the area, or a total lack of suitable habitat. Species may be recorded as being locally extinct
Pr EN VU	Conservation Status as per State or National Listings Priority Fauna (WA) Endangered Vulnerable
*	Pest Species
#	Species at risk of localised extinction within City of Melville as identified in few reserves
Species occurrence information compiled from the Department of Biodiversity, Conservation and Attractions NatureMap service, Atlas of Living Australia, local management plans and Ecoscape experience	

Table 36 Native Fauna Inventory

	Family	Species	COM Status	Conservation Status	Alec Lambert Park	Elizabeth Manion Park	Fred Johnson Park	Harry Baker Park	Hugh Corbet Park	Jim Ainsworth Reserve	Red Gum Park
Birds	**Threskiornithidae**	Australian White Ibis *Threskiornis moluccus*			P	1	P	P	P	P	P
	Columbidae	Spotted Turtle-Dove *Spilopelia chinensis*	*		L	L	L	L	L	L	L
		Laughing Turtle-Dove *Spilopelia senegalensis*	*		1	1	L	L	L	1	L
	Alcedinidae	Laughing Kookaburra *Dacelo novaeguineae*	*		L	1	L	L	L	L	L
	Cacatuidae	Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso	#	VU	3	2	P	S	P	S	3
		Galah *Cacatua roseicapilla*			L	L	1	L	L	L	L
		Little Corella *Cacatua sanguinea*	*		L	L	L	L	L	L	2
	Psittacidae	Rainbow Lorikeet *Trichoglossus moluccanus*	*		5	1	L	10	2	2	L
	Meliphagidae	Brown Honeyeater *Lichmera indistincta*			5	1	L	2	L	L	2
		New Holland Honeyeater *Phylidonyris novaehollandiae*	#		1	P	L	P	U	U	U
		Red Wattlebird *Anthochaera carunculata*			L	1	1	2	L	L	2
		Singing Honeyeater *Gavicalis virescens*			1	1	L	L	L	L	1
	Pardalotidae	Striated Pardalote *Pardalotus striatus*	#		L	1	L	L	P	P	L
	Acanthizidae	Weebill *Smicrornis brevirostris*	#		L	L	L	L	P	P	L
	Cracticidae	Grey Butcherbird *Cracticus torquatus*			L	L	5	L	P	P	L
		Australian Magpie *Cracticus tibicen*			2	L	L	4	2	2	L
	Rhipiduridae	Willie Wagtail *Rhipidura leucophrys*			L	L	L	1	L	L	L
	Monarchidae	Magpie-lark *Grallina cyanoleuca*			L	1	1	L	L	L	L
	Corvidae	Australian Raven *Corvus coronoides*			L	L	2	3	L	1	2
Reptiles	**Pygopodidae**	Common Scaly-foot *Pygopus lepidopodus*	#		P	U	1	U	U	U	U

	Scincidae	Western Limestone Ctenotus *Ctenotus australis*			P	U	3	U	U	U	U
		West Coast Laterite Ctenotus *Ctenotus fallens*			1	U	L	U	U	U	U
		Buchanan's Snake-eyed Skink *Cryptoblepharus buchananii*			4	1	1	L	1	L	1
		Two-toed Earless Skink *Hemiergis quadrilineata*			2	1	L	L	L	L	L
		Common Dwarf Skink *Menetia greyii*			L	L	1	L	L	L	L
		Western Bobtail *Tiliqua rugosa rugosa*			L	L	1	P	U	U	P
Mammals	**Molossidae**	White-striped Free-tailed Bat *Austronomus australis*			R	R	R	R	P	P	P
	Vespertilionidae	Gould's Wattled Bat *Chalinolobus gouldii*	#		R	R	R	R	P	P	P

Appendix 3 Reserve Mapping

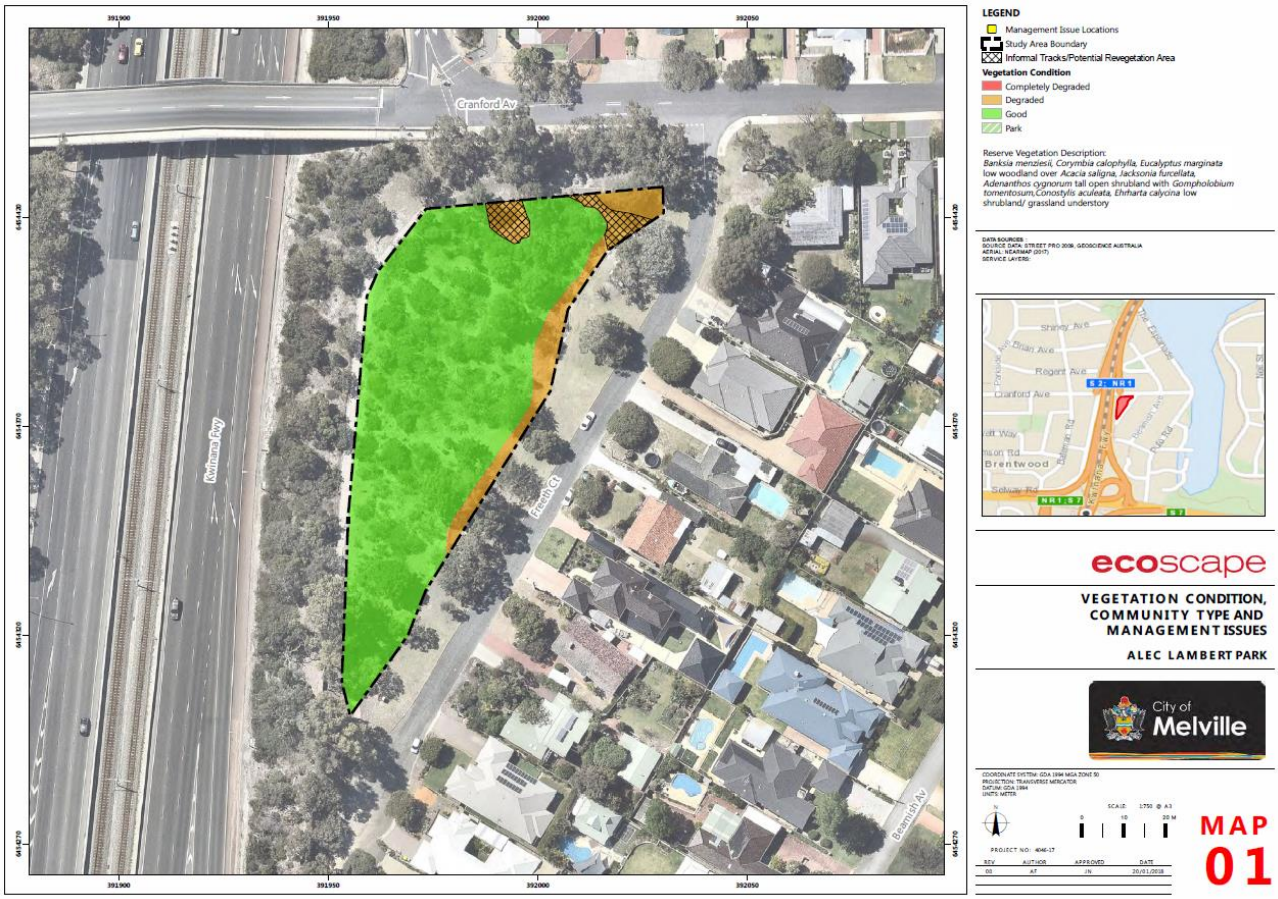

Figure 7 Vegetation condition, Revegetation Areas and Management Issues- Alec Lambert

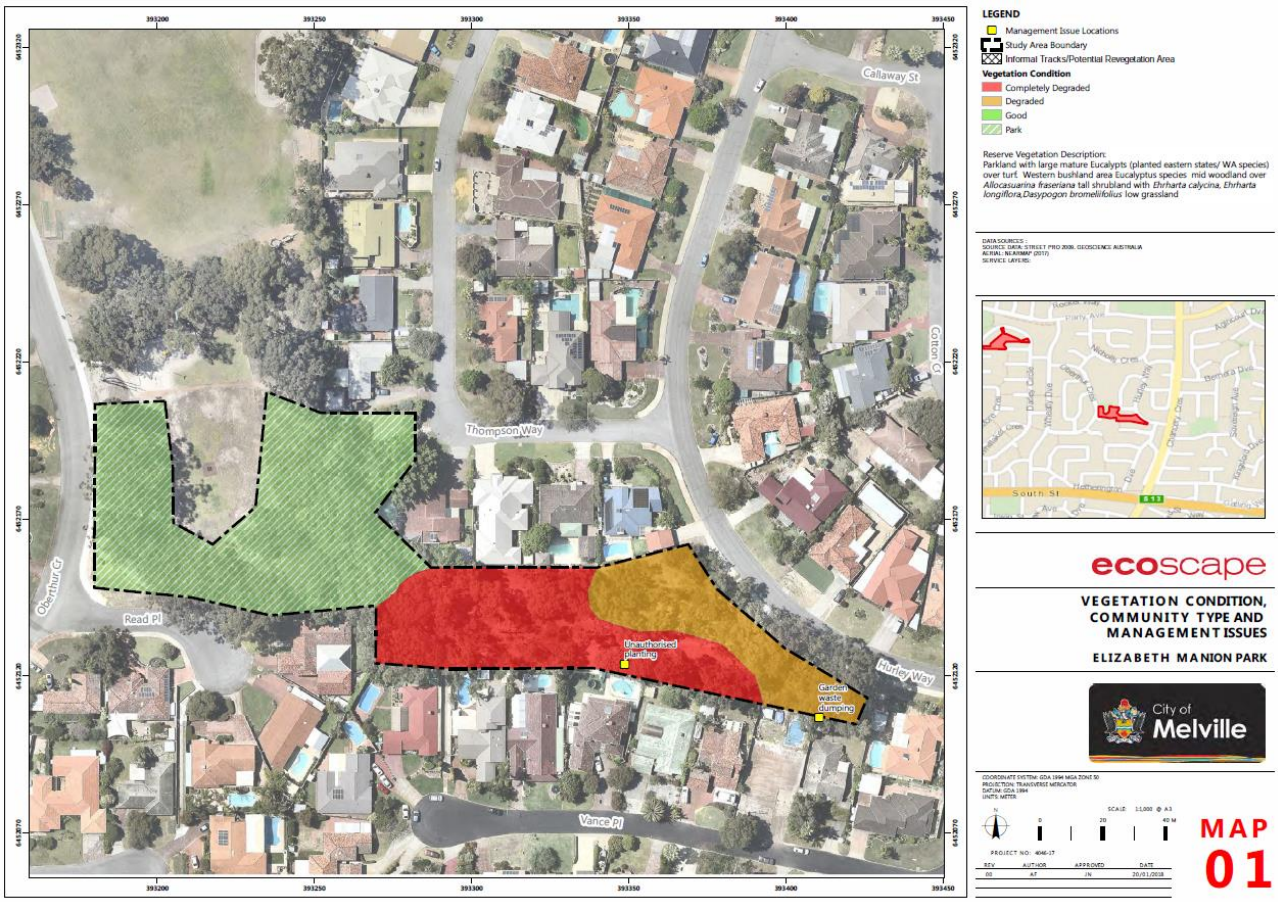

Figure 8 Vegetation condition, Revegetation Areas and Management Issues- Elizabeth Manion Park

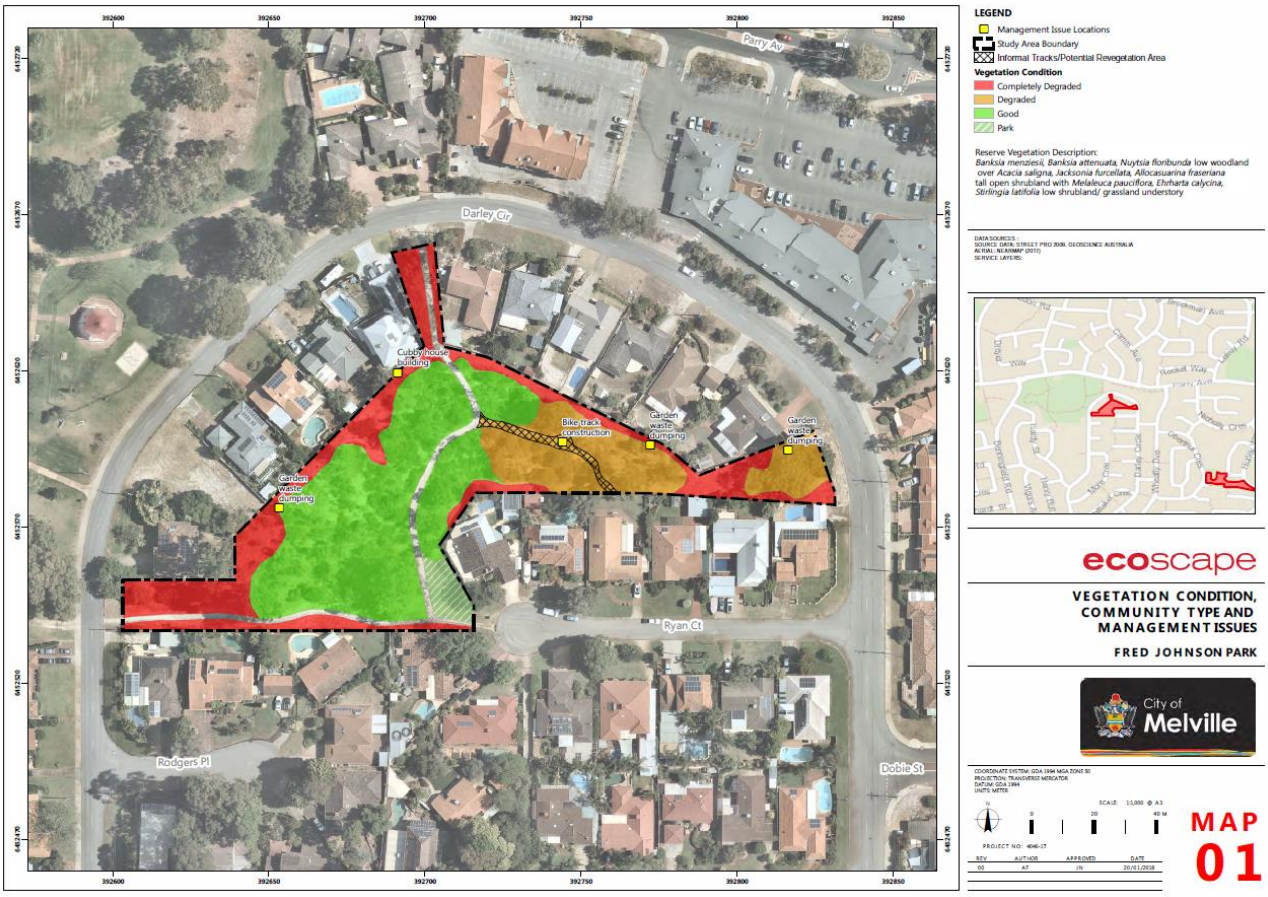

Figure 9 Vegetation condition, Revegetation Areas and Management Issues- Fred Johnson Park

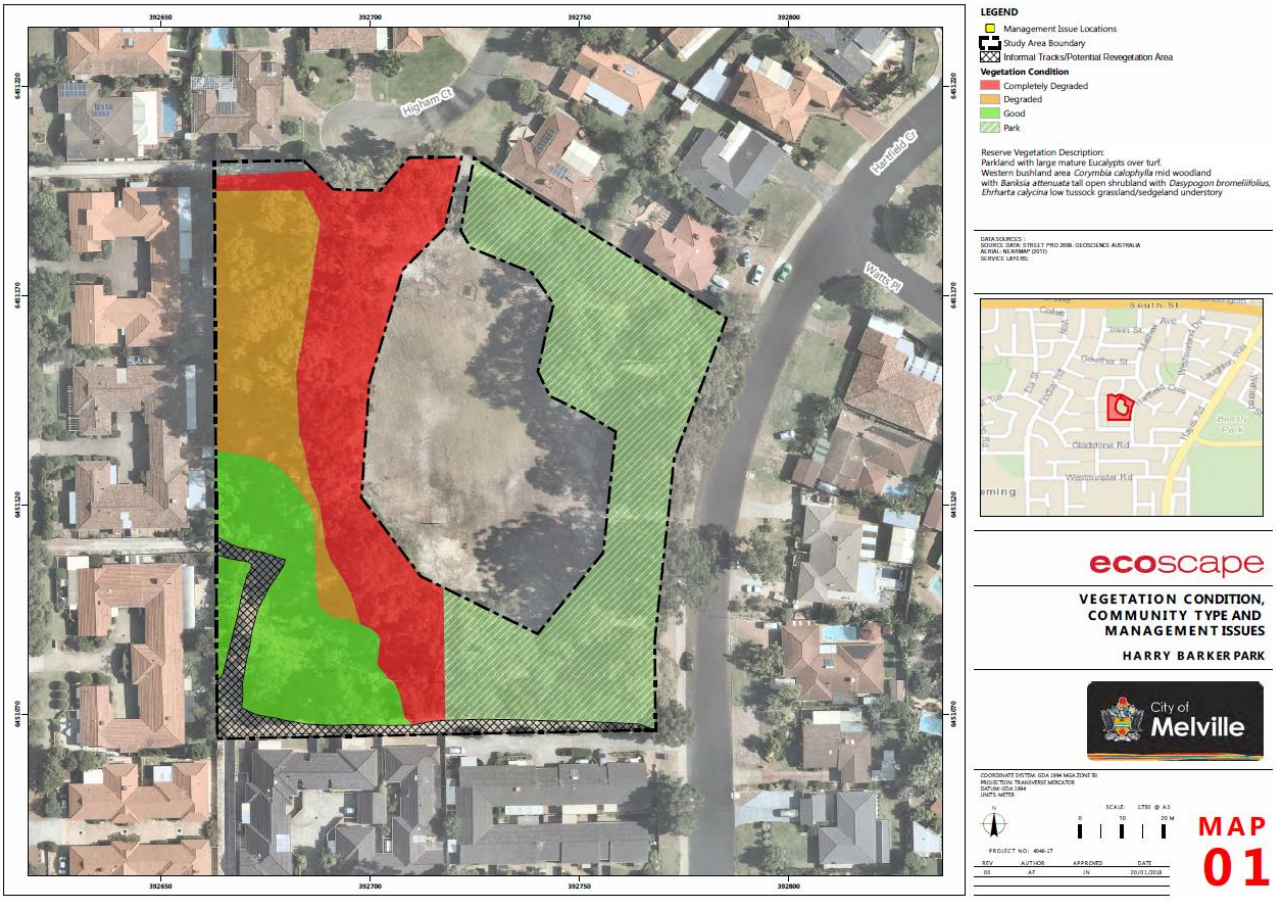

Figure 10 Vegetation condition, Revegetation Areas and Management Issues- Harry Baker

Figure 11 Vegetation condition, Revegetation Areas and Management Issues- Hugh Corbet Park

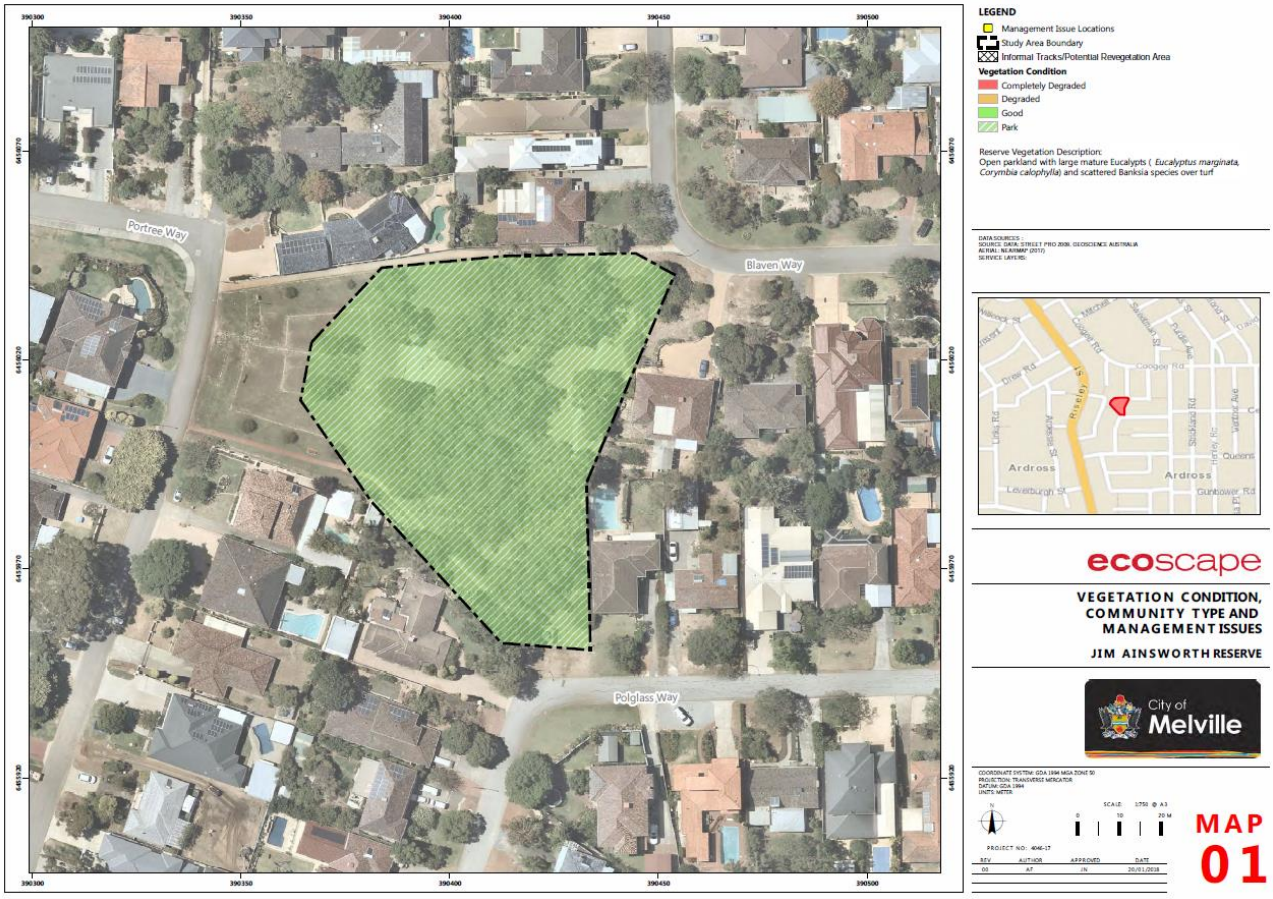

Figure 12 Vegetation condition, Revegetation Areas and Management Issues- Jim Ainsworth Reserve

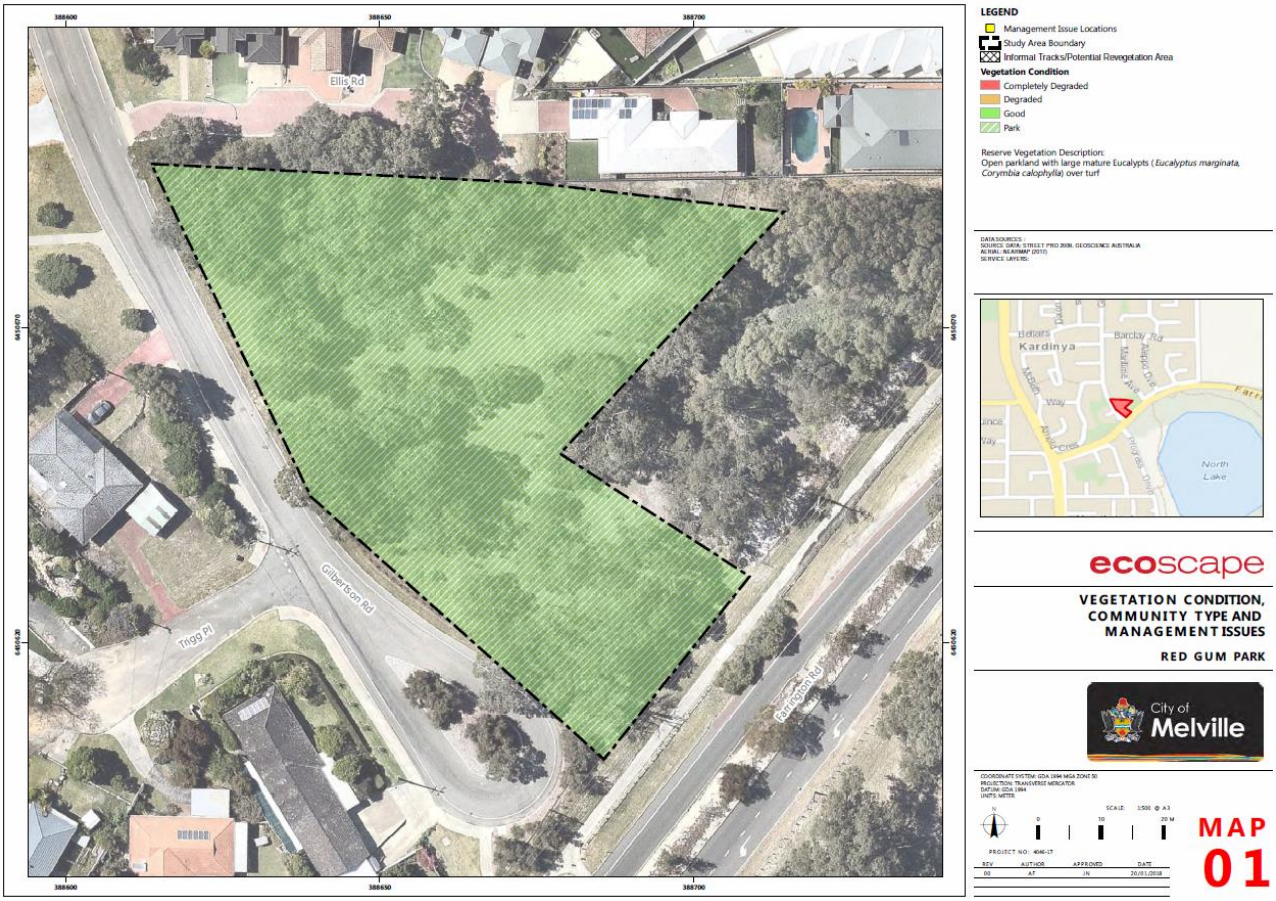

Figure 13 Vegetation condition, Revegetation Areas and Management Issues- Red Gum Park

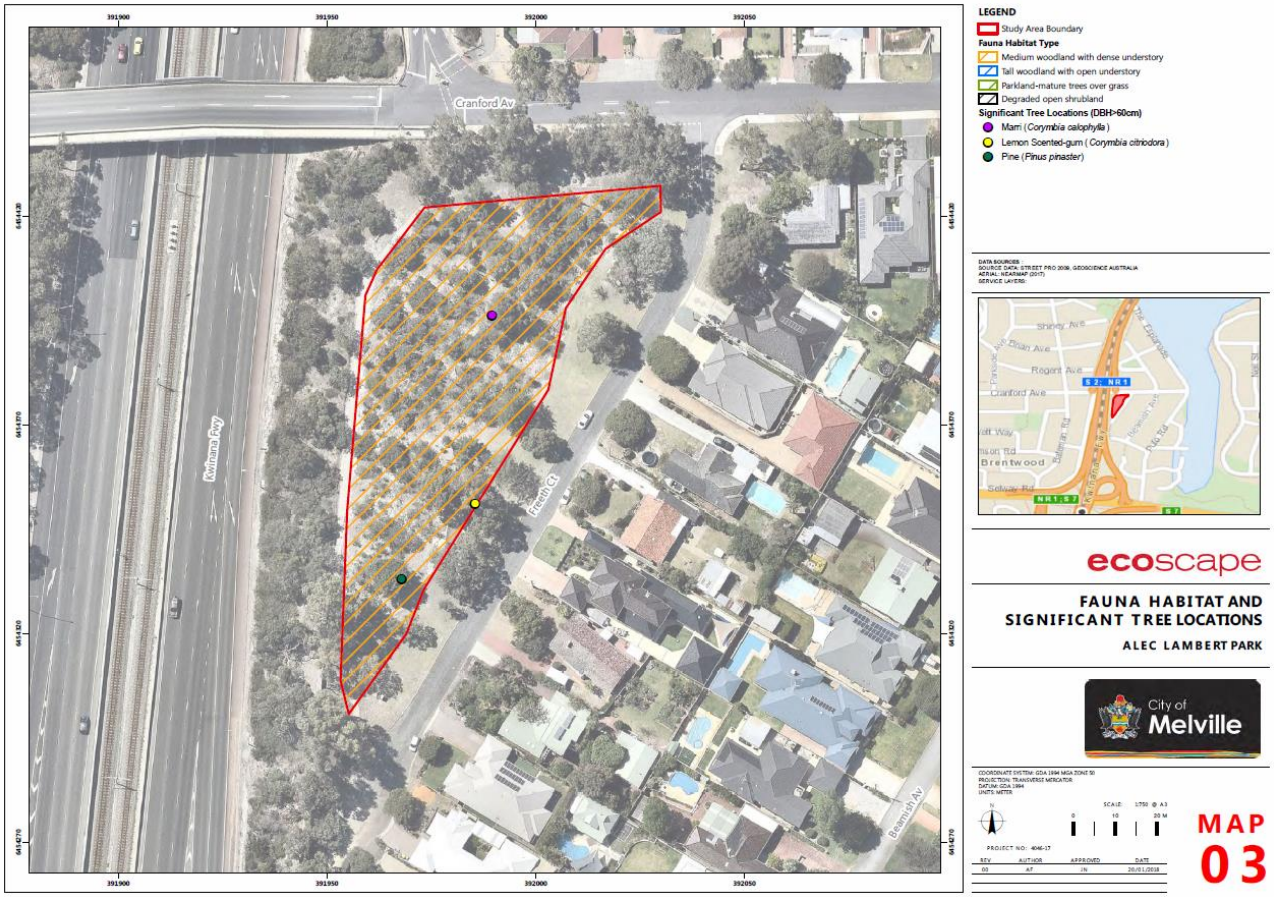

Figure 14 Significant Trees- Alec Lambert

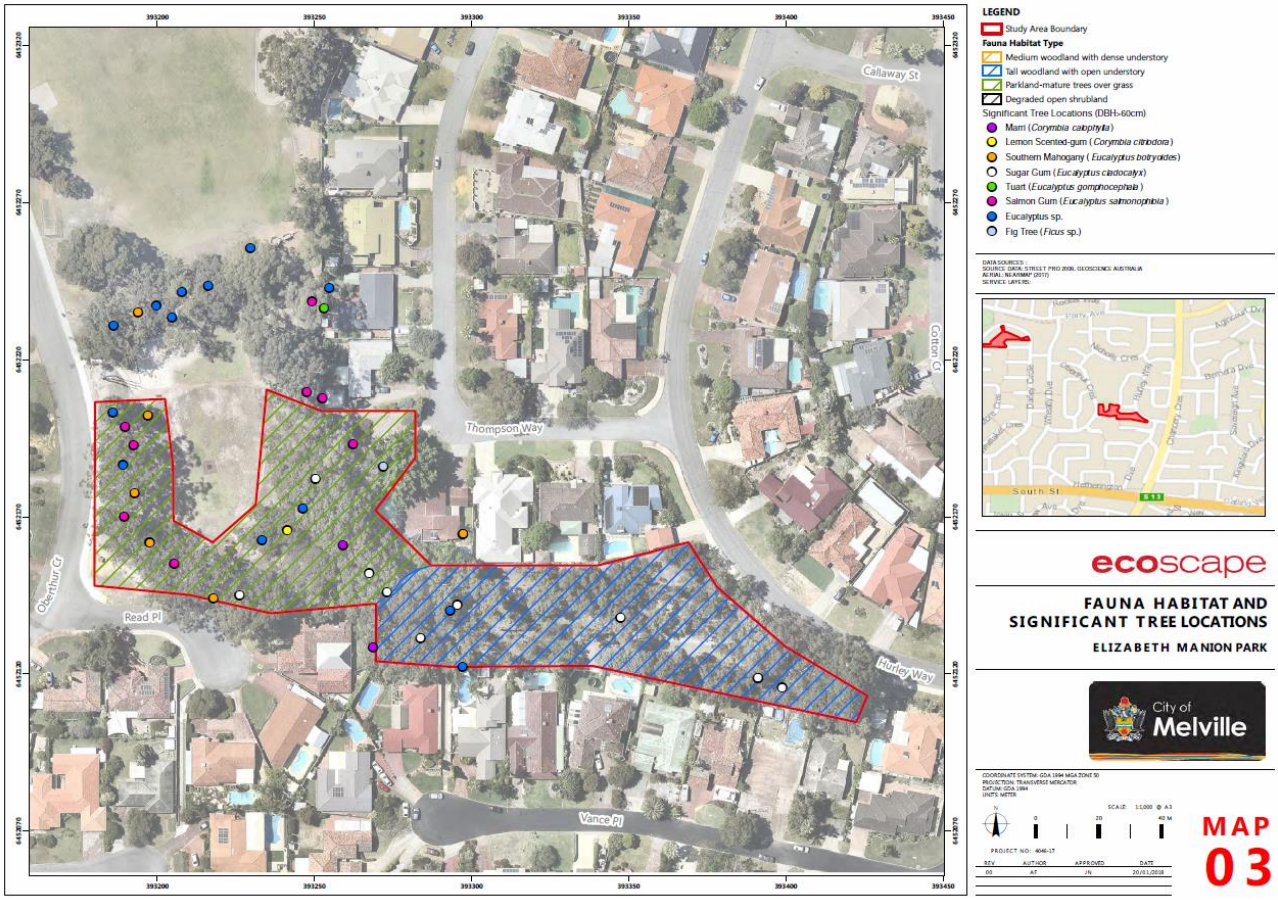

Figure 15 Significant Trees- Elizabeth Manion Park

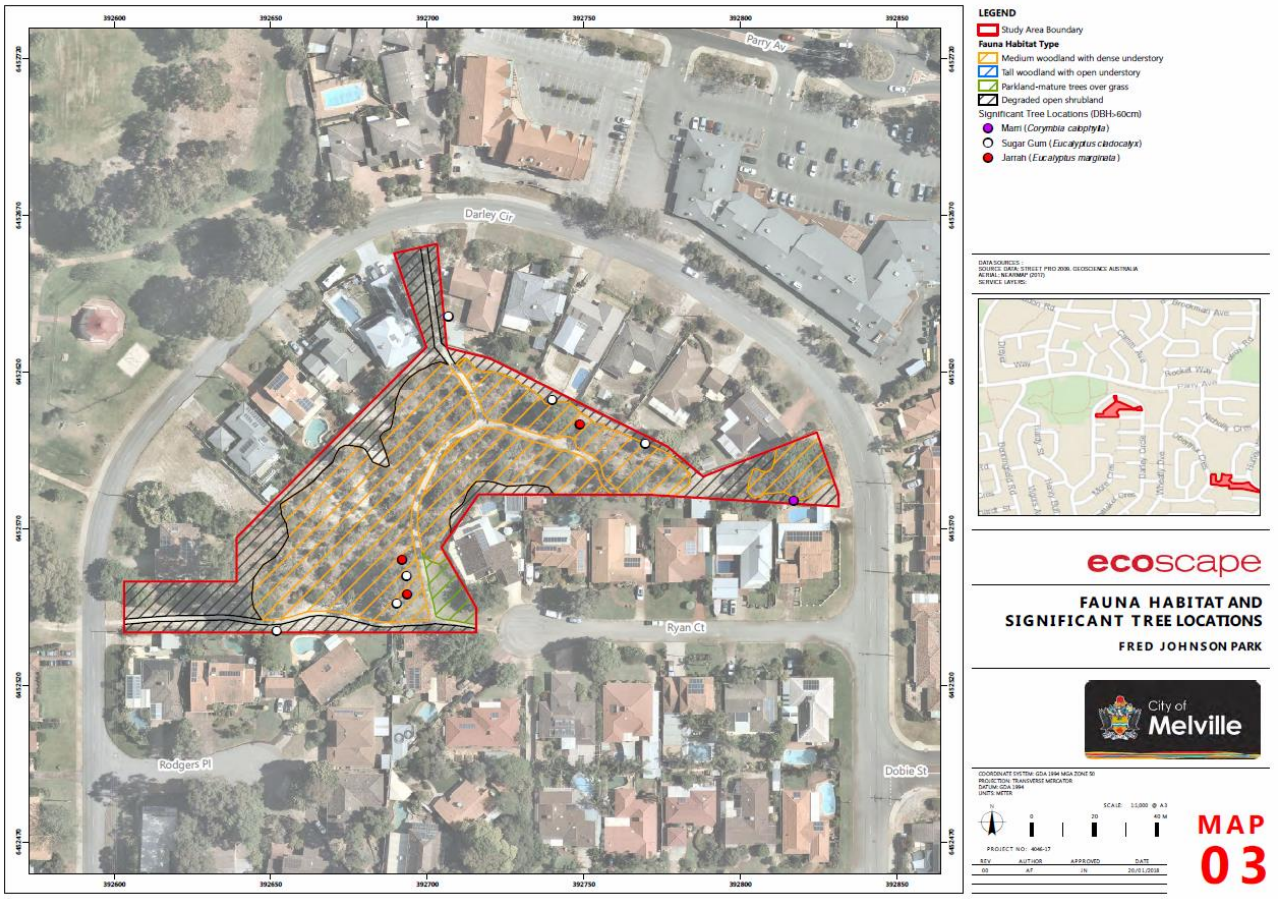

Figure 16 Significant Trees- Fred Johnson Park

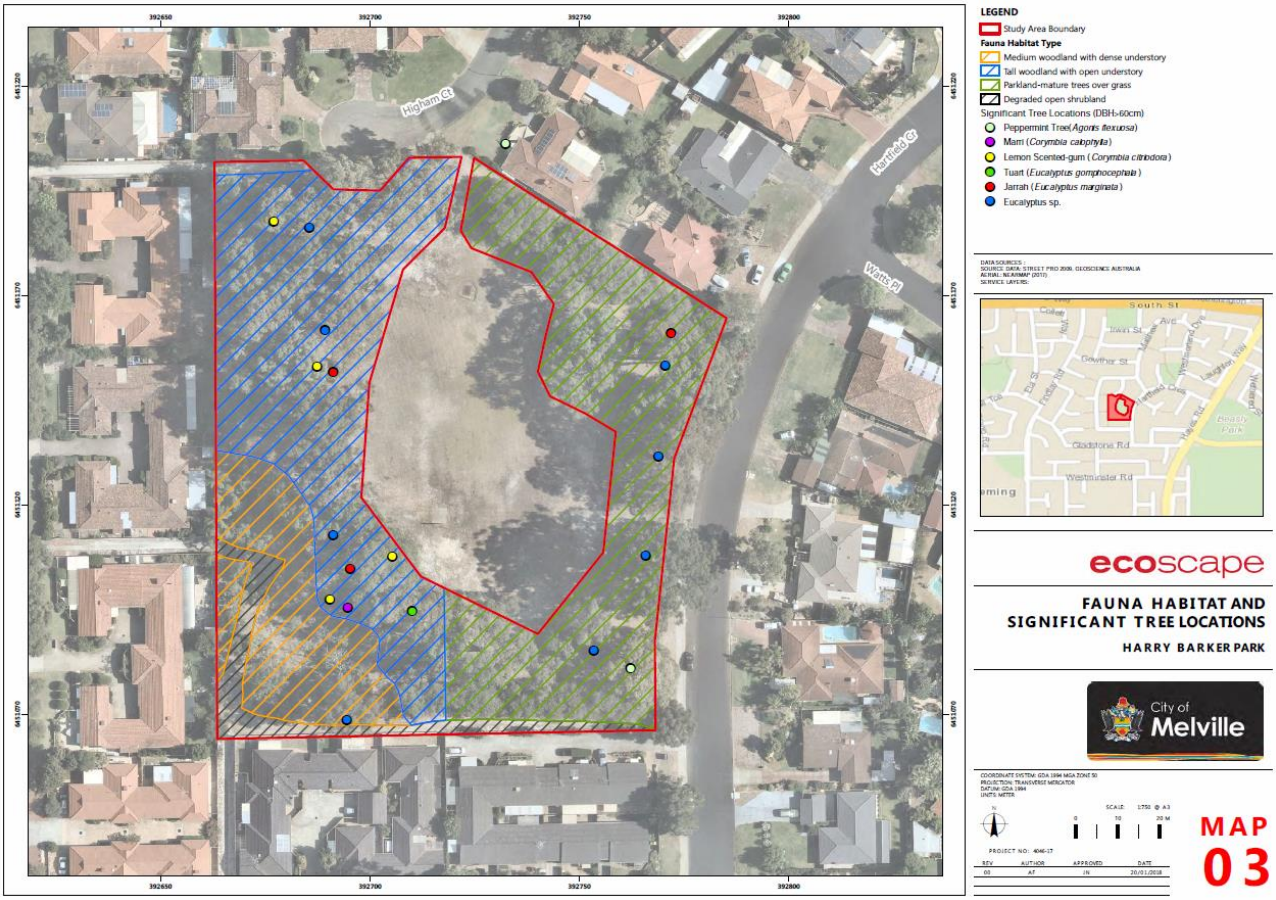

Figure 17 Significant Trees- Harry Baker

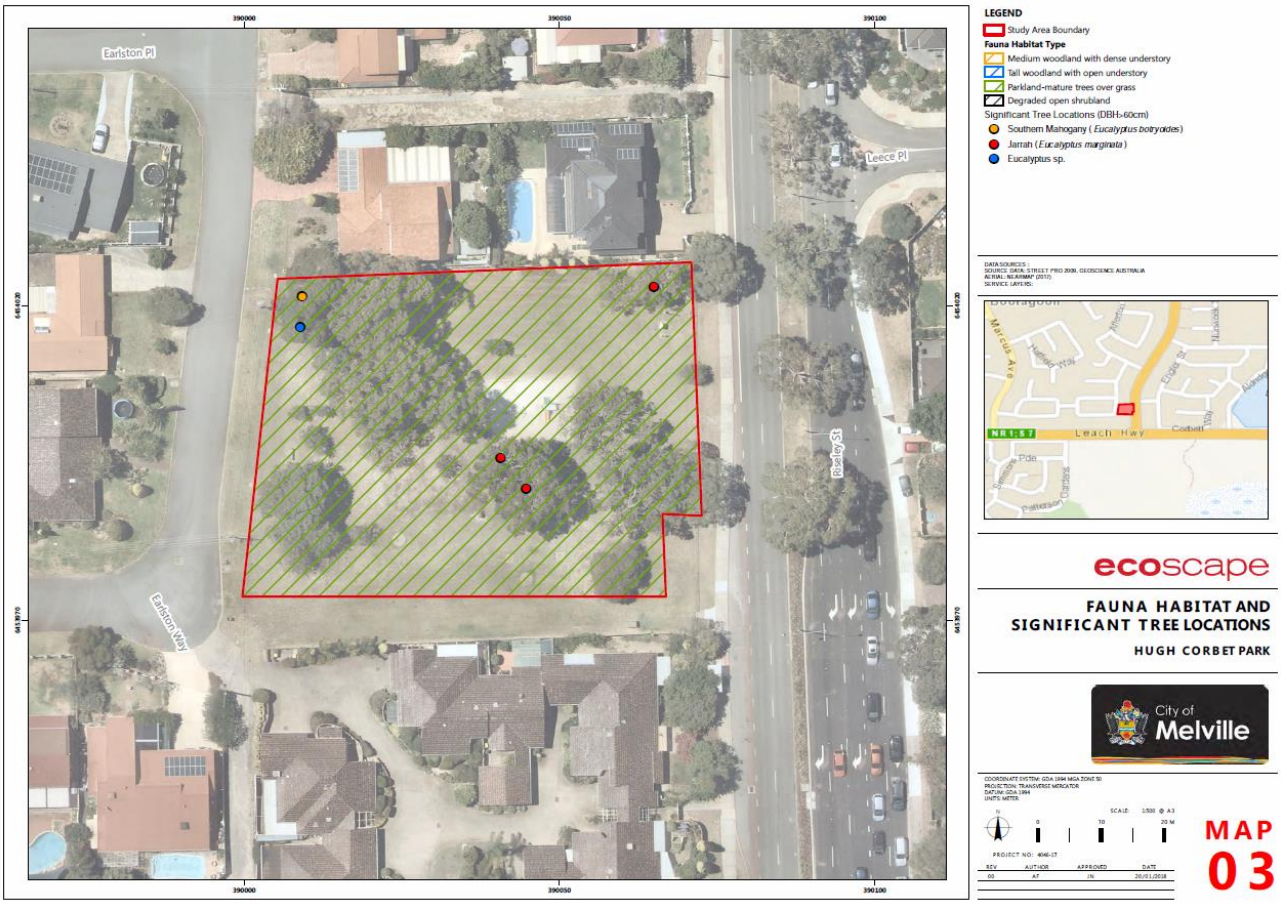

Figure 18 Significant Trees- Hugh Corbet Park

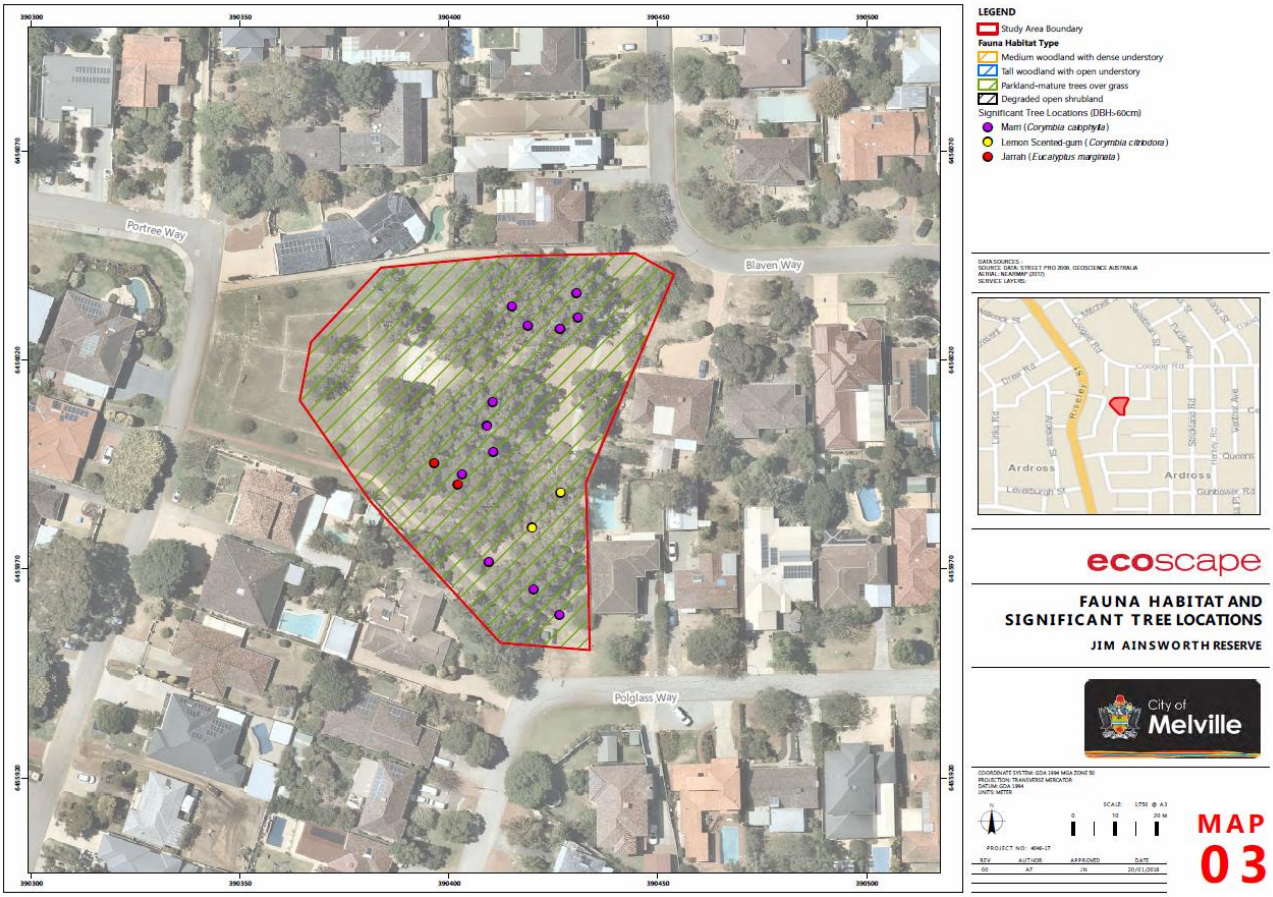

Figure 19 Significant Trees- Jim Ainsworth Reserve

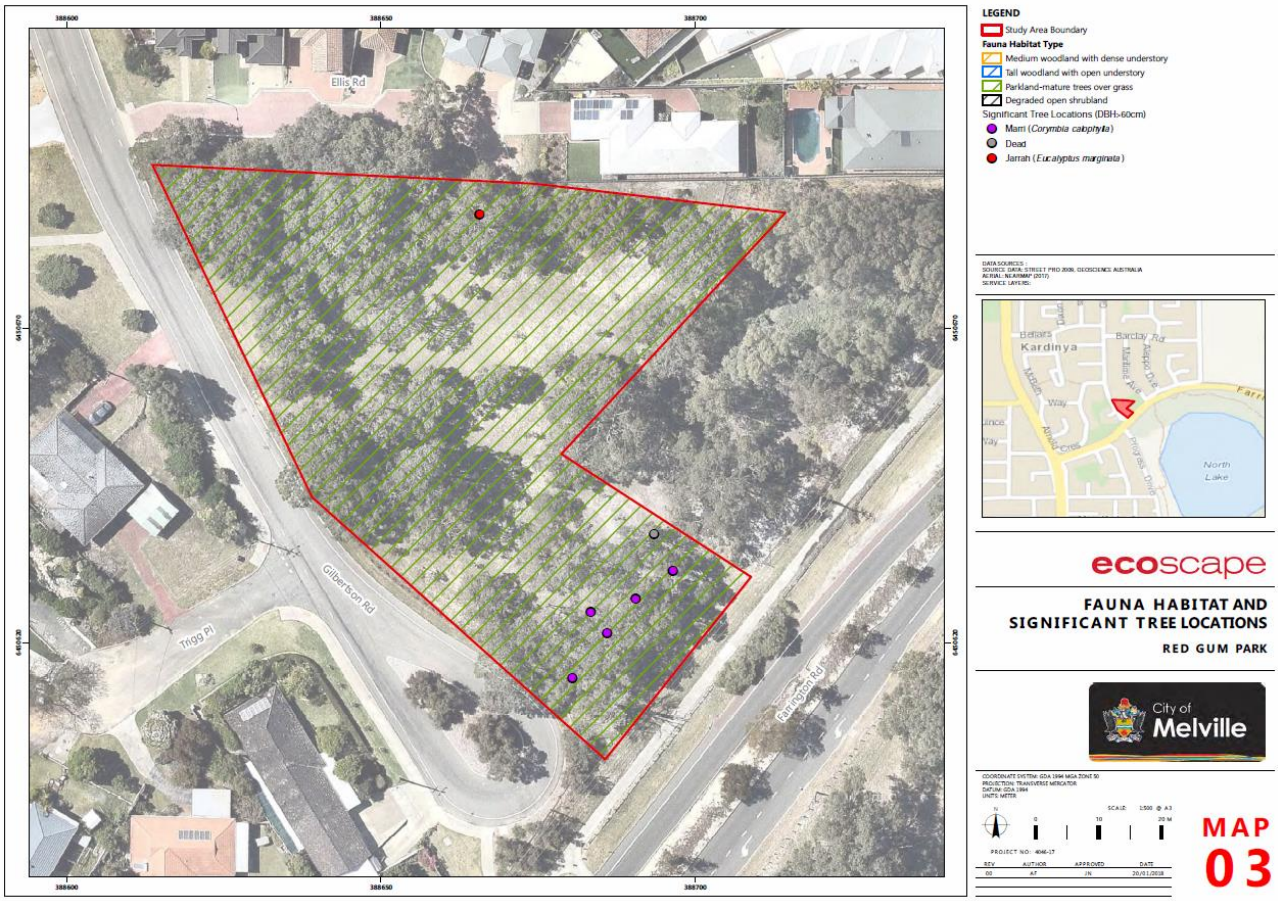

Figure 20 Significant Trees- Red Gum Park

Appendix 4 Weed Distributions

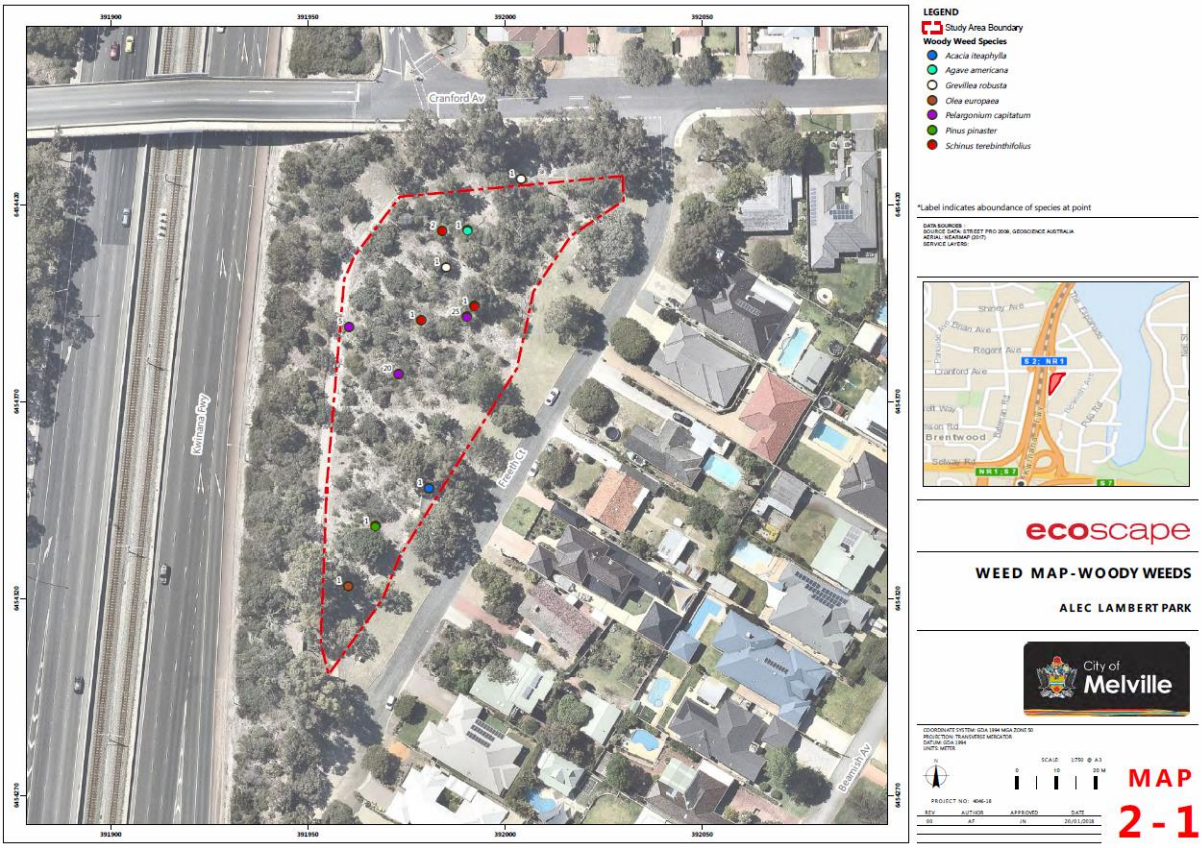

Figure 21 Woody Weeds- Alec Lambert

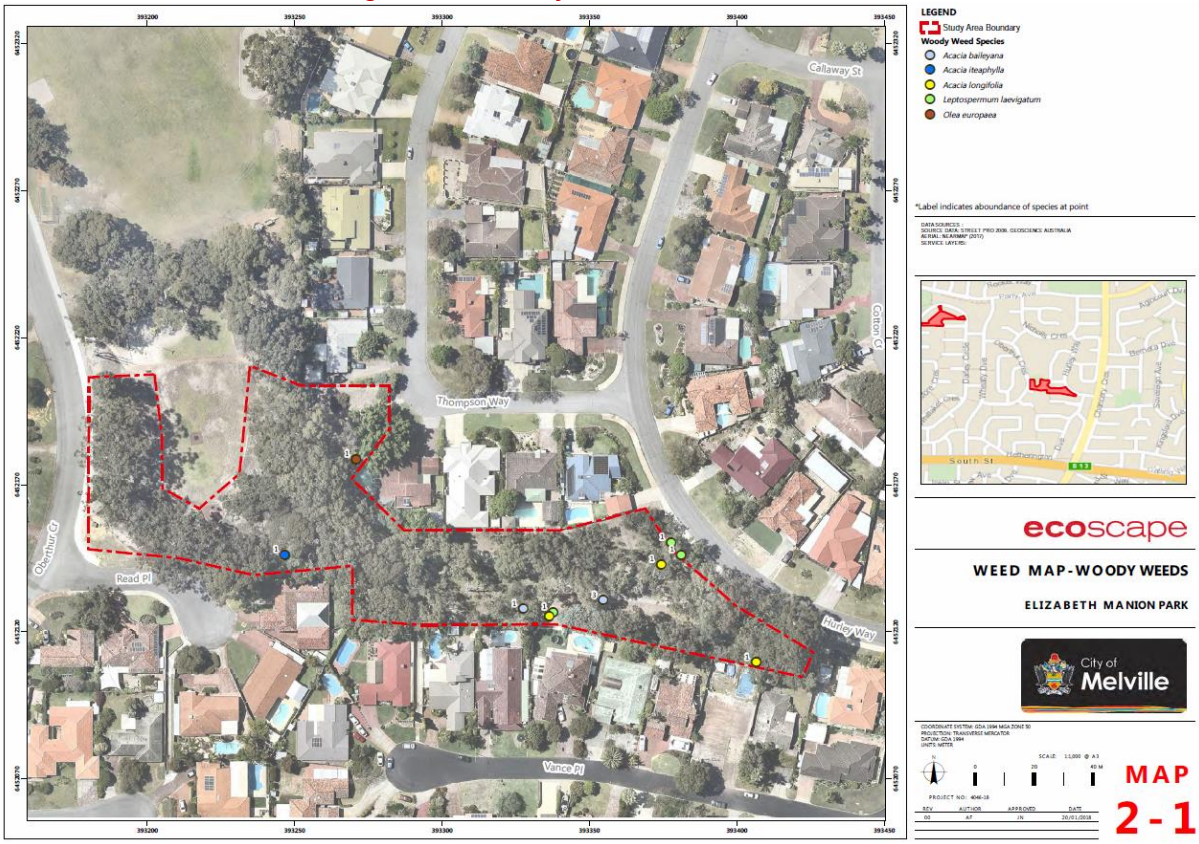

Figure 22 Woody Weeds- Elizabeth Manion

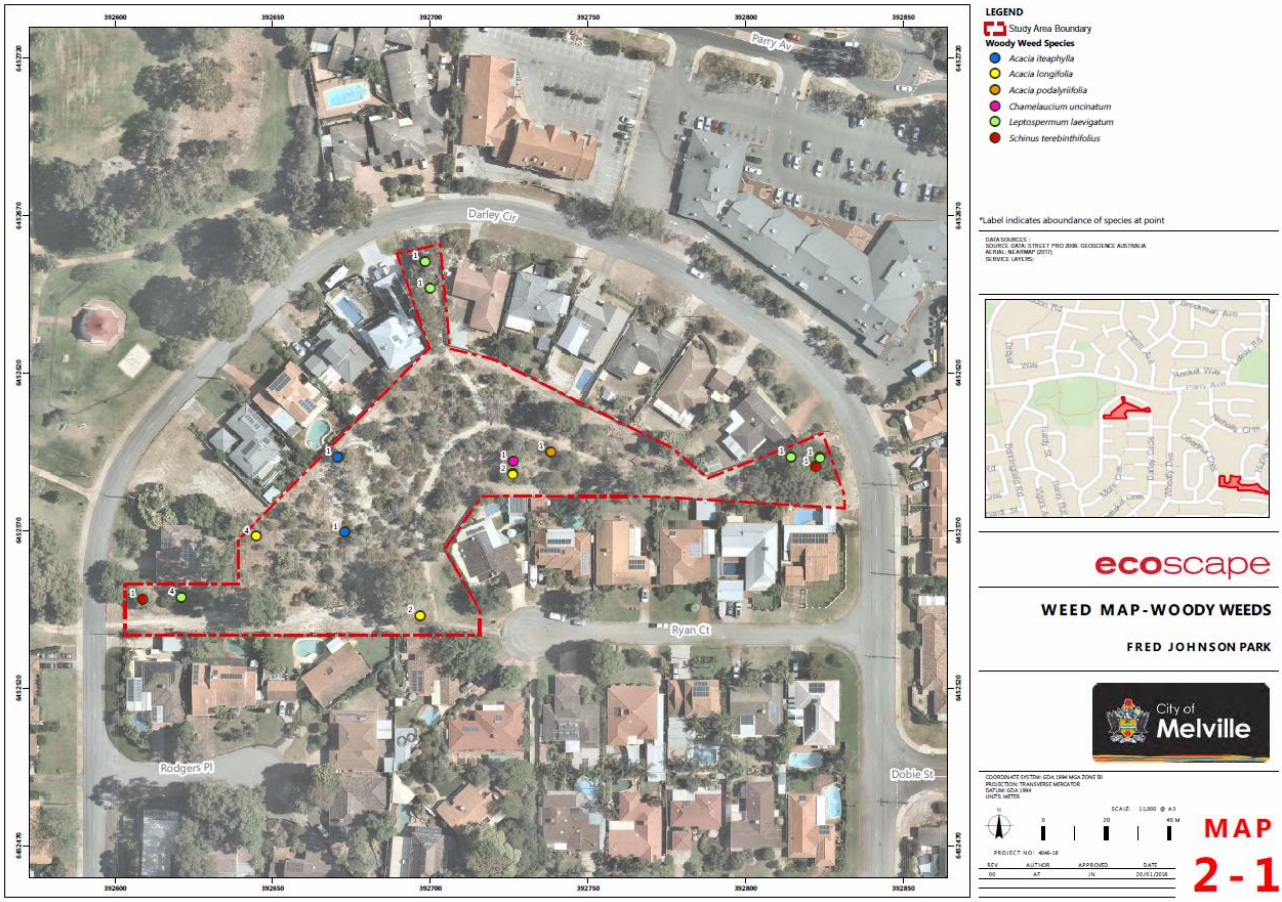

Figure 23 Woody Weeds- Fred Johnson

Figure 24 Woody Weeds- Harry Baker

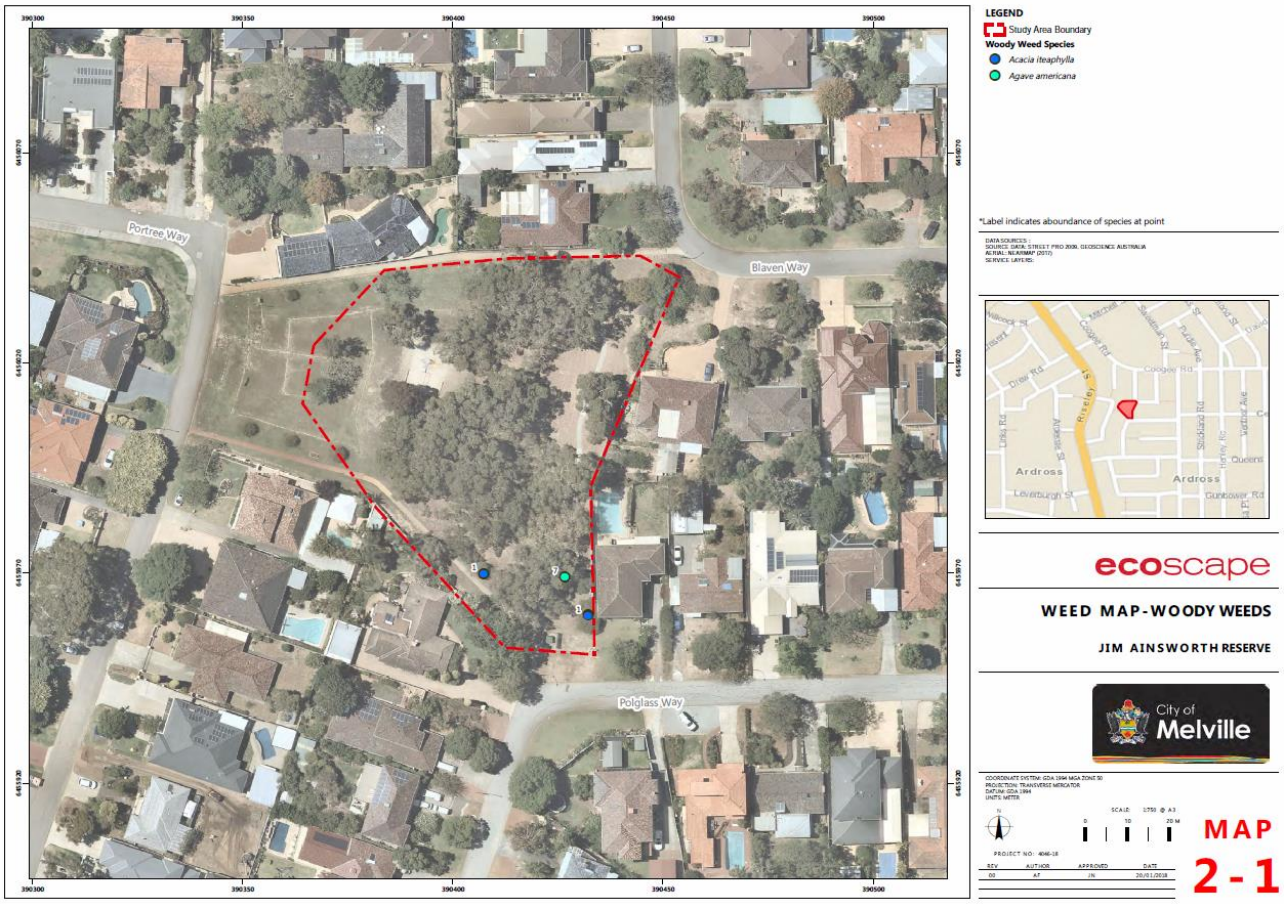

Figure 25 Wood Weeds- Jim Ainsworth

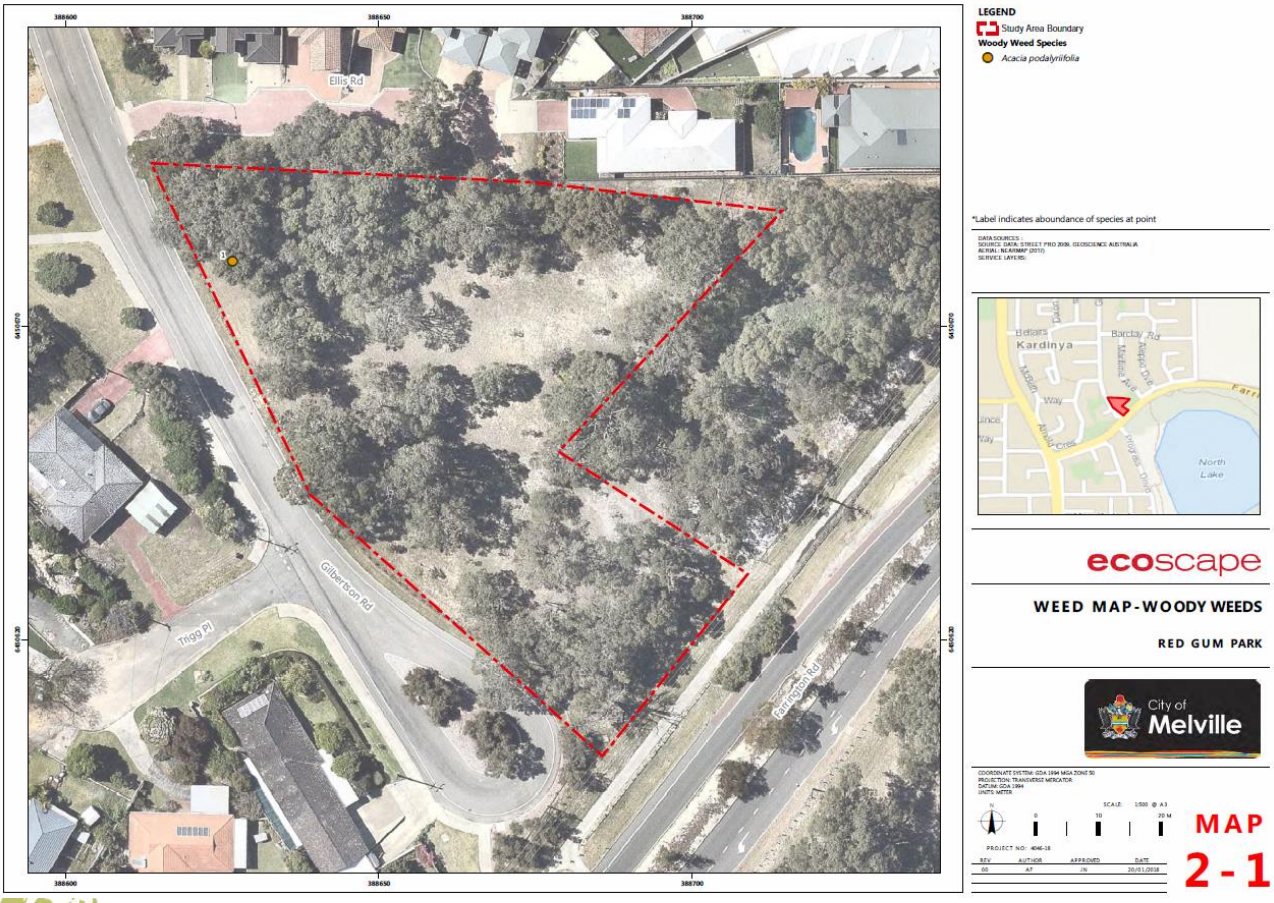

Figure 26 Woody Weeds- Red Gum

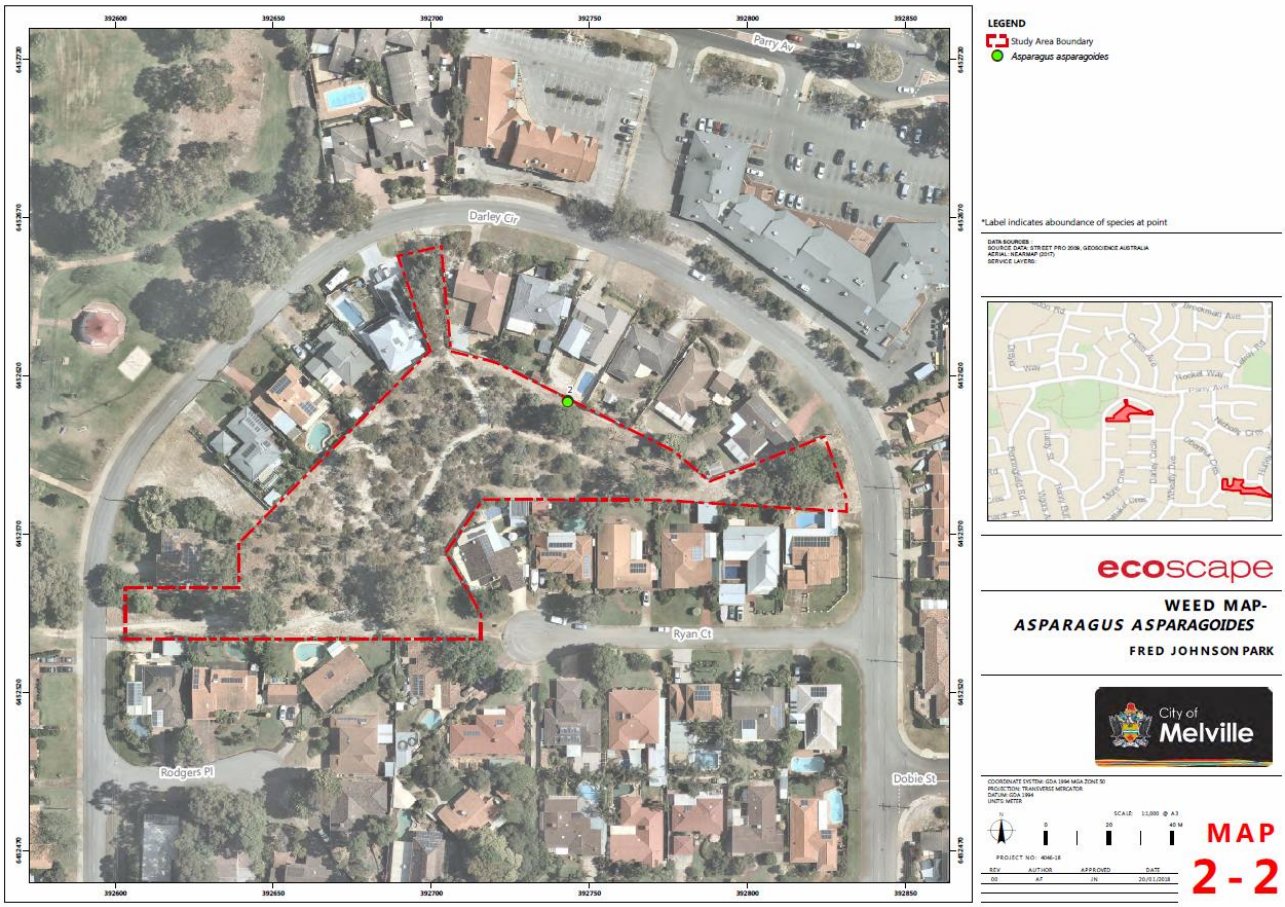

Figure 27 *Asparagus asparagoides* Bridal Creeper location- Fred Johnson