



City of Melville

Ken Hurst Park Strategic Management Plan

2021 - 2026

Executive Summary

The Ken Hurst Park Strategic Management Plan updates the previous management plan, *Ken Hurst Park Strategic Management Plan 2014–2019* and provides a new five-year management plan for 2021-2026.

Ken Hurst Park covers a total of 47.26 ha and is separated into two separate pockets, north and south of the existing rail line and rail reserve. Due to this barrier between the reserves this management plan provides detail on these two pockets separately to provide information on each specific portion of the reserve.

Ken Hurst Park is considered regionally significant bushland due to several key factors, including:

- makes up Bush Forever Site 245 (Ken Hurst Park)
- part of two high value ecological linkages within the Beeliar Regional Park linkage
- historical and recent presence of five conservation significant species:
 - Threatened, *Caladenia huegelii* (Grand Spider Orchid)
 - Priority 2, *Stylidium squamellosum* (Maize Trigger Plant)
 - Endangered, *Calyptorhynchus latirostris* (Carnaby's Cockatoo)
 - Priority 4, *Isodon fusciventer* (Southern Brown Bandicoot / Quenda)
 - Priority 4, *Macropus irma* (Western Brush Wallaby)
- wetlands changed from resource enhancement to conservation category
- occurrence of the threatened ecological community (TEC) Banksia Woodlands of the Swan Coastal Plain
- occurrence of the Priority 3, *Banksia ilicifolia* woodlands community associated with the threatened ecological community, Banksia Woodlands of the Swan Coastal Plain.

Survey activities identified a total of five vegetation types within Ken Hurst Park during the 2020 survey, including:

- *Hypocalymma angustifolium* and *Regelia inops* Shrubland (HaRiShrubland)
- *Banksia attenuata*, *Allocasuarina fraseriana* and *Xanthorrhoea preissii* Woodland (BaAfXpW)
- Mixed Banksia and *Nuytsia floribunda* Woodland (MixedBanksiaNf Woodland)
- *Banksia attenuata* and *Banksia menziesii* Woodland (BaBmW)
- *Melaleuca preissiana* Woodland (MpW)

A total of 188 flora species were present within the reserve (122 in the north and 157 in the south with 47% of species occurring within both sections of the reserve. No threatened or priority species were recorded during the 2020 survey with five 'at risk' species as identified by the City recorded. A total of 80 habitat trees were recorded throughout with hollows varying in size to provide habitat for bird species.

Ken Hurst provides a habitat for a range of fauna species including species which have a Priority listing, including

- five mammals, of which two are introduced and two are Priority species
- 14 birds, of which one is an introduced and one is an Endangered species
- 10 reptiles, all native species
- one amphibian, all native species
- 26 invertebrates of which one is introduced.

Several threats occur within Ken Hurst, including:

- physical disturbance e.g., dumped rubbish, campfires, children's cubby



- weeds, a total of 53 species were recorded with six classified as very high impact and 22 as high impact. Of the six very high impact, five are those classified as significant (declared pest and/or Weeds of National Significance), including:
 - Arum Lily (*Zantedeschia aethiopica*) (Declared Pest)
 - Bridal Creeper (*Asparagus asparagoides*) (Declared Pest, WoNS)
 - Common Prickly Pear (*Opuntia stricta*) (Declared Pest, WoNS)
 - Paterson's Curse (*Echium plantagineum*) (Declared Pest, WoNS)
 - Perennial Veldt Grass (*Ehrharta calycina*)
 - One-leaf Cape Tulip (*Moraea flaccida*) (Declared Pest)
- presence of habitat loss in the form of bare ground with a total of 9.74% of Ken Hurst presenting bare ground of 25% or greater with more bare ground present in the southern section than the north.
- a total of six feral fauna species were observed with two classified as declared pests, including:
 - Rainbow Lorikeet (*Trichoglossus haematodus*),
 - Rabbit (*Oryctolagus cuniculus*)
- Red Fox (*Vulpes vulpes*) potential presence of Dieback outside of existing infestation which requires further investigation.

Management strategies have been developed for 2021-2026 including Key Performance Indicators for Ken Hurst. The main management for the Ken Hurst Park including:

- undertake weed control of Very High and High impact weeds
- revegetate areas proposed in Figure 8 to enhance vegetation condition and reduce habitat loss
- continue to monitor and report any increase in threats in the reserves and undertake management in accordance with the NAAMP
- continue to monitor assets for decline in health or damage and repair or manage in accordance with the NAAMP.



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- Jacklyn Kelly from the City of Melville
- Friends of Ken Hurst Park



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1 Introduction

The City of Melville (the City) commissioned Natural Area Consulting Management Services (Natural Area) to update a site-specific Management Plan for Ken Hurst (Ken Hurst Park), in accordance with the City of Melville's *Natural Areas Asset Management Plan* (NAAMP 2019). Natural Area carried out flora, vegetation, and fauna surveys within Ken Hurst Park to provide updated flora and fauna inventory lists outlined in the NAAMP, to ensure the management strategy addresses local and current conditions.

1.1 Background

Ken Hurst is located in the suburb of Leeming within the City of Melville and is approximately 20 km south of the Perth's Central Business District (CBD). Ken Hurst is also known as Lot D063916 to the City. It is separated into two parts (north and south) by a rail reserve and covers a total of 47.26 ha (Figure 1).

Two management plans have been previously conducted, *Ken Hurst Park Management Plan 2003 - 2007* (ATA Environmental, 2003) and *Ken Hurst Park Strategic Management Plan 2014 – 2019* (Waters, 2013). These management plans highlight site-specific threats and assets while outlining strategies to manage them accordingly. This management plan updates the *Ken Hurst Park Strategic Management Plan 2014 –2019* and provides a new five-year management plan for 2021-2026.

1.2 Objectives

The objectives of this plan are to provide flexible management strategies for site specific risks in accordance with the City's NAAMP. The aim of the management plan is to maintain and enhance the various ecological functions and values associated within Ken Hurst, which included:

- identification of threatening processes outlined within the NAAMP that occur within the bushland areas
- identification of assets
- identification of site-specific threatening processes over time
- provide clear reserve management key performance indicators and recommendations to reduce negative impacts associated with the various threatening processes
- provide a plan to improve degraded areas within the reserve and maintain areas.





Figure 1:
Site Boundary
Ken Hurst Park, Melville

Client: City of Canning
Date: 30/03/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 200 400 m



1.3 Scope

Natural Area carried out the following works across October and November of 2020, activities included:

- basic flora survey to record any at-risk species, vegetation types and conditions
- point infestation and density mapping of all weed species
- detailed fauna survey including funnel and Elliot trapping over a 5-day period and installation of camera traps
- mapping locations of existing tracks and paths within the reserves
- mapping locations of disturbance activities and infrastructure
- mapping locations of habitat trees
- assess key threatening processes within the reserve
- management recommendations for Ken Hurst Park.

1.4 Land Tenure and Zoning

Ken Hurst Park is approximately 53 ha and is fenced and gated, with restricted access to the public. Access to the park requires permission from the City and is usually facilitated through the local community landcare group (Friend of Ken Hurst Park) through guided tours.

According to the City of Melville Local Planning Policy Scheme No. 6, Ken Hurst Park is zoned as Parks and Recreation and is currently bisected by a railway reserve.



2 Assets

2.1 Reserve Ratings

The City of Melville's NAAMP (2019a) developed a framework considering factors such as species present, vegetation types and community value in order to rate the city's numerous reserves from 1 (highest) to 5 (lowest). This allows the prioritisation and management of higher rated reserves in order to maintain their value. Ken Hurst Park is one of five reserves that were given the rating of 1.

2.1.1 Bush Forever

Bush Forever Sites are regionally significant bushland and wetland areas within the Swan Coastal Plain that were identified as needing protection in Perth's Bushland Project (Government of Western Australia, 2000).

Ken Hurst meets five key criteria and is currently listed as a Bush Forever Site number 245, Ken Hurst Park, Leeming (Table 1).

Table 1: Bush Forever Criteria, Ken Hurst

Bush Forever Criteria	Comments
Representation of ecological communities	<ul style="list-style-type: none">Within the vegetation complex Bassendean- Central and Southfloristic community types comprise of Seasonal Wetlands and Uplands centred on Bassendean Dunes and Dandaragan Plateau
Rarity	<ul style="list-style-type: none">Conservation significant species are known to occur in the area including:<ul style="list-style-type: none">Threatened, <i>Caladenia huegelii</i> (Grand Spider Orchid)Priority 2, <i>Stylidium squamellosum</i> (Maize Trigger plant)Endangered, <i>Calyptrorhynchus latirostris</i> (Carnaby's Cockatoo)Priority 4, <i>Isoodon fusciventer</i> (Southern Brown Bandicoot / Quenda)Priority 4, <i>Macropus irma</i> (Western Brush Wallaby)
Scientific or evolutionary importance	<ul style="list-style-type: none">Contains Banksia Woodland, which is biologically diverse and hosts a wide diversity of flora and fauna speciesKen Hurst Park is one of the largest remnant fragments of Banksia Woodland in good condition in the Perth regionGibson et al (1994) undertook a study of plant communities of remnant bushland on the southern Swan Coastal Plain. 509 quadrats were established and the floristic data was used to define the major regional community type. Four of these quadrats were set up within Ken Hurst Park and are recognised as important scientific sites.
General criteria for the protection of wetland and coastal vegetation	<ul style="list-style-type: none">Contains Resource Enhancement Wetlands

Bush Forever Criteria	Comments
Diversity (Areas with a high diversity of flora and/or fauna species or communities in close association)	<ul style="list-style-type: none"> Contains Banksia Woodland, which is biologically diverse and hosts a wide diversity of flora and fauna species, over 200 species of flora species recorded Provides linkages to adjacent bushland to the north and south and is listed as part of a regionally significant fragmented bushland/wetland linkage

Source: Government of Western Australia (2000) and NAAMP (2019)

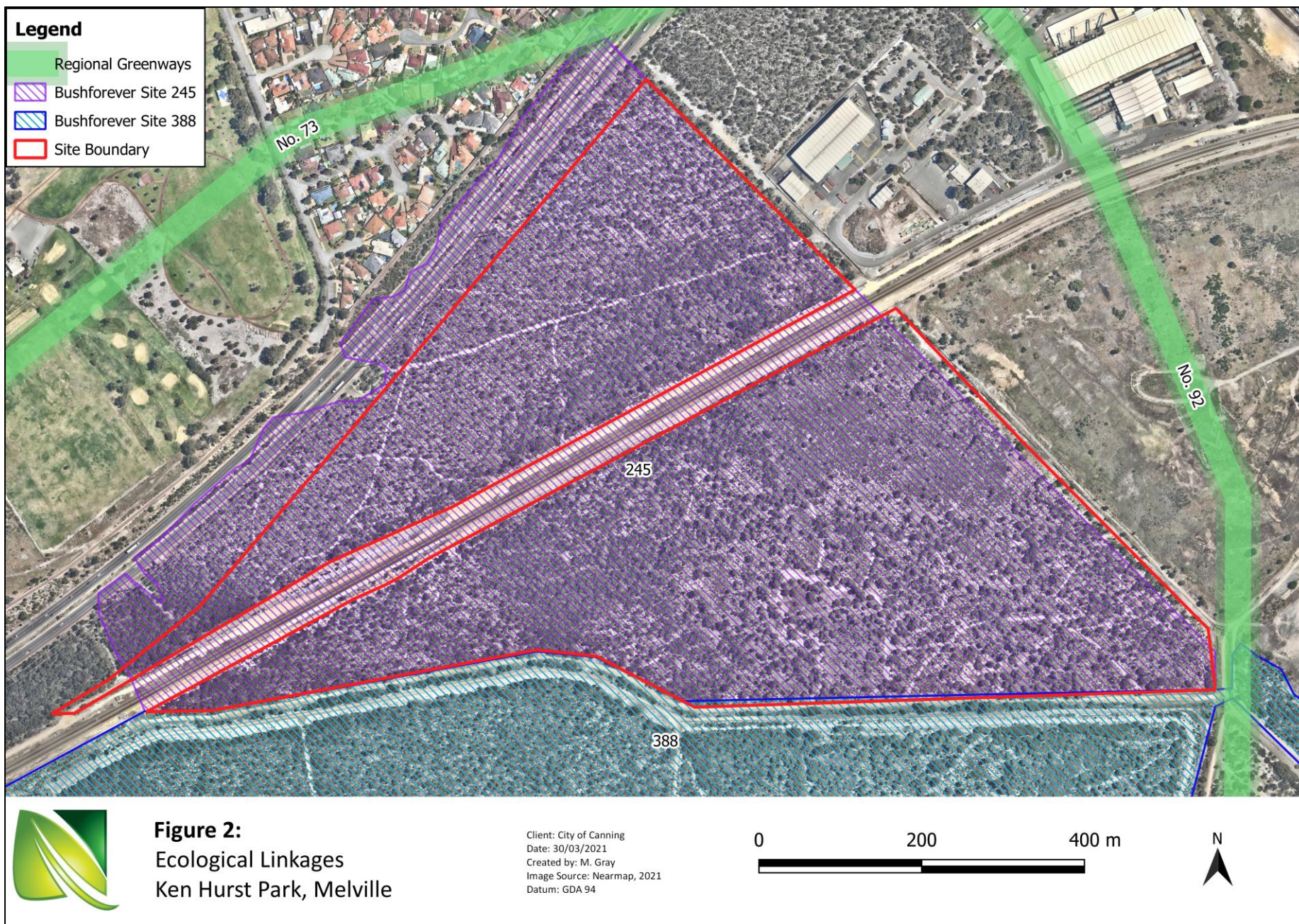
2.1.2 Ecological Linkages

Ecological Linkages provide refuge for fauna to move between natural bushland areas, therefore increasing the size of available fauna habitat and increases genetic diversity of species present. Ecological linkages can also increase the effective size and maintain genetic diversity of flora populations between isolated bushland remnants. Extensive land clearing has led to a fragmented landscape which can disrupt native species. Therefore, it is important to identify and protect remnant ecological linkages which acts as steppingstones to facilitate ecological processes and movement across a landscape (WALGA, 2009).

City of Melville's NAAMP (2019a) assesses Ken Hurst Park to be a High value linkage and forms part of the Beeliar Regional Park linkage as well as serving as local linkages between Bateman and Bull Creek reserves (Greenway 73: North Lake-Bibra Lake- Roe Highway Extension and Greenway 92: Jandakot Botanic Park-North Lake) (Alan Tingay and Associates, 1998) (Figure 2).

Ken Hurst Park is divided into northern and southern section due to existing and developing railway infrastructure. Waters (2013) suggests that the two sections are likely to support independent resident fauna populations as re-colonisation across the rail line would be limited, specifically regarding sedentary and low mobility populations. Previous surveys of Ken Hurst have not separated findings into the two portions and do not highlight if this infrastructure creates a barrier reducing ecological movement. Surveys conducted by Natural Area in 2020, recorded flora, vegetation, and fauna information into two sections to provide a baseline of populations present on either side and to determine if fauna species inhabit both portions of the reserve. Further monitoring of Ken Hurst should continue to survey these sections separately.





2.2 Site Assets

This section discusses the environmental, heritage and social assets of Ken Hurst Park.

2.2.1 Ecological Communities

2.2.1.1 Vegetation Complex

Ken Hurst Park is situated with the Bassendean Complex- Central and South (DPIRD, 2021). This complex is described as woodlands of Jarrah-Sheoak-Banksia on sand dunes to low lying woodland of *Melaleuca* spp., sedgelands on low-lying depressions and swamps. Plant species include *Banksia attenuata*, *B. grandis*, *B. menziesii*, *B. ilicifolia*, *B. littoralis*, *M. preissiana*, *Kunzea vestita*, *Hypocalymma angustifolium*, *Adenanthos obovatus* and *Verticordia* spp. (Hedde, Loneragan and Havel, 1980). The pre-European extent of this vegetation complex remaining is:

- 27.7% within the Swan Coastal Plain (WALGA, 2013)
- 8.29% within the City of Melville local government area (WALGA, 2010).

2.2.1.2 Vegetation Types

Ecological communities are biological assemblages of plants and animals found in particular landscapes. They are mainly described based on the dominant plant structures and assemblages present but do provide fauna habitat for specific species. In this strategic management plan, ecological communities are described based on the flora assemblages present within each of the reserves.

Protected Matters Search Tool (PMST) indicated the potential for three Threatened Ecological Communities (TEC) to occur within 5 km of Ken Hurst Park. Table 2 lists the three TECs which have the potential to occur in the area. Due to the species composition at Ken Hurst the only TEC likely to occur is Banksia Woodlands of the Swan Coastal Plain (Table 2). Previous requested DBCA database search has identified that Ken Hurst occurs within the Priority 3, *Banksia ilicifolia* woodlands (SCP 22) community which is a component of the endangered Banksia Woodlands of the Swan Coastal Plain TEC (DBCA, 2017).

A total of five vegetation types were identified during the 2020 survey by Natural Area which are listed in Table 3, Figure 3. Vegetation types for the reserve vary slightly from those previously recorded although the overarching classification and vegetation associations remains consistent with the 2003 survey. Differences are attributed to the judgement of assessors in the field with the time since the last assessment allowing for different species to mature and changes to dominant species composition.

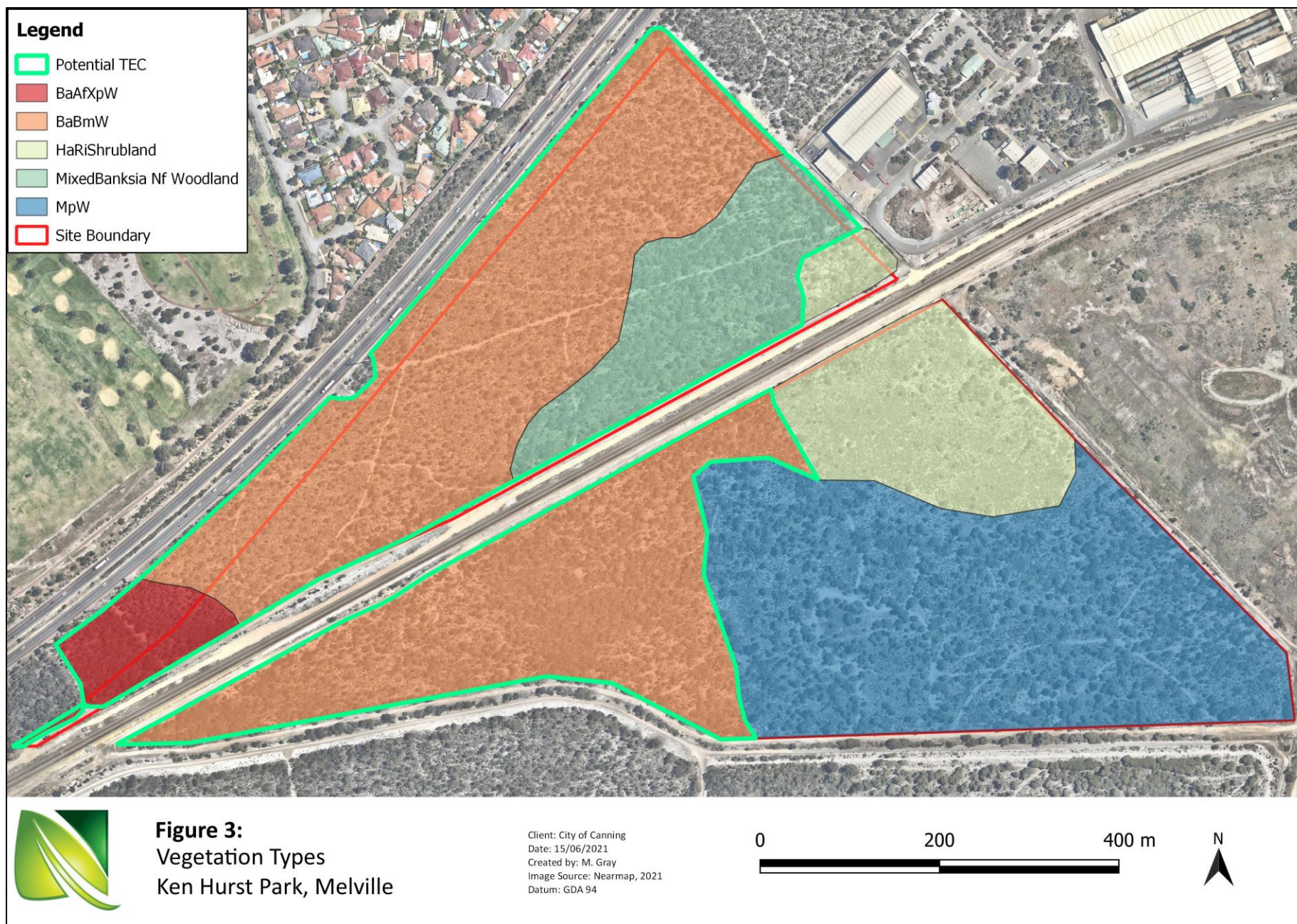
Table 2: Threatened Ecological Communities potentially occurring within Ken Hurst.

TEC Name	Conservation Code	Likelihood of Occurrence
Banksia Woodlands of the Swan Coastal Plain	EN	Community likely to occur
Subtropical and Temperate Coastal Saltmarsh	VU	Unlikely to occur
Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain	CR	



Table 3: Vegetation types present in Ken Hurst

Vegetation Type	
ATA Environmental (2003)	Natural Area (2020)
Ken Hurst North	
<i>Regelia inops</i> , <i>Scholtzia involucrata</i> , <i>Hypocalymma angustifolium</i> , <i>Kunzea glabrescens</i> Closed Low Heath with scattered <i>Melaleuca preissiana</i>	<i>Hypocalymma angustifolium</i> and <i>Regelia inops</i> Shrubland (HaRiShrubland)
<i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> Low Open Forest with scattered <i>Eucalyptus tottiana</i> and <i>Nuytsia floribunda</i>	<i>Banksia attenuata</i> , <i>Allocasuarina fraseriana</i> and <i>Xanthorrhoea preissii</i> Woodland (BaAfXpW)
<i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> Low Woodland	Mixed <i>Banksia</i> and <i>Nuytsia floribunda</i> Woodland (MixedBanksiaNf Woodland)
	<i>Banksia attenuata</i> and <i>Banksia menziesii</i> Woodland (BaBmW)
Ken Hurst South	
<i>Regelia inops</i> , <i>Scholtzia involucre</i> , <i>Hypocalymma angustifolium</i> , <i>Kunzea glabrescens</i> Closed Low Heath with scattered <i>Melaleuca preissiana</i>	<i>Hypocalymma angustifolium</i> and <i>Regelia inops</i> Shrubland (HaRiShrubland)
<i>Banksia ilicifolia</i> Low Woodland	
<i>Melaleuca preissiana</i> Tall Open Scrub	
<i>Melaleuca preissiana</i> and <i>Banksia littoralis</i> Low Open Woodland over <i>Xanthorrhoea preissii</i> Shrubland	<i>Melaleuca preissiana</i> Woodland (MpW)
<i>Banksia littoralis</i> , <i>Melaleuca preissiana</i> , <i>Nuytsia floribunda</i> and <i>Eucalyptus marginata</i> Open Woodland	
Mixed <i>Banksia</i> sp. and <i>Eucalyptus</i> sp. Woodland	<i>Banksia attenuata</i> and <i>Banksia menziesii</i> Woodland (BaBmW)
<i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> Low Woodland	
<i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Allocasuarina fraseriana</i> Low Open Forest with scattered <i>Eucalyptus tottiana</i> and <i>Nuytsia floribunda</i>	



2.2.2 Fauna Habitat

Ken Hurst Park serves as an important habitat at a local level as well as providing regional ecological linkages to surrounding areas, particularly for mobile species such as bats and birds. Ken Hurst Park also provides a refuge for native fauna, including habitats for threatened black cockatoos and the Western Brush Wallaby.

Black cockatoos are known to roost and forage within Ken Hurst Park (DBCA 2021a). Ken Hurst (north and south) is recorded as occurring within:

- Black Cockatoo Roosting Site Buffered
- Carnaby's Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain IBRA region
- Carnaby Cockatoo Confirmed Roost Sites Buffered 6 km
- Carnaby's Cockatoo Unconfirmed Roost Sites Buffered 6 km (south only).

Spring surveys during 2020 undertaken by Natural Area confirmed that Ken Hurst contained preferred food sources for threatened black cockatoos including Eucalypt and Banksia species occurring on both sides of the rail line (Department of Environment and Conservation, 2011). The endangered Carnaby Cockatoo (*Calyptrorhynchus latirostris*) was also observed feeding on *Banksia menziesii* at the most southern boundary of Ken Hurst Park.

Large native trees with a diameter at breast height (DBH) greater than 500 mm provide important habitat for bird and bat species. They provide roosting, foraging and nesting habitats with larger trees more likely to contain hollows suitable for black cockatoo nesting. Habitat trees with a DBH greater than 600 mm were mapped across Ken Hurst Park with any notable fauna interactions such as nests, hollows and feral bee hives recorded (Table 4, Figures 4 to 6). Tree hollows with a sufficiently wide entrance, suitable entry angle and hollow depth may present potential breeding habitat for black cockatoos. Smaller hollows within trees provide nesting habitat for other bird species and have the potential to become suitable for black cockatoos in the future.

One bat box was recorded on a *Melaleuca raphiophylla* within Ken Hurst south with no observable signs of bats present during the survey (Figures 4 and 5).



Figure 4: Ken Hurst Park bat box

Table 4: Habitat Trees with DBH > 600 mm in Ken Hurst Park

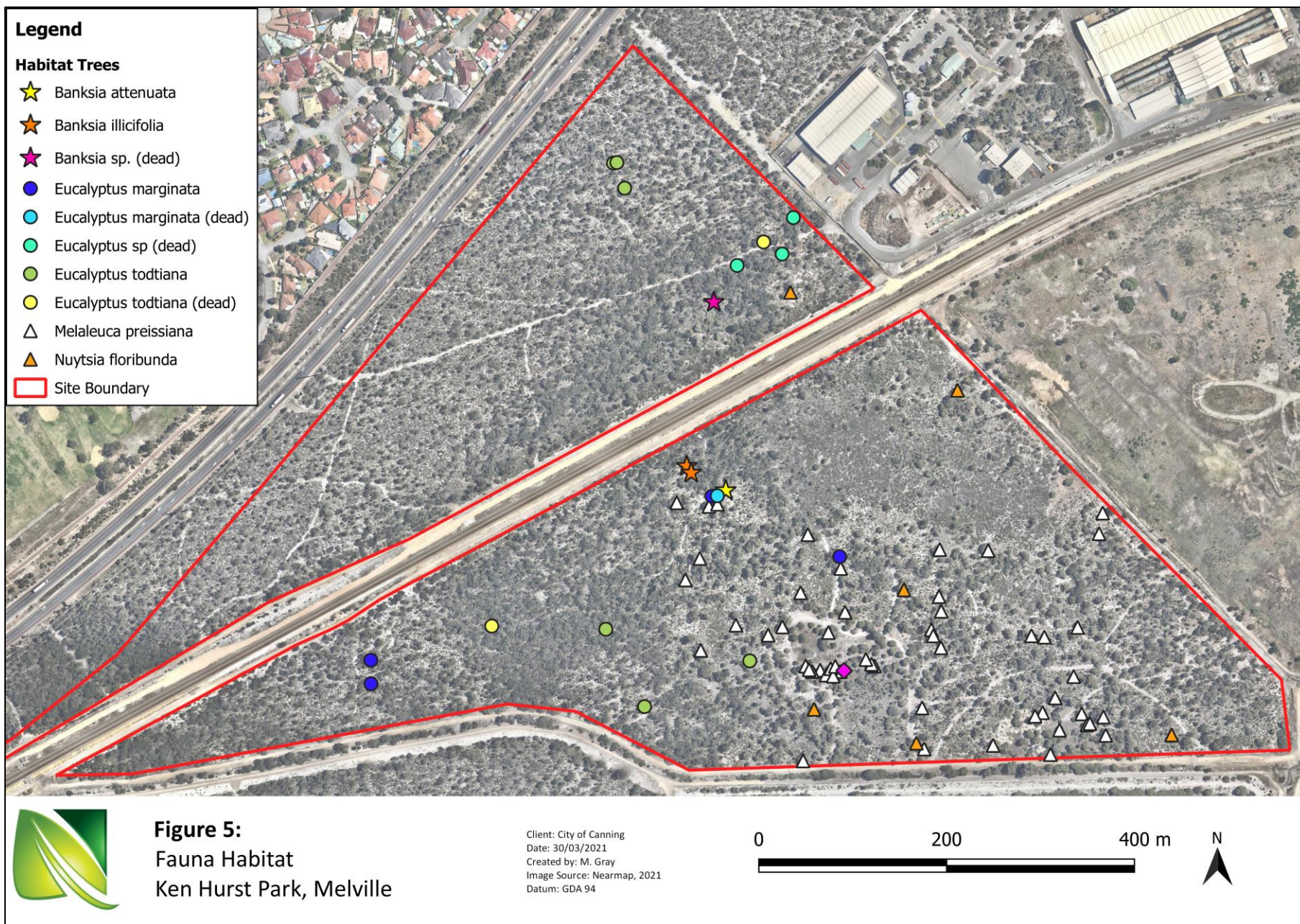
Species	Alive	Dead	Total
Ken Hurst North			
<i>Banksia</i> sp.	0	1	1
<i>Eucalyptus</i> sp.	0	3	3
<i>Eucalyptus tottiana</i>	3	1	4
<i>Nuytsia floribunda</i>	1	0	1
Subtotal	4	5	9
Ken Hurst South			
<i>Banksia attenuata</i>	1	0	1
<i>Banksia ilicifolia</i>	2	0	2
<i>Eucalyptus marginata</i>	4 (1 tree with bird nests)	1 (1 tree with a hollow-suitable for cockatoos)	5
<i>Eucalyptus tottiana</i>	3 (1 tree with a hollow-suitable for cockatoos)	1 (1 x hollows with bees)	4
<i>Melaleuca preissiana</i>	54 (1 tree with a bird nest, 5 tree with small hollows)	0	54
<i>Nuytsia floribunda</i>	5	0	5
Sub total	69	2	71
Total	73	7	80

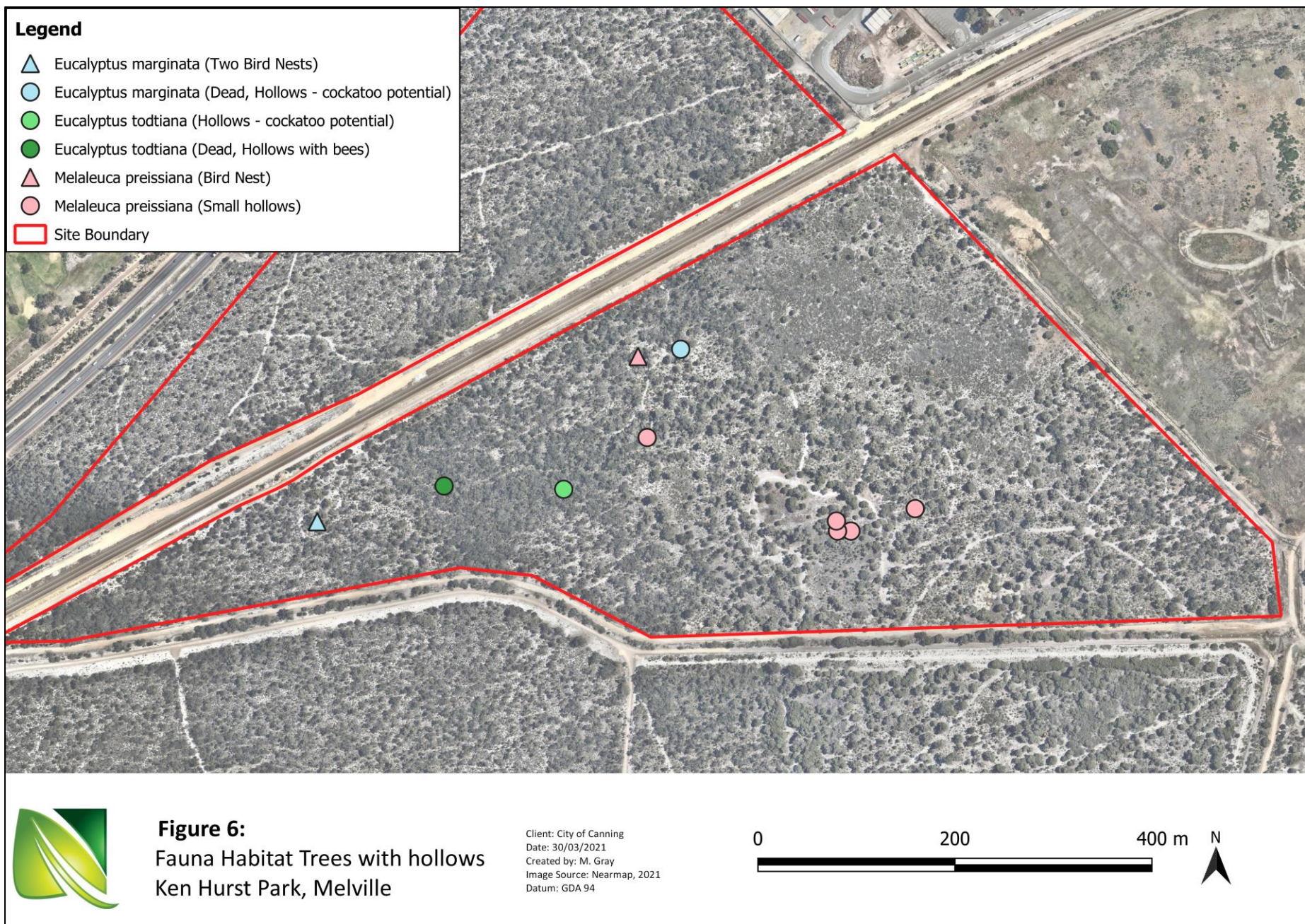
Fauna habitat site indices for habitat trees is show in Table 5 and are recorded in trees per hectare for easier comparison between reserves within the City of Melville. As there is no previous information regarding the number of habitat trees at Ken Hurst, no comparison can be made to determine if an increase or loss has occurred.

Table 5: Habitat Trees with a DBH > 600 mm in Ken Hurst Park

Values	Habitat Sites	Trees / Hectare 1992-2002	Trees / Hectare 2003-2013	Trees / Hectare 2020	Assets 2014-2020
Medium Very Large Trees	Live native tree	No data	No data	1.54	Unable to assess changes
	Dead tree			0.15	







2.2.3 Wetlands

Wetlands are areas that experience permanent, seasonal or intermittent waterlogging or inundation by water (DBCA, 2018). The Perth Ground Water Map from the Department of Water and Environmental Regulation (2021) identifies the depth to groundwater ranging from:

- 3.0 to 11.3 m within Ken Hurst South
- 4.0 to 13.0 m within Ken Hurst North.

Two damplands were classified as resource enhancement within Ken Hurst in 2014, making up an area of 10.53 ha (Waters, 2013). Since then, these two damplands and their bordering associate vegetation were reclassified to management category: Conservation, increasing its footprint to 20.56 ha (DBCA, 2021b) (Table 6). According to the Groundwater Dependent Ecosystem Atlas, the two wetlands within Ken Hurst Park are classified as having a moderate potential to be a groundwater dependent ecosystem (GDE) (BOM, 2021).

Table 6: Ken Hurst Park Wetland characteristics

Features	2000 ^a	2013 ^b	2020N ^c	2020S ^c
Management Category	Resource Enhancement	Resource Enhancement	Conservation	Conservation
ID (Area) Wetland Type Landform	Dampland	6776 (7.27 ha) Dampland, basin	16113 (0.37 ha) Dampland, basin	16112 (7.25 ha) Dampland, basin
		6777 (3.26 ha) Dampland, basin	16116 (0.86 ha) Unidentified	16114 (3.86 ha) Dampland, basin
				16115 (8.22 ha) Unidentified
Total Area (ha)	N/A	10.53	1.23	19.33
			20.56	

Source: Government of Western Australia (2000)^a, Waters (2013)^b & Natural Area (2021)^c

2.2.4 Heritage

Ken Hurst Park and its adjacent areas are listed on the Register of National Estate, which is a list of natural, indigenous and historic heritage places through Australia (non-statutory archive, Place ID:100375) (DAWE, 2021). It is nominated based on its size and environmental value as a remnant Banksia Woodland and presence of several threatened and priority flora species. Heritage associations of a site are important when determining management activities.

The *Aboriginal Heritage Act 1972 (WA)* recognizes the strong relationship of Aboriginal people to the land and provides protection for all places and objects that have historical and cultural significance. Section 175 of the *Aboriginal Heritage Act 1972* states that it is an offence to excavate, destroy, damage, conceal or in any way alter an Aboriginal heritage site.

Ken Hurst Park contains no heritage sites listed on the:

- Australia's National Heritage List (DAWE, 2021)
- Aboriginal Heritage Inquiry System (DPLH, 2021)
- WA Heritage Register (Government of Western Australia, 2021)
- City of Melville Heritage Register (City of Melville, 2019b)

The closest two registered aboriginal sites occur approximately less than 2 km south of Ken Hurst Park, including Site 4310 (Kelso Road) and Site 4311 (Acourt Road). Both sites are categorised as Artefacts/Scatter sites with no gender restrictions (DPLH, 2021).



2.2.5 Community Interest

Ken Hurst Park has restricted access to the public and contains no recreational areas. Permission to enter the reserve is controlled by the City of Melville and is often facilitated through guided tours by the local community landcare group. Some informal and formal maintenance access tracks occur within the reserve (Figure 8).

Although access into the reserve is limited, there is an active community group, Friends of Ken Hurst Park, which participate in natural area management activities including revegetation, rubbish removal as well as opportunistic reporting of flora and fauna species encountered within the reserve. Engaging the community in decision-making processes and on-ground field work helps to raise awareness and increase knowledge on local environmental related issues. Community groups and schools can also provide an invaluable resource to help with on-going revegetation efforts and monitoring. Friends of Ken Hurst Park is the main active community group servicing the reserve with members undertaking activities such as:

- guided walks
- planting in revegetation sites
- monitoring
- rubbish removal.

Potential revegetation sites within the north and south portions of the reserve are shown in Figure 8 and the proposed area size is shown in Table 7. These vegetation sites have been identified due to the high level of bare ground and weed species present. Current revegetation was observed during the 2020 surveys some of which was observed in a poor state due the fallen tree bags which were smothering any surviving plants (Figure 7). It is recommended to ensure that regular maintenance occurs following revegetation installation with the removal of bags once plants have established.

A potential revegetation area (Area 5) adjacent to the Canning Landfill and Recycling Facility is recommended to only be subject to revegetation once the issue of Kangaroo trampling is resolved. There is direct access for Kangaroos through a hole in the fence (Figure 7 and 8) from the landfill site which has cause a kangaroo thoroughfare with any revegetation in this area likely to be unsuccessful due to excessive trampling and grazing, with revegetation to occur once access is restricted. Revegetation within Area 3 is recommended to be comprised of understorey and mid storey species as these occur less often in this area.

Table 7: Ken Hurst Park proposed revegetation

Location		Area (m ²)
North	1	0.399
	2	0.091
	Total	0.49
South	3	2.629
	4	4.141
	5	0.804
	6	0.279
	Total	7.853



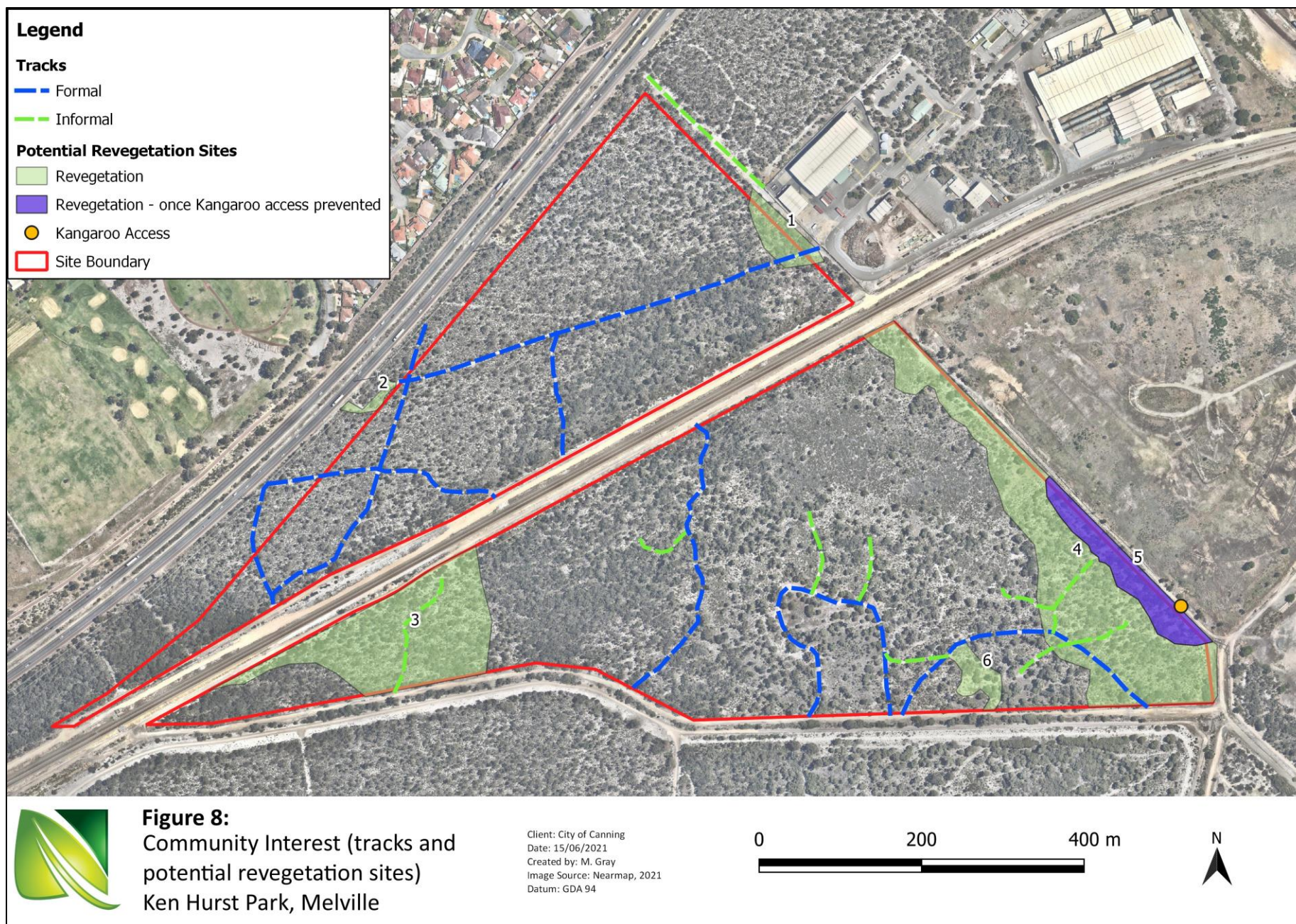


Current revegetation within Ken Hurst
Figure 7: Ken Hurst Park revegetation



Kangaroo access from the Canning Landfill





2.2.6 Reference Sites

Reference sites present within Ken Hurst Park include the four quadrats established by Gibson *et al* (1994), with their GPS co-ordinates listed in Table 8 and fauna trapping activity set out during Natural Areas fauna survey in 2020, with locations shown in Appendix 1. Natural Area trapping sites consisted of:

- trail cameras, five cameras within the south pocket, three cameras within the north
- Elliot traps
- trap lines consist of funnel traps and fly-wire.

Table 8: Location of Gibson *et al* (1994) flora quadrats within Ken Hurst

FID	Latitude	Longitude
HURST01	-32.081	115.888.1
HURST02	-32.0807	115.8904
HURST03	-32.0799	115.8837
HURST04	-32.0766	115.8846

2.3 Species

Native flora, fauna and weed species were identified during the 2020 survey of Ken Hurst Park. Native flora and fauna is described in section 2.3.1 and 2.3.2 with introduced species described within the Threats sections 3.3 and 3.5.

2.3.1 Native Flora

A combined total of 188 flora species from 52 families were recorded in Ken Hurst Park, 122 species within the north and 157 in the south, with 87 (46%) of flora species occurring in both the northern and southern section. Of the species recorded 52 (27.5%) are introduced (weeds). No threatened or priority species were recorded during the survey. The families Myrtaceae and Fabaceae were the most species rich, observing 18 and 20 species, respectively.

Using the City of Melville's 'At-Risk' species list, four species listed in Table 9 were identified across Ken Hurst Park in 2020. Examples of the native flora species are shown Figure 9, with a complete flora list in Appendix 3.

Table 9: At-Risk (high priority) flora species recorded 2020

At-Risk Flora Species	1992 ^a	2000 ^a	2002 ^a	2003 ^c	2012 ^a	2020 N ^b	2020 S ^b	Assets 2014-2020
<i>Boronia dichotoma</i>	X		X				X	Confirmed present – species maintained
<i>Caladenia huegelii</i>	X		X		X			Not assessable
<i>Drosera zonaria</i>	X							Not assessable
<i>Grevillea obtusifolia</i>				X				Not assessable
<i>Hensmania turbinata</i>	X							Not assessable, not recorded for 28 years.
<i>Lysinema elegans</i>	X							Not assessable, not recorded for 28 years.
<i>Platysace filiformis</i>						X		New record- confirmed present

At-Risk Flora Species	1992 ^a	2000 ^a	2002 ^a	2003 ^c	2012 ^a	2020 N ^b	2020 S ^b	Assets 2014-2020
<i>Pterostylis pyramidalis</i>							X	New record- confirmed present
<i>Stylidium squamellosum</i>	X							Not assessable Occurrence unlikely due to geographic distribution
<i>Stylidium preissii</i>	X							Not assessable, not recorded for 28 years.
<i>Wahlenbergia preissii</i>	X	X					X	Confirmed present – species maintained

Source: Waters (2013)^a, Natural Area (2021)^b City of Melville (2019c)^c





Thelymitra benthamiana (Leopard Orchid)



Calytrix fraseri
(Pink Summer Calytrix)



Thysanotus sparteus



Boronia dichotoma



Euchilopsis linearis
(Swamp Pea)



Caladenia longicauda
(Common White Spider Orchid)

Figure 9: Examples of native flora observed within Ken Hurst

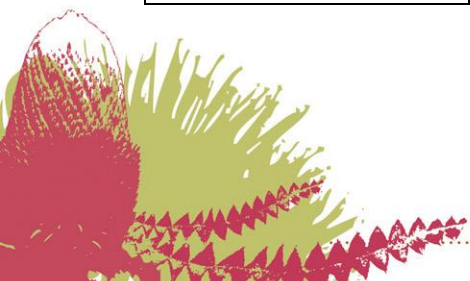
2.3.2 Native Fauna

Ken Hurst Park provides a variety of habitats for an array of fauna species with their movement across the northern and southern sections impacted by the existing and developing railway infrastructure. All fauna surveys including trapping, night stalks and motion activated camera trapping was conducted between the 2nd to the 6th of November 2020.

A total of 54 species from five species groups were observed across the reserve, with 30% of native fauna species occurring in both the northern and southern section (Table 10). Examples of species observed are shown in Figure 10 with a complete species list in Appendix 4.

Table 10: Native Fauna species found within Ken Hurst Park

Species Group	Ken Hurst Park		
	North	South	Overall
Mammals	2	3	3
Birds	9	12	14
Reptiles	6	7	10
Amphibians	0	1	1
Invertebrates	16	13	26
Total	33	36	54





Western Brush Wallaby
(*Notamacropus irma*)



Carnaby's Cockatoo
(*Calyptorhynchus latirostris*)



Rainbow Bee-eater
(*Merops ornatus*)



Western Banjo Frog
(*Limnodynastes dorsalis*)



Gray's Legless Lizard
(*Delma grayii*)



Dugite
(*Pseudonaja affinis*)

Figure 10: Examples of fauna observed within Ken Hurst

2.3.1.1 Mammals

Of the five mammals observed within Ken Hurst Park, two were introduced species, the Red Fox and the European Rabbit. Two priority species were recorded within the reserve, Quenda (*Isodon fusciventer*) which was recorded both north and south, and the Western Brush Wallaby (*Notamacropus irma*), southern portion, both are listed as Priority 4 under the *Biodiversity Conservation Act 2016 (WA)*. Previously the Western Brush Wallaby was thought to have gone locally extinct as it had not been recorded since 1992. The use of trail cameras allowed this population to be captured on all five of the cameras on the southern side, indicating their presence is absent from the northern section but occurrence was determined to be widespread on the southern.

The City's NAAMP (2019) identified six 'at-risk' mammal species, of which three species have been maintained within Ken Hurst Park. The remaining three species have not been recorded and are assumed to be locally extinct. The six 'at risk' mammal species listed by the City are shown in Table 11 and their presence or absence is compared against fauna studies for previous management plans.

Natural Area (2013) estimated that the Western Grey Kangaroo population stands at approximately 30 individuals. This exceeds the carrying capacity of Ken Hurst Park to maintain a sustainable population. However, it was observed that the proximity of Ken Hurst Park to its surrounding area may support a larger population as adjacent areas, such as the Canning Landfill may provide additional resources. Observations during the 2020 fauna surveys noted that the southern section had a considerably higher population of kangaroos as well as high evidence of vegetation grazing. Breaks along fence-line facilitates movement of kangaroos between the Landfill and Jandakot airport which provide food resource in the form of maintained grassed areas. As such, kangaroo management should be undertaken holistically with the various stakeholders (City of Melville, City of

Canning, Jandakot Airport) undertaking population surveys to ensure kangaroos numbers do not overwhelm and cause damage to conservation areas.

The Honey Possum is the only obligate nectivorous non-flying mammal species that is also endemic to the South-western corner of Australia (Dundas, Hardy & Fleming, 2016). Living off nectar, this species primarily lives within Banksia woodlands where there is rich floral diversity supplying nectar and pollen year-round. This species is an important pollinator of various flora species from the Proteaceae, Myrtaceae and Ericaceae families. Individuals home ranges overlap with males known to travel up to 200 m in a day (Bradshaw, 2002). Threatened by predation from feral fauna and habitat loss through urbanisation, dieback and increased fire regimes, this species has seen prime habitat reduced and fragmented over time (Dundas, Hardy & Fleming, 2016, Bradshaw, 2017 & Everaardt, 2003).

Primarily habituating the far south-west of Western Australia this species was confirmed to persist within the Perth Metropolitan Region, found within Ranford Bushland in 2014 (Natural Area, 2014). Ranford Bushland makes up part of the Bush Forever Site 388 – *Jandakot Airport*, which is adjacent to the southern border of Ken Hurst (Government of Australia, 2000). Due to this proximity of these reserves and the similarity of vegetation present within them it is likely this species has a population that utilises suitable habitat across these reserves.

Table 11: At Risk Mammal Species Indices.

Species Values	Mammals	Confirmed	Presence 2020		Assets
			North (N)	South (S)	
Very High	Southern Brown Bandicoot / Quenda – P4 (<i>Isodon fusciventer</i>)	2012	X	X	Maintained
	Western Brush Wallaby – P4 (<i>Notamacropus irma</i>)	1992	-	X	N; presumed locally extinct. S; maintained.
Medium	Western Grey Kangaroo (<i>Macropus fuliginosus</i>)	2012	X	X	Assume unchanged
	Bush Rat (<i>Rattus fuscipes</i>)	-	-	-	Assumed locally extinct.
	Honey Possum (<i>Tarsipes rostratus</i>)	-	-	-	Possibly present
	Brush-tailed Possum (<i>Trichosurus vulpecula</i>)	-	-	-	Assumed locally extinct.

2.3.1.2 Bats

No evidence of confirmation of native bats found within Ken Hurst in the 2020 survey, it is assumed that native bats would still be present and utilise the site for breeding (Table 12).

Table 12: At Risk Bat Species Indices

Species Values	Bat Species	Previous year observed	Presence 2020		Assets
			North (N)	South (S)	
Very High	Western False Pipistrelle (<i>Falsistrellus mackenziei</i>)	Assumed present	Assumed present		Assumed unchanged
Medium	Gould's Wattled bat (<i>Chalinolobus gouldii</i>)	2012			
	Chocolate Wattled Bat (<i>Chalinolobus morio</i>)	Assumed present			
	Lesser Long-eared Bat (<i>Nyctophilus geoffroyi</i>)				

Species Values	Bat Species	Previous year observed	Presence 2020		Assets
			North (N)	South (S)	
	Gould's Long-eared Bat (<i>Nyctophilus gouldii</i>)				
	Greater Long-eared Bat (<i>Nyctophilus major</i>)				
	Southern Forest Bat (<i>Vespadelus regulus</i>)				

2.3.1.3 Birds

Birds observed within Ken Hurst Park are listed in Appendix 4. A total of fifteen bird species from ten families were observed, one of these was an introduced species, Rainbow Lorikeet (*Trichoglossus moluccanus*).

One conservation significant species was observed in the southern section of Ken Hurst, Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and is listed as endangered under the *EPBC Act 1999* (Cwlth) and threatened under the *Biodiversity Conservation Act 2016 (WA)*. Seven of the 15 species (47%) were observed within both portions of Ken Hurst and due to mobility through flight, species observed in one section are likely to be present in both. Birds that are classified as 'at risk' by the City are categorised by value in Table 13 and their presence or absence compared against fauna in previous management plans.

Table 13: At Risk Bird Species Indices

Species Values	Birds	Previous year observed	Presence 2020		Assets
			North (N)	South (S)	
Very High	Carnaby's Cockatoo – T/EN (<i>Calyptorhynchus latirostris</i>)	2012	Presence likely due to foraging source	X	Maintained
	Barking Owl (<i>Ninox connivens</i>)	1992	-	-	Assumed locally extinct
	Red-tailed Black Cockatoo – VU/EN (<i>Calyptorhynchus banksii naso</i>)	-	Potential to occur due to presence of foraging species		Assumed present.
	Baudin's Black Cockatoo – VU/EN (<i>Calyptorhynchus baudinii</i>)	-	-	-	Assumed locally extinct, outside of known range.
High	Inland Thornbill (<i>Acanthiza apicalis</i>)	1992	-	-	Assumed locally extinct
	Yellow-rumped Thornbill (<i>Acanthiza chrysorrhoa</i>)	2012	Assumed present		Maintained.
	Western Thornbill (<i>Acanthiza inornata</i>)	1992	-	-	Assume locally extinct
	Western Wattlebird (<i>Anthochaera lunulata</i>)	2003	-	-	Assumed maintained, habitat suitable.
	Grey Strike-thrush (<i>Colluricincla harmonica</i>)	2003	-	-	Assumed locally extinct. Occurrence possible, habitat suitable.
	Splendid Fairy-wren (<i>Malurus splendens</i>)	2012	X	Presence likely	Maintained

Species Values	Birds	Previous year observed	Presence 2020		Assets
			North (N)	South (S)	
	Rainbow Bee-eater (<i>Merops ornatus</i>)	2012	X	X	Maintained
	Common Bronzewing (<i>Phaps chalcoptera</i>)	2012	X	X	Maintained
	New Holland Honeyeater (<i>Phylidonyris novaehollandiae</i>)	2012	X	Presence likely	Maintained
	Weebil (<i>Smicrornis brevirostris</i>)	1992	-	-	Assumed locally extinct. Occurrence possible, habitat suitable.
	Painted Button-quail (<i>Turnis varia</i>)	1992	-	-	Assume locally extinct. Occurrence possible, habitat suitable.
	Rufous Treecreeper (<i>Climacteris rufa</i>)	-	-	-	Presume locally extinct. Scarce on the Swan Coastal Plain.
Medium	Red-capped Parrot (<i>Platycercus spurius</i>)	2012	X	X	Maintained
	Scarlet Robin (<i>Petroica boodang</i>)	-	-	-	Occurrence possible, habitat suitable.
Low	Western Spinebill (<i>Acanthorhynchus superciliosus</i>)	2003	-	-	Occurrence possible, habitat suitable.
	Tree Martin (<i>Hirundo nigricans</i>)	1992	-	-	Occurrence possible, habitat suitable.
	Striated Pardalote (<i>Pardalotus striatus</i>)	2012	Assumed present		Occurrence possible, habitat suitable. Assume unchanged
	Australian Ringneck (<i>Platycercus zonarius</i>)	2012	Assumed present		Assume unchanged
	Sacred Kingfisher (<i>Todiramphus sanctus</i>)	1992	-	-	Assume locally extinct

Source: Waters (2013) and Natural Area (2021)

2.3.1.3 Reptiles and Amphibians

Reptiles and Amphibians observed within Ken Hurst Park are listed in Appendix 4. A total of eleven species from six families were observed across Ken Hurst. Reptiles that are classified as 'at risk' by the City are categorised by value in Table 14 and their presence or absence compared against fauna studies for previous management plans.

Of the eleven species, one has not been previously recorded within Ken Hurst Park, Gould's Sand Goanna (*Varanus gouldii*). Being the second largest monitor species within Australia, this species is a generalist forager eating almost anything smaller than itself, preferring small lizards, insects and arachnids (Bird *et al.*, 2013). Found throughout Australia on sandy terrains, this species burrows underground to shelter and lay their eggs (King, 1980 & Thompson, G). With burrows often located beneath rocks, shrubs or logs the Gould's Sand Goanna has been known to utilise pre-existing rabbit warrens for shelter (McDonnell, n.d). With an approximate lifespan of 18 years this species is considerably more active in summer than winter, generally foraging within the leaf litter (Green & King, 1978 & Thompson, 1996).



Table 14: At Risk Reptile and Amphibian Species Indices

Species Values	Reptiles and Amphibians	Previous year observed	Presence 2020		Assets
			North	South	
Very High	Lined Skink – P3 (<i>Lerista lineata</i>)	1992	-	-	Unconfirmed, possible habitat suitable.
	Black-striped Snake – P3 (<i>Neelaps calonotos</i>)	-	-	-	Unconfirmed, possible habitat suitable.
High	Gould's Sand Goanna (<i>Varanus gouldii</i>)	-	-	X	Southern population confirmed.
Medium	Western Heath Dragon (<i>Ctenophorus adalaidensis</i>)	1992	-	X	Southern population maintained. Northern portion occurrence possible.
	Fraser's Legless Lizard (<i>Delma fraseri</i>)	2012	Assumed present		Assume unchanged
	Gray's Legless Lizard (<i>Delma grayii</i>)	-	X	Assumed present	Northern population maintained. Southern population assumed unchanged.
	Burton's Snake Lizard (<i>Lialis burtonis</i>)	1992	X	X	Maintained
	Black-naped Snake (<i>Neelaps bimaculatus</i>)	1992	-	-	Unconfirmed, possible habitat suitable.
	Common Scaly-Foot (<i>Phygopus lepidopodus</i>)	1992	Assumed present	X	Northern population assumed unchanged. Southern population maintained.
	Southern Blind Snake (<i>Anilius australis</i>)	-	-	-	Unconfirmed, possible habitat suitable.
	Common Beaked Blind Snake (<i>Anilius waitii</i>)	-	-	-	
	Yellow Faced Whip Snake (<i>Demansia psammophis</i>)	-	-	-	
	Keeled Legless Lizard (<i>Pletholax gracilis</i>)	-	-	-	
	Western Tiger Snake (<i>Notechis scutatus</i>)	-	-	-	Unconfirmed, possible habitat suitable.
Low	Western Bearded Dragon (<i>Pogona minor minor</i>)	1992	X	Assumed present	Northern population maintained. Southern population assumed unchanged.
	Dugite (<i>Pseudonaja</i>)	2003	Assumed present	X	Northern population assumed unchanged. Southern population maintained.
	Worm Lizard (<i>Aprasia repens</i>)	-	-	-	Unconfirmed, possible habitat suitable.
	Marbled Gecko (<i>Christinus marmoratus</i>)	-	-	-	Unconfirmed, possible habitat suitable.

Source: Waters (2013) and Natural Area (2021)

2.3.1.5 Invertebrates

Invertebrates observed within Ken Hurst Park are listed in Appendix 4. A total of 31 different species were observed, of which three were introduced species. One species of invertebrates is classified

as 'at risk' by the City, the Western Petalura (*Petalura hesperia*) and is not likely to occur within Ken Hurst Park.



3 Threats

Threats present within the reserve include:

- physical disturbance
- fire
- weed species
- habitat loss
- feral animals
- diseases and pathogens
- stormwater
- reticulation
- acid sulphate soils
- climate change.

3.1 Physical Disturbance

Physical disturbance relates to anthropogenic influences such as informal tracks, trampling of vegetation, dumping of rubbish and garden waste, removal of vegetation and geocaching.

Physical disturbance within Ken Hurst includes:

- rubbish dumping
- campfires
- treehouse cubby
- trampling and the creation of informal tracks.

Examples of physical disturbances are shown in Figure 11 with locations provided in Appendix 2 and assessed in Table 15.





Rubbish dumping



Excess revegetation material not removed.



Cubby within a tree



Campfire and rubbish

Figure 11: Examples of physical disturbance in Ken Hurst Park

Table 15: Physical Disturbance Indices

Impact	Physical Disturbance	1992 - 2002	Disturbance 2003 - 2013	Disturbance 2020	Threats
High Potential to substantially change ecosystem structure, composition or function	Clearing for utilities	1020 m ²		None observed	Contained
Medium Potential to moderately change ecosystem structure, composition or function	Trampling (informal paths)	3500 m ²	0	410 m ²	Decreased
	Rubbish Dumping	No Data	6 occurrences (2010 – 2012 only)		
	Tree Poisoning		0	None observed	Contained
	Vandalism		6 occurrences (data available from 2010 – 2012 only)		Contained
	Cubby		-	1 cubby	Increased



3.2 Fire

One small unauthorised campfire was recorded within the southern portion (Appendix 2), no other signs of fires were observed during the 2020 survey (Table 16). No signs of fire could be determined from aerial photographs from 2014-2020.

Table 16: Fire Indices

Impacts	Fires	Extent of fires 2003 - 2013	Extent of fires 2014 - 2020	Threats
High Potential for local extinctions of ground dwelling species	Large Fires	0 ha	No recent fires observed.	Prevented
High Potential for local extinctions of Endangered Grand Spider Orchid	Fires May to mid- November	0 ha		
High Potential for local extinctions of trees and shrubs that regenerate only from seed stored in the plant	Repeat fires	0 ha		
Medium Potential for moderate impact of ground dwelling species	Small spot fires, unauthorized campfires and bonfires	No Data	1 campfire	Increased

3.3 Weeds

A total of 53 introduced flora species were identified in the spring 2020 survey, undertaken by Natural Area botanists, Sharon Hynes and Kylie Sadgrove and field assistant Megan Gray. Weed species were then categorised through the categorization plan by the City of Melville under the categories Very High, High, Medium and Low (Table 17).

A total of five significant weed species present within the reserve include both Declared Pests and Weeds of National Significance (WoNS):

- Arum Lily (*Zantedeschia aethiopica*) (Declared Pest)
- Common Prickly Pear (*Opuntia stricta*) (Declared Pest, WoNS)
- One-leaf Cape Tulip (*Moraea flaccida*) (Declared Pest)
- Paterson's Curse (*Echium plantagineum*) (Declared Pest, WoNS)
- Bridal Creeper (*Asparagus asparagoides*) (Declared Pest, WoNS).

Declared pests are listed on the Western Australian Organism List under the *Biosecurity and Agriculture Management Act 2007* (WA). This classification requires the landowner/land manager to control the population to limit damage as a result of the presence of these species (Department of Primary Industries and Regional Development 2021a).

Tables 18 and 19 show the individual weed species and groups rated as Very High and High within Ken Hurst, where they have been assessed as either widespread (highlighted red) or localised. Density weed maps of these Very High and High weed species or groups are provided and examples of weeds are shown in Figure 12.

All other medium (perennial) and low (annual) priority weeds were recorded and assessed as localised or not present, with the southern section observing twice the number of low priority species. Low and medium priority weeds were mainly concentrated around tracks and edges of the reserve particularly those adjacent to vehicle access tracks. *Trachyandra divaricata* and *Fumaria capreolata* were the predominant species in the low and medium priority weeds.



Table 17: Number of Weed Species in each Impact Category

Impact	Number of Species in Ken Hurst Park		
	North	South	Species occurring in both north and south
Very High	4	5	6
High	14	20	22
Medium	4	6	8
Low	8	16	17
Total	30	47	53



Bridal Creeper
(*Asparagus asparagoides*)



Prickly Pear
(*Opuntia spicata*)



Arum Lily
(*Zantedeschia aethiopica*)



African Cornflag
(*Chasmanthe floribunda*)



Paterson's Curse
(*Echium plantagineum*)



Freesia
(*Freesia x leichtlinii*)

Figure 12: Examples of introduced flora species



Table 18: Change in extent of infestation over time

Priority	Species or Group	Common Name	1992	2002	2005	2012	2020 N %	2020 S %	Threats
Very High	<i>Zantedeschia aethiopica</i>	Arum Lily	-	-	-	3%	1.67	1.16	Decreased
	<i>Asparagus asparagoides</i>	Bridal Creeper	-	-	-	3%	4.17	15.65	Increased
	<i>Echium plantagineum</i>	Paterson's Curse	X	X	2%	6%	-	4.64	Decreased
	<i>Opuntia stricta</i>	Common Prickly Pear	-	-	-	-	0.42	-	Not assessable
	<i>Morea flaccida</i>	One-leaf Cape Tulip	-	-	-	-	-	0.58	Not assessable
	Perennial Clumping Grasses		X	X	92%	100%	60.50	31.99	Decreased
High	Clumping Geophytes		X	X	29%	72%	26.05	31.12	Decreased
	Perennial Running Grasses		X	X	?	?	-	-	Not assessable (no records)
	Annual Clumping Grasses		X	X	100%	100%	68.49	80.98	Decreased
	Giant Grasses		X	X	<1%	0%	-	-	Not assessable (no records)
	Woody Weeds		X	X	<1%	1%	2.52	4.61	Increased
Medium	Perennial weeds		X	X	X	X	1.5	3	Not assessable
Low	Annual Weeds		X	X	X	X	1	2	Not assessable

Table 19: Extent of infestations within Ken Hurst Park

Species or Group	Common Names	Priority	Count	Area			Extent
				>20 grid points	>2ha	>50% of reserve	
<i>Zantedeschia aethiopica</i>	Arum Lily	Very High	North - 4 South - 4	No	No	No	Localised North population localized. South population spread laterally along southern boundary ≈0.5 km.
<i>Asparagus asparagoides</i>	Bridal Creeper	Very High	North – 10 South - 54	Yes	No	No	Localised North population localized. Widespread South concentrated in dampland to the south east.
<i>Echium plantagineum</i>	Paterson's Curse	Very High	North - 0 South – 16	No	No	No	Localised South localized to southern/east boundaries. Absent from North.
<i>Opuntia stricta</i>	Common Prickly Pear	Very High	North - 1 South - 0	No	No	No	Localised: One small plant in the North's northern corner. Absent from South.
<i>Morea flaccida</i>	One-leaf Cape Tulip	Very High	North – 0 South - 2	No	No	No	South localised along tracks. Absent from North.
Perennial Clumping Grasses		Very High	North - 144 South - 111	Yes	No	No	Widespread North population more prolific along north boundary. South population concentrated to the north east corner.
<i>Ehrharta calycina</i>	Perennial Veldt Grass						
Annual Clumping Grasses		High	North - 134 South - 273	Yes	Yes	No	Widespread Northern and Southern populations both widespread throughout Ken Hurst Park.
<i>Avena barbata</i> <i>Briza maxima</i> <i>Briza minor</i> <i>Bromus diandrus</i> <i>Ehrharta longifolia</i>	Bearded Oat Blowfly Grass Shivery Grass Great Brome Annual Veldt Grass						

Species or Group	Common Names	Priority	Count	Area			Extent
				>20 grid points	>2ha	>50% of reserve	
<i>Hordeum vulgare</i> <i>Lagurus ovatus</i> <i>Lolium rigidum</i> <i>Vulpia myuros</i>	Barley Hare's Tail Grass Wimmera Rye Grass Rat's Tail Fescue						
Clumping Geophytes		High	North - 62 South - 108	Yes	No	No	Localised: North population primarily low-density <i>G. caryophyllaceus</i> . Widespread: Southern population, higher density of species concentrated in the center of the southern boundary.
<i>Chasmanthe floribunda</i> <i>Freesia alba x leichtlinii</i> <i>Gladiolus caryophyllaceus</i> <i>Gladiolus undulatus</i>	African Cornflag Freesia Wild Gladiolus Wild Gladiolus						
Trees and Shrubs		High	10 north 18 south	No	No	No	Localised Populations concentrated around edges and tracks.
<i>Acacia iteaphylla</i> <i>Acacia longifolia</i> <i>Chamaecytisus palmensis</i> <i>Leptospermum laevigatum</i> <i>Retama raetam</i> <i>Ricinus communis</i> <i>Solanum nigrum</i>	Tagasaste Coast Teatree White Weeping Broom Castor Oil Black Berry Nightshade						

3.4 Habitat Loss

Ken Hurst Park north and south are ecologically linked which means there is relatively safe fauna movement between the reserves for species that have the capacity to cross the rail line. Habitat loss can be assessed through assessment of bare ground and weed coverage percentage over time in order to establish trends. The percentage of bare ground for Ken Hurst is shown in Figure 13 and in Table 20, with percentage weed cover per reserve shown in Table 21.

Overall habitat loss is assessed in Table 22 looking at the extent of bare ground and weed cover greater than 25%. It is recommended that areas with >25% bare ground and weed cover be targeted for future revegetation and to maximise success it is recommended to undertake revegetation in conjunction with weed control activities and watering if required. Bare ground was mapped as a percentage where 0% was no bare ground and >25% was the highest bare ground cover.

Prior to the 2020 flora and vegetation survey only vegetation condition was recorded, therefore no historical data regarding bare ground and weed coverage across Ken Hurst is available. It is recommended future surveys assess bare ground and weed coverage to identify changes in habitat loss.

Table 20: Bare Ground Over 2020

Category	Ken Hurst Park		
	North	South	Total
<5%	62.24	55.81	58.46
6-24%	32.37	31.40	31.79
≥25%	5.39	12.79	9.74
Total	100	100	100

Table 21: Weed Cover 2020

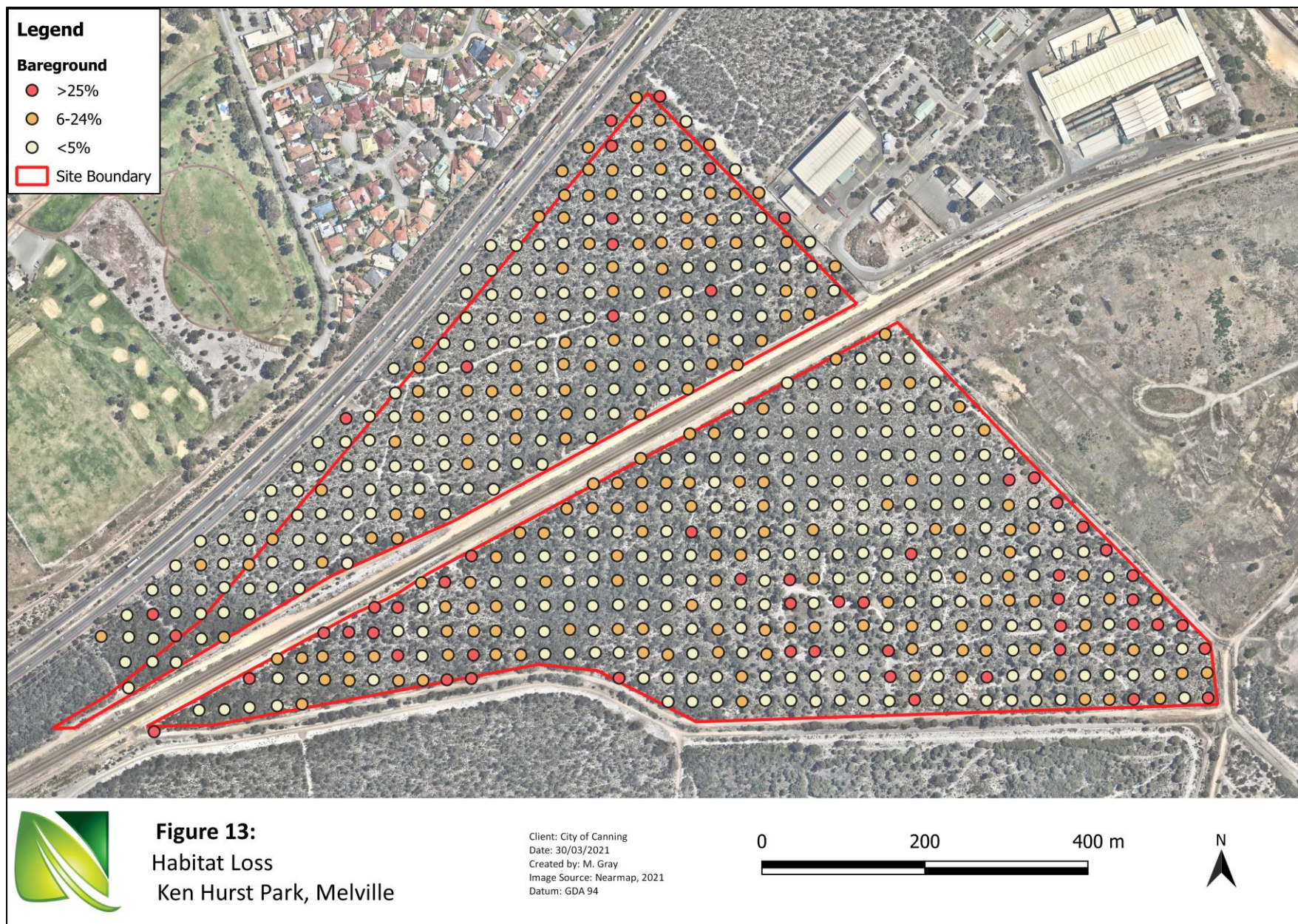
Category	Ken Hurst Park		
	North	South	Combined
0%	7.92	7.25	7.52
1-5%	49.17	39.13	43.25
6-24%	40.42	45.80	43.59
≥25%	2.5	7.83	5.64
Total	100	100	100



Table 22: Habitat Loss Indices

Impact	Habitat Loss	Ken Hurst Park	Percentage of Reserve (%)				Threat
			1992	2003	2013	2020	
Medium Process of moderate ecosystem function modification <ul style="list-style-type: none"> reduced natural regeneration increased fire or erosion risk 	Weed Cover >25%	North	No Data	No Data	No Data	2.5	Change not assessable
		South				7.83	
		Combined				5.64	
Low Process of low ecosystem function modification <ul style="list-style-type: none"> reduced natural regeneration increased fire or erosion risk 	Bare Ground >25%	North	No Data	No Data	No Data	5	Change not assessable
		South				12.75	
		Combined				9.75	

Source: Waters (2014)



3.5 Feral Animals

Feral fauna impact native fauna and flora through predation, competition for food, and shelter, spreading disease and destroying habitat. Six feral fauna species were recorded during the 2020 survey, four of which were observed within both sections of Ken Hurst. Three are considered declared pests under the *Biosecurity and Agriculture Management Act 2007 (WA)*, including the Rainbow Lorikeet (*Trichoglossus haematodus*), Rabbit (*Oryctolagus cuniculus*) and the Red Fox (*Vulpes vulpes*). The feral fauna indices are listed in Table 23 and a complete list of feral fauna occurrences (historical and during this survey) are shown in Table 24. Examples of feral fauna observed are shown in Figure 14.

Table 23: Feral Animal Indices

Impact	Feral Animal	1992	2003 - 2013	2014 - 2020	Threat
Very High Key Threatening Process under the EPBC Act 1999	Feral Cat (<i>Felis catus</i>)	No Data	No Data	2 caught 2014-16, Activity present*	Increase in predation on native fauna
	Rabbit (<i>Oryctolagus cuniculus</i>)	No Data	No Data	Activity Low (2014-15) to Moderate (2016 – 20) Multiple sightings (>10) via trail cameras (2020)	Increase in land degradation and competition
	Red Fox (<i>Vulpes vulpes</i>)	No Data	No Data	9 foxes caught* 3 sightings via trail cameras (2020)	Increase in predation on native fauna
High Competition with native birds for hollows and food (impact level variable)	Honeybee (<i>Apis mellifera</i>)	No Data	>28 beehives	2 beehives	Reduced
Low Competition with native birds and mammals for food and hollows	Rainbow Lorikeet (<i>Trichoglossus haematodus</i>)	No Data	No Data	Present, breeding	Increase in competition

*City of Melville, pers comm

Table 24: Feral Animals observed within Ken Hurst with years observed

Species Group	Feral Animal	Confirmed previously	Confirmed 2020	Status 2021
Mammals	House Mice (<i>Mus musculus</i>)	1992	-	Assumed present
	Feral Cat (<i>Felis catus</i>)	2012	-	Assumed present
	European Rabbit (<i>Oryctolagus cuniculus</i>)	2012	Confirmed present	Confirmed present
	Red Fox (<i>Vulpes vulpes</i>)	2012	Confirmed present	Confirmed present
Birds	Rainbow Lorikeet (<i>Trichoglossus haematodus</i>)	2012	Confirmed present	Confirmed present
	Laughing Dove (<i>Streptopelia senegalensis</i>)	2012	-	Assumed present

Species Group	Feral Animal	Confirmed previously	Confirmed 2020	Status 2021
	Spotted Dove (<i>Streptopelia chinensis</i>)	2012	-	Assumed present
	Rock Dove (<i>Columba livia</i>)	2012	-	Assumed present
Invertebrates	Honeybee (<i>Apis mellifera</i>)	2012	Confirmed present	Confirmed present
	Portuguese millipede (<i>Ommatoiulus moreletii</i>)	2012	Confirmed present	Confirmed present
	Cabbage White (<i>Pieris rapae</i>)	Assumed present	Confirmed present	Confirmed present



Fox predation on Quenda



Rabbit



Feral bee hive

Figure 14: Example of feral fauna observed

3.6 Diseases and Pathogens

Vegetation can be subject to diseases that result in a decline in their vigour or death in the longer term. Common plant pathogens include *Phytophthora* (Dieback), *Armillaria luteobubalina* (Honey Fungus), *Quambalaria* (Marri Canker) and Myrtle Rust. Activities that impact directly on trees, such as the installation of nesting boxes can result in wounds making them more susceptible to infection from pathogens. No evidence of Armillaria, Marri Canker or Myrtle Rust were found within Ken Hurst

but signs of potential dieback, in the form of dead mature Banksia trees and Grass Trees (Figure 15) were observed which extended outside the 2019 Dieback Map (Figure 16), within the northern pocket (Terratree, 2019) (Appendix 2). Indices are provided in Table 25.

The extent of Dieback infestation was mapped in 2019 by Terratree appears to be contained with only one new positive sample outside the confirmed infestation. Three samples collected in proximity to the 2016 samples that were uninfected. It is recommended that further samples are to be taken in area's identified as having potential dieback during the survey conducted by Natural Area in 2020 (Appendix 2).

Table 25: Disease and pathogen indices

Impact	Disease and Pathogens	1992 - 2002	2003 - 2013	2014 - 2020	Threat
Very High Key Threatening Process under the EPBC Act 1999	<i>Phytophthora cinnamomi</i> Dieback	20.94 ha (2002)	Assumed 20.94 ha (2013)	Present 2016 – new positive sample outside previous mapped area.	No maintained, potential for increase. Required investigation.
Medium Native species capable of moderate modification of structure an composition of flora by killing multiple species	<i>Armillaria luteobubalina</i> Honey Fungus	No Data	No Data	Not observed, potential to occur.	Change not assessable



Potential dieback affecting Banksia and Grass Trees

Figure 15: Potential Dieback affected flora



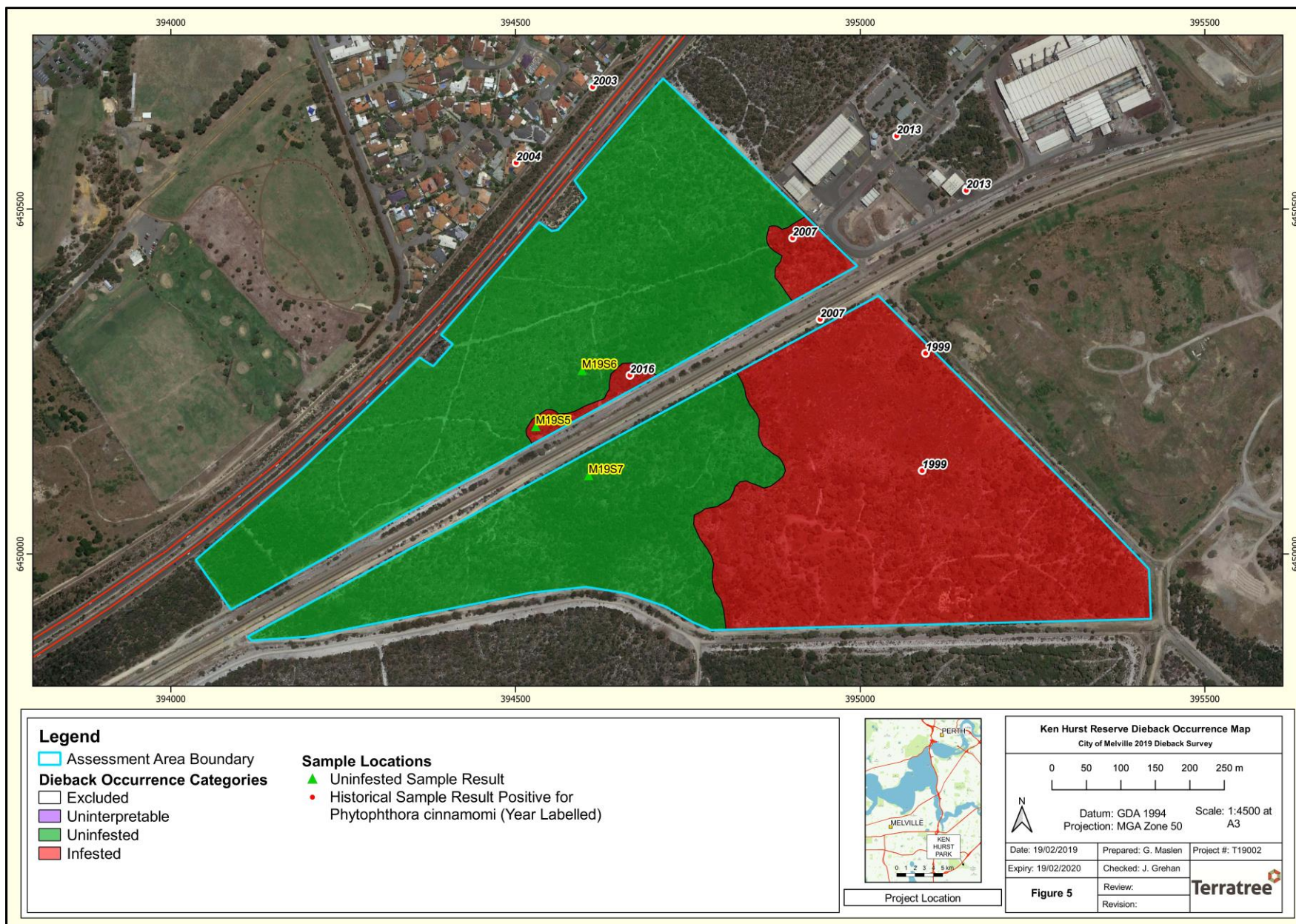


Figure 16: Dieback free and infested areas

3.7 Stormwater

No storm water is re-routed into Ken Hurst Park with no observed impacts from stormwater located during Natural Areas 2020 surveys.

3.8 Reticulation

There is no reticulation present within Ken Hurst Park with no areas adjacent to the reserve with reticulation. Indices for reticulation is found in Table 26 where an occurrence is defined as a recorded sighting of excessive overspray from reticulation or leakage.

Table 26: Reticulation Indices

Impact	Water Source	Occurrences 1992 - 2013	Occurrences 2014 - 2020	Threat
Low Alteration of Surface Water Flows	Overspray or leakage from reticulation adjacent to the reserve	No Data	No Data	Contained (assumed unchanged)

Source: Waters (2013)

3.9 Acid Sulfate Soils

Acid sulphate soils are naturally occurring soils that contain iron sulphides, primarily in the form of pyrite materials, formed under waterlogged conditions in fresh and saline wetlands around Western Australia. If left unexposed to air they do not pose a significant risk to humans or the environment. However, if exposed to air sulphuric acid is formed and this can lead to the release of heavy metals into the surrounding environment (DER, 2015). Acid sulfate soils can occur when the soils are disturbed, where:

- excavations for drainage maintenance or infrastructure construction are dug below the minimum level of the watertable
- groundwater extraction results in oxidation of soils previously permanently saturated by lowering the minimum level of the watertable.

Maintenance activities that require excavations or groundwater extractions are to be managed so that acid sulphate soil reactions do not occur. If this is done those activities will not be recorded as an occurrence of the threat. A review of the DWER acid sulfate risk map indicated that the entire area of Ken Hurst has a moderate to low risk of acid sulfate soils (DWER, 2021). No records of previous acid sulfate soils occurring from excavations or groundwater extraction are available. No obvious signs of acid sulfate soils were noted during the 2020 survey as shown in Table 27.

Table 27: Acid Sulfate Soils Indices

Impact	Potential initiation of Acid Sulfate Soil Reactions	Occurrence 1992- 2002	Occurrence 2003- 2013	Occurrence 2014 - 2020	2020?
Very High	Excavations below the minimum level of water table	No data	0	0	Prevented (assumed none occurred and no changes)
	Groundwater extraction resulting in lowering of minimum water table		0	0	Prevented (assumed none occurred and no changes)

3.10 Climate Change

Climate change within the south-west of Western Australia is expected to cause more frequent and intense weather events, decreasing rainfall, rising sea levels and increasing temperatures. These changes are likely to increase the potential for erosion during storm events and associated strong winds and increased water stress on plants due to rising temperatures and decreasing rainfall. Water stress has the potential to lead to changes in vegetation types and complexes which has the potential to affect the fauna that these vegetation associations support. Reduced rainfall may decrease the groundwater table and in turn negatively affect groundwater dependent species. As some areas of Ken Hurst are listed as a wetland climate change has the potential to impact on this classification. The City of Melville has undertaken a risk assessment to establish climate change risks within the Melville area which was used to develop a Climate Change Adaptation Plan.



4 Implementation

4.1 Management Strategies

The management objectives and implementation of strategies for 2021 – 2026 will be measured in KPIs discussed in the NAAMP (2019).

4.1.1 Key Performance Indicators (KPIs)

Leading indicators and trends indicate (for the life of a reserve management plan) (Table 28):

- whether guidelines and procedures are being effective in meeting objectives of preventing, eliminating, containing and managing impacts from threats; and
- provide a feedback mechanism as to whether guidelines and procedures need to be modified.

4.1.2 Leading Indicators

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

Table 28: Application of leading indicators

Objective	Leading indicators	Acceptable When
Prevent	Prevent <ul style="list-style-type: none">▪ introduction to or occurrence of	<ul style="list-style-type: none">▪ Threat absent from reserve▪ Unplanned introduction possible
Eliminate	Reduce <ul style="list-style-type: none">▪ rate of density/ abundance/ extent▪ eventual complete removal (short term may only reduce numbers or prevent seed set on site)	<ul style="list-style-type: none">▪ Large discrepancy between current and potential impact▪ Potential impact high▪ Elimination feasible
Contain	Stop, restrict, or reduce <ul style="list-style-type: none">▪ rate of spread or▪ frequency of occurrence	<ul style="list-style-type: none">▪ Moderate discrepancy between current and potential impact▪ Potential but not current impact high▪ Elimination not feasible
Manage	Limit <ul style="list-style-type: none">▪ negative impacts on assets	<ul style="list-style-type: none">▪ Small discrepancy between current and potential impact▪ Threat “naturalised” or near maximum extent▪ No information on density/ abundance/ extent
Confirm	Identify <ul style="list-style-type: none">▪ number of threats for which their presence/ extent is uncertain	<ul style="list-style-type: none">▪ Historic but no records in reserve and/ or▪ Presence/ extent uncertain in reserve
None	Not applicable	<ul style="list-style-type: none">▪ Threat absent from reserve▪ Only planned introduction possible

Table 29: Objectives for Weed species in Ken Hurst

Objective	Impact	Weed Species/ Group	2020 Extent	Comment
Prevent	Very High	<ul style="list-style-type: none"> Tamarisk Blackberry Asparagus Fern (aethiopicus) Golden Dodder Madeira Vine Lantana camara Lachenalia reflexa Schinus terebinthifolius 	0	Not present on site
	High	<ul style="list-style-type: none"> Perennial Running Grasses Giant Grasses 	0	Not present on site
Eliminate	Very High	<ul style="list-style-type: none"> Arum Lily 	<5%	North at four locations in wetland area. South pocket; southern boundary four points.
		<ul style="list-style-type: none"> Bridal Creeper 	<5% to 25%	Widespread throughout reserve. North pocket; 11 points at the eastern and western sections. South pocket; widespread, concentrated wetland south-east, 54 points.
		<ul style="list-style-type: none"> Paterson's Curse 	<5% to 25%	Absent from North. South pocket has 16 points along southern and western boundary.
		<ul style="list-style-type: none"> One-leaf Cape Tulip 	<5% to >25%	Absent from North, 2 grid points within the South pocket.
		<ul style="list-style-type: none"> Prickly Pear 	<5%	One small plant within the northern corner of the North pocket.
	High	<ul style="list-style-type: none"> Annual Clumping Grasses Clumping Geophytes Trees and shrubs 	<5% to 25% <5% to 25% <5% to >25%	Widespread both North (224 points) and South (480 points). Widespread both North (62 points) and South (122 points). North (18 points) along borders with >25% on the eastern border. South (11 points) all <5%.
Contain	Very High	<ul style="list-style-type: none"> Perennial Clumping Grasses 	<5% to 25%	Widespread across North (141 points) and South (111 points). Difficult to eliminate in short term, requires regular treatment.
Manage	Medium	<ul style="list-style-type: none"> All other perennial weeds 	<5% to 25%	Localised infestations mainly located adjacent to reserve edges and tracks.
	Low	<ul style="list-style-type: none"> All other annual weeds 		

Table 30: Objective for all other threats in Ken Hurst

Objective	Impact	Threat	Comment
Prevent	Very High	Acid Sulphate Soils	These should not occur as no excavation or groundwater extraction is proposed
		Diseases and Pathogens (<i>Armillaria luteobubalina</i>)	Assumed absent – never recorded in Ken Hurst. Apply appropriate hygiene standards for on-ground works to prevent introduction.
	High	Fires (large)	Prevent large fires that burn more than one third of the reserves, work in consultation with the Department Fire and Emergency Services to limit fires and maintain fire breaks.
Eliminate	Very High	Feral Animals (Foxes)	Present – remove population, and any subsequent incursions before they permanently establish Implement controls outlined in City's Feral Animal Management Guidelines
		Feral Animals (Rabbits)	
	High	Feral Animals (Bees)	Present – implement controls outlined in the City's Feral Animal Management Guidelines
Contain	Very High	Habitat Loss	Limit fragmentation (e.g., multiple paths and tracks). Areas with weeds and bare ground >25% prioritise for revegetation and management.
	High	Fire (repeat)	Limit fires burning in the same location within the bushland in consultation with Department of Fire and Emergency Services (DFES). Maintain firebreak access and reduce fire fuel load through weed control.
	Medium	Physical Disturbance	Present within the reserve. Limit public access by maintaining existing paths and fencing. Present in the form of rubbish dumping (couch). Report disturbance through regular maintenance inspections to determine locations of dumped rubbish and to identify breaches in fencing and implement controls in accordance with the NAAMP. Monitor activity associated with the development of the rail corridor, ensuring any disturbance is contained within the construction area.
		Small spot fires, unauthorized campfires and bonfires	One area with a small campfire. Conduct regular checks to determine presence.
Manage	Very High	Feral Animals (Cats)	Likely ongoing presence – difficult to prevent, eliminate or contain. Implement controls outlined in the City's Feral Animal Management Guidelines
		Diseases and Pathogens (Dieback)	Present and therefore difficult to prevent, eliminate and contain Current boundary of Dieback unknown across entire site, further testing is recommended to determine extent of infestation within the reserve. Continue 3 yearly treatment to reduce impact on susceptible species. Update locations of current dieback signage once new boundary is confirmed.
		Climate Change	Consideration should be given to the wider context of climate change and impacts that may occur over time. Reference sites could be installed in the areas within that contain groundwater dependent species, such as <i>Melaleuca preissiana</i> . Management can include: ▪ undertaking weed control to minimise competition for water with native plants

Objective	Impact	Threat	Comment
			<ul style="list-style-type: none"> planting and enhancement of native vegetation cover within the reserves particularly where large-scale deaths occur, and potentially substituting species that are declining in the area with more adaptable species that can fill the same niche developing and undertaking a groundwater monitoring programs within Ken Hurst Park to determine trends over time for ground water levels and nutrient loading, with results utilised for management of the reserve to best support the damplands and groundwater dependent ecosystems present. <p>Records should be taken of changes over time to assist with knowledge and understanding of ongoing processes.</p>
	Medium	Feral Animals (Rainbow Lorikeet)	Declared Pest- Implement controls outlined in the City's Feral Animal Management Guidelines Identify roost sites and monitor population sizes within Ken Hurst
None	Low	Stormwater	No stormwater to be diverted into the Ken Hurst Park
		Reticulation	Not present or required within Ken Hurst Park

4.1.3 Lagging Indicators

Lagging indicators and trends in assets, indicate whether strategic goals of maintaining assets are being met. The levels of acceptable change are discussed in the NAAMP and are summarised in Table 31 and applied to Ken Hurst in Table 32 and 33.

Table 31: Tiered Goals for assets and associated lagging indicators

Goal	Lagging Indicator	Application When
Enhance	Increase in either: <ul style="list-style-type: none"> ▪ extent ▪ density ▪ number ▪ occurrence 	Assets can be enhanced when: <ul style="list-style-type: none"> ▪ 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., reduced requirements for on-going for threat management)
Maintain	No decrease in either: <ul style="list-style-type: none"> ▪ extent ▪ density ▪ number ▪ occurrences 	Assets can be maintained when: <ul style="list-style-type: none"> ▪ 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: <ul style="list-style-type: none"> ▪ number of assets for which their presence is uncertain 	Assets significant when: <ul style="list-style-type: none"> ▪ historic but no recent records in reserve and/or ▪ potentially to be in reserve based on habitat and/or proximity to other records
Monitor	No indices for management effectiveness	Assets that cannot be maintained by action within City of Melville boundaries for which no quantifiable indices exist when: <ul style="list-style-type: none"> ▪ reserved are not critical component of habitat (e.g., highly mobile/ wide roaming and/or infrequent/irregular visitors to the City of Melville) ▪ there is 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	No. of Reserves (NAAMP)	Comments
Maintain Species	Very High	Grand Spider Orchid (<i>Caladenia huegeli</i>)	2	<p>Endangered species, last observed in 2012. Population size and distribution unconfirmed.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat, including weed control and fire management liaise with DFES regarding frequency and location of burn offs confirm presence and extent of population through targeted surveys
		Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>)	19	<p>Endangered migratory species, utilizing the site for foraging and potential roosting and breeding.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of existing resources including <i>Banksia</i> spp. and habitat trees incorporate flora species found in Ken Hurst that are also Carnaby Cockatoo resources in future revegetation efforts (Department of Environment and Conservation, 2011).
		Southern Brown Bandicoot / Quenda (<i>Isodon fusciventer</i>)	6	<p>Priority 4 species present both north and south. Actively breeding, pouch young observed.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat, including ensuring flora species of varying strata layers are incorporated into revegetation efforts reduce predator populations through continuation of feral animal management programs targeting foxes and cats.
		Western Brush Wallaby (<i>Notamacropus irma</i>)	1	<p>Priority 4 species, previously thought to be extinct within Ken Hurst. Population size unknown with a widespread presence on southern side, however presence unconfirmed on northern side.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
				<ul style="list-style-type: none"> determine presence within northern section and confirm population size across Ken Hurst through targeted surveys determine if population utilizes habitat outside Ken Hurst south through hole in fence.
	High	Splendid Fairy-wren (<i>Malurus splendens</i>)	5	<p>Observed within northern section, likely present to the south.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat.
		Rainbow Bee-eater (<i>Merops ornatus</i>)	21	<p>Observed across Ken Hurst in pairs. Likely nesting in open disturbed sandy sections, such as tracks.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> during breeding season (spring to summer) if any maintenance or revegetation activities are to be undertaken in open areas where nesting may occur, these areas should be checked for any active nesting burrows and isolated from activities using temporary fencing continued maintenance of habitat.
		Common Bronzewing (<i>Phaps chalcoptera</i>)	3	<p>Observed both sections.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat.
		New Holland Honeyeater (<i>Phylidonyris novaehollandiae</i>)		<p>Observed within northern section.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat.
		Gould's Sand Goanna (<i>Varanus gouldii</i>)	1	<p>Observed along tracks on southern section. New species, not previously recorded within Ken Hurst. Likely utilizing rabbit warrens as burrows within Ken Hurst.</p> <p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat particularly understory flora species, leaf litter and habitat logs reduce predator populations and habitat competition through continuation of feral animal management programs targeting foxes, cats and rabbits.

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
	Medium	Western Heath Dragon (<i>Ctenophorus adelaidensis</i>)	2	Observed within the south section. Recommended management: <ul style="list-style-type: none"> continued maintenance of habitat particularly understorey, leaf litter and habitat logs.
		Gray's legless Lizard (<i>Delma grayii</i>)	1	Observed within the north section. Recommended management: <ul style="list-style-type: none"> continued maintenance of habitat particularly understorey, leaf litter and habitat logs.
		Burtons Legless Lizard (<i>Lialis burtonis</i>)	1	Observed within both sections. Recommended management: <ul style="list-style-type: none"> Maintenance of habitat particularly understorey, leaf litter and habitat logs.
		Red-capped Parrot (<i>Platycercus spurius</i>)	1	Observed within both sections. Recommended management: <ul style="list-style-type: none"> continued management of habitat including the presence of mature trees to provide nesting habitat and weed control. monitor and treat hollows occupied with Feral Bees. installation of bird boxes unlikely to provide stable viable habitat due presence of rainbow lorikeets, and the costs associated with accessing and upkeeping.
	Low	Common Scaly-foot (<i>Pygopus lepidopodus</i>)	1	Observed within the south section. Recommended management: <ul style="list-style-type: none"> Continued maintenance of habitat particularly understorey, leaf litter and habitat logs.
		Western Bearded Dragon (<i>Pogona minor minor</i>)	1	Observed within the north section. Recommended management: <ul style="list-style-type: none"> continued maintenance of habitat particularly understorey, leaf litter and habitat logs.
		Dugite (<i>Pseudonaja affinis</i>)	1	Observed within the south section, within a degraded <i>X. preissii</i> Recommended management:

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
				<ul style="list-style-type: none"> continued maintenance of habitat particularly understorey (including grasses, sedges, shrubs, and <i>Xanthorrhoea preissii</i>), leaf litter and habitat logs.
	At-risk	<i>Gompholobium confertum</i>	1	<p>Recommended management:</p> <ul style="list-style-type: none"> continued maintenance of habitat utilise species available as tubestock (<i>Boronia dichotoma</i>, <i>Gompholobium confertum</i>) in revegetation works where they occur. Collect seed and direct seed into revegetation (<i>Platysace filiformis</i>) Annual species (<i>Wahlenbergia preissii</i>) maintain habitat
		<i>Boronia dichotoma</i>	1	
		<i>Wahlenbergia preissii</i>	1	
		<i>Platysace filiformis</i>	1	
Confirm	Very High	Lined Skink (<i>Lerista lineata</i>)	0	<p>Maintain habitat through revegetation, weed control and disease management to enhance habit for these species.</p> <p>Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.</p> <p>Maintain habitat through revegetation, weed control, feral control and disease management to enhance habit for these species.</p>
		Maize Trigger Plant (<i>Stylidium squamellosum</i>)	1	
	High	Yellow-rumped Thornbill (<i>Acanthiza chrysorrhoa</i>)	7	
		Western Wattlebird (<i>Anthochaera lunulata</i>)	2	
		Grey Shrike-thrush (<i>Colluricincla harmonica</i>)	1	
		Inland Thornbill (<i>Acanthiza apicalis</i>)	2	
		Wester Thornbill (<i>Acanthiza inornata</i>)	5	
		Weebill (<i>Smicronis brevirostris</i>)	2	
		Painted Button-quail (<i>Turnix varia</i>)	2	
		<i>Lysinema elegans</i>	1	
		<i>Hensmania turbinata</i>	3	
		Obtuse Leaved Grevillea (<i>Grevillea obtusifolia</i>)	2	

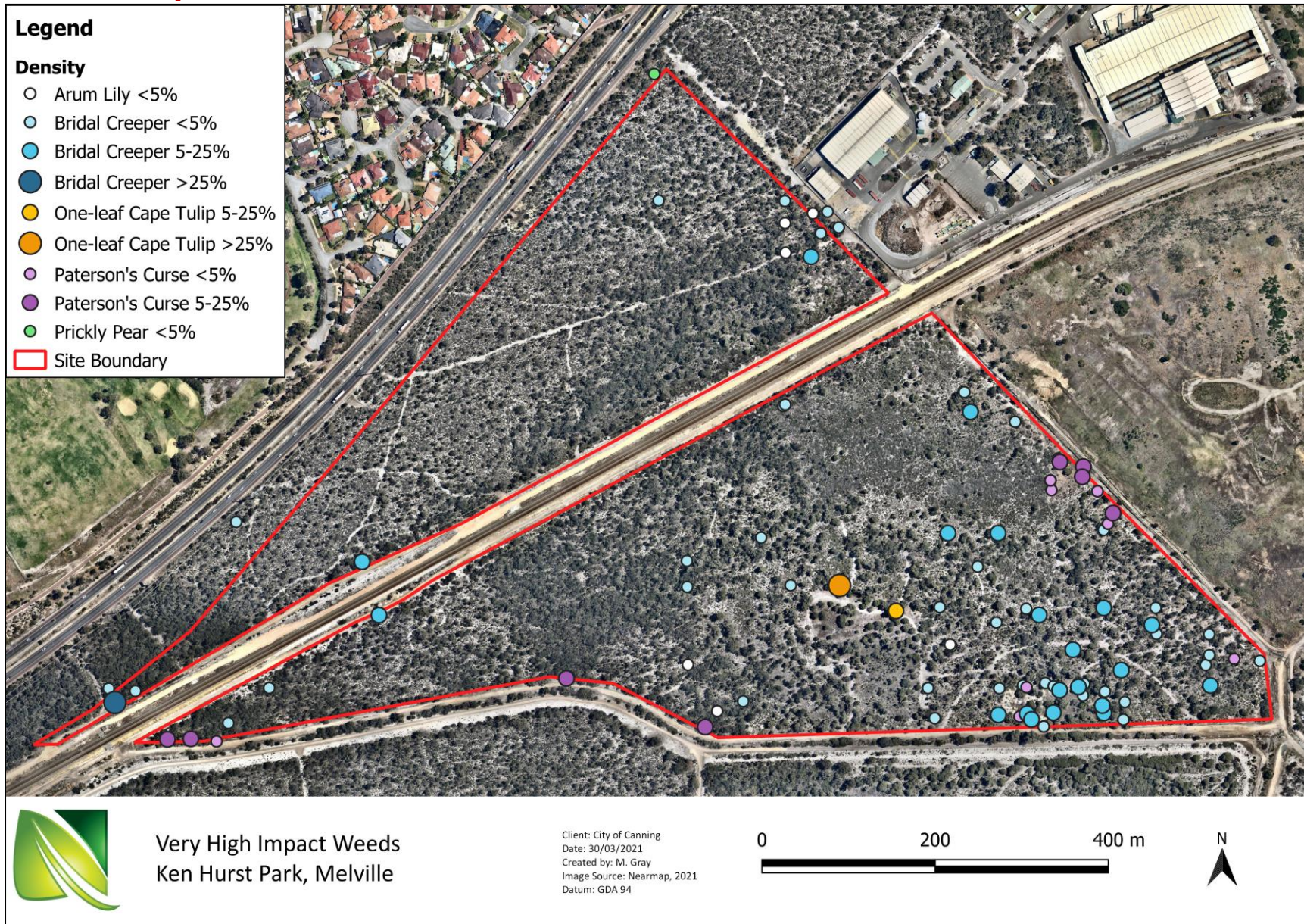
Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
	Medium	Painted Sundew (<i>Drosera zonaria</i>)	1	Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.
		Bridal Rainbow (<i>Drosera macrantha</i>)		
		Fraser's Legless Lizard (<i>Delma fraseri</i>)	1	
		Black-naped snake (<i>Neelaps bimaculatus</i>)	1	
		Honey Possum (<i>Tarsipes rostratus</i>)	1	Species unconfirmed within Ken Hurst, however, population observed in adjacent bushland reserve in 2014. Suitable habitat exists within Ken Hurst. Recommended management: <ul style="list-style-type: none"> Targeted survey to determine presence of species within Ken Hurst Revegetation should incorporate flora species from the Proteaceae, Myrtaceae and Ericaceae family. reduce predator populations through continuation of feral animal management programs targeting foxes and cats liaise with DFES regarding frequency and location of burn offs
		Gould's Hooded Snake (<i>Rhinoplocephalus gouldii</i>)	1	Maintain habitat through revegetation, weed control, feral control and disease management to enhance habit for these species. Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.
	Low	Striated Pardalote (<i>Pardalotus striatus</i>)	2	
		Australian Ringneck (<i>Platycercus zonarius</i>)	0	
		Western Spinebill (<i>Acanthorhynchus superciliosus</i>)	2	
		Tree Martin (<i>Hirundo nigricans</i>)	0	
		Sacred Kingfisher (<i>Todiramphus sanctus</i>)	7	
	At-risk	Gompholobium scabrum	1	
		Coarse club-rush (<i>Isolepis marginata</i>)	1	
		Johnsonia acaulis	1	
		Small Sundew (<i>Drosera paleacea</i>)	3	

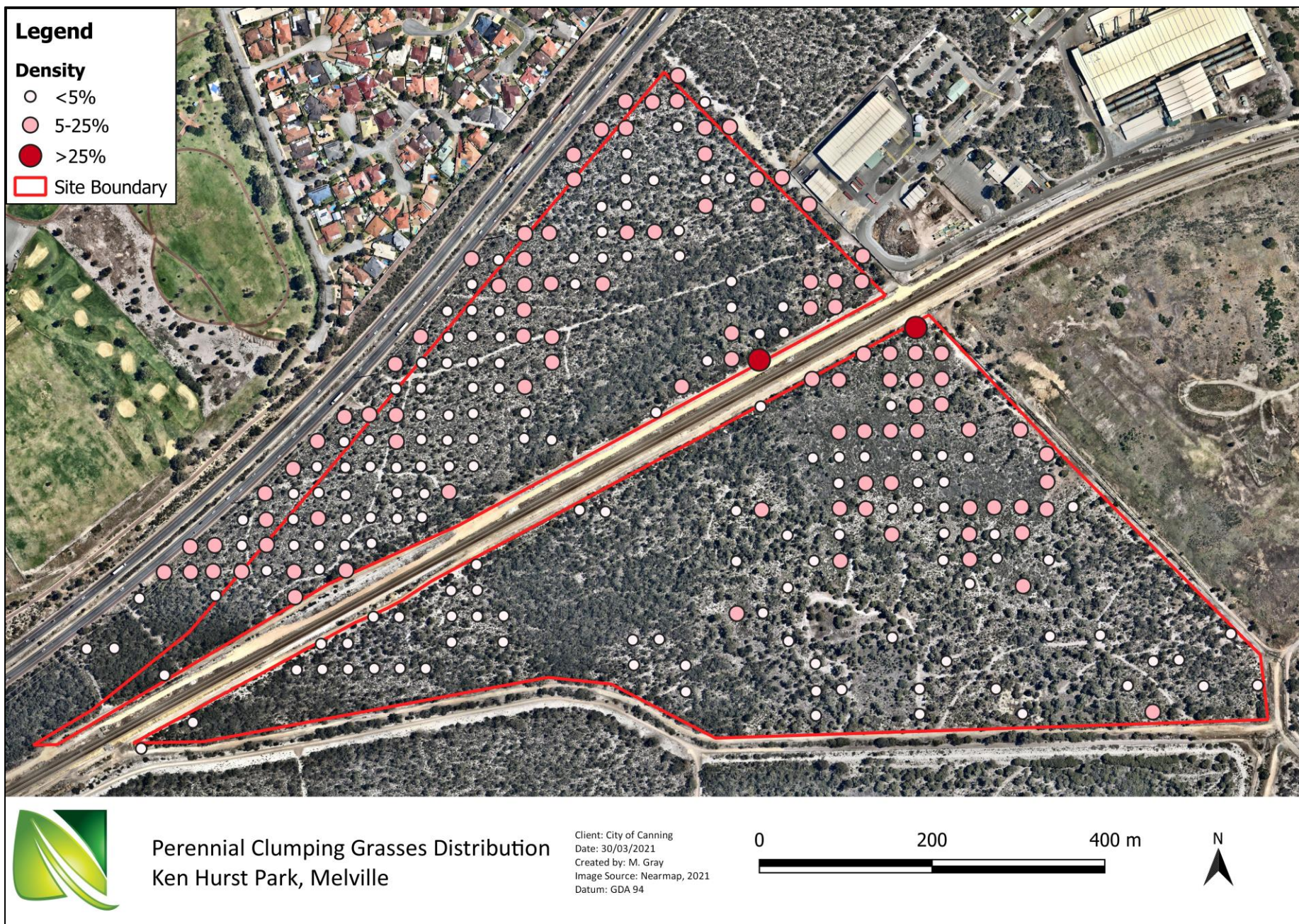
Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
		<i>Lachnagrostis filiformis</i>	1	
		<i>Leucopogon polymorphus</i>	1	
		Daddy-long-legs (<i>Stylidium divaricatum</i>)	1	<p>Maintain habitat through revegetation, weed control, feral control and disease management to enhance habit for these species.</p> <p>Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.</p>
		Lizard Trigger Plant (<i>Stylidium preissii</i>)	1	
		<i>Actinotus glomeratus</i>	1	
		<i>Senecio quadridentatus</i>	1	
		Leafless Globe Pea (<i>Sphaerolobium vimineum</i>)	0	
		Drummond's Featherflower (<i>Verticordia drummondii</i>)	1	
		Camphor Myrtle (<i>Babingtonia camphorosmae</i>)	0	
		Hispid Stinkweed (<i>Opercularia hispidula</i>)	1	
		Leaping Spider Orchid (<i>Caladenia macrostylis</i>)	1	
		<i>Leucopogon pulchellus</i>	1	
		<i>Petrophile striata</i>	1	
		Little Leek Orchid (<i>Prasophyllum ovale</i>)	1	
Monitor	Medium	Western Grey Kangaroo (<i>Macropus fuliginosus</i>)	1	<p>Present in large numbers on southern side. Assess through tip side and high evidence of foraging.</p> <p>Monitor numbers to ensure that population numbers are less then carrying capacity that the area can sustain to ensure that excessive numbers do not increase grazing pressures.</p>

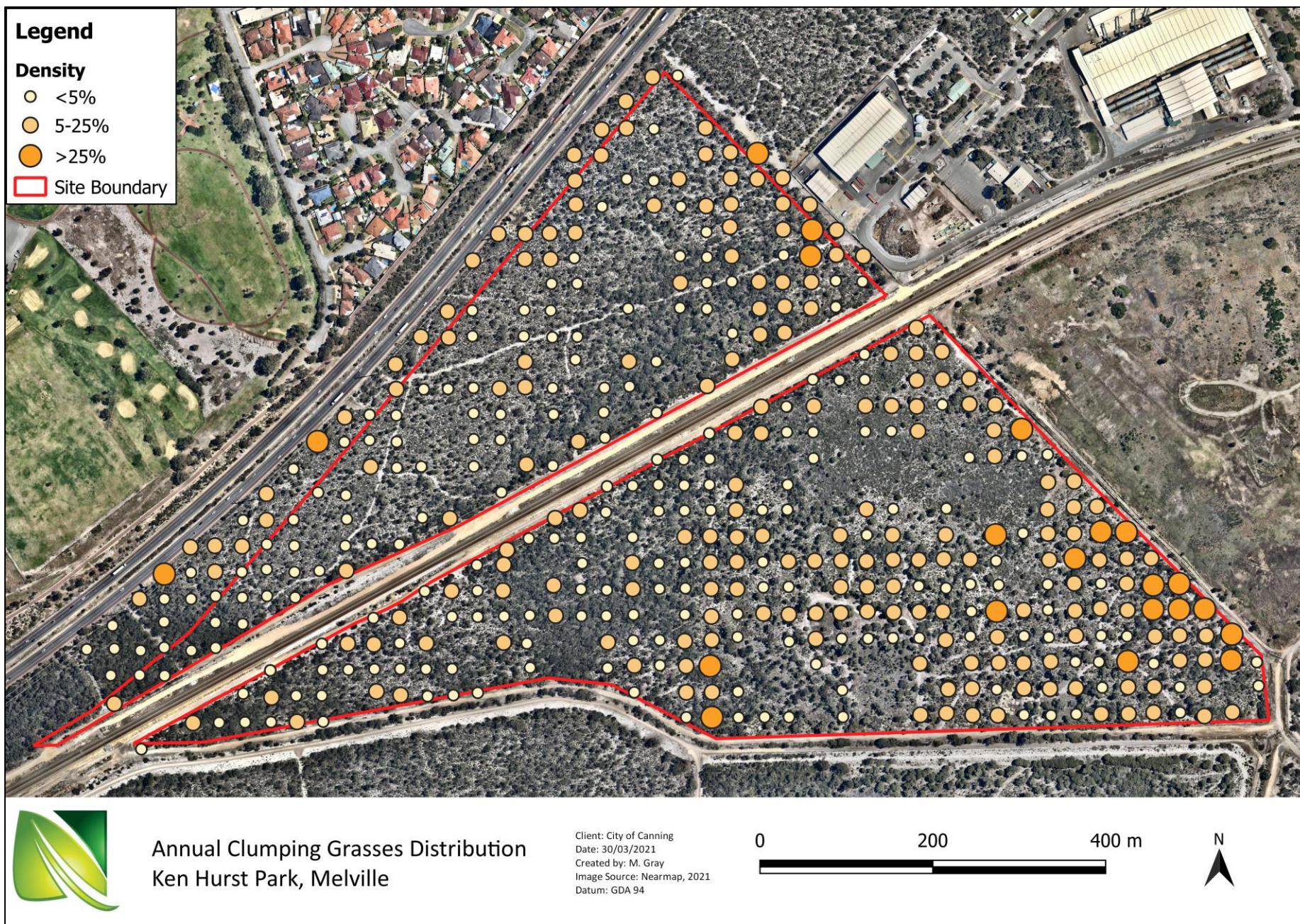
Table 33: Goals for Site

Goal	Priority	Asset	Comments
Enhance	Medium	Proposed Revegetation Sites	Revegetate areas proposed in Figure 8, in accordance with the standard of rehabilitation in the NAAMP and following City Guidelines. Where tubestock is available, prioritise 'at risk' species, understory species for reptiles and species utilised by black cockatoos.
Maintain	Very High	Wetland Sites - Damplands	Maintain wetland sites through weed control, revegetation, feral animal management and general reserve management (e.g., rubbish removal, fence maintenance) to manage threats within the reserve.
	High	Regional Ecological Linkage	Ecological linkages can be maintained through the maintenance of ecological communities and enhancement of these communities through proposed rehabilitation, also through avoiding clearing and fragmentation of the reserves.
		Habitat Trees	Habitat trees to be protected by the management of threats such as fire and disease and enhancement of these communities via proposed rehabilitation. Where safe, maintain dead habitat trees. Rehabilitation should include species with the potential to become habitat trees, particularly within the northern section where observations of <i>Banksia</i> and <i>Eucalyptus</i> spp. have senesced. Presence of dieback will impact the survivability of potential habitat trees. It is recommended Ken Hurst be mapped for dieback, particularly the northern section as the <i>Banksia</i> and <i>Eucalyptus</i> species within Ken Hurst are not resistant to <i>Phytophthora cinnamomi</i> (Groves, Hardy & McComb, n.d).
	Medium	Community Interest Sites (bat and bird boxes)	Assets to be monitored during the City's current inspection and maintenance works, and any damage or repair requirements noted to be reported with maintenance to occur as soon as practicable.
		Revegetation Sites	Maintain revegetation sites via infill planting, weed control and watering as required to complete the revegetation to the standard outlined in the NAAMP. Include flora species that benefit fauna species (Refer to Table 32) Ensure planting lists are consistent with vegetation types and composition present.
Monitor	Low	All assets	Monitoring of all assets should occur in accordance with the City's policies and guidelines outlined in the NAAMP. It is recommended that the northern and southern sections of Ken Hurst continue to be monitored separately in order to assess the impact of the rail line.

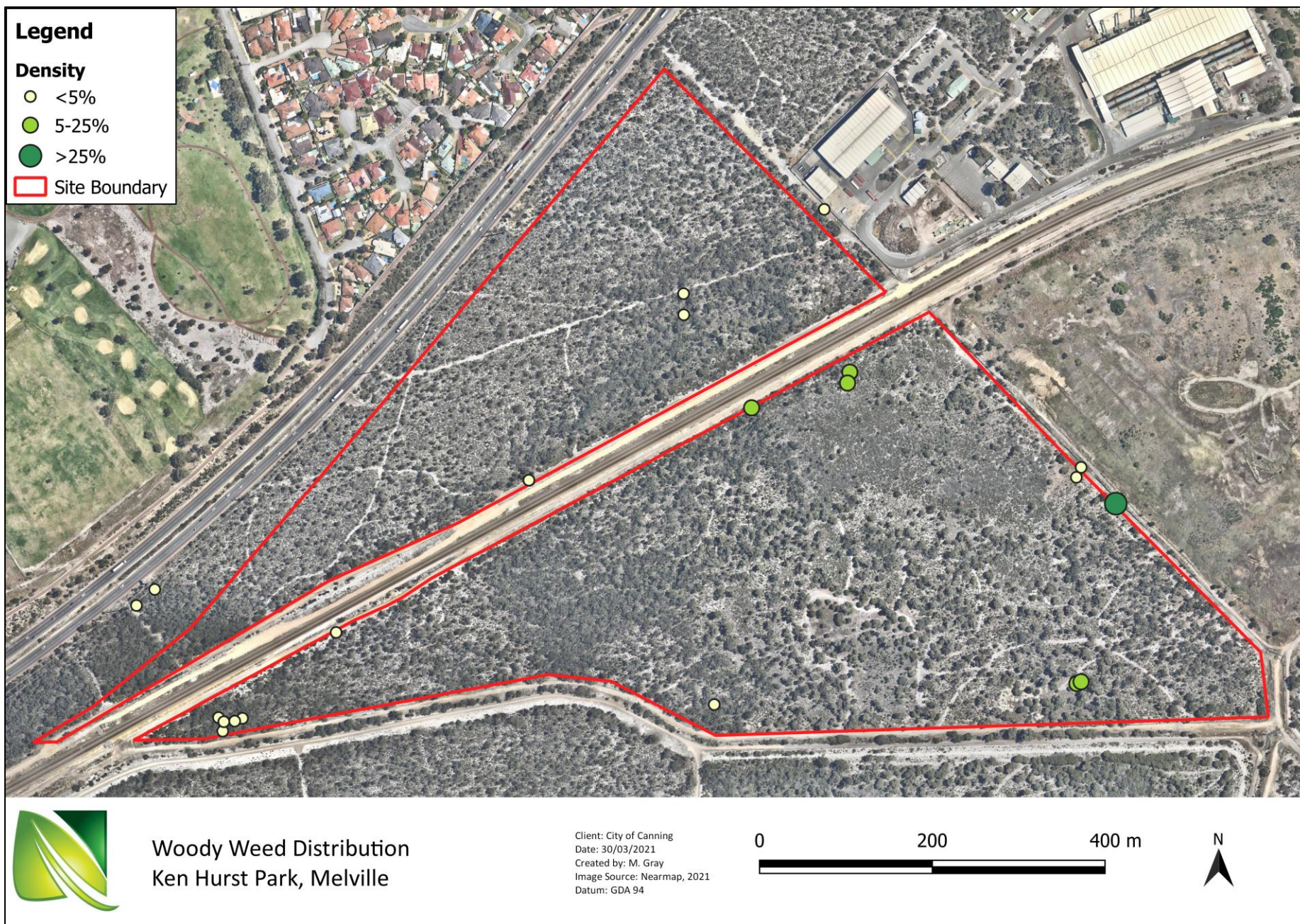
Weed Maps











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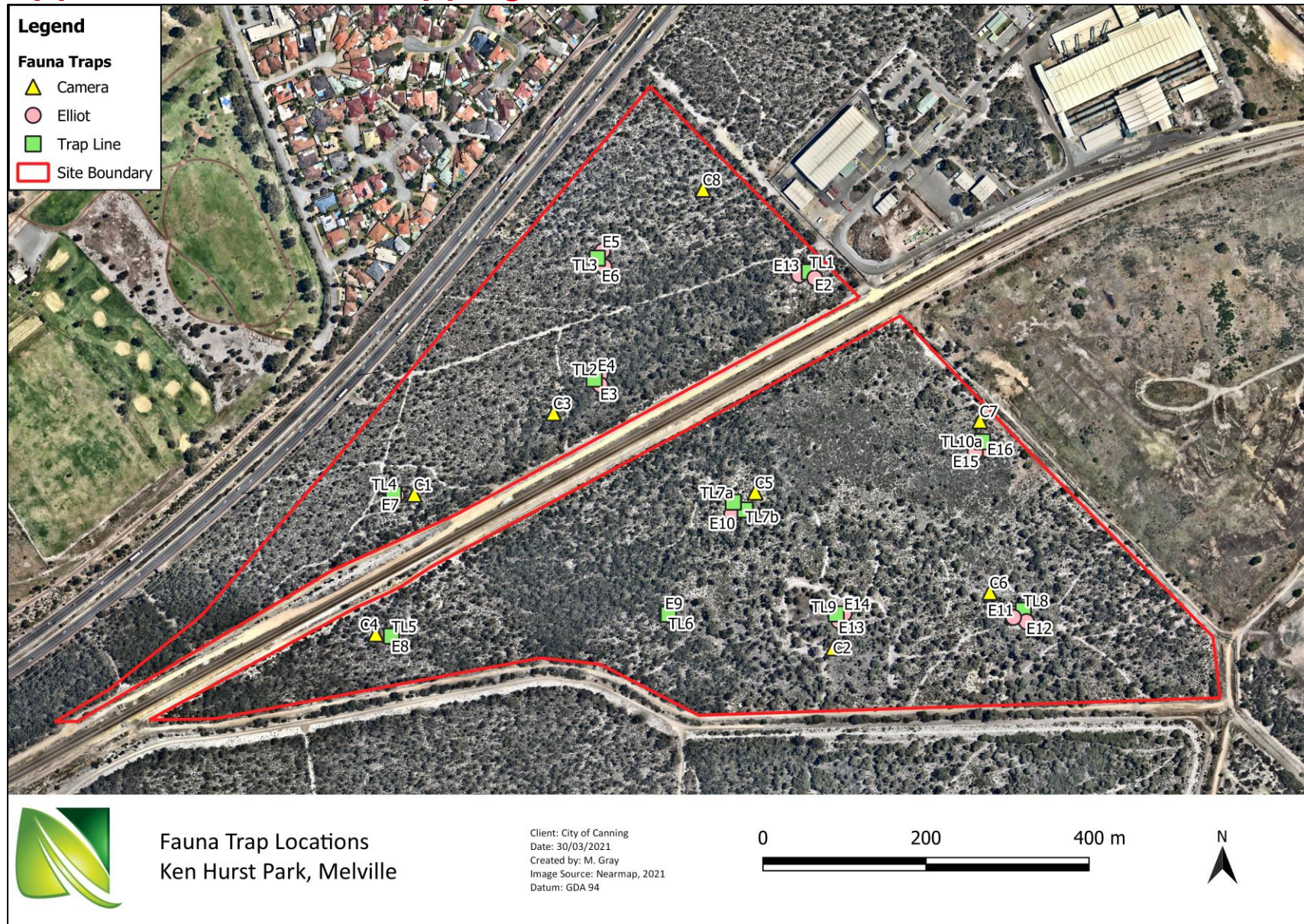
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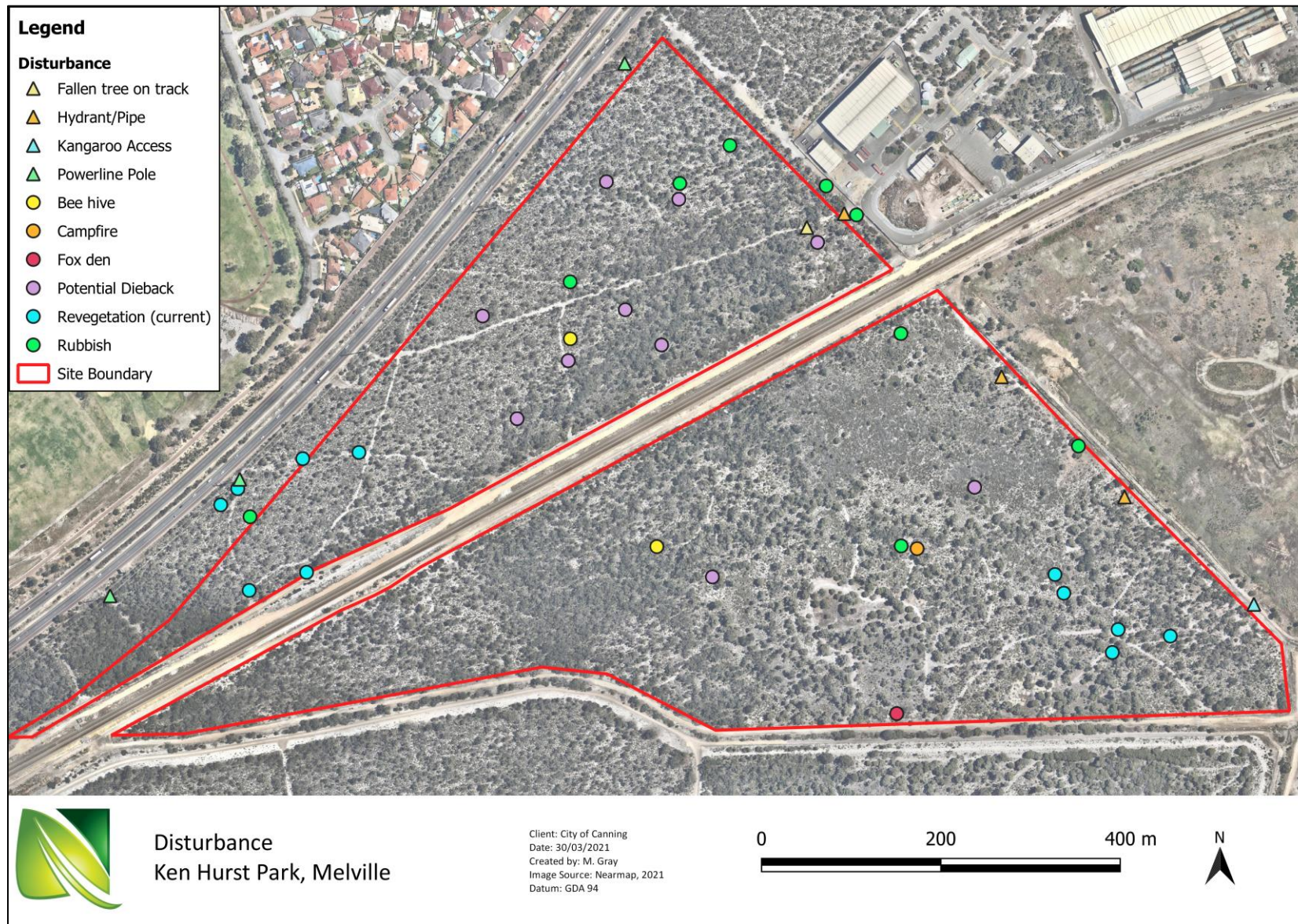
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Appendix 1 – Fauna Trapping Locations



Appendix 2 - Disturbance



Appendix 3 – Flora Species List

*Green denotes 'at risk' species

Native Species Name	North	South
<i>Acacia applanata</i>		X
<i>Acacia pulchella</i>	X	X
<i>Acacia stenoptera</i>	X	
<i>Adenanthos cygnorum</i>		X
<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	X	
<i>Adenanthos obovatus</i>	X	X
<i>Allocasuarina fraseriana</i>	X	X
<i>Allocasuarina humilis</i>	X	X
<i>Amphipogon turbinatus</i>	X	X
<i>Anigozanthos humilis</i>	X	X
<i>Anigozanthos manglesii</i>	X	X
<i>Arnocrinum preissii</i>	X	
<i>Astartea scoparia</i>	X	X
<i>Asteridea pulverulenta</i>	X	X
<i>Austrostipa compressa</i>	X	X
<i>Banksia attenuata</i>	X	X
<i>Banksia ilicifolia</i>	X	X
<i>Banksia littoralis</i>	X	
<i>Banksia menziesii</i>	X	X
<i>Boronia crenulata</i>	X	
<i>Boronia dichotoma</i>		X
<i>Bossiaea eriocarpa</i>	X	X
<i>Burchardia congesta</i>	X	X
<i>Caladenia flava</i>	X	X
<i>Caladenia longicauda</i>		X
<i>Calandrinia corrigioloides</i>		X
<i>Calectasia narragara</i>		X
<i>Calytrix angulata</i>	X	
<i>Calytrix flavescens</i>		X

<i>Calytrix fraseri</i>	X	X
<i>Centrolepis aristata</i>		X
<i>Chamaescilla corymbosa</i>	X	X
<i>Comesperma calymega</i>		X
<i>Conostephium pendulum</i>	X	X
<i>Conostylis aculeata</i>	X	X
<i>Conostylis juncea</i>	X	
<i>Conostylis setigera</i>		X
<i>Dampiera linearis</i>	X	X
<i>Dasypogon bromeliifolius</i>	X	X
<i>Daviesia decurrens</i>	X	
<i>Daviesia divaricata</i>	X	
<i>Daviesia triflora</i>	X	X
<i>Desmocladius flexuosus</i>	X	X
<i>Dianella revoluta</i>	X	X
<i>Diuris</i> sp.		X
<i>Drosera macrantha</i>		X
<i>Drosera nitidula</i>	X	X
<i>Drosera erythrorhiza</i>		X
<i>Eremaea asterocarpa</i> subsp. <i>asterocarpa</i>		X
<i>Eremaea astrocarpa</i>	X	
<i>Eremaea pauciflora</i>	X	X
<i>Eriochilus dilatatus</i>		X
<i>Eucalyptus marginata</i>	X	X
<i>Eucalyptus todtiana</i>	X	X
<i>Euchilopsis linearis</i>	X	X
<i>Euphorbia peplus</i>		X
<i>Gastrolobium capitatum</i>	X	
<i>Gompholobium confertum</i>	X	
<i>Gompholobium tomentosum</i>	X	X
<i>Hemiandra pungens</i>	X	X
<i>Hibbertia huegelii</i>	X	X

<i>Hibbertia hypericoides</i>	X	X
<i>Hibbertia racemosa</i>		X
<i>Hibbertia subvaginata</i>	X	X
<i>Hovea trisperma</i>	X	X
<i>Hypocalymma angustifolium</i>	X	X
<i>Hypolaena exsulca</i>	X	X
<i>Isolepis cernua</i>		X
<i>Jacksonia furcellata</i>	X	X
<i>Jacksonia sternbergiana</i>		X
<i>Kunzea glabrescens</i>	X	X
<i>Lagenophora huegelii</i>	X	X
<i>Laxmannia squarrosa</i>	X	X
<i>Lechenaultia floribunda</i>	X	
<i>Lepidosperma longitudinale</i>	X	
<i>Leporella fimbriata</i>		X
<i>Levenhookia pusilla</i>		X
<i>Lomandra caespitosa</i>	X	
<i>Lomandra hermaphrodita</i>	X	X
<i>Lyginia barbata</i>	X	X
<i>Macrozamia riedlei</i>	X	X
<i>Melaleuca preissiana</i>	X	X
<i>Melaleuca seriata</i>	X	
<i>Melaleuca thymoides</i>	X	X
<i>Microtis media</i>	X	X
<i>Nuytsia floribunda</i>	X	X
<i>Opercularia vaginata</i>		X
<i>Patersonia occidentalis</i>	X	X
<i>Pericalymma ellipticum</i>		X
<i>Persoonia saccata</i>	X	X
<i>Petrophile linearis</i>	X	X
<i>Philothea spicata</i>	X	
<i>Phlebocarya ciliata</i>	X	X

<i>Phlebocarya filifolia</i>	X	X
<i>Phyllangium paradoxum</i>		X
<i>Pimelea sulphurea</i>	X	
<i>Platysace filiformis</i>	X	
<i>Podotheca gnaphalioides</i>	X	X
<i>Podotheca angustifolia</i>		X
<i>Pterostylis pyramidalis</i>		X
<i>Pterostylis recurva</i>		X
<i>Pterostylis vittata</i>		X
<i>Pultenaea reticulata</i>		X
<i>Pyrorchis nigricans</i>		X
<i>Quinetia urvillei</i>		X
<i>Regelia inops</i>	X	X
<i>Scaevola repens</i>	X	X
<i>Schoenus curvifolius</i>		X
<i>Schoenus pedicellatus</i>		X
<i>Scholtzia involucreta</i>	X	X
<i>Senecio condylus</i>		X
<i>Siloxerus filifolius</i>	X	
<i>Siloxerus humifusus</i>		X
<i>Stackhousia huegelii</i>		X
<i>Stackhousia monogyna</i>	X	
<i>Stirlingia latifolia</i>	X	X
<i>Stylidium brunonianum</i>	X	X
<i>Stylidium piliferum</i>		X
<i>Stylidium repens</i>	X	X
<i>Stylidium rigidulum</i>		X
<i>Styphelia conostephioides</i>		X
<i>Synaphea spinulosa</i>	X	
<i>Thelymitra benthamiana</i>	X	X
<i>Thelymitra sp.</i>	X	
<i>Thysanotus manglesianus</i>		X

<i>Thysanotus sparteus</i>	X	
<i>Thysanotus thyrsoides</i>		X
<i>Trachymene pilosa</i>	X	X
<i>Tricoryne elatior</i>	X	X
<i>Wahlenbergia preissii</i>		X
<i>Waitzia suaveolens</i>	X	X
<i>Xanthorrhoea brunonis</i>	X	X
<i>Xanthorrhoea preissii</i>	X	X
<i>Xanthosia huegelii</i>		X

Weed Species Name	North	South
<i>Acacia iteaphylla</i> *	X	X
<i>Acacia longifolia</i> *	X	X
<i>Aira cupaniana</i> *		X
<i>Arctotheca calendula</i> *		X
<i>Asparagus asparagoides</i> *	X	X
<i>Avena barbata</i> *	X	X
<i>Brassica tournefortii</i> *	X	X
<i>Briza maxima</i> *	X	X
<i>Briza minor</i> *	X	X
<i>Bromus diandrus</i> *	X	X
<i>Cenchrus setaceus</i>		X
<i>Centranthus macrosiphon</i> *		X
<i>Chamaecytisus palmensis</i> *		X
<i>Chasmanthe floribunda</i> *		X
<i>Crassula alata</i> *		X
<i>Disa bracteata</i> *	X	X
<i>Echium plantagineum</i> *		X
<i>Ehrharta calycina</i> *	X	X
<i>Ehrharta longiflora</i> *	X	X
<i>Euphorbia terracina</i> *	X	
<i>Freesia alba</i> x <i>leichtlinii</i> *	X	X

<i>Fumaria capreolata</i> *	X	X
<i>Gladiolus caryophyllaceus</i> *	X	X
<i>Gladiolus undulatus</i> *		X
<i>Hordeum vulgare</i> *		X
<i>Hypochaeris glabra</i> *		X
<i>Hypochaeris radicata</i> *	X	
<i>Lachenalia reflexa</i> *		X
<i>Lagurus ovatus</i> *		X
<i>Leontodon rhagadioloides</i> *	X	
<i>Leptospermum laevigatum</i> *	X	X
<i>Lolium rigidum</i> *	X	
<i>Lysimachia arvensis</i> *	X	X
<i>Moraea flaccida</i> *		X
<i>Opuntia stricta</i> *	X	
<i>Orobanche minor</i> *		X
<i>Pelargonium capitatum</i> *		X
<i>Petrorhagia dubia</i> *		X
<i>Pseudognaphalium luteoalbum</i> *		X
<i>Retama raetam</i> *	X	
<i>Ricinus communis</i> *	X	X
<i>Romulea rosea</i> *		X
<i>Silene gallica</i> *	X	X
<i>Solanum nigrum</i> *	X	X
<i>Sonchus asper</i> *		X
<i>Sonchus oleraceus</i> *		X
<i>Trachyandra divaricata</i> *	X	X
<i>Trifolium campestre</i> *		X
<i>Urospermum picroides</i> *	X	X
<i>Ursinia anthemoides</i> *	X	X
<i>Vulpia myuros</i> *		X
<i>Wahlenbergia capensis</i> *	X	X
<i>Zantedeschia aethiopica</i> *	X	X



Appendix 4 – Fauna Species List

*Denotes introduced.

Family	Species name	Common Name	North	South
Mammals				
Leporidae	* <i>Oryctolagus cuniculus</i>	Rabbit	X	X
Canidae	* <i>Vulpes vulpes</i>	Red Fox	X	X
Peramelidae	<i>Isodon fusciventer</i>	Quenda	X	X
Macropodidae	<i>Macropus fuliginosus melanops</i>	Western Grey Kangaroo	X	X
Macropodidae	<i>Notamacropus irma</i>	Western Brush Wallaby		X
Birds				
Psittacidae	* <i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	X	X
Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird	X	X
Cacatuidae	<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo		X
Columbidae	<i>Columba livia</i>	Domestic Pigeon		X
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		X
Corvidae	<i>Corvus coronoides</i>	Australian Raven	X	X
Psittacidae	<i>Lichmera indistincta</i>	Brown Honeyeater		X
Maluridae	<i>Malurus splendens</i>	Splendid Fairywren	X	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	X	X
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon		X
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	X	X
Meliphagidae	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	X	
Psittacidae	<i>Platycercus spurius</i>	Red-capped Parrot	X	X
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	X	X
Zosteropidae	<i>Zosterops lateralis</i>	Grey-breasted White-eye (Silvereye)	X	
Amphibians				
Limnodynastidae	<i>Limnodynastes dorsalis</i>	Western Banjo Frog		X
Reptiles				
Agamidae	<i>Ctenophorus adalaidensis</i>	Western Heath Dragon		X
Pygopodidae	<i>Delma fraseri</i>		X	

Family	Species name	Common Name	North	South
Scincidae	<i>Hemiergis quadrilineata</i>		X	X
Pygopodidae	<i>Lialis burtonis</i>	Burton's Legless Lizard	X	X
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink	X	X
Agamidae	<i>Pogona minor minor</i>	Western Bearded Dragon	X	
Elapidae	<i>Pseudonaja affinis</i>	Dugite		X
Pygopodidae	<i>Pygopus lepidopodus</i>	Common Scaly Foot		X
Scincidae	<i>Tiliqua rugosa rugosa</i>	Bobtail	X	
Varanidae	<i>Varanus gouldii</i>	Sand Goanna		X
Invertebrates				
Adidae	* <i>Apis mellifera</i>	Western Honeybee		X
Julidae	<i>Ommatoiulus moreletii</i>	Portuguese Millipede	X	X
Pieridae	<i>Pieris rapae</i>	Cabbage White	X	
Tenebrionidae	<i>Adelium sp.</i>			X
Dicadae	<i>Arenopsaltria fullo</i>	Western Sandgrinder		X
Araneidae	<i>Argiope protensa</i>	Tailed Forest Spider	X	
Araneidae	<i>Austracantha minax</i>	Christmas Jewel Spider	X	
Curculionidae	<i>Catasarcus pallidiventris</i>	Weevil		X
Acridicae	<i>Coryphistes ruricola</i>	Bark-mimicking Grasshopper	X	
Pisauridae	<i>Dolomedes sp.</i>	Fishing Spider	X	
Blattidae	<i>Drymaplaneta semivitta</i>	Gisborne Cockroach		X
Ectobiidae	<i>Ellipsidion humerale</i>	Bush Cockroach		X
Nymphalidae	<i>Geitoneura klugii</i>	Kulg's Xenica	X	
Nanomantidae	<i>Gyromantis occidentalis</i>	Eastern Bark Mantis		X
Corduliidae	<i>Hemicordulia tau</i>	Tau Emerald		X
Tettigoniidae	<i>Metaballus frontalis</i>	Common Marauding Katydid	X	
Formicidae	<i>Myrmecia sp.</i>	Bull Ant	X	X
Sparassidae	<i>Neosparassus sp.</i>	Badge Huntsman Spiders		X
Blattidae	<i>Platyzosteria armata</i>			X
Araneidae	<i>Plebs cyphoxis</i>	Western Bush Orbweaver	X	
Acrididae	<i>Pycnostictus seriatus</i>	Common Bandwing Grasshopper	X	

Family	Species name	Common Name	North	South
Pholcidae	<i>Smeringopus natalensis</i>	Natal Daddy Long-legs Spider	X	X
Tettigoniidae	<i>Torbia viridissima</i>	Gum-leaf Katydid	X	
Araneidae	<i>Trichonephila edulis</i>	Australian Golden Orbweaver	X	X
Lycosidae	<i>Venatrix sp.</i>	Wolf Spider	X	
Blattidae		Cockroach	X	
Formicidae		Ant		X
Lumbricidae		Earthworm	X	
Rhipiceridae		Feather Horned Beetle	X	

