

Final Report V5

Fauna Corridor Management Plan: 40-46 Cyril Beechey Lane, Victoria

Prepared for

Greenridge Properties Pty Ltd

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Greenridge Properties Pty Ltd to provide a Fauna Corridor Management Plan for 40-46 Cyril Beechey Lane, Victoria.

The study area is proposed to be rezoned from Farming Zone – Schedule 2 (FZ2) to a residential zone with a development overlay, to facilitate development works for residential purposes. A Biodiversity Assessment was originally completed for the site in 2017 and concurrently in 2022 (Ecology and Heritage Partners 2022a) which identified suitable habitat for Southern Brown Bandicoot within the study area. Targeted surveys were completed for the species between March – April 2018, with Southern Brown Bandicoot detected on motion-sensing cameras on 17 occasions (Ecology and Heritage Partners 2019).

The design of the development has been revised since its initial concept to reduce the impacts of the proposed development on native vegetation and habitat for Southern Brown Bandicoot and provide a north-south habitat corridor for Southern Brown Bandicoot along the eastern boundary of the study area.

The purpose of Fauna Corridor Management Plan is to establish a 30-metre wide habitat corridor to be retained for the purpose of supporting additional Southern Brown Bandicoot within the study area and facilitate the dispersal of the species, and outline specific management actions that can be implemented to improve habitat quality for the species, whilst meeting bushfire risk requirements associated with the Bushfire Prone Area (BPA). The fauna corridor is intended to facilitate the dispersal of Southern Brown Bandicoot to undeveloped pastureland and the Royal Botanical Gardens to the south and council managed reserves to the north of the study area, along Cemetery Road.

1.1.1 Fauna Corridor

A review of existing data and a summary of recommendations for the development was commissioned by Urbis on behalf of Brown Property Group (Nature Advisory 2022). Based on the letter of advice provided, the most suitable option for the development was determined to be the inclusion of a 20-metre habitat corridor and 14.5 metre road reserve, as this was considered to provide a balance between the proposed land development and the provision of a habitat connectivity corridor for Southern Brown Bandicoot. Following further consultation with the City of Casey and the Department of Energy, Environment and Climate Action (DEECA), the proponent has increased the width of the ecological corridor to 30 metres with a 14.5 metre road reserve (Figure 1). Once implemented, the Fauna Corridor will comprise 0.611 hectares, of which the total area of Southern Brown Bandicoot habitat being retained is 0.475 hectares. The fauna corridor will be zoned as Rural Conservation Zone (RCZ) and ongoing maintenance of the corridor will be managed by council.

1.1.2 Bushfire Risk

The study area is located in the BPA, and as such, must respond to the legislative implications associated with Clause 13.02-15 Bushfire. A Bushfire Risk Assessment (BRA) has been prepared to address these requirements (Ecology and Heritage Partners 2022b). The retention of the native vegetation within the site requires the implementation of appropriate separation distances from any Classified vegetation within 100 metres of proposed dwellings. The presence of classified Woodland vegetation within the corridor on Upslope/ Flat land

results in a commensurate separation distance of 33-metres, which comprises the viability of the project due to the substantial loss of developable land. Consequently, the BRA has proposed that the corridor be modified and managed in a Shrubland state, in order to reduce the requisite separation distance to 19-metres.

Management works within the Fauna Corridor will be required to achieve the intended purpose of the corridor and to meet bushfire safety regulations by providing appropriate separation distances. The vegetation within the corridor has been considered consequential loss due to the likely modifications required to meet bushfire regulations. The corridor represents a 0.61-hectare area that will be managed for the express purposed of Southern Brown Bandicoot movement and habitat within the site, providing connectivity for Grandeur Nature Reserve (north of the study area) to areas south of the site, including the Cranbourne Botanic Gardens.

The purpose of this report was to provide a management plan that would describe management priorities and actions to protect and enhance the quality of Southern Brown Bandicoot habitat within the designated 30-metre corridor, while also achieving bushfire safety regulations required by Clause 13.02-1S Bushfire.

1.2 Study Area

The study area is located at 40-46 Cyril-Beechey Lane, Cranbourne, approximately 65 kilometres south-east of Melbourne's CBD (Figure 1). The study area covers approximately 3.8 hectares and is bound by residential properties along Grandeur Court to the north, private property to the south, Cemetery Road to the east and Cyril Beechey Lane to the west. The study area is generally flat, with no ridges, crests or waterways within or immediately adjacent to the site. It consists almost entirely of native vegetation.

According to the DEECA Native Vegetation Regulation Map (DEECA 2022a), the study area occurs within the Melbourne Water bioregion. It is located within the jurisdiction of the Melbourne Water Catchment Management Authority (CMA) and the City of Casey municipality (DEECA 2022b).

2 SOUTHERN BROWN BANDICOOT

2.1 Status

Southern Brown Bandicoot is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Endangered under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act). In early 2015, the Department of the Environment and Energy (DoEE) sought public comment on a consultation paper concerning the eligibility of the species' classification under the EPBC Act. The Threatened Species Science Committee recommended that Southern Brown Bandicoot retain its current listing status of Endangered in the list referred to in Section 178 of the EPBC Act (TSSP 2016).



Plate 1. Southern Brown Bandicoot. (Ecology and Heritage Partners Pty Ltd).

2.2 Description

The Southern Brown Bandicoot is a medium sized ground dwelling marsupial with a long tapering snout, a naked nose, a compact body and a short tail. Males weigh between 500–1850 grams and females 400–1200 grams (Van Dyck and Strahan 2008). The dorsal surface of the body usually appears grey-brown at a distance but grizzled (with golden-brown flecks) at close range due to banded guard hairs. The underparts and forefeet are creamy white or pale yellow, and the tail brown above and creamy yellow below. The forelegs are short with curved claws on each of the five digits, and the hind limbs much longer (Brown and Main 2010).

2.3 Distribution

In Victoria, the species is predominantly coastal and exhibits a disjunct and patchy distribution across the state. Records are clustered around six general regions: far-east Gippsland lowlands, western Gippsland Plain, Warrnambool Plain, Otway Plain, Glenelg Plain, and the Greater Grampians (Coates *et al.* 2008). As in other states, the species is generally associated with sites supporting heaths, heathy woodlands and forests or other vegetation communities providing a thick ground cover over sandy well-drained soils (Coates *et al.* 2008, Menkhorst and Seebeck 1990). Species experts define suitable habitat for Southern Brown Bandicoot to be any patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 metre height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (*Rubus* spp.), can and often does, provide important habitat (DSEWPac 2011a).

2.4 Ecology

The breeding season for Southern Brown Bandicoot varies across their range, with peak breeding occurring from winter through to late summer (DoEE 2015). The species is omnivorous, opportunistically exploiting a wide variety of food resources such as invertebrates (mainly insects but also earthworms and other

invertebrates), plant material and fungi. The species has been found to be active both day and night, with the activity period varying between location and habitat. The majority of home range studies of the species have all reported estimates which range from 0.5 to 9.0 hectares (DoEE 2015).

3 METHODS

3.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of flora and fauna values associated with the study area. The following information sources were reviewed:

- The DEECA NatureKit Map (DEECA 2023a) and Native Vegetation Regulation (NVR) Map (DEECA 2023b) for:
 - Modelled data for location risk, native vegetation patches, scattered trees and habitat for rare or threatened species; and,
 - The extent of historic and current Ecological Vegetation Classes (EVCs).
- EVC benchmarks (DEECA 2023c) for descriptions of EVCs within the relevant bioregion;
- The online VicPlan Map (DEECA 2023d) to ascertain current zoning and environmental overlays in the study area;
- The Victorian Biodiversity Atlas (VBA) for previously documented flora and fauna records within the project locality (DEECA 2023e);
- Aerial photography of the study area;
- Previous ecological assessments relevant to the study area and Southern Brown Bandicoot recovery, including;
 - Biodiversity Assessment – 39-45 and 40-46 Cyril Beechey Lane, Cranbourne. Ecology and Heritage Partners 2022.
 - Bushfire Risk Assessment – 39-45 and 40-46 Cyril Beechey Lane, Cranbourne. Ecology and Heritage Partners 2022.
 - Targeted Southern Brown Bandicoot *Isodon obesulus obesulus* 40-46 Cyril Beechey Lane, Cranbourne. Ecology and Heritage Partners 2019.

3.2 Field Assessment

A field assessment was undertaken on 9 September 2022 to obtain information on flora and fauna values within the Fauna Corridor. The Fauna Corridor was walked, with all trees and the extent of exotic shrub cover mapped. The presence of any hollow-bearing trees was also noted.

4 RESULTS

4.1 Existing Conditions

4.1.1 Native Vegetation

Native vegetation within the fauna corridor is representative of one EVC: Heathy Woodland (EVC 48). The presence of the EVCs in the study area is generally consistent with the modelled pre-1750s native vegetation mapping (DEECA 2022b).

Heathy Woodland

Heathy Woodland is located throughout the majority of fauna corridor and was contiguous in quality throughout. Heathy Woodland was highly modified, with several Coast Manna Gums *Eucalyptus viminalis* subsp. *pyroriana* constituting the patch. The understory was highly modified, with few native understory species present (Plate 2; Plate 3). Austral Bracken *Pteridium esculentum* and Heath Tea-tree *Leptospermum myrsinoides* were generally present in these areas. The cover of invasive shrubs (i.e. Montpellier Broom and Sallow Wattle) within the corridor is quite high.



Plate 2. Modified Heathy Woodland within study area with Coast Manna Gum Present (>2-metres in height) (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 3. Heathy Woodland within study area with an understory of Austral Bracken and Coast Manna Gum present (>2-metres in height) (Ecology and Heritage Partners Pty Ltd 19/04/2022).

4.2 Future Vegetation Condition

Once tree removal, weed management and revegetation actions commence, the future vegetation of the Fauna Corridor is proposed to be managed as a Shrubland in order to reduce the requisite separation distance for the adjacent development.

Any species used for revegetation works within the Fauna Corridor must meet the following criteria:

- a) Correspond to a Heathy Woodland, where possible;
- b) Provide suitable habitat for Southern Brown Bandicoot; and

- c) Be no more than two metres in height in order to meet the AS 3959-2009 vegetation classification criteria for Shrubland.

In order to reduce the vegetation classification from Woodland to Shrubland, selective trees will be removed to ensure that there are no more than two trees with overlapping canopies and the understorey is <2-metres in height (Plate 3; Plate 4).

Treeless Heathy Woodland

Future vegetation condition is proposed to be managed by removing selective trees and managing exotic shrubs, such as Montpellier Broom and Sallow Wattle, and implementing revegetation of species <2-metres in height (Table 2).

The vegetation structure will be consistent with Heathy Woodland (EVC 48), however will lack a consistent canopy structure. Recommended species for revegetation are consistent with Heathy Woodland EVC, including Common Heath *Epacris impressa*, Heath Tea Tree, Prickly Tea tree *Leptospermum continentale*, Prickly Broom Heath *Monotoca scoparia*, Broom Spurge *Amperea xiphoclad*, a Common Beard Heath *Leucopogon virgatus*, Variable Sword-sedge *Lepidosperma laterale*, Red-fruit Sword-sedge *Gahnia sieberiana*, Austral Bracken, Tussock Grasses *Poa* spp., Wallaby Grass *Rytidosperma* spp., among others (Table 2). Indicative images of what a Treeless Heathy Woodland may look like once management has commenced is outlined below (Plates 4-11).



Plate 4. Modified Heathy Woodland present within study area with no Large Trees present (<2-metres in height) (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 5. Heathy Woodland present within study area with no Large Trees present (<2-metres in height) (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 6. Example of Heathy Woodland within study area primarily consisting of Coastal Tea Tree (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 7. Example of Treeless Heathy Woodland with Coastal Tea Tree and no Large Trees (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 8. Example of Heathy Woodland within study area with Coastal Tea Tree with no Large Trees (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 9. Example of Heathy Woodland within study area primarily consisting of Austral Bracken and Coastal Tea Tree (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 10. Example of Heathy Woodland within study area primarily consisting of Coastal Tea Tree (Ecology and Heritage Partners Pty Ltd 19/04/2022).



Plate 11. Example of Treeless Heathy Woodland with Wallaby Grass, Grass Tree *Xanthorrhoea australis* and Banksia present (Ecology and Heritage Partners Pty Ltd 19/04/2022).

4.3 Southern Brown Bandicoot

4.3.1 Desktop Assessment

The VBA contains a substantial number of Southern Brown Bandicoot records within five kilometres of the study area (Figure 3) (DEECA 2023e). There are multiple Southern Brown Bandicoot records within the immediate area, particularly to the south of the study area, including the Royal Botanic Gardens Cranbourne which supports the largest population of Southern Brown Bandicoot in or near Melbourne (Marr *et al.* 2011).

Recent records of Southern Brown Bandicoot (2011, 2012 and 2013) are prevalent to the south-east of the study area through the Cranbourne Thoroughbred Training Complex, which appears to have good connectivity with the Cranbourne Royal Botanic Gardens. Many of the recent records occur within one to three kilometres of the study area, with some within 500 metres (DEECA 2022b).

4.3.2 Habitat Assessment

The habitat preferences of Southern Brown Bandicoot are relatively broad, with the species known to occur in a variety of habitats, including disturbed areas dominated by exotic species (e.g. Blackberry). High-quality habitat for Southern Brown Bandicoot predominantly occurs in the southern portion of the fauna corridor (Figure 2). This is due to the presence of dense ground cover vegetation over sandy well-drained soils, which may provide a corridor or refuge island within the broader landscape, particularly considering the high number of records in the Cranbourne Royal Botanical Gardens to the south and suitable connectivity to existing populations. The remainder of the corridor provides low-quality habitat for Southern Brown Bandicoot due to the dominance of invasive understorey shrub species, particularly Sallow Wattle *Acacia longifolia* and Montpellier Broom *Genista monspessulana*, which provide limited protective habitat and foraging resources for the species.

5 MANAGEMENT ACTIONS

5.1 Overview

This Fauna Corridor Management Plan has a dual purpose of rehabilitating a 30-metre wide corridor to provide additional Southern Brown Bandicoot habitat and creating a north-south habitat corridor to facilitating the dispersal of the species, whilst mitigating bushfire risk for the proposed development. As such, the management actions outlined in this report aim to improve Southern Brown Bandicoot habitat and connectivity, whilst reclassifying vegetation from Group B woodland to Group C Shrubland. The specified management actions are in accordance with the following themes:

- Vegetation Reclassification;
- Tree Removal;
- Weed and Vegetation Removal;
- Fire Break;
- Fencing;
- Southern Brown Bandicoot Refuges; and,
- Pest Animal Management.

5.2 Vegetation Reclassification

The study area is located in a Bushfire Prone Area (BPA) and must respond to Clause 13.02-1S which requires all dwellings to achieve a BAL-12.5 construction standard.

The current condition of the corridor results in a classification of Group B Woodland (Plate 12) due to:

- The presence of more than two trees with overlapping canopies;
- An understory that is > 2 metres in height.

The requisite separation distance for Group B Woodland vegetation on Upslope/Flat land is 33-metres. However, this separation distance is not practicable in the context of the proposed development due to the small size of the study area and loss of developable land associated with the magnitude of the separation distance.

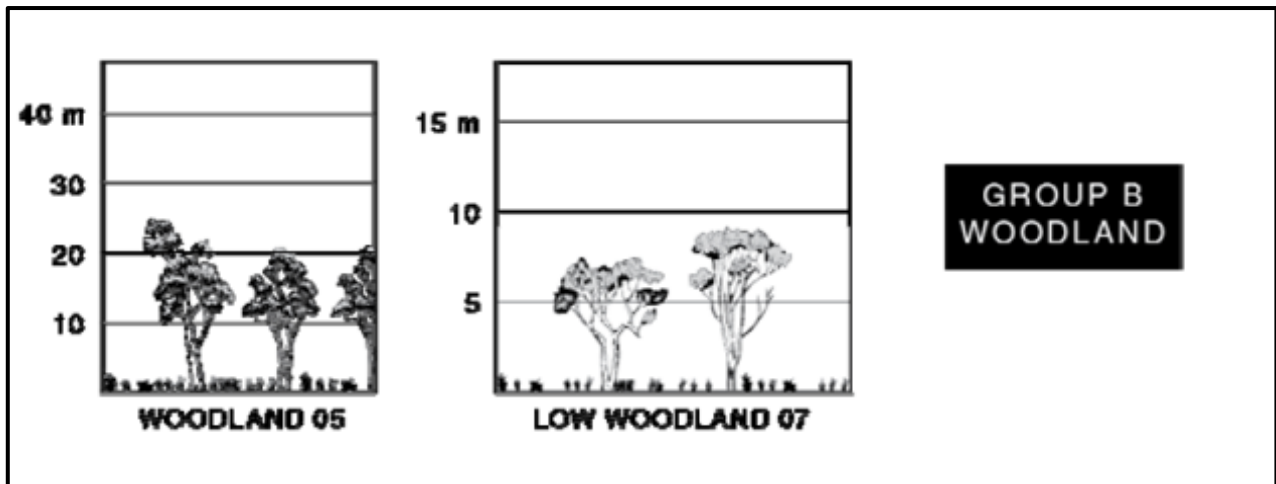


Plate 12. Classification of vegetation (Group B Woodland) as described in AS 3959-2009

Thus, in consultation with the CFA and DELWP, the corridor will be modified and managed in order to meet the criteria for Group C Shrubland (Plate 13) under the AS 3959-2009. This requires the selective removal of trees with overlapping canopies and gradual replacement of understory weeds with suitable native species. The corridor can be actively managed to meet bushfire reclassification requirements, without compromising objectives to improve and maintain the Southern Brown Bandicoot corridor. Southern Brown Bandicoot are known to inhabit areas of dense vegetation, including heathlands, wetland fringes and shrublands (TSSC 2016), and the species has been observed in both native bushlands and areas dominated exotic vegetation, such as Blackberry. As such, due to the degraded nature of the study area, undertaking vegetation removal to reclassify the Group B Woodland to Group C Shrubland, will provide suitable habitat within the study area for Southern Brown Bandicoot, without comprising habitat requirements for the species.

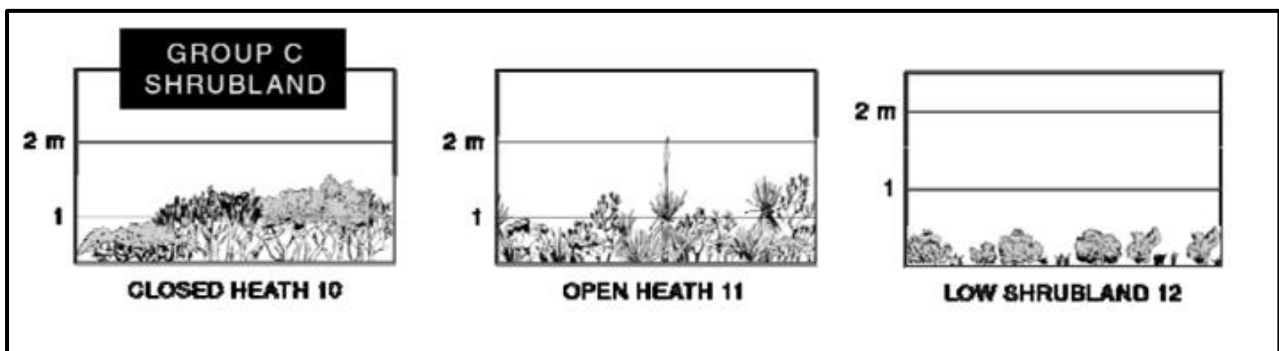


Plate 13. Classification of vegetation (Group C Shrubland) as described in AS 3959-2009

Further detail on the proposed management actions is described below.

5.3 Tree Removal

Selective tree removal will be undertaken in order to reduce the density of trees within the corridor and the associated fuel loads. Tree removal has been proposed where required to ensure that there are no more than two trees with overlapping canopies in any part of the corridor. Groupings of trees with more than two overlapping canopies have been identified during the site assessment and consideration has also been given

to possible canopy overlap that may occur in the future as the trees continue to grow. In order to provide additional habitat for Southern Brown Bandicoot and other ground-dwelling mammals, removed trees should be retained as logs in the ground layer within the fauna corridor.

Hollow-bearing and large trees have been prioritised for retention, as these provide additional shelter and breeding resources for a range of locally common fauna species that may occur on site (e.g. microbats, possums, parrots, gliders, owls).

Of the 36 trees mapped in the corridor, 15 are proposed for removal (13 small trees and two Large Trees based on the EVC benchmark). The trees outlined below will be removed prior to any other management actions commencing. The retention status of the trees is summarised below (Table 1) (Figure 1).

Removal of the selected trees will adhere to the following approach:

- Remove all trees outlined as *removed* in Table 1 and Figure 1; and,
- All *removed* trees will be placed as logs within the fauna corridor, to provide additional habitat for southern Brown Bandicoot as weed removal occurs.

Table 1. List of trees within the Fauna Corridor and their retention/removal status.

Species	Tree #	DBH	Hollow-bearing	Size	Status	Approximate Distance to Housing (West)	Approximate Distance to Southern Grassland
Coast Manna Gum	1	32	No	Small	Retained	44-metres	>50-metres
Coast Manna Gum	2	52	No	Large	Removed	N/A	N/A
Coast Manna Gum	3	33	No	Small	Retained	40-metres	>50-metres
Coast Manna Gum	4	21	No	Small	Retained	33-metres	>50-metres
Coast Manna Gum	5	20	No	Small	Retained	44-metres	>50-metres
Coast Manna Gum	6	26	No	Small	Retained	18-metres	>50-metres
Coast Manna Gum	7	23	No	Small	Retained	19-metres	>50-metres
Coast Manna Gum	8	21	No	Small	Removed	N/A	N/A
Coast Manna Gum	9	22	No	Small	Removed	N/A	N/A
Coast Manna Gum	10	17	No	Small	Removed	N/A	N/A
Coast Manna Gum	11	11	No	Small	Removed	N/A	N/A
Coast Manna Gum	12	21	No	Small	Retained	18-metres	>50-metres
Coast Manna Gum	13	19	No	Small	Retained	17-metres	>50-metres
Coast Manna Gum	14	16	No	Small	Removed	N/A	N/A
Coast Manna Gum	15	43	No	Small	Retained	31-metres	>50-metres
Coast Manna Gum	16	42	Yes	Small	Retained	40-metres	>50-metres
Coast Manna Gum	17	30	No	Small	Removed	N/A	N/A
Coast Manna Gum	18	53	No	Large	Retained	41-metres	>50-metres
Coast Manna Gum	19	22	No	Small	Removed	N/A	N/A
Coast Manna Gum	20	51	No	Large	Removed	N/A	N/A

Species	Tree #	DBH	Hollow-bearing	Size	Status	Approximate Distance to Housing (West)	Approximate Distance to Southern Grassland
Coast Manna Gum	21	49	No	Small	Retained	34-metres	>50-metres
Coast Manna Gum	22	37	No	Small	Removed	N/A	
Coast Manna Gum	23	58	No	Large	Retained	28-metres	42-metres
Coast Manna Gum	24	47	No	Small	Retained	25-metres	46-metres
Coast Manna Gum	25	46	No	Small	Removed	N/A	N/A
Coast Manna Gum	26	33	No	Small	Removed	N/A	N/A
Coast Manna Gum	27	14	No	Small	Removed	N/A	N/A
Coast Manna Gum	28	39	No	Small	Removed	N/A	N/A
Coast Manna Gum	29	39	No	Small	Retained	21-metres	28-metres
Coast Manna Gum	30	27	No	Small	Retained	38-metres	36-metres
Coast Manna Gum	31	35	Yes	Small	Retained	23-metres	17-metres
Coast Manna Gum	32	45	No	Small	Retained	24-metres	13-metres
Coast Manna Gum	33	26	No	Small	Removed	N/A	N/A
Coast Manna Gum	34	31	No	Small	Retained	31-metres	3-metres
Coast Manna Gum	35	46	No	Small	Retained	43-metres	>50-metres
Coast Manna Gum	36	14	No	Small	Retained	16-metres	>50-metres

5.4 Weed Removal and Revegetation

The cover of invasive shrubs (e.g. Montpellier Broom and Sallow Wattle) within the corridor will be incrementally reduced and replaced with appropriate native species (Figure 2). Much of the suitable Southern Brown Bandicoot habitat within the fauna corridor comprises of invasive shrubs, which the species is known to rely on. Anecdotal reports suggest that broadscale weed removal has resulted in the disappearance of Southern Brown Bandicoot following works (TTSC 2016). As such, weed removal and revegetation intensity must be undertaken in a manner as to avoid rampant removal of vegetation within the corridor. Species used for revegetation works within the Fauna Corridor must meet the following criteria:

- d) Correspond to a Heathy Woodland EVC (48), where possible;
- e) Provide suitable habitat for Southern Brown Bandicoot; and
- f) Be no more than two metres in height in order to meet the *AS 3959-2009* vegetation classification criteria for Shrubland.

Understorey vegetation structure with 50–80% average foliage density in the 0.2–1 metre height range is suitable for Southern Brown Bandicoot habitat. Based on the criteria, a recommended list of native species proposed for retention and revegetation works is provided below (Table 2).

Table 2. Proposed species list for planting and native vegetation retention within the Fauna Corridor.

Scientific name	Common Name	Typical height of plant (m)	Native Species	Heathy Woodland (EVC 48)	Currently Present
<i>Amperea xiphioclada</i>	Broom Spurge	<1	✓	✓	✓
<i>Cassytha glabella</i>	Slender Dodder-laurel	<1	✓	✓	-
<i>Clematis microphylla</i>	Small-leaved Clematis	<1	✓	✓	-
<i>Dillwynia glaberrima</i>	Smooth Parrot-pea	<1	✓	✓	✓
<i>Epacris impressa</i>	Common Heath	<1	✓	✓	-
<i>Gahnia sieberiana</i>	Red-fruit Sword-sedge	<1	✓	✓	
<i>Hibbertia</i> sp.	Guinea flower	<1	✓	✓	✓
<i>Hypolaena fastigiata</i>	Tassel Rope-rush	<1	✓	✓	-
<i>Lepidosperma laterale</i>	Variable Sword-sedge	<1	✓	✓	✓
<i>Leucopogon virgatus</i>	Common Beard Heath	<1	✓	✓	
<i>Lomandra longifolia</i>	Spiny-headed Mat Rush	<1	✓	✓	✓
<i>Monotoca scoparia</i>	Prickly Broom Heath	<2	✓	✓	-
<i>Poa</i> spp.	Tussock Grasses	<1	✓	-	-
<i>Pteridium esculentum</i>	Austral Bracken	<1	✓	✓	✓
<i>Rytidosperma</i> spp.	Wallaby Grass	<1	✓	-	-
<i>Senecio minimus</i>	Shrubby Fireweed	<1	✓	-	-
<i>Themeda triandra</i>	Kangaroo Grass	<1	✓	-	-
<i>Xanthorrhoea minor</i> ssp. <i>lutea</i>	Small Grass-tree	<1	✓	✓	-

Revegetation efforts will be implemented using tube stock of the key native species outlined above and must be sourced from a local native plant provenance. Weed management and revegetation efforts must occur gradually throughout the study area. If intensive weed control were to occur in Year 1 of operation, there is the risk that remaining Southern Brown Bandicoot habitat will be eliminated from the study area. Despite the prevalence Montpellier Broom and Sallow Wattle, removal of these species must occur gradually over 3 - 5 years to ensure protective habitat for Southern Brown Bandicoot remains along the corridor. Intensive revegetation will occur alongside woody weed removal to ensure that additional Southern Brown Bandicoot replaces lost habitat from weed management activities.

It is recommended that weed control and revegetation occur over a five-year period, and by the end of management, noxious weeds/Weeds of National Significance (WoNS) (i.e. Blackberry), and Montpellier Broom and Sallow Wattle will be <1% cover. In adherence with this plan, no more than 50% of weed removal will be undertaken in Year 1, followed by immediate revegetation activities, aiming for a minimum 50% survivability of revegetated species. Throughout the remaining four years, only 50% of the remaining weed cover for each year is proposed to be removed. As such, the percentage cover of weeds by the end of Year 2 should be ≥25%, followed by ≥12.5% in Year 3, ≥6.25% in Year 4 and <1% in Year 5. Indicative targets for woody weed control and revegetation are outlined below (Table 3), which seek to balance survivorship of revegetation efforts and reduction in the cover of weeds to ensure Southern Brown Bandicoot habitat is retained within the study area.

Table 3. Targets for weed control and revegetation over 5 years.

Year	Performance measure	Target
1	Percentage cover of weeds	≥50%
	Percentage survivorship of revegetation	>50%
2	Percentage cover of weeds	≥25%
	Percentage survivorship of revegetation	>75%
3	Percentage cover of weeds	≥12.5%
	Percentage survivorship of revegetation	>87.5%
4	Percentage cover of weeds	≥6.25%
	Percentage survivorship of revegetation	>93.75%
5	Percentage cover of weeds	<1%
	Percentage survivorship of revegetation	>97%

5.4.1 Retention of native vegetation

Management actions must be implemented to ensure native vegetation does not degrade further as a result of any future use of the site. Native vegetation is scattered throughout the study area and management actions should ensure it is retained.

5.5 Fire Break

Following a site visit and consultation with the CFA (Jude Kennedy, CFA, pers. comms), a recommendation was made for the inclusion of a fire break to further mitigate potential risks associated with the retention of native vegetation in close proximity to a residential estate.

The maximum width of breaks in the corridor that will not compromise on the functionality of the corridor (i.e. provision of safe egress for Southern Brown Bandicoot) is seven metres, and multiple fire breaks may be required (Nature Advisory 2022). The reduction of this width to a minimum of five metres will be more favourable for the species by further reducing exposure to potential predators, as well as allowing for additional native vegetation retention. This recommendation is in line with the *Guidelines for Best Practice Management of Modified Habitats for Southern Brown Bandicoot* (Masters et al. 2019). Furthermore, given the small size of the corridor (30 x 200 metres) and lack of connectivity to any substantial areas of contiguous vegetation in the surrounds, it is proposed that a single fire break is sufficient in this instance. This will reduce fuel loads with the corridor and slow the spread of a fire should one ignite in the area.

The most likely direction of fire attack on severe fire weather days is north-west (or south-east following a wind change). Given that the study area is bound by existing residential developments to the north-west, roads to the east and west, and Council-managed land to the south, the potential for a fire to cause neighbourhood-scale destruction is very low. The Grandeur Nature Reserve to the north-east of the site is also small in size

and managed by Council, which further reduces the likelihood of a hot and intense fire affecting the study area. Therefore, as the immediate surrounds contain managed vegetation/ low fuel loads (i.e. grassland) or existing dwellings and 'fire breaks' (i.e. roads), the potential for fire movement across the landscape is partially mitigated. Thus, the location of the fire break has been selected in order to minimise further loss of native vegetation within the corridor.

The fire break will be five metres in length and run east-west across the corridor. The nominated placement is shown in Figure 2. The fire break will be maintained in perpetuity in a Low-Threat state, that is:

- Vegetation will consist of grass less than 100 mm in height; and
- All leaves and vegetation debris will be removed at regular intervals during the Fire Danger Period.

5.6 Fencing

Protective fencing (up to 1.2 metres) will be established along the interface of the residential development and the Fauna Corridor using 50 mm diamond mesh fencing. This will allow for Southern Brown Bandicoot movement while restricting access to the corridor by members of the public. Furthermore, interpretive/ educational signage will be erected to highlight the conservation significance of the corridor for the species.

While predator-proof fencing is sometimes installed to protect priority areas for Southern Brown Bandicoot, it is deemed to not be suitable in this instance, given that the corridor will connect to neighbouring unfenced areas which would provide points of access for cats/foxes (e.g. Grandeur Reserve to the north). Fencing considerations for Southern Brown Bandicoot are outlined in Table 4.

Table 4. Fencing considerations as specified in the Referral Guidelines for Southern Brown Bandicoot (SEWPaC 2011) and justification for implementation within the current study area.

Fencing Consideration	Justification
Does the fencing restrict access by fencing populations to limit use as a thoroughfare, minimise risk of accidental damage, and destruction or degradation of habitat (e.g. from construction activities, recreational users, pest animals, rubbish dumping or unauthorised vehicle movement through an area)?	The fencing will limit movement from suitable bandicoot habitat located north of Ballarto Road in Area A, which is adjacent to the Cranbourne Botanic Gardens. The area to the south of Ballarto Road is characterised by existing residential development and provides marginal foraging and dispersal habitat for Southern Brown Bandicoot. The fence will aim to minimise the risk of road mortality.
Will the fencing occur in habitat near roads to direct southern brown bandicoots to safe road crossing points? Note that southern brown bandicoots move freely through 40 – 50 mm diamond mesh fencing.	The fencing will be adjacent to a road within the proposed development. However, it will not restrict the movement of Southern Brown Bandicoot (40 -50 mm diamond mesh fencing will be used).
Does the fence encompass habitat where there is a major development that abuts but does not fragment habitat or a movement corridor	Yes. Development is proposed to occur within the remainder of the property (i.e. residential subdivision) which is west of the Fauna Corridor.
Does the fence incorporate bandicoot access holes in fences to allow dispersal and movement through fences? A fence diamond mesh size of 40 – 50 mm will allow dispersal of southern brown bandicoots.	Yes, diamond mesh of 40 – 50 mm will be used to permit dispersal of Southern Brown Bandicoot.
Will interpretive/educational signage be erected to highlight conservation significance.	Yes.
Will the fencing result in fragmented habitat; reduced connectivity; isolate southern brown bandicoots and their access to habitat; lead to entrapment (including on the outside of the fence); prevents movement during critical periods (such as extreme fire events); funnels southern brown bandicoots towards roads, leading to mortality; or blocks escape routes.	No. The use of 40 – 50 mm diamond mesh will ensure that Southern Brown Bandicoots can move freely through the fence, whilst reducing accessibility to the corridor for members of the public. The retention of the corridor will maintain connectivity to other areas of suitable habitat (e.g. Grandeur Reserve), thereby allowing for dispersal and movement.

5.7 Southern Brown Bandicoot Refuges

Artificial structures must be employed to provide Southern Brown Bandicoot with additional shelter and protection from introduced predators (i.e. cats and foxes). While not a replacement for native vegetation cover, the refuges can be used as a temporary measure following the removal of dense exotic weeds. This will afford the species with continued protection until such time that the new plantings are established (Plate 14).

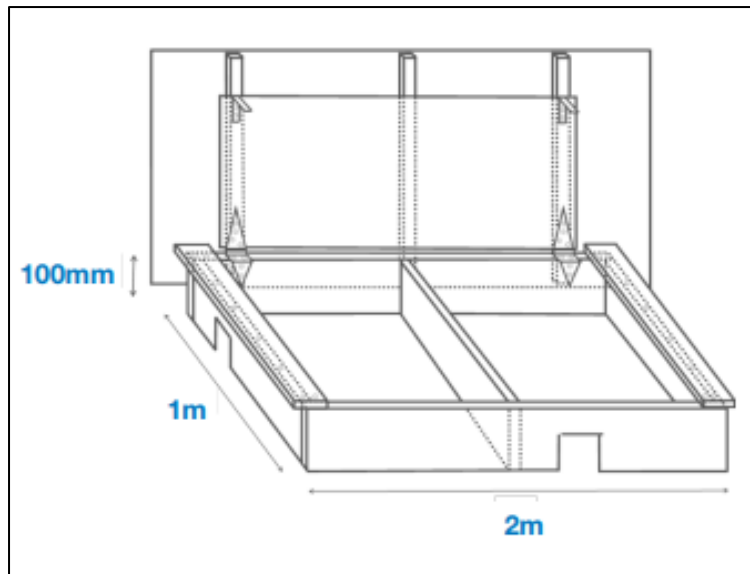


Plate 14. Artificial Structure Design for Southern Brown Bandicoots (Masters *et al.* 2019).

A staged revegetation plan is recommended for the Fauna Corridor. This is due to the limited availability of dense ground cover vegetation in the northern portion of the corridor. In contrast, the southern portion of the corridor contains higher quality habitat for Southern Brown Bandicoot, with numerous shelter resources present (e.g. logs and blackberry patches). Despite being a weed, blackberry in the southern portion of the corridor will be retained until such time that the new plantings in the north of the corridor have established.

The following approach must be undertaken:

- Prior to any tree removal or weed management, at least 10 man-made shelters will be implemented across the fauna corridor, a minimum 10 metres apart in areas where vegetation has been cleared to facilitate the movement of Southern Brown Bandicoot between areas of suitable habitat;
- Monitor the structures to determine if they are being used by Southern Brown Bandicoot (i.e. motion cameras);
- Install signage near areas containing artificial structures to provide community education; and,
- Natural refuges (e.g. logs, branches) can also be provided by placing woody debris in piles of at least 1.0m² where vegetation cover is lacking.

5.8 Pest Animal Management

Pest animal management will be undertaken by the developer for the first two years of management, at which point, on-going pest management will be the responsibility of Council to manage. Pest animals, such as European Rabbit *Oryctolagus cuniculus*, European Red Fox *Vulpes Vulpes* and Feral Cat *Felis catus*, have the potential to establish within the study area. Due to predation and competition, pest animals pose an intrinsic risk to existing Southern Brown Bandicoot populations within the fauna corridor. Pest animal management will be undertaken for the first two years of management while intensive weeding and revegetation occurs. As habitat reduces Southern Brown Bandicoot may be more susceptible to invasive predators, such as feral cats and foxes.

All pest species control action must be conducted by a suitably experienced and qualified operator and only after the completion of a risk assessment and the deployment of appropriate safety measures. Pest animal management is best achieved using a combination of methods and in combination with control programs within the wider area. Pest animals to be controlled and methods to be undertaken are outlined below (Table 5).

Table 5. Pest animals to be controlled – species, method and timing.

Common name	Method	Timing
Cats	Engage qualified and licenced trapper/shooter; ensure Southern Brown Bandicoot are not impacted. Encourage homeowners to confine cats to the house overnight.	Ongoing
Foxes	Remove dens taking care to ensure no impacts to Southern Brown Bandicoot. Engage qualified and licenced trapper/shooter; ensure Southern Brown Bandicoot are not impacted. Investigate the use of Canid Pest-ejectors in the corridor.	Ongoing
Rabbits	Remove dens taking care to ensure no impacts to Southern Brown Bandicoot. Engage qualified and licenced trapper/shooter; ensure Southern Brown Bandicoot are not impacted.	Ongoing
New and emerging pest animals	Monitor and control	Ongoing

5.8.1 European Rabbit

Strategies for the management measures commonly adopted to control European Rabbits in Victoria are provided above (Table 5). European Rabbits commence breeding in autumn and continue until vegetation dries off, which generally occurs in early summer. Rabbit control must be undertaken throughout the year and as per the directions outlined below (Table 6). Monitoring of European Rabbits must be undertaken quarterly as per Appendix 3.

Table 6. European Rabbit control requirements.

Method	Comments	Timing of Control Actions
Poison Baiting (Pindone)	Although an antidote exists for domestic pets which have ingested Pindone (Vitamin K1), there is a risk that off target species may consume poisoned baits. Poison baiting must only be undertaken by a suitably experienced and licenced operator after the completion of a risk assessment and deployment of appropriate safety measures.	Appropriate timing for baiting is mid to late summer.
Warren fumigation	In the event that warren networks are identified, this method may be employed.	If warren networks are located, they must be fumigated just before the start of the rabbit breeding season.

Method	Comments	Timing of Control Actions
Warren ripping	In order to avoid impacts on native vegetation communities, ripping would be constrained to areas of non-native vegetation.	Appropriate actions all year
Netting	Night netting is an effective method, particularly in situations where rabbits are leaving bushland harbour to feed in areas of open space.	Appropriate actions all year

5.8.2 Red Fox

Strategies for the management measures commonly adopted to control Red Foxes in Victoria are provided below (Table 7).

The most effective Fox control is achieved during late winter and spring. At this time foxes are less mobile and they are rearing young and food demands are high. Fumigation and den destruction are most effective during August and September, within 10 weeks of cubs being born. Vixens are only likely to be killed through fumigation when they are confined to the den, within the first three weeks after the birth of cubs.

Table 7. Feasibility assessment of Red Fox control requirements.

Method	Comments	Timing of Control Actions
Poison Baiting	There is a risk that off target species may consume poisoned baits including native and domestic animals. Poison baiting must only be undertaken by a suitably experienced and licenced operator after the completion of a risk assessment and deployment of appropriate safety measures.	This action can occur all year round
Fumigation and den destruction	If completed at appropriate times, fumigation and den destruction can be effective in reducing Fox numbers.	Fumigation should be conducted in August and September
Trapping	Only soft jawed traps and cage traps must be used to control Red Foxes. Foxes are known to be extremely trap-shy thus this method should not be solely relied upon.	This action can occur all year round

5.8.3 Feral Cat

A variety of control methods can be used including shooting, trapping, poison baiting and exclusion fencing. However, in urban/residential areas, cage traps are preferred over leg hold traps as fewer injuries are sustained, non-target animals can be released unharmed and trapped feral Cats can be transported away from the area for euthanasia. The following method is recommended:

- Use a non-poison bait such as tuna;
- Traps are to be set in the late-afternoon/evening and checked and closed each morning;
- Every effort must be made to avoid target and non-target deaths from factors such as exposure or shock;

- Before euthanising a trapped Cat it must first be established that it is a feral Cat, rather than a domestic pet or stray Cat. Look for a collar and identification/ registration tag and scan for a microchip; and,
- Once it has been established that the trapped Cat is feral, it should be euthanised in a humane manner. This can be performed either by an authorised person at an animal shelter, council pound or veterinarian

6 IMPLEMENTATION

The specified management actions must be undertaken as part of this five-year management strategy. Greenridge Properties Pty Ltd and/or City of Casey will be responsible for enacting this five-year strategy. Management of the fauna corridor will be agreed upon with City of Casey at a later date. For instance, Greenridge Properties Pty Ltd is likely to manage the fauna corridor for first two years and pay a maintenance cost to City of Casey for the remaining three years. A brief outline of the requirements of each management action and the responsible party is outlined in Table 8.

Table 8. Outline of management actions, timing, responsible party included in this five-year strategy.

Management Action	Timing	Responsible Party	Description
Fauna corridor site assessment	September 2022	Ecology and Heritage Partners (completed)	A site assessment was undertaken to determine the existing conditions within the fauna corridor. This aimed to determine the density of trees bushfire purposes and inform tree removals, determine the presence of suitable habitat for Southern Brown Bandicoot, and determine the presence of invasive weeds and pests within the corridor.
Tree Removal	Post-Permit Approval/Prior to development of first stage	Land Developer	As outlined in Section 4.2.1, selective tree removal will be undertaken in order to reduce the density of trees within the corridor and the associated fuel loads. Trees which are required to be removed are outlined in Figure 1, which aims to ensure groupings of trees have no more than two overlapping canopies. Removed trees must be placed as logs within the fauna corridor
Weed removal and revegetation	Post-removal of selected trees	Land Developer	Revegetation will primarily be undertaken through tube-stock plantings and will ultimately aim to establish the low dense layer of understorey vegetation (up to 1.5m), which provides shelter from predators. All revegetation activities will follow the principles identified in the Southern Brown Bandicoot Strategic Management Plan for the former Koo Wee Rup Swamp Area (Ecology Australia 2009) (Pages 128-130).
Implement Firebreak	Post-Permit Approval/Prior to weeding and revegetation	Land Developer	As outlined in Section 5.4, a fire-break is proposed in the centre of the Fauna Corridor to limit Bushfire Risk to adjacent developments. This is required to occur prior to any revegetation efforts occurring.
Pest Animal Management	Ongoing	Land Developer	Ongoing weed and pest management will be required to be undertaken within the Fauna Corridor. The purpose of this is to reduce incidental Southern Brown Bandicoot mortality within the area and improve habitat quality for Southern Brown Bandicoot populations.
Annual Reporting	Post-construction	Land Developer	Annual report submitted to Council on the habitat value and management actions that have been undertaken on site.

Management Action	Timing	Responsible Party	Description
			The report will be compiled in a letter report suitable for submission to Council and/or DELWP.
Inform future landowners of the ecological values within the study area	Post-construction	Council	Future land holders will be informed of the ecological values of the study area to promote appropriate land use activities (i.e. control of domestic pets).

6.1 Responsibilities, Targets and Timeframes

Greenridge Properties Pty Ltd and/or City of Casey is responsible for all management actions described in this five-year management strategy, and are subsequently responsible for engaging relevant experienced contractors, where required. An outline of contracts required to satisfy each component is outlined in Table 9.

Table 9. Outline of specified management actions and contracts required to be engaged.

Management Action	Contractor/Responsible Person
Tree Removal	Engage Arborist to undertake tree removal as specified in Section 5.3.
Weed Removal	Engage land management contractor to undertake weed removal as specified in Section 5.4.
Revegetation	Engage land management contractor to undertake revegetation as specified in Section 5.4.
Firebreak	Land Developer.
Fencing	Engage fencing contractor to erect temporary fencing along western boundary of fauna corridor.
Southern Brown Bandicoot Refuges	Engage ecologist/land management contractor to implement a minimum of 10 artificial refuges.
Pest Animal Management	Engage pest animal contractor for the first two years of management, while weeding and revegetation occurs incrementally.

6.1.1 Targets and Timeframes

In order to satisfy requirements of this Fauna Corridor Management Plan, five components are required to be actioned over the five-year program. This management plan must commence prior to or upon commencement of construction for the proposed development. Management actions and timeframes over the five-year program are outlined in .

Table 10.

Table 10. Management actions across the five-year program.

Management Action	Year 1	Year 2	Year 3	Year 4	Year 5
Tree Removal	Undertake the removal of 15 specified trees; Section 5.3; Figure 1	-	-	-	-
Weed Removal	Conduct weeding post-tree removal; Percentage Cover of weeds ≥50%	Percentage cover of weeds ≥25%	Percentage cover of weeds ≥12.5%	Percentage cover of weeds ≥6.25	Percentage cover of weeds <1%
Revegetation	Conduct revegetation post-tree removal; Percentage survivorship of revegetation >50%	Percentage survivorship of revegetation >75%	Percentage survivorship of revegetation >87.5%	Percentage survivorship of revegetation >93.75%	Percentage survivorship of revegetation >97%
Firebreak	Prior to weeding and revegetation implement a firebreak as specified on Figure 2.	-	-	-	-
Fencing	Prior to commencement of development erect temporary exclusion fencing along western boundary of fauna corridor.	-	-	-	-
Southern Brown Bandicoot Refuges	Prior to commencement of weed management and tree removal, implement a minimum of 10 artificial refuges; implement motion sensor cameras to monitor Southern Brown Bandicoot use.	On-going monitoring of artificial refuges	On-going monitoring of artificial refuges	On-going monitoring of artificial refuges	On-going monitoring of artificial refuges
Pest Animal Management	Undertake pest animal management as specified in Section 5.8	Undertake pest animal management as specified in Section 5.8	-	-	-

6.2 Ongoing Management, Monitoring and Reporting

Monitoring of the site must be implemented to track condition and to identify management issues early.

The following monitoring activities must be followed:

- Continual monitoring and control of invasive species (weeds and pest animals), revegetation efforts and artificial refuges within the site (every twelve months); and,

- Identifying ongoing management issues requiring remediation (e.g. increase revegetation efforts, increase weed management efforts, implement additional refuges).

It is the developer and/or Council's responsibility to ensure weeds are controlled to the specified amount under the CaLP Act. Fines or prosecution are possible if landowners do not control weeds within their land.

Monitoring is required to assess the positive and negative impacts of management actions on the integrity of the study area, and to implement change if required. The outcome of each monitoring assessment will be summarised in a progress report. Ongoing monitoring will also provide feedback to inform an adaptive management approach, which is critical to tailor management actions to prevailing environmental conditions and for the provision of contingency plans.

A regular monitoring program will be undertaken with respect to the management actions outlined in this plan, over the five-year period. Monitoring will be undertaken every 12 months for the life of the Plan and include the following:

- Monitoring the effectiveness of tree removal, including whether additional trees are required to be removed;
- Surveys for weed species, as well as identification of any new outbreaks;
- Monitoring the effectiveness of revegetation efforts, including whether revegetation is meeting the targets specified in this plan;
- Note any fence breaks along the western boundary of the fauna corridor;
- Check the health of artificial refuges for any damage which might have been incurred;
- Undertake monitoring of the use of artificial refuges by Southern Brown Bandicoot by deploying cameras for a one-month period each year;
- Undertake pest animal monitoring, noting any observations of pest animals and indirect evidence, such as scats, tracks and diggings; and,
- Assess the overall success of the management actions.
- An annual report submitted to Council on the management actions that have been undertaken within the fauna corridor at the end of each management year, suitable for submission to Council and/or DELWP. The annual report will be compiled in a letter report will include a brief outline of the results of the management actions and include the yearly reporting template outlined in Section 6.2.1 (Table 11).

6.2.1 Yearly Reporting template

Table 11. Management measures and compliance requirements to be followed up by client each year.

Action #	Management Measure	Relevant Section	Results	Compliance Actions Required?	Supervisor/Ecologist Name and Signature	Date
Yearly (circle): 1 / 2 / 3 / 4 / 5						
1	Tree Removal	Section 5.3	Example – Tree removal of specified trees has been conducted as specified; no additional trees required to be removed.	Example – No further action.		
2	Weed Removal	Section 5.4	Example - Weed removal for Year 1 has been conducted in accordance with this plan, <60% cover of weeds at the end of Year 1.	Example – No further action.		
3	Revegetation	Section 5.4	Example – survivorship of revegetation efforts lower than expected in Year 1.	Example - Additional revegetation efforts to be undertaken in Year 2		
4	Fencing	Section 5.6				
5	Southern Brown Bandicoot Refuges	Section 5.7				
6	Pest Animal Management	Section 5.8				

7 INDICATIVE MANAGEMENT COSTS

On-going management will be required within the Fauna Corridor, these include: the replacement of invasive shrubs with native species; on-going weed and pest management for high risk species, such as European Rabbits and Red Foxes; implementation of Southern Brown Bandicoot refuges and on-going monitoring; and annual reporting on management actions. Indicative costs for the on-going management which will be required within the fauna corridor (Table 12).

Table 12. Outline of indicative ongoing management costs for the Fauna Corridor.

Management Action	Indicative Management Cost Per Year
Revegetation, Weed and Pest Management	Initial costs for revegetation, weed and pest management are likely to cost approximately \$40,000.00 in the first year of management. On-going management will cost approximately \$15,000.00 per annum (+10% per year)
Southern Brown Bandicoot Refuges and monitoring	Artificial refuges - \$1,000.00/structure Monitoring - \$5,000.00-\$8,000.00/year

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FIGURES

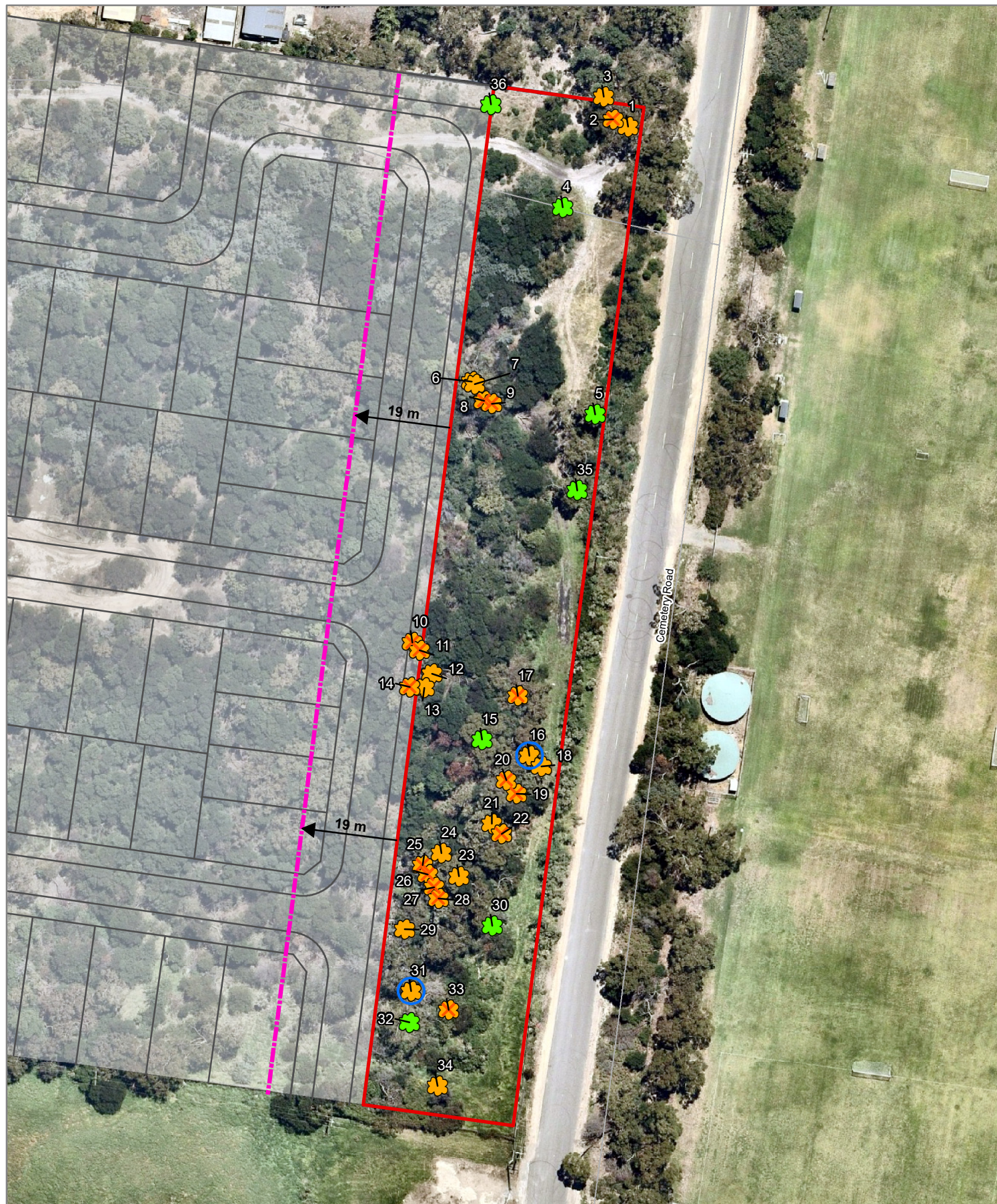
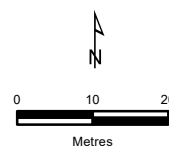


Figure 1
Mapped trees
Fauna Corridor
Management Plan: 9-45
and 40-46 Cyril Beechey
Lane, Cranbourne

Legend

- Study Area (Fauna corridor)
- ✱ Mapped trees without overlapping canopies
- ✱ Mapped trees with overlapping canopies
- ◯ Tree is hollow-bearing
- ✕ Indicative tree to be removed
- Development area
- Development plan
- Building separation distance (BAL-12.5 from Shrubland (19m))



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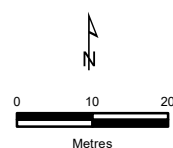
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Figure 2
Extent of exotic shrub cover
Fauna Corridor Management Plan: 9-45 and 40-46 Cyril Beechey Lane, Cranbourne

Legend

- Study Area (Fauna corridor)
- Exotic shrub cover
- Habitat
- Firebreak - Nominal Location*
- Development area
- Development plan
- Building separation distance (BAL-12.5 from Shrubland (19m))



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