



# Survey of Candlebark (*E. rubida*) in the Kingborough Municipality

## Kingborough Council

Final report - 16th July 2019

## Summary

This report outlines the findings of a survey of *Eucalyptus rubida* (candlebark) in the Kingborough Municipality. The survey was commissioned by Kingborough Council to gain a better understanding of the status of the species, and to identify opportunities to improve conservation outcomes.

The survey targeted eight key locations based on previous NVA records and expert advice. *Eucalyptus rubida* was found in a total of 24 'sites' across six locations. A total of 530 individuals were recorded, with the largest populations recorded at Margate, Leslie Vale, and Snug Falls. The species could not be relocated at Woodbridge or Lower Longley.

The overall health of mature trees was poor, with widespread evidence of dieback and low reproductive load. More than 65% of the population are classed as juvenile, including seedlings and resprouters. Only 6% of the population are classed as large trees (>70 cm DBH) and most were visibly stressed with recent dieback.

*Eucalyptus rubida* was found in a range of vegetation communities including DOB, DPU, DTO and DOV. The geology of the sites was usually Permian mudstone, but it was also found on Jurassic dolerite in the Snug Tiers. The elevation ranges from 30-275m a.s.l., with most sites on well drained slopes or valley flats subject to frost. This information was used to develop predictive habitat mapping for the species which can be used to plan further surveys and potential revegetation sites.

An assessment of the conservation status of *E. rubida* in Kingborough was undertaken using IUCN criteria. In this Municipality the species meets the criteria for Endangered (B1a, b, C2a(i)) based on its restricted geographic range, small population size, severe fragmentation, and inferred population decline.

*Eucalyptus rubida* is closely related to *E. dalrympleana*, and populations in Kingborough may represent a gradation between the two species. Most specimens had glaucous juvenile foliage, but the shape varied from orbicular to ovate. The buds and fruit were not glaucous and indistinguishable from *E. dalrympleana*. 'Good' *E. rubida* was collected from Leslie Vale Walking Trail, Tramway Hill, and Slatterys Rd, and Harts Hill. Genetic samples were collected from 26 individuals across 15 sites and will be included in a broader phylogenetic study by UTAS. Seed was collected from three trees across two sub-populations and is stored at the Tasmanian Seed Conservation Centre.

This report provides recommendations for:

- follow-up surveys at 14 sites that are known or likely to contain the species,
- measures to protect *E. rubida* populations especially for larger remnants and sites at risk,
- additional seed collection to provide representative genetic diversity for long-term storage and revegetation, and
- revegetation to improve the conservation status based on predictive habitat mapping.

## 1. Introduction

*Eucalyptus rubida* is a medium-sized tree 10-30 m high. It has smooth white bark, often with pink to red blotches, and scaly at the base. The juvenile leaves are opposite, glaucous (greyish-blue), and rounded (orbicular). Adult leaves are dull green, alternate, and lance-shaped (lanceolate). Buds are in groups of 3, often glaucous, ovoid, with a conical cap (operculum). Capsules with prominent disk and valves exerted (Curtis 1956, Gray et al. (In press), Slee et al. 2016).

*Eucalyptus rubida* is closely related to *Eucalyptus dalrympleana*. It is distinguished by its glaucous juvenile leaves, whereas *E. dalrympleana* has light green juvenile leaves. The shape of the juvenile leaves is also used to distinguish between the two species, with *E. rubida* being more rounded compared to *E. dalrympleana* which tends to be more pointed (ovate).

*Eucalyptus rubida* has a sparse distribution across the low-mid altitude regions of eastern and south-eastern Tasmania, predominantly 200 m – 600 m a.s.l. It occurs sporadically in dry sclerophyll forest and grassy woodland communities, typically with one of the peppermints, *E. amygdalina*, *E. pulchella*, and *E. tenuiramis*. It generally occurs on shallow, infertile and well-drained soils derived from Triassic or Permian sediments or on Jurassic dolerite. These habitats are not only dry but are seasonally prone to extended periods of frosts and cold-air drainage (Williams and Potts 1996).

*E. rubida* tends to replace *E. viminalis* on inland sites subject to frost and cold-air drainage and may intergrade with *E. dalrympleana* on wetter sites at higher altitudes (Williams and Potts 1996). There is currently a lack of information relating to specific genetic or ecological aspects of *Eucalyptus rubida* in Tasmania (Williams and Potts 1996).

Snug Tiers is the southernmost extent of *Eucalyptus rubida* in Kingborough. There are very few records of *Eucalyptus rubida* in the Municipality, with only seven verified sites in the Natural Values Atlas (Figure 1). There is also taxonomic uncertainty about the identity of some specimens, especially those occurring at higher elevations.

### **Acknowledgements**

We would like to thank Alan Gray, David Marrison, Rob Wiltshire, and Nicholas Alexander for providing information about *Eucalyptus rubida* in Kingborough. We would also like to thank Dr Rebecca Jones (UTAS) and James Wood (Tasmanian Seed Conservation Centre) for partnering on this project. This survey was also made possible by the landholders who provided access to their properties.

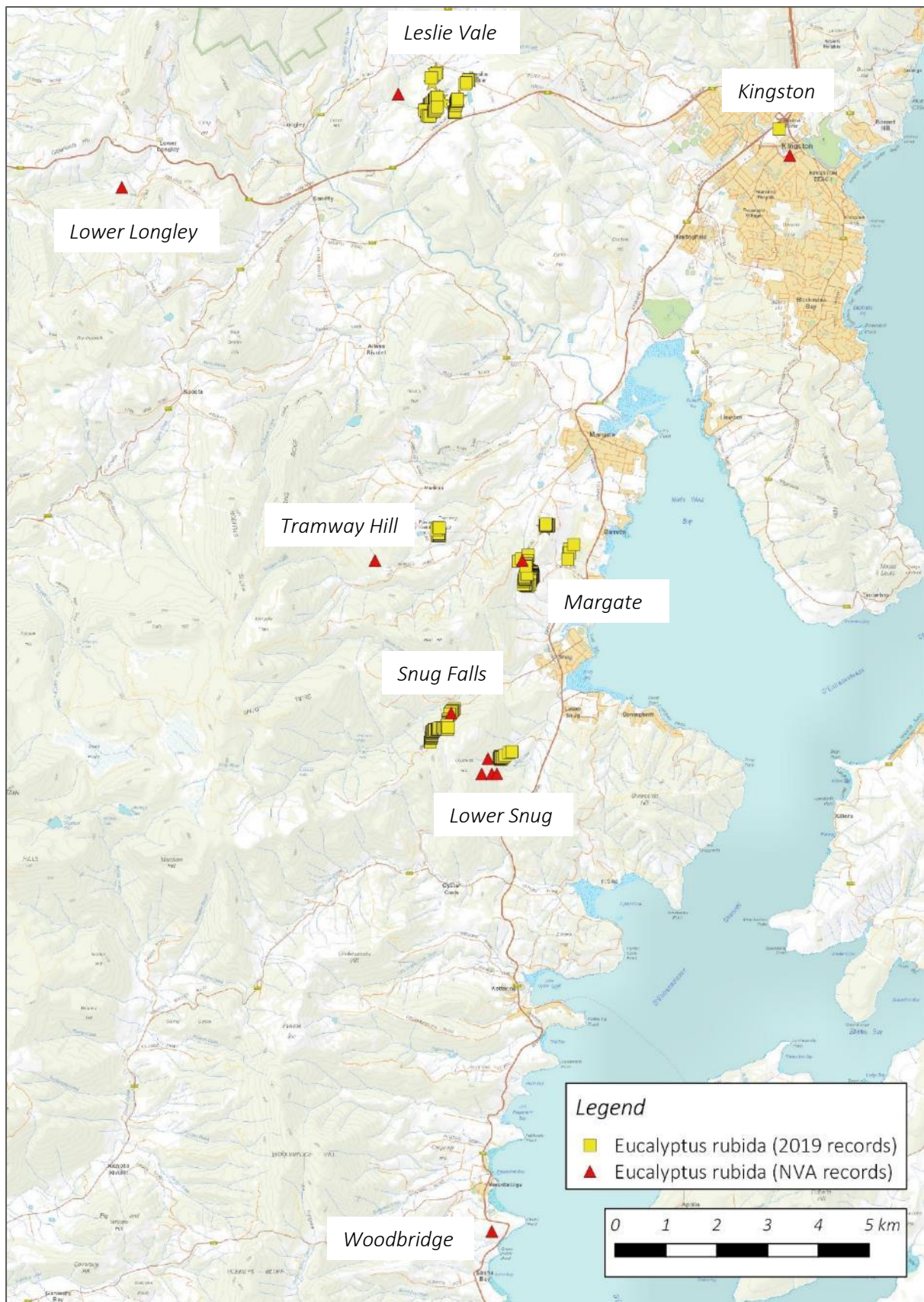


Figure 1: Distribution of *Eucalyptus rubida* in Kingborough Municipality.

## 2. Methods

### ***Data extraction and expert consultation***

Data on the species was gathered from a range of sources to inform the survey. Verified records were extracted from the Natural Values Atlas (DPIPWE 2019), including both *E. rubida* and *E. dalrympleana* records. Eucalypt expert Alan Grey was consulted about the species, especially regarding the precise location of historical records in Kingborough. Other experts consulted include David Marrison (Royal Tasmanian Botanical Gardens) and Rob Wiltshire (UTAS), particularly for information on additional or unverified sites. Nicholas Alexander from Kingborough Council also provided information on the location of additional sites. A review of literature on the species was also undertaken.

### ***Field surveys and population assessments***

A series of field surveys were undertaken between 5<sup>th</sup> March and 9<sup>th</sup> May 2019. The surveys focussed on revisiting and assessing all known populations of *E. rubida* in Kingborough and also included extension surveys to detect additional populations. Landholders were contacted prior to the survey for gain permission to access properties (refer to Appendix 3 for list of landholders contacted).

Eight key locations were targeted based on existing records, expert advice, and potential habitat – Kingston, Leslie Vale, Lower Longley, Tramway Hill, Margate, Snug Falls, Lower Snug, and Woodbridge (refer to Figure 1). Multiple sites within each location were surveyed, including private land, council reserves, and road reserves.

The surveys involved systematic searching for *E. rubida* in known or potential sites. Identification of *E. rubida* was primarily based on the presence/characteristics of juvenile leaves in epicormic growth. The glaucous juvenile leaves are distinctive and the most obvious means of detecting the species. Capsules and/or buds were also used to confirm identification, especially where juvenile foliage was absent.

The spatial position of individual *E. rubida* trees was recorded using a handheld GPS to 5-10 m accuracy. Clusters of seedlings or small juveniles were not individually mapped. Data was captured for individual trees including estimated tree height, diameter at breast height (DBH), canopy health, lignotuber regrowth, epicormic regrowth, and reproductive load. Scores were allocated for canopy health, epicormic growth, lignotuber regrowth and reproductive load as per the following:

***Canopy health:*** 0= 100% dead leaves or bare branches, 1= >50% dead leaves or bare branches, 2=<50% dead leaves or bare branches, 3=minor leaf damage, 4=no evident leaf damage.

***Epicormic growth:*** 1=few, weakly developed or heavily browsed, 2=some, healthy, 3=vigorous, likely to restore crown.

**Lignotuber regrowth:** 1=few, weakly developed or heavily browsed, 2=some, healthy, 3=vigorous, likely to restore crown.

**Reproductive load:** 0=no buds or capsules per tree, 1=10, 2=100, 3= 1000, 4=10 000 buds or capsules

Diameter at breast height (DBH) was used to determine size class with 1. Juvenile <15 cm DBH, 2. Small 15-30 cm DBH, 3. Medium 30-70 cm DBH, 4. Large 70-100 cm DBH or 5. Very Large cm >100 cm DBH.

Habitat characteristics were also captured for each site e.g. vegetation community, soil type, altitude, and aspect. Any observable threats or management issues were also recorded.

### **Predictive habitat mapping**

Predictive habitat mapping was developed for *E. rubida* using the most frequent habitat characteristics identified during surveys, TASVEG, Geological data and NVA records. This mapping was used to identify other potential areas where the species may occur in Kingborough.

### **Conservation Status**

The conservation status of *Eucalyptus rubida* in Kingborough Municipality was assessed using the International Union for Conservation of Nature (IUCN) Red List criteria using the population data collected in this survey. The IUCN red list criteria are international recognised criteria for assessing conservation status of threatened species, including their use in determining EPBC listing. These criteria have been used at the regional level, though they are designed to be used at larger scales. For more information on the IUCN Red List criteria - <https://www.iucnredlist.org/resources/summary-sheet>

### **Genetic sampling**

Leaf samples were collected from individuals in each site for genetic analysis. Samples were taken from mature trees identified by either juvenile foliage or buds/fruit and were a minimum of 20 m apart. The samples were placed in plastic zip lock bags and deposited with Dr Rebecca Jones of the University of Tasmania, School of Plant Science who will include them in a genetic study of *E. rubida* across Tasmania.

### **Seed collection**

Seed capsules were collected from *E. rubida* where accessible using 5 m pole loppers. Mature trees were generally >20 m in height which limited the ability to collect seed. Seed lots from individual trees were placed in separate paper bags and deposited at the Tasmanian Seed Conservation Centre for storage.

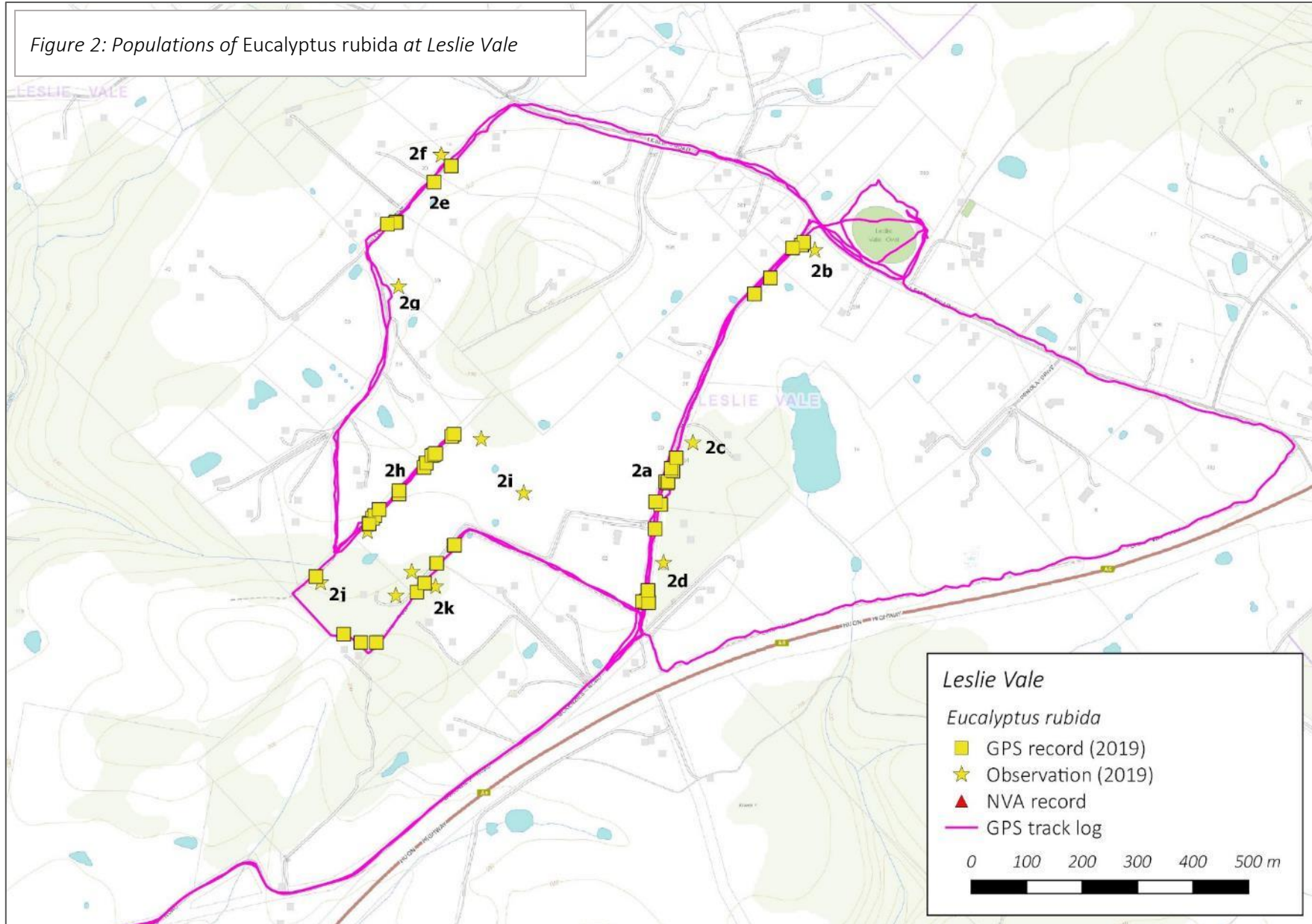
### 3. Results

#### ***Distribution***

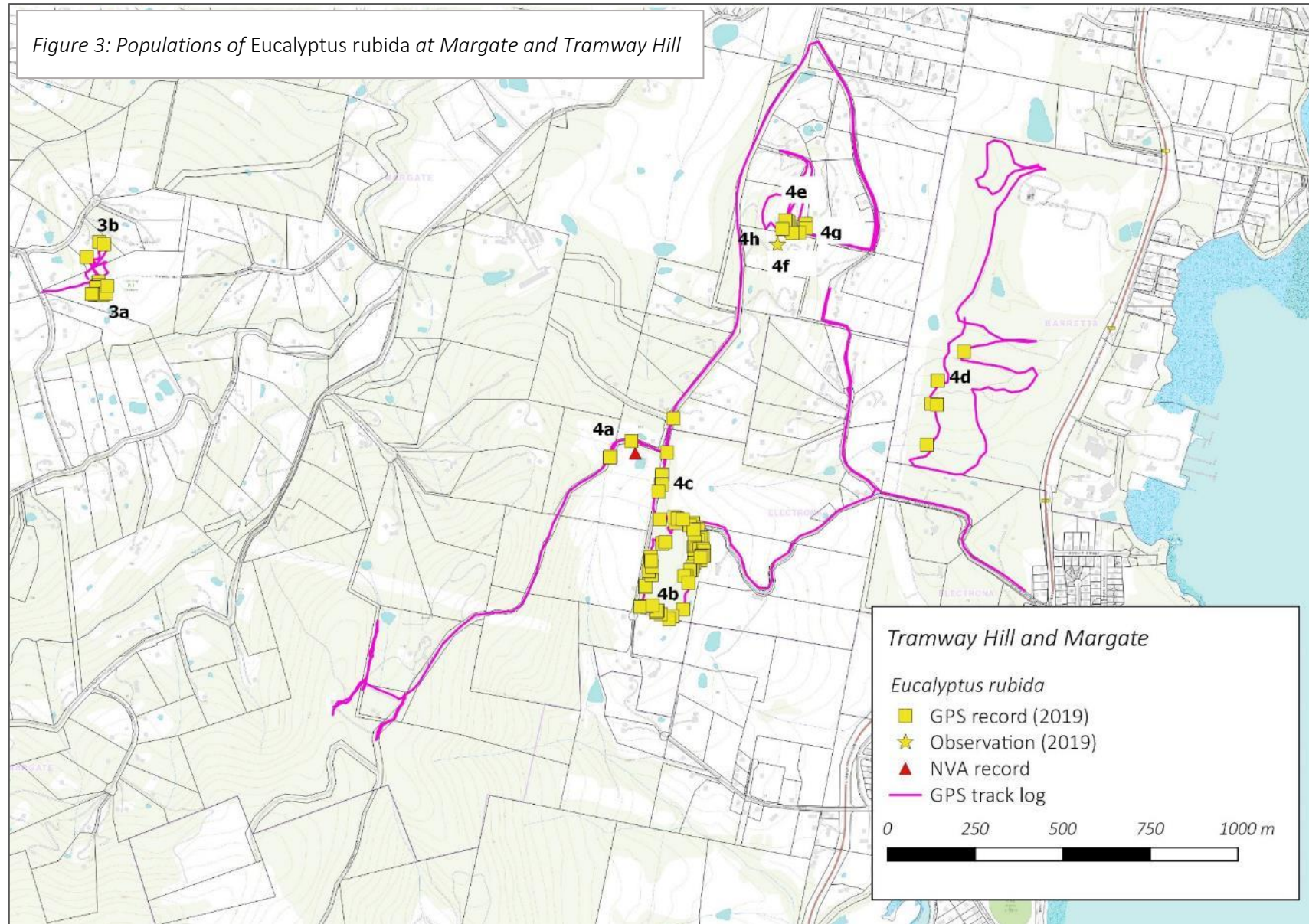
*Eucalyptus rubida* was recorded in 24 sites during the survey (refer to Table 1). The sites have been grouped in six 'sub-populations' based on proximity and likelihood of previous connectivity and gene flow (Figure 1). As a general rule, sites separated by <1 km were grouped into a sub-population. Some sub-populations are highly fragmented (Margate and Leslie Vale), with almost half of the sites occurring in roadsides, easements, or as isolated paddock trees. The origin of the Kingston sub-population is unknown, but it is suspected that it could have been planted.

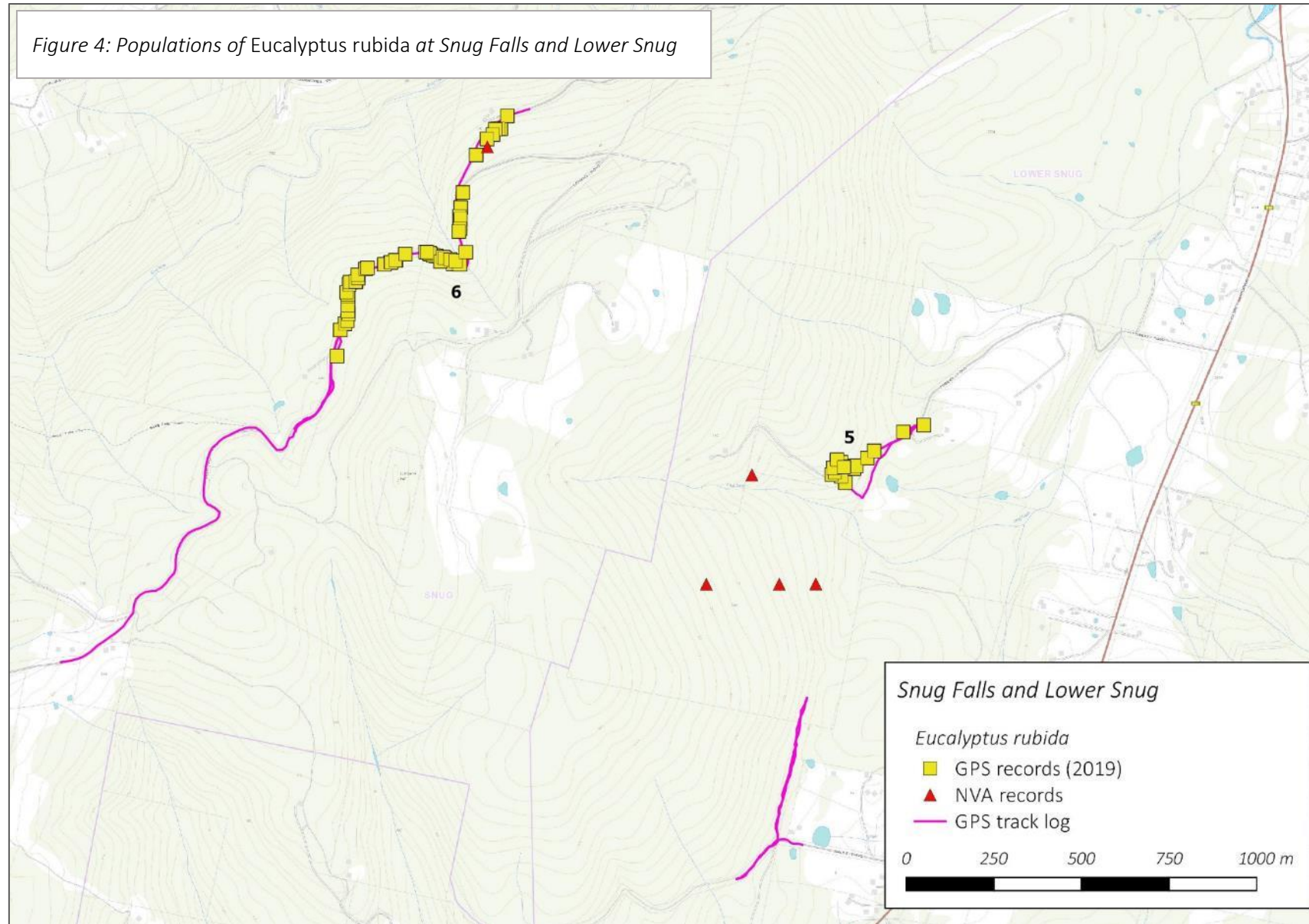
*Eucalyptus rubida* was not detected in two of previously recorded locations, Woodbridge and Lower Longley. The record from Woodbridge is 35 years old (Kirkpatrick 1984) and it is possible that the species has been lost from this site, as there has been considerable clearance in the area. The record from Lower Longley (Gray 2007) has low spatial accuracy but Alan Gray suggested searching along Krause Road, which was unsuccessful. However, it is likely that isolated trees occur elsewhere in the vicinity of these records and may require further investigation.

The locations of survey sites at Leslie Vale, Margate, Tramway Hill, Lower Snug, and Snug Falls are shown in Figures 2 – 5. Several other sites were searched as part of the extension surveys with negative results (Waldie Drive (Lower Snug), 140 Longmans Road, and Culbara Road (Margate)).









**Table 1.** Plant numbers, size class and health assessment for *E. rubida* at each surveyed location. Canopy health: 0= 100% dead leaves or bare branches, 1= >50% dead leaves or bare branches, 2=<50% dead leaves or bare branches, 3=minor leaf damage, 4=no evident leaf damage. Epicormic growth: 1=few, weakly developed or heavily browsed, 2=some, healthy, 3=vigorous, likely to restore crown. Reproductive load: 0=no buds or capsules per tree, 1=10, 2=100, 3= 1000, 4=10 000 buds or capsules. Size class: Juvenile <15 cm DBH, Small 15-30 cm DBH, Medium 30-70 cm DBH, Large 70-100 cm DBH or Very Large cm >100 cm DBH.

No.	Sub-population	Site	Total numbers	Size Class					Average adult canopy health	Average adult epicormic growth	Average adult reproductive load	Sample size for health assessment
				Juvenile	Small	Medium	Large	Very large				
1	Kingston	†Whitewater Creek	1	0	0	1	0	0	2.0	2.0	0	1
2a	Leslie Vale	Mckenzie Rd	21	7	4	9	1	0	2.3	1.4	1.5	13
2b		555 Leslie Vale Rd	2	0	0	0	0	2	2.5	2.5	4	2
2c		51 Mckenzie Rd	*30	-	-	-	-	-	-	-	-	-
2d		59 Mckenzie RD	*5	-	-	-	-	-	-	-	-	-
2e		Bullock Dr	5	1	0	2	1	1	2.5	2	1	2
2f		20 Bullock Dr	*20	-	-	-	-	-	-	-	-	-
2g		51 Bullock Dr	*6	-	-	-	-	-	-	-	-	-
2h		Leslie Vale walking track	33	14	3	8	6	2	2.2	1.7	1.8	20
2i		38 Mckenzie Rd	*20	-	-	-	-	-	-	-	-	-
2j		60 Mckenzie Rd	*10	-	-	-	-	-	-	-	-	-
2k		98 Mckenzie Rd	*2	-	-	-	-	-	-	-	-	-
		<i>Subtotal</i>	<i>150</i>	<i>22</i>	<i>7</i>	<i>19</i>	<i>8</i>	<i>5</i>	<i>2.4</i>	<i>1.8</i>	<i>1.4</i>	<i>38</i>
3a	Tramway Hill	Tramway Hill Reserve	11	3	3	4	1	0	1.8	1.5	2	4
3b		20 Trowenna Rise	6	3	0	3	0	0	3.3	0	3.3	3
		<i>Subtotal</i>	<i>17</i>	<i>6</i>	<i>3</i>	<i>7</i>	<i>1</i>	<i>0</i>	<i>2.3</i>	<i>0.8</i>	<i>2.2</i>	<i>7</i>
4a	Margate	Longmans Rd	4	1	1	2	0	0	1.6	1	3	3
4b		145 Slatterys Rd (south)	*125	28	14	22	1	1	2	1.5	2	2
4c		145 Slatterys Rd (north)	12	5	0	4	3	0	2.3	0.7	3.3	4
4d		Baretta Reserve	5	0	5	0	0	0	1.4	1.6	0	5
4e		Harts Hill Reserve	22	17	2	0	2	1	2	1.4	1	5

No.	Sub-population	Site	Total numbers	Size Class					Average adult canopy health	Average adult epicormic growth	Average adult reproductive load	Sample size for health assessment
				Juvenile	Small	Medium	Large	Very large				
4f		77 Hickmans Rd	9	8	0	1	0	0	2	2	0	1
4g		61 Hickmans Rd	5	3	0	0	1	1	2.5	2	4	2
4h		48 Frosts Rd	3	3	0	0	0	0	-	-	-	-
		<i>Subtotal</i>	<i>185</i>	<i>65</i>	<i>22</i>	<i>29</i>	<i>7</i>	<i>3</i>	<i>1.8</i>	<i>1.4</i>	<i>1.5</i>	<i>22</i>
5	Lower Snug	Powers Rd	48	38	7	3	0	0	-	-	-	
6	Snug Falls	Snug Falls Rd	125	114	4	7	0	0	2.8	0.4	2.4	5
	Lower Longley	Krause Rd	0									
	Woodbridge	Channel Hwy	0									
		TOTAL	<b>530</b>	245	43	66	16	8	2.2	1.5	1.6	73

†The origin of the tree in Kingston is unknown, but it is suspected that it could have been planted.

\* Total numbers include individuals for which identification was not confirmed through observation of juvenile leaves or fruit buds, though highly likely to be *E. rubida* based on other characters and proximity to individual with confirmed identification.

### Population size

A total of 530 individuals of *E. rubida* were recorded during the survey (Table 1). Most of these were individually counted and mapped, while population estimates had to be made for several sites due to access limitations or time constraints (n=135). It is likely that the actual population size is higher than indicated by current survey data. Recommendations for follow-up surveys are provided in Section 4.

### Species identification

All individuals recorded as *E. rubida* had glaucous juvenile foliage which is the main character used to separate it from *E. dalrympleana*, but the shape of the juvenile leaves varied from orbicular to ovate (see images below). The buds were ovoid with a conical operculum and the fruits were cup-shaped with convex disk and exerted valves, but none were glaucous.



Plate 1: *E. rubida* seedling (Tramway Hill).



Plate 2: *E. rubida* buds and fruits (Tramway Hill).



Plate 3: Variation in juvenile leaves (Snug Falls).



Plate 4: Lignotuber regrowth (Lower Snug).

Identification of some individuals was hampered by a lack of juvenile leaves, and difficulty observing flower buds closely enough to distinguish from *Eucalyptus viminalis*. These were recorded as possible *E. rubida* in the dataset. Other species recorded in the dataset include *E. viminalis* and *E. cordata* and potential *E. rubida* hybrids.

### ***Health assessment***

An assessment of tree health was undertaken for 73 mature individuals (see Appendix 2 for sample size from each site). The overall health of mature trees was poor, with an average canopy health score of 2.2 (*up to 50% of leaves dead/branches bare*) and widespread evidence of dieback. The average reproductive load score was 1.6 (*between 10-100 capsules per tree*), with only 56% of adult trees carrying buds or capsules. Mature trees accounted for only 35% of the total population, with some sites comprising almost entirely of juveniles (refer to Population Structure).

Epicormic growth was present on most mature trees, and was the main character used to detect and identify the species. The health of epicormic growth was reasonable with an average score of 1.5 (*some, healthy*), and appears to be the main mechanism for restoring the crown after stress such as drought or insect attack. Very few mature trees had lignotuber growth, but there were hundreds of individuals classed as juveniles along Snug Falls Road and Powers Road that were resprouting from the base due to pruning (vegetation management under power lines).

### ***Population structure and demographics***

The largest sub-populations are Margate (n=185), Leslie Vale (n=150) and Snug Falls (n=125), which collectively account for 87% of the total population. The healthiest sub-population in terms of size and age structure is Margate. The key site in this sub-population is Slatterys Road which contains an estimated 125 trees of mixed age class (including large reproductive trees) and is in a 5 ha block of remnant vegetation. Other important sites are Snug Falls and Lower Snug which occur in sizeable remnants but do not contain any large trees.

Recruitment was evident in all populations, except for Barretta Reserve, but many of the seedlings are in paddocks under threat from grazing or clearance. Juveniles account for 66% of the total population (Figure 6), but a large proportion of these are resprouts from lignotubers after pruning (especially along Snug Falls Rd and Powers Rd). Only 24 trees (6% of population) have a DBH >70 cm and are confined to Leslie Vale, Margate and Tramway Hill (9 sites).

Large trees are generally in poor health, with low canopy cover and evidence of die back. The canopy health of small-medium sized trees was better, except for Baretta Reserve where there was considerable dieback and no recruitment. A large proportion of trees had no or very few observable buds or fruits.

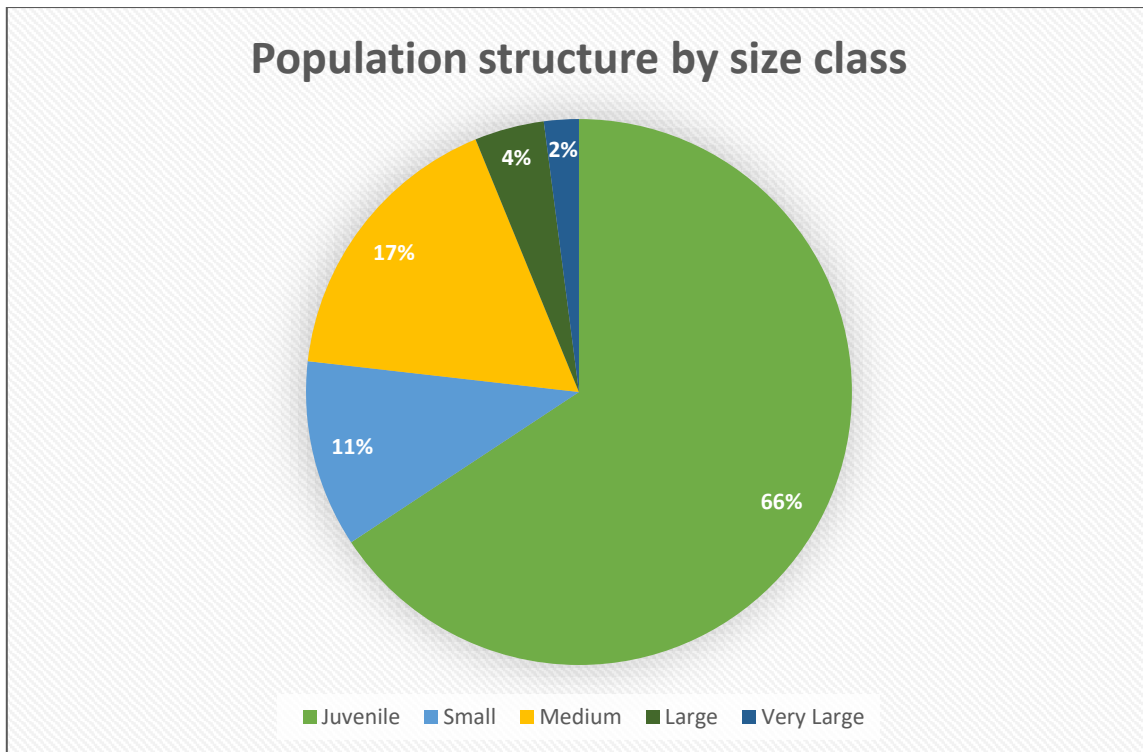


Figure 6: *Eucalyptus rubida* population structure by age class.

### **Habitat**

*Eucalyptus rubida* was found in a range of native vegetation communities, including two of the most common vegetation types in Kingborough – *E. obliqua* dry forest (DOB) and *E. pulchella* forest (DPU). It was also found in two threatened vegetation types - *E. tenuiramis* forest on sediments (DTO) and *E. ovata* forest (DOV) and recorded as paddock trees in Agricultural land (FAG).

It was generally found on mudstone sediments (DOB, DTO, DOV), but was also found on dolerite (DPU) at Snug Falls and Lower Snug. The elevation of ranges from 30-275m a.s.l., with most sites on mid-upper slopes or valley flats. This information was used to develop a predictive habitat mapping for *E. rubida* in Kingborough (refer to Section 5, Figures 7-10).

### **Genetic samples**

Leaf samples were collected from 26 individuals across the six sub-populations (Table 3). A summary of genetic sampling is outlined in Appendix 2. These samples have been deposited with Dr Rebecca Jones at UTAS for analysis.

### **Seed collection**

Seed was collected from two sites (Tramway Hill and Harts Hill) and submitted to the Tasmanian Seed Conservation Centre for storage (Appendix 2). Seed numbers were extremely low (30-304) with considerable insect infestation, which was cleaned from stored seeds. These accessions will be

available for revegetation purposes. It was difficult to collect seed with 5 m pole loppers due to the height of canopy stored seed (>10 m high). Further seed collections are recommended but may require an arborist.

## 4. Discussion

### ***Taxonomy***

*Eucalyptus rubida* is closely related to *E. dalrympleana* and there have been questions as to the identify of some populations in Kingborough. The main characters used to separate the two species are the colour and shape of juvenile leaves. In Kingborough, specimens assigned to *E. rubida* have glaucous juvenile foliage, but the shape of the juvenile leaves varies from orbicular to ovate. The buds and fruit are also not glaucous making them indistinguishable from *E. dalrympleana*.

It is hypothesised that populations in Kingborough may represent a gradation between *E. rubida* and *E. dalrympleana*. The geographic broader genetics study being undertaken by UTAS will aim to answer to question and clarify the taxonomic identify of specimens in Kingborough.

### ***Conservation status assessment***

*Eucalyptus rubida* is not listed as a threatened species in Tasmania and there is probably insufficient data to make a formal conservation assessment of the species at a State or bioregional level using IUCN criteria. However, the species does have a naturally sporadic and restricted distribution in Tasmania and is also likely to have declined due to habitat clearance especially in the Midlands and Derwent Valley.

*Eucalyptus rubida* meets the criteria for Endangered within the Kingborough Municipality based on IUCN criteria. It is only known from six sub-populations (one of which is possibly planted) which are highly fragmented. The known population size is approximately 530 individuals, of which only 280 are classed as 'mature'. It is possible that additional populations occur within Kingborough, but the overall population is very unlikely to exceed 5,000 individuals. It is likely that population size has declined significantly in the last 50-100 years due to habitat clearance, especially around Margate and Leslie Vale.

The current extent of occurrence of *E. rubida* in Kingborough is 55 km<sup>2</sup> based on survey data. This does not include Woodbridge or Lower Longley which could not be relocated. The historical range of the species is estimated to be 130 km<sup>2</sup> based on all previous records. This represents a 62% decline in the species' range in the last 35 years.



### **Reservation and management**

Only four of the 25 sites occur in remnant vegetation covering >5 ha (Snug Falls, Lower Snug, Baretta Reserve, and Slatterys Rd south). Most sites are in road reserves, easements, or paddocks, and are generally classed as Agricultural land (FAG). The only site within a formal reserve is Tramway Hill Reserve, but Baretta Reserve and Harts Hill are also informal reserves managed by Kingborough Council.

### **Threats**

The main threat to *E. rubida* in Kingborough is vegetation clearance. This includes removal of trees and pruning along roadsides and under powerlines. Removal of paddock trees and grazing of seedlings is also a significant threat. Symptoms of dieback are also widespread, which is most likely due to climatic (drought and heat) stress and browsing by invertebrates. Herbicide drift from paddocks and roadside spraying is also a potential threat. There was also evidence of over browsing by macropods in Baretta Reserve which appears to be contributing or related to dieback.

## **5. Recommendations**

### **Extension surveys**

It is recommended that follow-up surveys are undertaken at 14 properties where *E. rubida* was observed during the survey (Figures 7-10). Detailed mapping at these sites was not carried out due to a lack of landholder permission. Additional properties likely to contain *E. rubida* based on proximity to known sites are also shown in Figures 7-10 (labelled with PID).

Predictive habitat mapping for *E. rubida* identifies other potential areas where the species may occur in Kingborough (Figures 7-10). The key attribute used in the model was Permian mudstone overlaid with DOB and DTO vegetation. It also includes selective areas of DPU and DOB on dolerite between Snug Falls and Lower Snug.

This mapping should be used to plan future extension surveys for *E. rubida* and could also be used to inform suitable areas for planting.

### **Habitat Protection**

It is recommended that landholders are consulted about the presence and conservation significance of *E. rubida* on their properties. Options for providing incentives for conservation covenants or management agreements should be considered, especially at Slatterys Rd south, Snug Falls Rd, and Powers Rd.

Measures should be put in place to protect *E. rubida* along road reserves and other LGA managed land. The location of roadside populations should be entered into a Council database or GIS, and management systems put in place to protect trees during road maintenance works, including roadside slashing or spraying.

Figure 7: Recommended extension survey areas at Leslie Vale

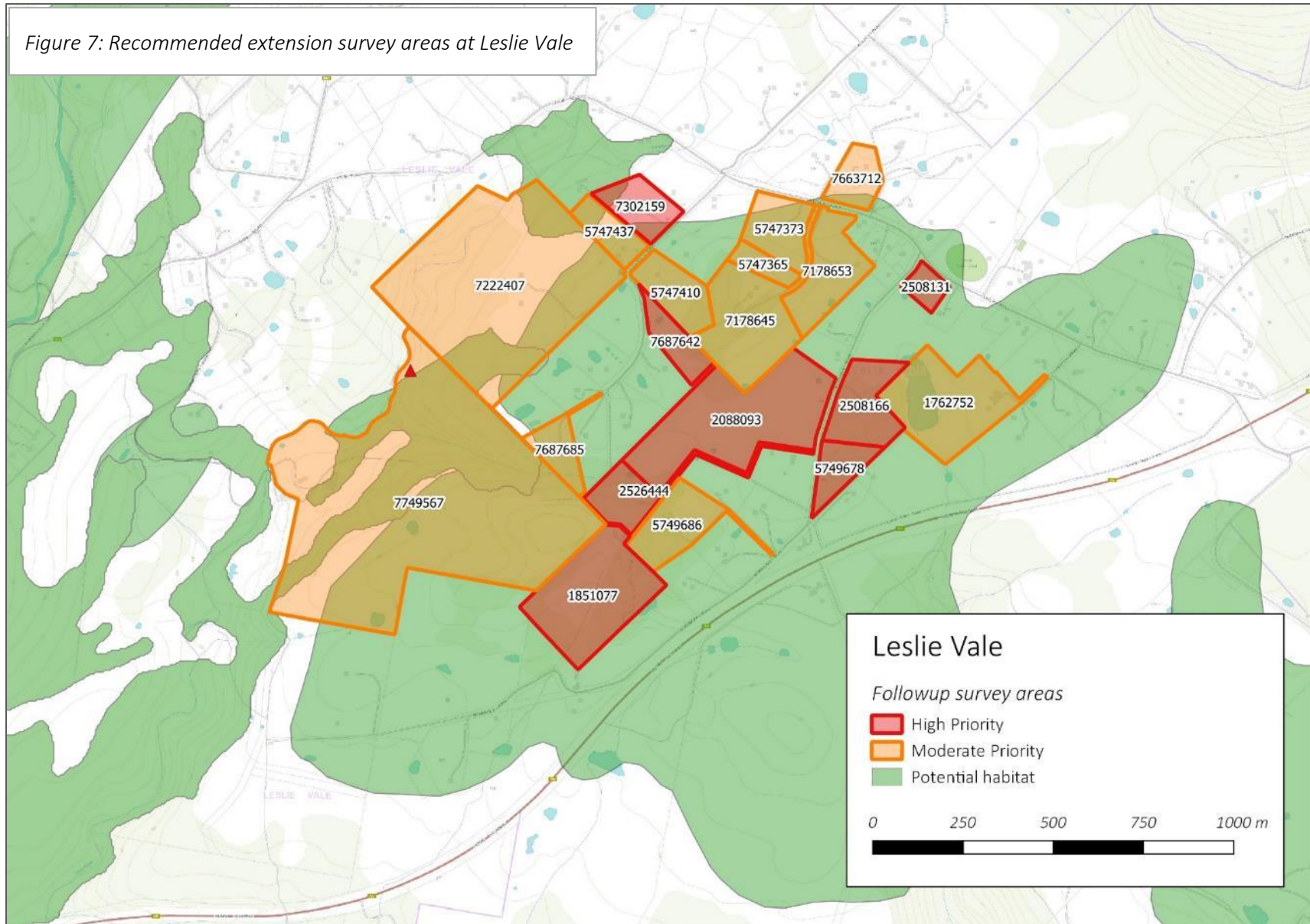
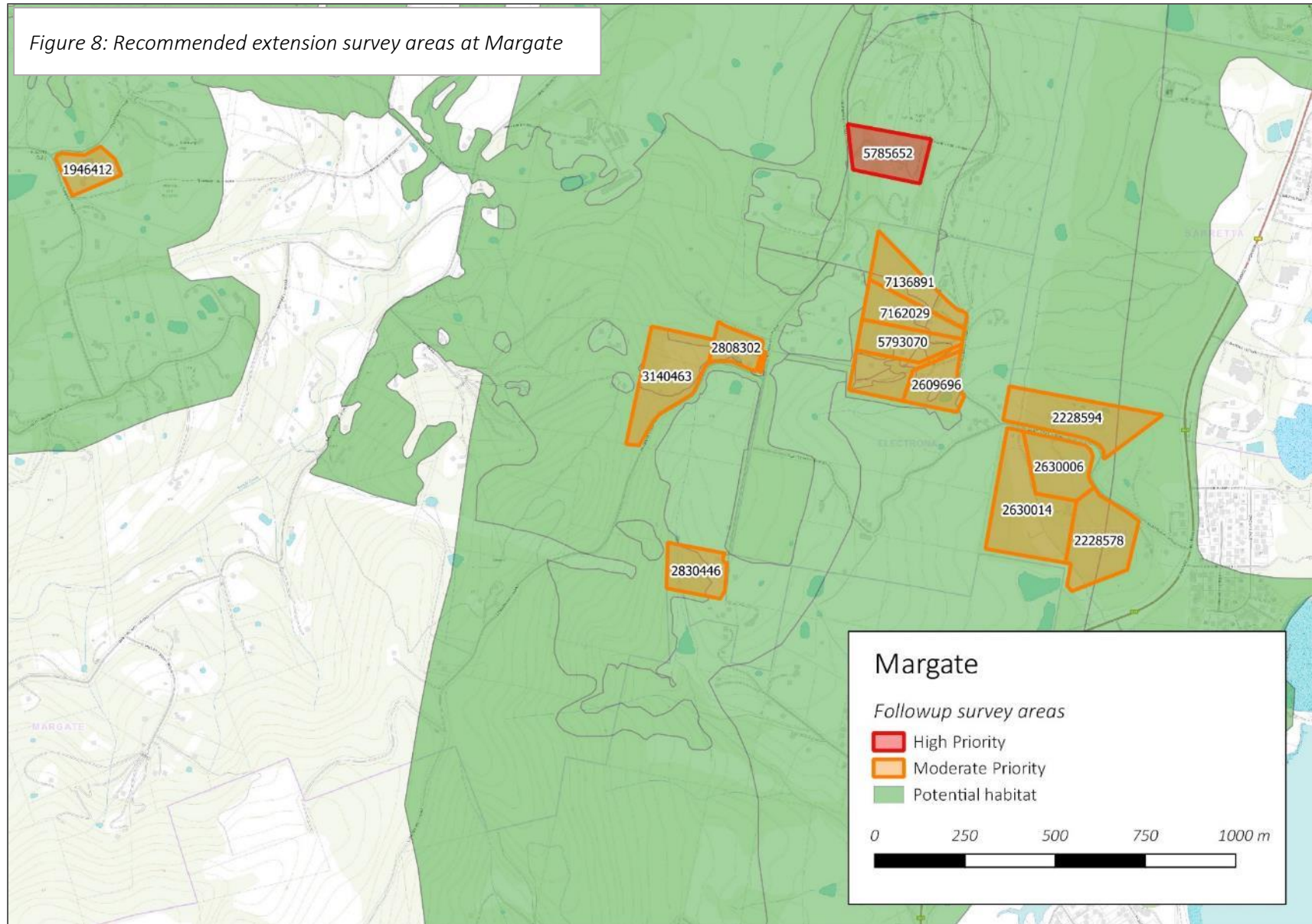
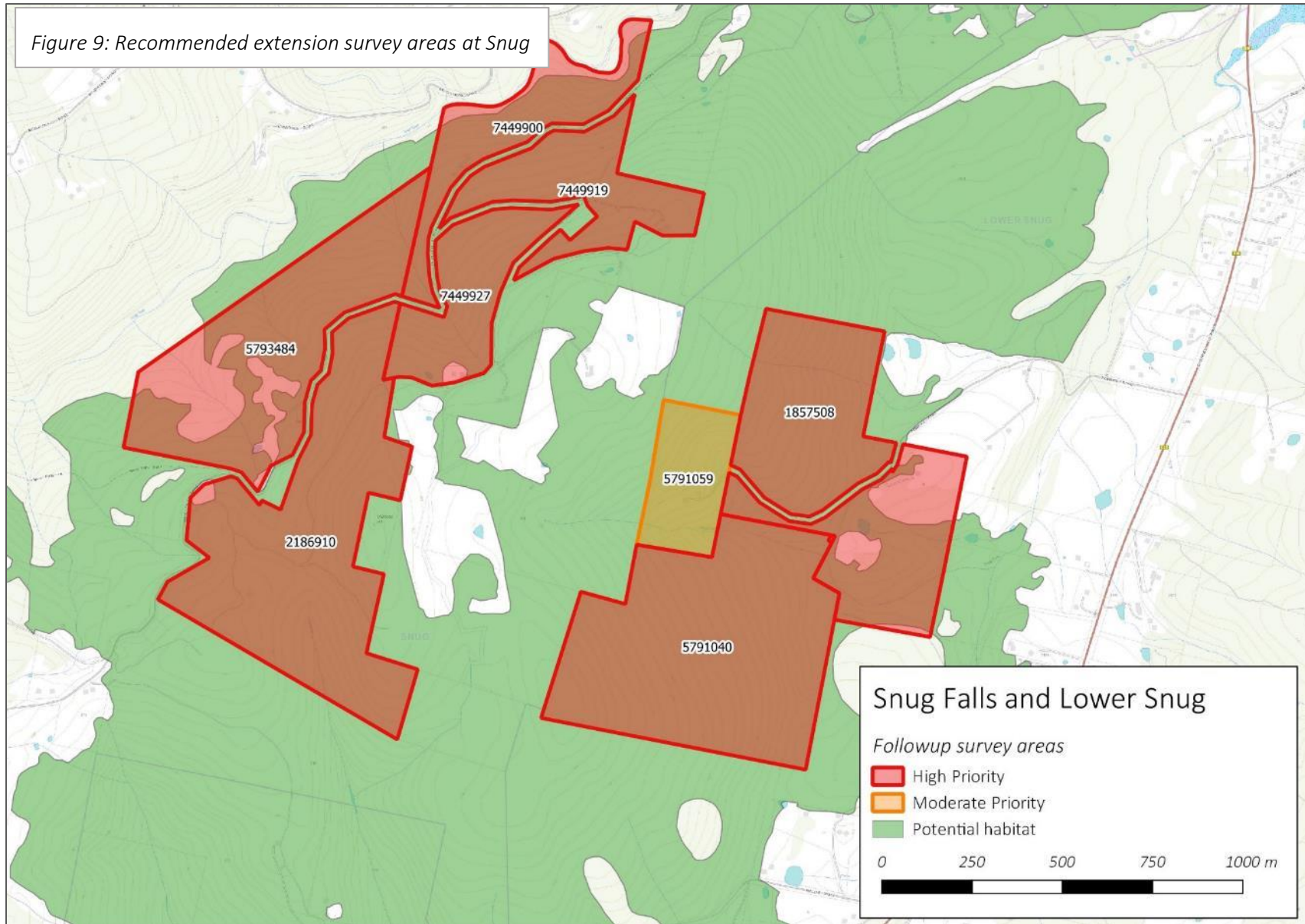


Figure 8: Recommended extension survey areas at Margate





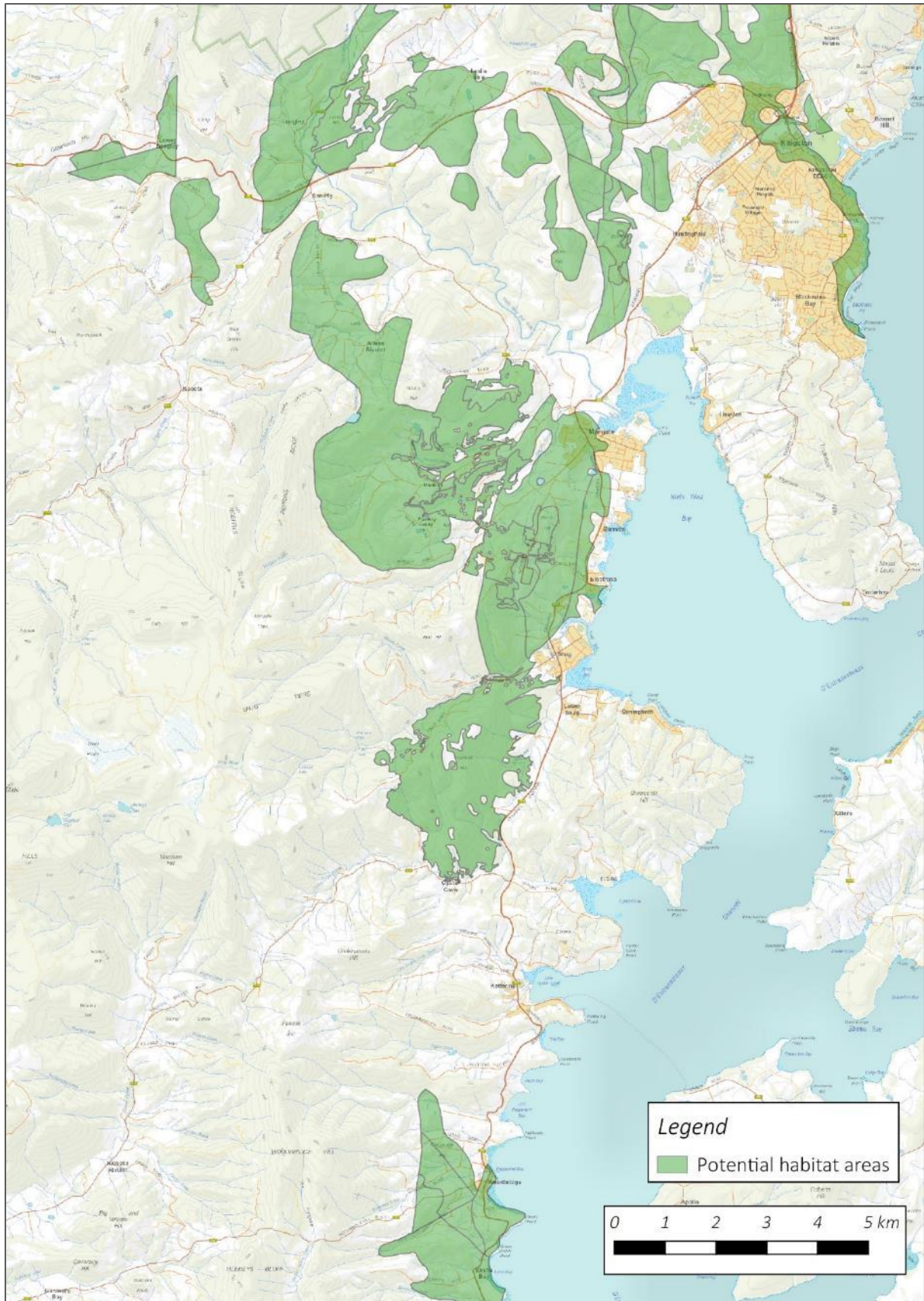


Figure 10: Predictive habitat modelling for *E. rubida*.

### ***Seed collection***

Additional seed collections are recommended from 555 Leslie Vale Rd (population 2b) and 145 Slatterys Rd (population 4b). It is likely that 2b can be reached with pole loppers, but arborists may be required to make a diverse collection from 4b.

Further seed could also be collected from Tramway Hill Reserve and Harts Hill (including 61 Hickmans Rd) with pole loppers. Other sites to consider for seed collections include Bullock Dr (population 2f) and Leslie Walking Track (population 2i), but arborists may be required.

### ***Plantings***

It is recommended that conservation plantings of *E. rubida* are undertaken at Tramway Hill Reserve and Harts Hill. Reintroductions into other Council reserves with suitable habitat could also be considered.

*Eucalyptus rubida* could be included in other revegetation programs in Kingborough, but it is recommended that this include some single-origin provenance plantings to provide future seed orchards. Records should be kept on the location and provenance of planted populations.

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## Appendix 1 - Site Descriptions

### Leslie Vale

#### Kingston

##### Whitewater Creek

TASVEG Code: FUR

Geology: mudstone

Total individuals: 1 (*possibly planted*)

Isolated tree in poor health and is possibly planted. It had glaucous juvenile foliage which was variable in shape (orbicular-ovate). Growing near planted *E. globulus* and *E. tenuiramis*. There is remnant *E. viminalis* nearby along Whitewater Creek. Leaf sample for genetics where taken from this plant.

55G 525172 5242159



### Leslie Vale

#### Mckenzie Rd

TASVEG Code: FAG, DOB

Geology: mudstone

Total individuals: 19

Scattered trees along roadside. Juvenile foliage is glaucous but more ovate shaped Other eucalypts growing along roadside include *E. ovata*, *E. obliqua*, *E. pulchella*, *E. globulus*, *E. viminalis* and *E. amygdalina*. There were also some possible hybrids. Most of the surrounding vegetation has been cleared (FAG) but there are small remnants of *E. obliqua* dry forest (DOB) on adjacent properties containing *E. rubida*.

LV17&19  
55G 518833 5242750



**555 Leslie Vale Rd**

TASVEG Code: FAG

Geology: mudstone

Total individuals: 2

2 very large trees in paddock on corner of Leslie Vale Rd and McKenzies Rd. Confirmed by Alan Gray. No seedling recruitment in paddock. Seed collection is recommended but requires landholder permission.

LV22  
55G 519068 5243154



**51 Mckenzie Rd**

TASVEG Code: DOB

Geology: mudstone

Total individuals: 20 (*estimated from roadside*)

Small remnant adjacent to roadside near house site. Approximately 20 small-medium sized trees observed. Follow-up survey is required to map population but requires landholder permission.

LV20  
55G 518826 5242771



### 259 Mckenzie Rd

TASVEG Code: DOB

Geology: mudstone

Total individuals: 10 (*estimated from roadside*)

Small remnant in the corner of property near driveway. Number of trees observed from roadside. Needs follow-up survey to map population but requires landholder permission.

55G 518775 5242498



### Bullock Dr

TASVEG Code: DOB

Geology: mudstone

Total individuals: 5

5 trees recorded along roadside, with recruitment in adjacent paddocks. Adjacent vegetation is *E. obliqua* dry forest (DOB), with *E. ovata* and *E. globulus* sub-dominant. There are also lots of planted eucalypts along Bullock Drive including *E. cordata*.

L26  
55G 518427 5243288



### 20 Bullock Dr

TASVEG Code: FAG

Geology: mudstone

Total individuals: 20 seedlings

Cluster of seedlings observed near driveway. Growing near row of planted eucalypts but close to remnant trees in roadside.

juvenile s  
55G 518427 5243296



### 51 Bullock Dr

TASVEG Code: FAG

Geology: mudstone

Total individuals: 6+

Several paddock trees observed amongst row of pines along fence line. Requires follow-up survey.

extention survey site  
55G 518319 5243036



### Leslie Vale walking track

TASVEG Code: FAG

Geology: mudstone

Total individuals: 33

33 trees recorded along footway between Bullock Drive and McKenzie Road. This included some of the best examples of *E. rubida* from the location with most trees having orbicular juvenile leaves. There was significant recruitment in adjacent paddock.

LV40-42  
55G 518368 5242738



### 38 Mckenzie Rd

TASVEG Code: FAG, DOB

Geology: mudstone

Total individuals: 20+

Lots of seedlings observed in paddock as well as large trees in remnant DOB. Requires a follow-up survey to determine numbers. This is important site because it provides a link between McKenzies Rd and Bullock Rd sites.

extention survey  
55G 518446 5242808



### 60 Mckenzie Rd

TASVEG Code: DOB

Geology: mudstone

Total individuals: 10+

Number of trees observed in this property from footway. Property is mostly remnant vegetation (DOB) with a house site. Requires a follow-up survey to determine numbers.

### 98 Mckenzie Rd

TASVEG Code: FAG

Geology: mudstone

Total individuals: 2+

2 seedlings observed in paddock from footway but likely to be more. Requires follow-up survey to map trees.

### *Tramway Hill*

#### Tramway Hill Reserve

TASVEG Code: DOB

Geology: mudstone

Total individuals: 11

This site has some of the better examples of *E. rubida* with rounder juvenile foliage. Some of these trees with been identified with plastic labels by the local landcare group. There was evidence of hybridisation with *E. obliqua* and *E. pulchella*. Genetic samples were taken for analysis.

TW71  
55G 518475 5234214



## 20 Trowenna Rise

TASVEG Code: DOB

Geology: mudstone

Total individuals: 6

This site is continuous with Tramway Hill Reserve. Disturbed bushland surrounding house site. Seed was collected from this site.

TW72  
55G 518431 5234280



## Margate

### Longmans Rd

TASVEG Code: DTO

Geology: mudstone

Total individuals: 4

Scattered trees along roadside up from junction with Hickmans Rd. There is an NVA record from adjacent property which has recently been developed (Table 2) and no trees remain at this site. There is remnant vegetation on opposite side of road which is *E. tenuiramis* on mudstone (DTO).

M76  
55G 520035 5233675



**145 Slatterys Rd (south)**

TASVEG Code: DOB

Geology: mudstone

Total individuals:

Approximated 125 trees recorded in 5 ha remnant at 145 Slatterys Road. Vegetation is classed as DOB on mudstone (mapped as DPU on TASVEG). The trees at this site were more *E. rubida* like with more rounded juvenile leaves and football shaped buds. There are also 200+ *Eucalyptus cordata* in this site.

M85  
55G 520186 5233488



**145 Slatterys Rd (north)**

TASVEG Code: DOB

Geology: mudstone

Total individuals: 12

12 trees recorded on Hickmans Road and a roadside estimate was made of numbers within the remanet veg in paddock across from 145 Slatterys road - both adults and juvenile likely to be *E. rubida* complex plants were observed along with *E. cordata* plants.

**Baretta Reserve**

TASVEG Code: DOB, DTO

Geology: mudstone

Total individuals: 5

Scattered small trees in very poor health, with one recently dead. Large remnant of DTO and DOB vegetation. Lots of dieback in tree canopy (mainly *E. obliqua*) and understorey is over-browsed by macropods. There is also DAS and DOV in this remnant making it an important area for conservation, and it should be considered for a formal reserve.



MT246  
55G 521121 5233995

**Harts Hill Reserve**

TASVEG Code: FAG

Geology: mudstone

Total individuals: 22

Council reserve containing some of the largest *E. rubida* trees in Kingborough. There is also significant recruitment, however many of the juvenile plant were stressed. The large trees showed evidence of recent canopy dieback, although new growth had occurred.



HH247  
55G 520637 5234362



**77 Hickmans Rd**

TASVEG Code: FUR

Geology: mudstone

Total individuals: 9

Scattered trees and seedling observed in modified vegetation adjacent to Harts Hill Reserve.

Requires follow-up survey to determine numbers.

At risk from slashing and clearance due to proximity to house site.



HH251  
556 520597 5234374

**61 Hickmans Rd**

TASVEG Code: FUR, DTO

Geology: mudstone

Total individuals: 5

Two very large trees along fence line and scattered seedlings near house site. In modified site but surrounding vegetation is DTO. The large trees showed evidence of recent canopy dieback, although new growth had occurred.

**48 Frosts Rd**

TASVEG Code: FUR

Geology: mudstone

Total individuals: 3

A few seedlings observed in paddock adjacent to Harts Hill walking track. Recruitment from large tree in Harts Hill. At risk of clearance due to proximity to new house site.

### Lower Snug

#### Powers Rd

TASVEG Code: DPU

Geology: dolerite

Total individuals: 48

Mainly juveniles (epicormic growth) along roadside and under transmission line. Difficult to ID adults due to lack of epicormic growth and few buds/fruit. Population is likely to extend into private land either side of road. Also NVA records from 109 Powers Rd. The plants observed are *E. dalrympleana*-like, as the juvenile leaves are predominately ovate and the buds observed were slightly pointed. Follow-up surveys are required to determine the extent of this population on adjacent properties. Note: recent clearance of native vegetation was observed at 105 Powers Road which is likely to have contained *E. rubida*.

LS177  
55G 519706 5229805



### Snug Falls

#### Snug Falls Rd

TASVEG Code: DPU

Geology: dolerite

Total individuals: 125

More than 100 juvenile plants (seedlings and coppiced regrowth) along roadside and under transmission line either side of road. These juveniles appeared to be more like *E. dalrympleana* (with ovate leaves), as the altitude increased. There were also scattered small-medium sized trees in adjacent vegetation, but it was difficult to ID adults due to a lack of epicormic growth or fruits/buds. It is likely that this population extends further into private land,

55G 518329 5230257



either side of road. Follow-up surveys on adjacent private land are required to determine the extent of this population.

## Appendix 2 – Summary of seed collection and genetic sampling

Table 3. Number of *E. rubida* complex plants from which leaf samples were collected for genetic analysis and ripe fruit capsules were collected for seed.

Location	Site	Leaf samples	Capsule samples
Kingston	White water creek	1	
Leslie Vale	McKenzies Rd	4	
Leslie Vale	Leslie Vale walking track	5	
Leslie Vale	Bullock Rd	1	
Lower Snug	Powers Rd	1	
Margate	Lower Longmans Rd	1	
Margate	Slatterys Rd (site 4b)	4	
Margate	Barretta Reserve	2	
Margate	Harts Hill Reserve	2	1
Margate	Harts Hill Private land (site 4g)	1	1
Snug Falls	Snug Falls Rd	1	
Tramway Hill	Tramway Hill Reserve	2 (including a <i>E. rubida</i> hybrid)	
Tramway Hill	Tram hill private land (site 3b)	1	1
Total		26	3



