

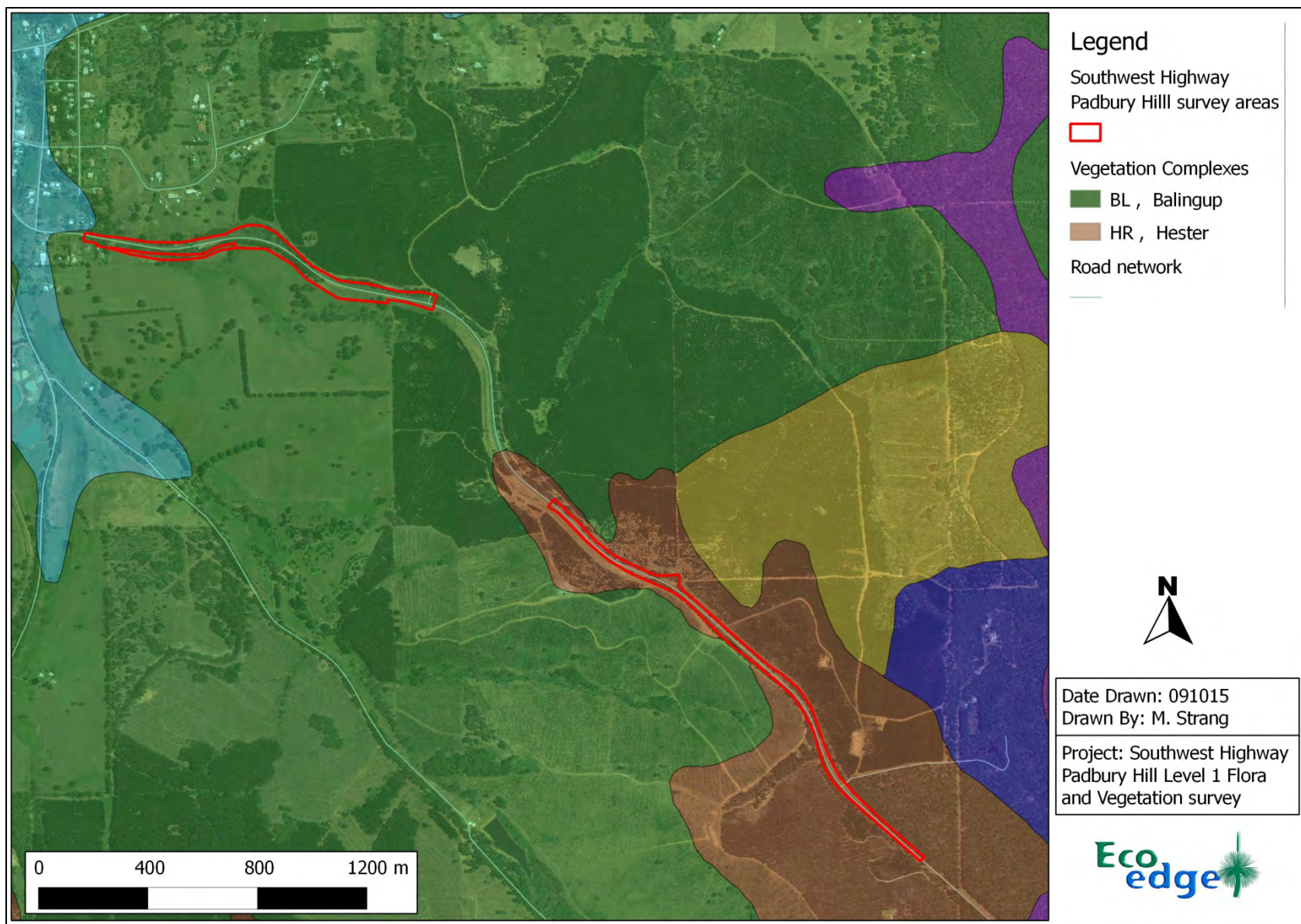


Figure 3. Vegetation complexes mapped as occurring within the Project Area.

1.6 Threatened and Priority Ecological Communities

Ecological communities are defined by Western Australia's Department of Parks and Wildlife (DPaW, previously the Department of Environment and Conservation (DEC)) as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC, 2010).

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; 'presumed totally destroyed', Critically Endangered (CE), Endangered (E) or Vulnerable (Vu) (DEC, 2010). Possible threatened ecological communities that do not meet survey criteria are added to DPaW's Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3 (referred to as P1, P2, P3). Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC, 2010). The current listing of Threatened and Priority Ecological Communities is specified in DPaW, 2015a and 2015b. Threatened Ecological Communities can also be listed under the *EPBC Act* (Department of the Environment (DotE), 2015a; Department of Environment, Water, Heritage and the Arts (DEWHA, 1999)).

Threatened Ecological Communities can also be listed under the Commonwealth *EPBC Act* (Department of the Environment (DotE), 2015a; Department of Environment, Water, Heritage and the Arts (DEWHA), 1999). There are three categories of TEC under the *EPBC Act*: Critically Endangered (CE), Endangered (E) and Vulnerable (V). These are defined in **Table 5**.

Table 5. Categories of Threatened Ecological Communities under the *EPBC Act*.

Category	Definition
Critically endangered	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).

A Protected Matters Search Tool query for communities listed under the *EPBC Act* occurring within a 7.5 km radius of the Project Area was undertaken (DotE, 2015b, **Appendix 1**), and the current DPaW TEC and PEC listings were consulted (DPaW 2015a; 2015b).

No threatened or priority ecological communities are known to occur within or in the vicinity of the Project Area.

1.7 Threatened and Priority Flora

Species of flora and fauna are defined as having Declared Rare (Threatened) or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment Regulation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Declared Rare (Threatened) Flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act 1950 (WC Act)* and therefore it is an offence to 'take' or damage rare flora without Ministerial approval. Section 6 of the *WC Act 1950-1980* defines 'to take' as "... to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means."

Priority Flora are under consideration for declaration as 'rare flora', but are in need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). **Table 6** presents the categories of Declared Rare and Priority Flora as defined by the *WC Act* (DPaW 2015c).

Table 6. Definitions of Declared Rare and Priority List flora (DPaW, 2015c).

Conservation code	Category
T	Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the <i>Wildlife Conservation Act 1950</i> . The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria (CR, EN, VU, EX)
P1	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Under the *EPBC Act*, a species may be listed in one of six categories; the definitions of these categories are summarised in **Table 7** (DotE, 2015c).

Threatened or Priority flora occurring within 10 km of the Project Area generated from a Naturemap data search (DPaW, 2014d) are listed in **Table 8**. Taxa listed under the *EPBC Act* (based on results of the Protected Matters Search Tool query (DotE, 2014b)) are listed in **Appendix 1**.

Table 7. Categories of Threatened Species under the *EPBC Act* (DotE, 2014c).

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the <i>extinct</i> category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (E)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (V)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Table 8. List of Declared Rare and Priority List flora known to occur within 10 km of the Project Area.

Species	Cons Status	Flowering	Habitat	Likelihood of Occurrence
<i>Caladenia harringtoniae</i>	T (Vu)	Oct-Nov	Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Low
<i>Gastrolobium whicherense</i>	P2	Oct	Red-grey sandy clay over quartzite. Steep westerly slopes.	Low
<i>Melaleuca viminalis</i>	P2	Sep-Dec	Along creeklines	Low
<i>Opercularia rubioides</i>	P3	Sep-Nov	White/grey sand, gravelly sandy clay, sandy loam. Floodplains, stony hills, flat plains.	Low
<i>Tetraria</i> sp. Blackwood River (A.R. Annel 3043)	P3	Sep-Dec	Not confirmed	Low
<i>Acacia flagelliformis</i>	P4	May-Sep	Sandy soils. Winter-wet areas.	Low
<i>Grevillea ripicola</i>	P4	Jan-Apr/Nov-Dec	Sandy clay, clay or gravelly loam. Swampy flats, granite outcrops, along watercourses.	Low

Note: The WC Act Conservation Status is shown and where applicable the EPBC Act status is in brackets.

Many of the species listed in **Table 8** could potentially occur within the Project Area, based on an assessment of their preferred habitats. All species listed would have either been flowering at the time of survey or could be identified in the field without flowers.

2 Methods

2.1 Desktop Study

Prior to the field survey, a 'desktop survey' was carried out by downloading from NatureMap (DPaW, 2015d) a list of all flora (including rare flora) occurring within 5 km of the Project Area. A Protected Matters Search Tool report was also generated, detailing all species listed under the *EPBC Act* known to occur, potentially occur or potentially have habitat occurring within 7.5 km of the Project Area (DotE, 2015b) (**Appendix 1**).

Vegetation condition was assessed against the method of Keighery (1994) (**Table 9**).

Table 9. Vegetation condition ratings according to Keighery (1994).

Score	Description
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

2.2 Field Survey

The survey was carried out on 15th September 2015. A comprehensive list of native and introduced species was compiled. Photographs were taken and notes on species composition, vegetation structure and vegetation condition were compiled at twenty-five unmarked relevés within the Project Area to be used, along with aerial photography, in mapping vegetation type and condition.

Flora species that were not identified in the field were collected or photographed for later identification. Taxonomy and conservation status of flora species was checked against Department of Parks and Wildlife databases (DPaW, 2015e and 2015f).

2.3 Survey limitations

Potential limitations with regard to the assessment are addressed in **Table 10**.

Table 10. Limitations with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	No	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements.
Proportion of flora identified	Negligible	The survey of Area B was carried out in mid-September which experience has shown to be within the prime flowering period for flora in the southern Jarrah Forest. It is estimated that 95-98% of native species in the remnant vegetation were identified.
Availability of contextual information	Negligible	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have not been carried out in the southern Jarrah Forest bioregion.
Completeness of the survey	Negligible	Vegetation within the Project Area was thoroughly search on foot. Further assessments outside the spring season would add to the completeness of the species list but probably only marginally affect the conclusions presented.
Skill and knowledge of the botanists	Negligible	The field botanist who conducted the survey has had extensive experience in botanical survey in south west Australia over a period of 25 years.

3 Results

3.1 Flora

One hundred and eleven species of vascular flora were identified within the Project Area, of which just under half (52) were introduced species, either naturalised or as part of amenity plantings (**Appendix 2**). A further three locally native taxa had been planted as amenity species. Thirty of the 59 native species were only found within the eastern section of the Project Area.

No Declared Rare Flora, Priority Flora, species of flora listed as Endangered under the *EPBC Act* or other flora of conservation significance were found within the Project Area.

3.1.1 Environmental weeds

Seven potentially significant environmental weeds were found during the survey. The distribution of individual plants and clumps of plants is shown in **Figure 4** and **Figure 5**, and their locations are provided in **Appendix 3**. One of these weeds, *Asparagus asparagoides* (Bridal Creeper), is a pest plant listed under the *Biosecurity and Agriculture Management Act 2007*, with the category of C3 (Management) for the whole of the State.

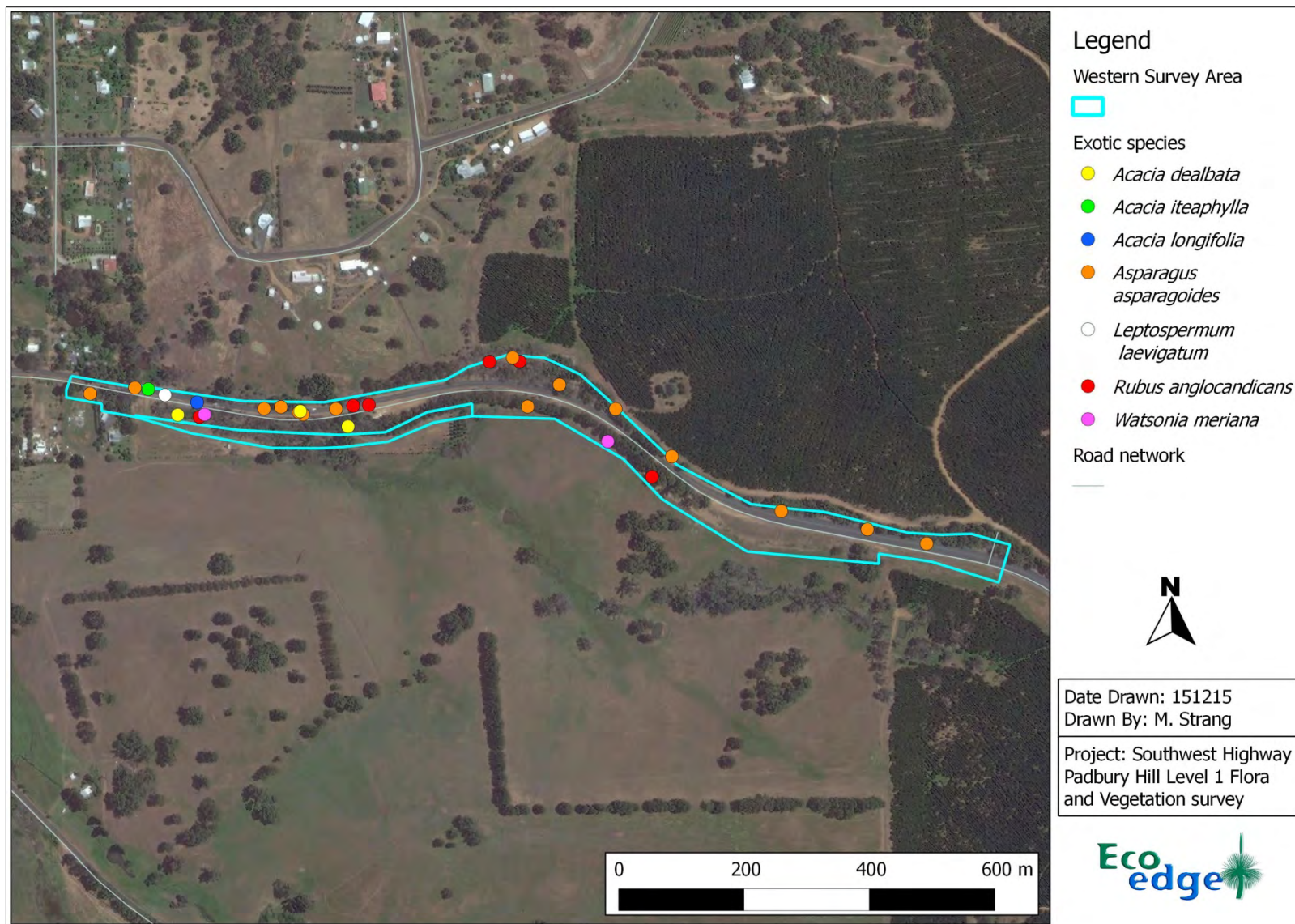


Figure 4. Location of environmental weeds within the western survey area of the Project Area.

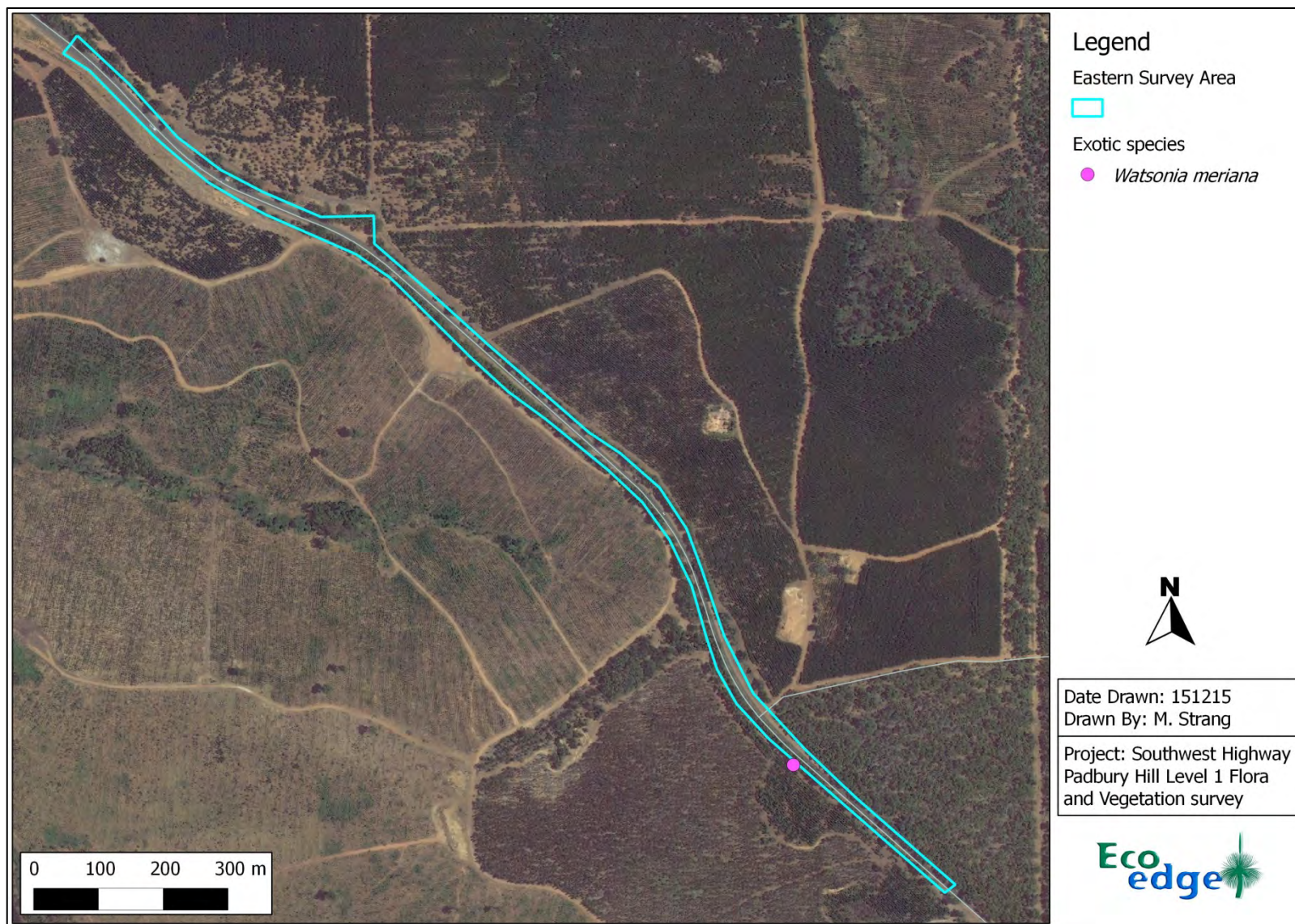


Figure 5. Location of environmental weeds within the eastern survey area of the Project Area.

3.2 Vegetation

3.2.1 Vegetation Units

Four vegetation units were recognised within the Project Area, three of them, Vegetation units A, B and C, dominated by native species are described below and mapped in **Figure 6** and **Figure 7**.

The fourth unit, comprised of mainly introduced pasture or annual weed species with scattered trees, is not described in detail.

Vegetation Unit A

Tall woodland/open forest of *Corymbia calophylla* and *Eucalyptus rudis* over scattered shrubs of *Acacia pulchella*, **Acacia* spp., **Asparagus asparagoides*, **Rubus anglocandicans* and *Xanthorrhoea preissii* over grassland including **Arctotheca calendula*, **Avena fatua*, **Briza maxima* **Holcus lanatus*, and **Phalaris minor* and herbland including **Fumaria capreolata*, **Oxalis pes-caprae*, **Rumex conglomeratus*, **Sonchus oleraceus* and **Sparaxis bulbifera* on grey-brown loam or clay-loam (**Figure 8**).

Vegetation Unit B

Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over scattered shrubs of *Acacia pulchella*, **Asparagus asparagoides*, **Acacia* spp., *Kennedia prostrata*, **Olea europaea*, **Pinus pinaster* and *Xanthorrhoea preissii* over grassland including **Arctotheca calendula*, **Avena fatua*, **Briza maxima* and **Phalaris minor* and herbland including *Pteridium esculentum*, **Trifolium campestre*, **T. subterraneum* and **Watsonia meriana* on gravelly sandy loam (**Figure 9**)

Vegetation Unit C

Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over low open woodland of *Banksia grandis*, *Persoonia longifolia* and **Pinus pinaster* over open heath/low open heath of *Bossiaea linophylla*, *Clematis pubescens*, *Hardenbergia comptoniana*, *Hibbertia amplexicaulis*, *Leucopogon capitellatus*, *Macrozamia riedlei* and *Xanthorrhoea gracilis* over open herbland including *Burchardia congesta*, *Patersonia umbrosa* var. *xanthina*, *Opercularia hispidula* and *Pteridium esculentum* on gravelly sandy loam (**Figure 10**).

3.2.2 Observations of the Vegetation in Lot 30

Observations were made of the vegetation of Lot 30 (private property), which lies at the western end of the Project Area, south of the highway. The land was not accessed but could be clearly seen from the road reserve. Lot 30 is comprised of pasture with an overstorey of *Eucalyptus rudis* (Flooded Gum) in places, and, at its eastern extent, planted eucalypts adjacent to the highway. The vegetation was completely degraded (**Figure 11**).

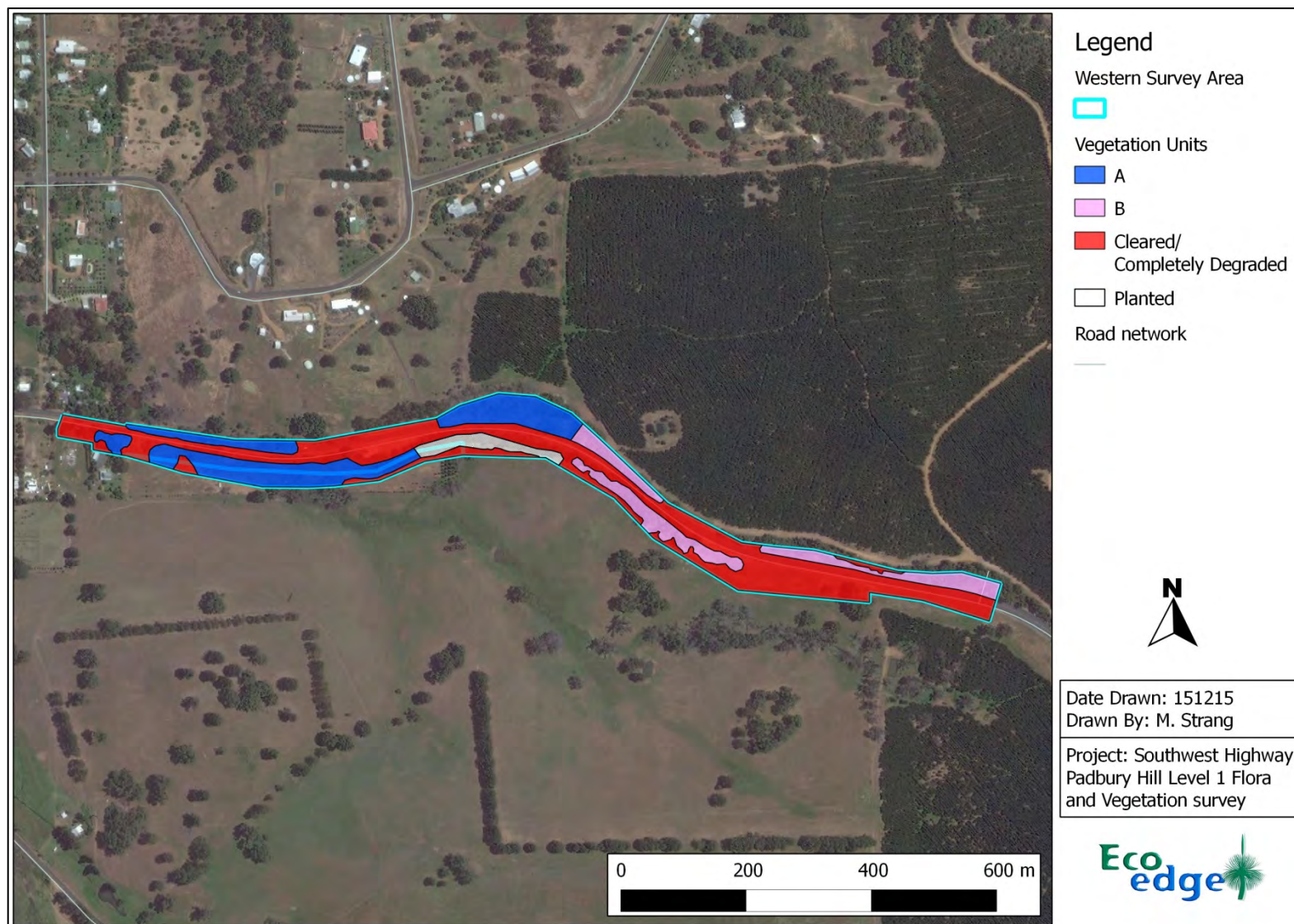


Figure 6. Vegetation units mapped within the western survey area at Padbury Hill.

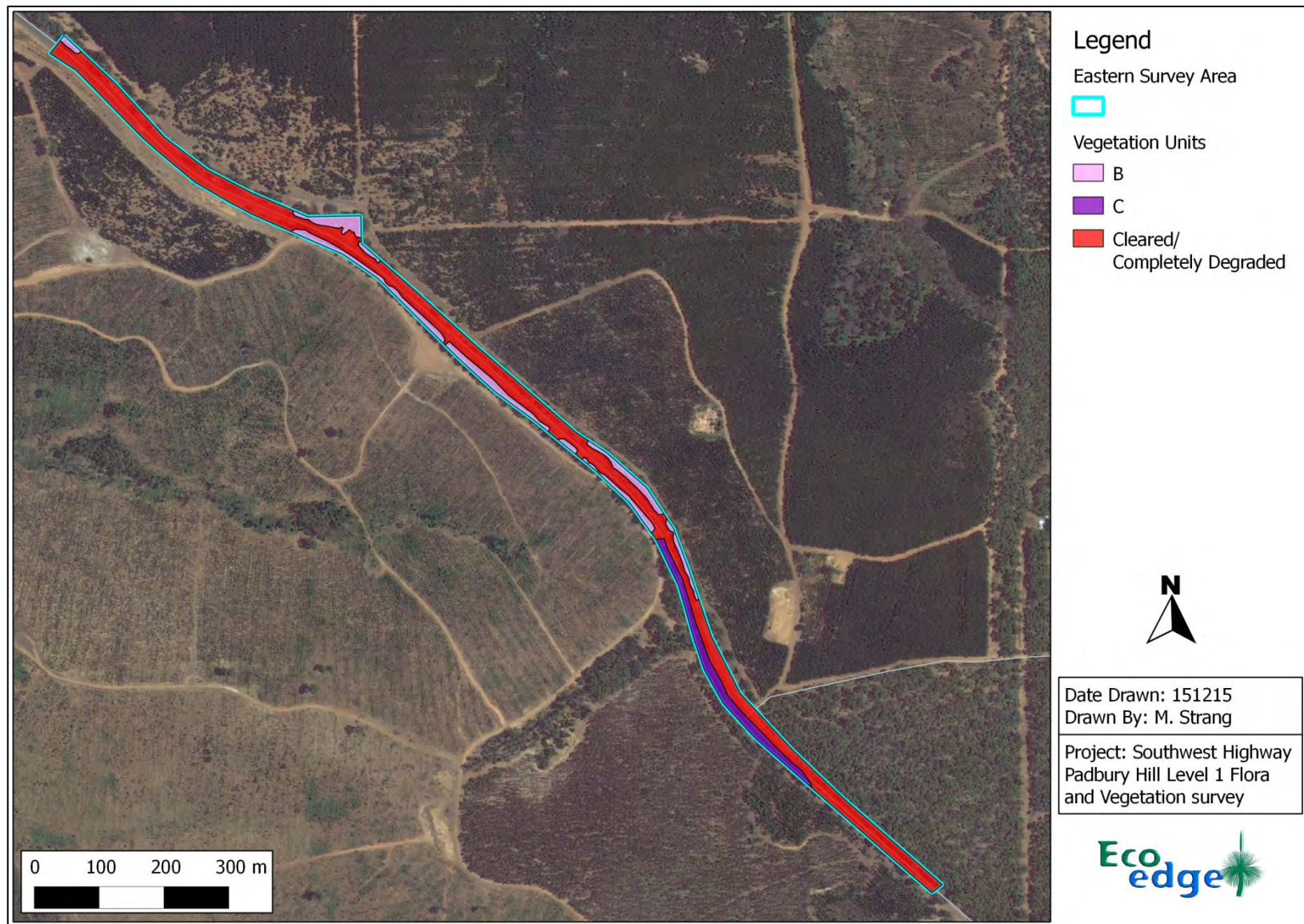


Figure 7. Vegetation units mapped within the eastern survey area at Padbury Hill.



Figure 8. Vegetation Unit A.



Figure 9. Vegetation Unit B.



Figure 10. Vegetation Unit C.



Figure 11. View of Lot 30.

3.2.3 Vegetation Condition

Almost 90% of the 13.1 ha Project Area was classed as Completely Degraded or Degraded, and another 1.9% was comprised of plantings of amenity species (**Table 11**). Only about 4% of the Project Area, mostly in the eastern Project Area, was in Good or Very Good condition.

The distribution of the various vegetation classes is mapped in **Figure 12** and **Figure 13** below.

Table 11. Area and percentage of vegetation within each condition category.

Condition	Area (Ha)	%
Planted	0.2	1.9
Cleared/Completely Degraded	8.3	63.1
Degraded	3.5	26.8
Degraded/Good	0.6	4.4
Good	0.1	1.1
Very Good	0.4	2.8
Total	13.1	100.0

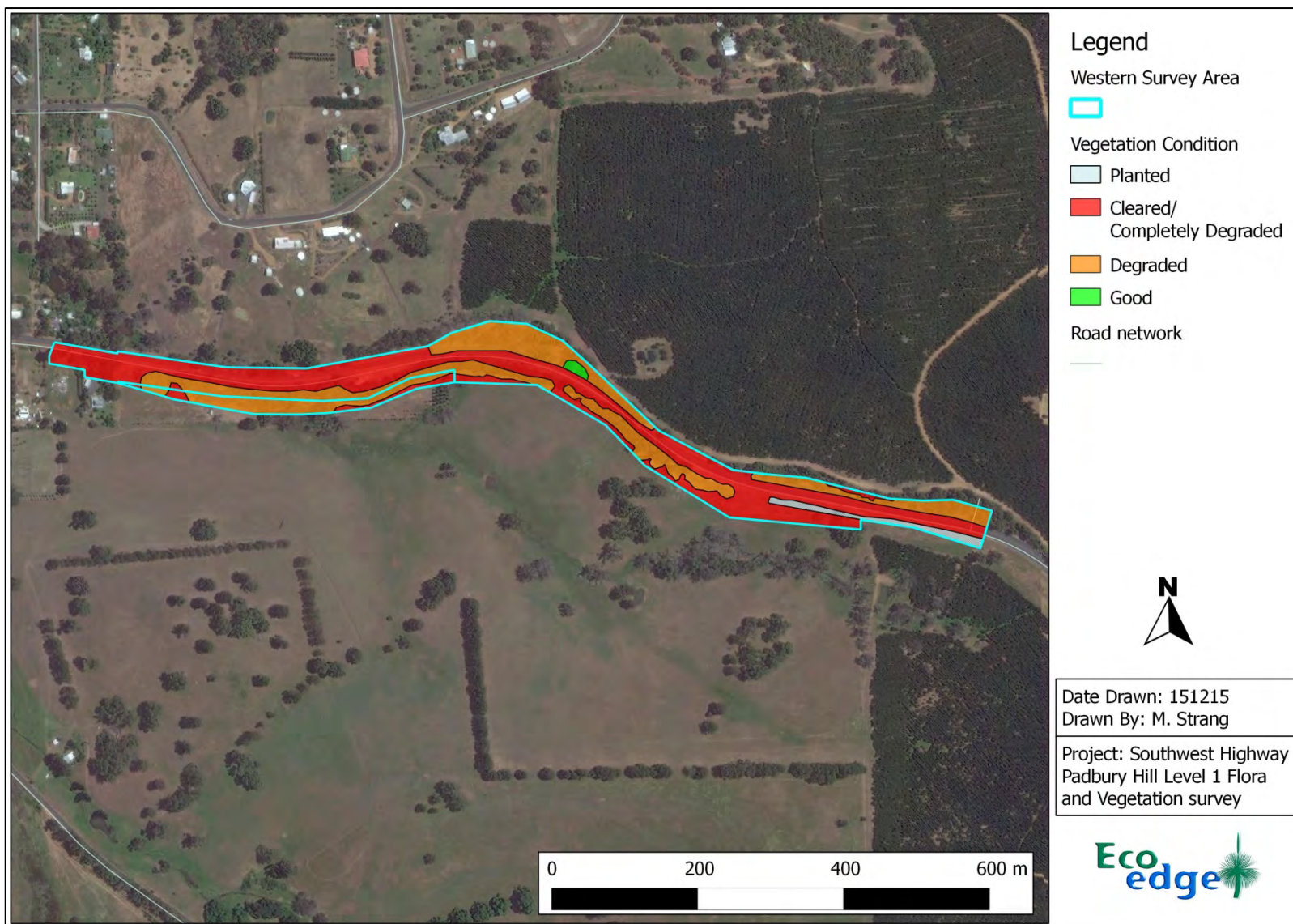


Figure 12. Condition of vegetation within the western survey area at Padbury Hill.

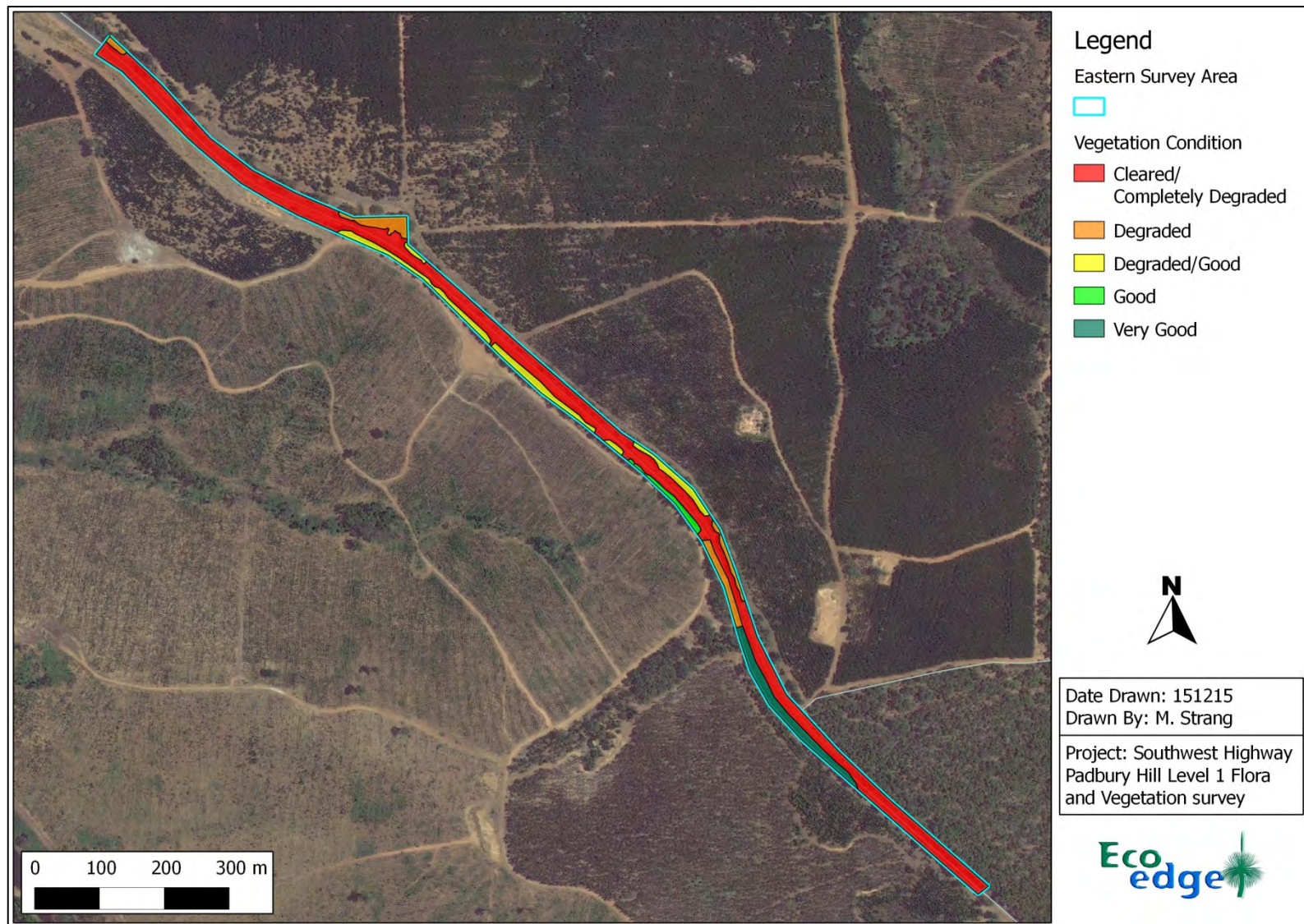


Figure 13. Condition of vegetation within the eastern survey area at Padbury Hill.

3.2.4 Conservation Status of the Vegetation Units

No regional floristic survey which assesses the conservation status of floristic community types has been conducted of the vegetation of the southern Jarrah Forest, as has been done for the Swan Coastal Plain (Gibson *et al.*, 1994) or Whicher Scarp (Keighery *et al.*, 2008). However, Strelein (1988) carried out a floristic survey in State forest between Nannup and Walpole which identified vegetation-landscape “site types”, which are comparable to “floristic community types”. Although the area surveyed by Strelein is located just south of the Project Area, the vegetation and landscape is similar.

Vegetation unit A is similar to the vegetation of site type “A” (Flats and broad drainage lines with *Eucalyptus rudis*) of Strelein (1988), however, it is situated within a major drainage line, whereas Strelein’s unit was in the upper valleys. Unit A is part of the Balingup vegetation complex, which as noted in section 1.5, above, is poorly represented in formal and informal nature reserves, although it meets the target of 30% remaining of pre-European area.

As can be seen from **Figure 6** and **Figure 12**, most of the vegetation mapped as Unit A was classed as “Completely Degraded”, with the remainder scored as “Degraded”. As such, it has low conservation value.

Vegetation unit B is too degraded to match it with any of the vegetation site types described by Strelein (1988) but unit C is similar to his Type Q. Type Q is described as occurring on well dissected landforms in moderate to high rainfall zones on steeper slopes and gullies, on brownish loamy soils, sometimes with a small amount of gravel. It covered a “limited area” within the southern Jarrah Forest, but was widespread where suitable soils occurred.

Vegetation unit B is “Completely degraded” or “Degraded”. It occurs within both the Hester and Balingup Vegetation Complexes (Section 1.5, above). The Hester Complex exceeds the 30% target for pre-European area remaining and 15% in formal and informal reserves.

Unit C occurs within the Hester Vegetation Complex which is extensive and well represented in the conservation estate.

None of the vegetation units resembles a threatened or priority ecological community.

4 Discussion

The survey of approximately 13 ha of road verge adjacent to the South West Highway at Padbury Hill determined that the remnant vegetation is generally quite degraded and poor in native species, with a high proportion of introduced species. Seven potential environmental weed species were recorded and their locations mapped.

No Declared Rare Flora, Priority Flora, species of flora listed as Endangered under the *EPBC Act* or other flora of conservation significance were found within the Project Area. Three vegetation units dominated by native species were recognised, none of which is an occurrence of a Threatened or Priority Ecological Community.

Only about 4% of the Project Area, mostly in the eastern Project Area, was in Good or Very Good condition.

5 Conclusion

With regard to floristic values, none of the remnant vegetation in the Project Area has a high conservation value and the proposed works will not impact on vegetation of conservation significance. There are no Declared Rare Flora, Priority Flora, species of flora listed as Endangered under the *EPBC Act* or other flora of conservation significance within the Project Area. Nor does any of the vegetation belong to a threatened or priority ecological community. Most the remnant vegetation within the Project Area is “Completely Degraded” or “Degraded”, with only a small amount on the south side of the highway in the eastern Project Area in “Very Good” condition.

Lot 30 is mainly comprised of pasture (“Completely Degraded”) with some remnant native bush (*E. rudis*) along the creek running through it, which was mapped as “Degraded”.

6 References

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Appendix 1. Protected Matters Search Tool Report

Appendix 2. List of vascular flora found within the Project Area at Padbury Hill.

Appendix 3. Environmental Weeds found within the Project Area at Padbury Hill.

Appendix 1. Protected Matters Search Tool Report