Strange Road Nature Reserve (R36063)
Environmental Assessment
2017

Prepared for:

Department of Parks and Wildlife
Perth Hills District
District Nature Conservation Program

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EXECUTIVE SUMMARY

This report has been prepared by Del Botanics on behalf of Department of Parks and Wildlife (DPaW) to review remnant flora, fauna and vegetation on Strange Road Nature reserve. A site survey was undertaken in October and December 2016. The site is approximately 108 kilometres south east of the Perth central area, in the Shire of Brookton.

Strange Road Nature reserve (R36063) consists of approximately 553.2 hectares of Wandoo (*Eucalyptus wandoo*) and Powderbark (*Eucalyptus accedens*) Woodland. The purpose of this reserve is to conserve the extensive woodlands of Wandoo and Powderbark.

The soils found in Strange Rd Nature reserve can be referred to as the *Zone of Rejuvenated Drainage*. This zone is defined by the Meckering Line to the east and the Darling Range Zone to the west. It encompasses the major portion of the Shire of Beverley and about a third of the Shire of Brookton. It represents the 'Inner Wheatbelt' and the central portion of the Avon Valley.

A large portion of the vegetation within Strange Rd Nature reserve is in very good condition and provides a great example of the variety of vegetation communities. During the site visits, vegetation communities were broadly mapped and described by recording the dominant tree species and upper level flora species. The vegetation described on site can be categorised into five broad vegetation communities.

The vegetation ranged from “Very Good” to “Degraded” Condition”. No species of Threatened (T), Priority Flora or Threatened Ecological Communities (TEC’s) pursuant to subsection 2 of section 23F of the *Biodiversity Conservation Act 2016* and listed by Department of Parks and Wildlife (DPaW) were located during the time of the survey.

Strange Rd Nature reserve is a conservation reserve for the protection of the extensive Wandoo – Powderbark vegetation communities. The reserve is currently in a very good condition and provides a valuable habitat for fauna with a diverse number of flora species.

STATEMENT OF LIMITATIONS

This environmental report has been prepared in accordance with the scope of services set out in the original quotation. In preparing the report, Del Botanics has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Del Botanics has not verified the accuracy or completeness of the data to the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Del Botanics will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed.

In accordance with the scope of services, Del Botanics has have relied on the data and have conducted environmental field monitoring in the preparation of the report. The nature and extent of monitoring conducted is described in the report. Within the limitations imposed by the scope of services, the monitoring and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care. No other warranty, express or implied, is made.

The report has been prepared for the benefit of the Client and for no other party. Del Botanics assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report. Other parties should not rely upon the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 STRANGE RD NATURE RESERVE

This report has been prepared by Del Botanics on behalf of Department of Parks and Wildlife (DPaW) to review remnant flora, fauna and vegetation on Strange Road Nature reserve. A site survey was undertaken in October and December 2016. The site is approximately 108 kilometres south east of the Perth central area, in the Shire of Brookton. The location of the site is shown on **Figure 1** below.

Figure 1: Strange Rd Nature reserve Location

The Shire of Brookton covers an area of 161,283 hectares and is located in the Avon River Catchment. The Avon River flows through the eastern part of the shire. Strange Rd Nature reserve is approximately 36km west of the Brookton townsite.

Strange Road Nature reserve (R36063) consists of approximately 553.2 hectares of Wandoo (*Eucalyptus wandoo*) and Powderbark (*Eucalyptus accedens*) Woodland. The purpose of this reserve is to conserve the extensive woodlands of Wandoo and Powderbark.

The reserve consists of 3 distinct areas. These areas are shown on **Figures 4a, 4b, 4c and 5a, 5b, 5c**. For the purpose of this report these will be referred to as follows:

The Island Section

This section is located to the north of the Northern Section and is referred to as The Island Section. It is currently in poor condition due to the isolation of other remnant vegetation the high density of weeds and adjacent farming properties.

Photo 3: The Island of Strange Rd Nature reserve

The Northern Section

This portion of the reserve is on the northern side of Strange Rd, it is a smaller area that has been degraded by weeds; however it still retains a good example of Jarrah and Wandoo Woodlands. This area is currently managed by the Shire of Brookton as a gravel reserve.

Photo 2: Northern Section of Strange Rd Nature reserve

The Southern Section

This is the main and larger portion of the reserve on the southern side of Strange Rd, this area is in the best condition and provides the best example of the vegetation communities found on the nature reserve.

Photo 1: Southern Section of Strange Rd Nature reserve

1.2 HISTORY

The first European farmers settled in the Avon Valley in 1831 and established themselves as pastoralists, grazing sheep on native herbage and cropping small areas of the better soil types. In 1880 the railway came to the Avon Valley and large advances to agriculture were made in the early 1900's. Native vegetation in the Shire of Brookton has been significantly cleared for agricultural purposes.

Photo 4: Recent clearing at within the Northern Section of Strange Rd Nature reserve

Native vegetation in the Shire of Brookton has been significantly cleared for agricultural purposes. The district was first settled in the mid 1800's and the best country for agriculture, the woodlands on heavy soils in the valleys were cleared by hand. Much of the sandplain areas were cleared post 1950's with bulldozers. Remnant vegetation areas were often cleared in the early days as they were seen to habour rabbits. The remaining areas of native vegteation are mostly the areas unsuitable for agriculture, such as granite outcrops, breakaway country and saline areas. Woodland and sandplain country are very poorly represented in reserves and much of the woodlands that do remain on private land have been degraded by grazing, weed invasion and inapropriate fire regimes.

2. EXISTING ENVIRONMENT

2.1 SOILS AND LANDFORMS

Brookton is underlain by Archaean rocks of the Yilgarn Block which has been a relatively stable part of the earth's crust for 2400 million years. The Great Plateau of Western Australia, referred to locally as the Darling Plateau, is the surface expression of the Yilgarn Block. The ancient 'basement' rocks of the Darling Plateau are composed of predominantly granite and metamorphics with localised intrusions of narrow quartz or dolerite dykes.

The surface of the Darling Plateau was once extensively mantled by Tertiary (Cainozoic) laterite and associated weathering products. Although the plateau is now substantially dissected by major drainage systems, remnants of the lateritised surface occur in upper parts of the landscape and along drainage divides.

2.1.1 Localised soils

The soils found in Strange Rd Nature reserve can be referred to as the *Zone of Rejuvenated Drainage*. This zone is defined by the Meckering Line to the east and the Darling Range Zone to the west. It encompasses the major portion of the Shire of Beverley and about a third of the Shire of Brookton. It represents the 'Inner Wheatbelt' and the central portion of the Avon Valley. The Zone of Rejuvenated Drainage is characterised by a greater degree of dissection of the landscape than in the Zone of Ancient Drainage to the east. Thus steeper, narrower valleys are formed which contain rivers and creeks that flow every winter. Large areas of yellow duplex soils have formed here from the dissection of the lateritic profile. In areas where the lateritic profile has been completely removed there are extensive areas of rocky, red and greyish soils developed from fresh rock. The valley floors contain alluvial clays, loams and sands.

2.2 VEGETATION

A large portion of the vegetation within Strange Rd Nature reserve is in very good condition and provides a great example of the variety of vegetation communities which dominated the area prior to European settlement. The vegetation within The Island Section is degraded as it is isolated and small between working agricultural properties and has been affected by grazing and weeds. The vegetation within the Southern Section of the reserve provides the best example of the best condition and community types.

The vegetation in the southern portion varies from open Wandoo Woodland over very sparse low shrubs on the ridges through increasing portions of Jarrah (*Eucalyptus marginata*) and then Marri (*Corymbia calophylla*) and Rock Sheoak (*Allocasuarina huegeliana*) lower in the landscape and on granite soils. The

Northern portion varies from Jarrah, over *Banksia sessils* and *Banksia squorrosa* over a sparse understorey then transitions back into Wandoo Woodland in the northern most portions with a sparse weedy understorey.

The southwest of Western Australia has been divided into districts, known as Natural Resource Zones, which are determined by their vegetation type, drainage/catchment system and rainfall. The Shire of Brookton contains parts of two Natural Resource Zones, the Swan/Avon catchment, which includes the Northern Jarrah Forrest and the Wheatbelt Vegetation District, which includes the Darling and Avon Districts.

Photo 5: Wandoo (*Eucalyptus wandoo*) and Powderbark (*Eucalyptus accedens*) Woodland in the Southern Section of the reserve

Photo 6: Rock Sheoak (*Allocasuarina huegeliana*) lower in the landscape and on granite soils, in the Southern Section of the reserve

2.3 CLIMATE

The Shire's climate consists of a warm Mediterranean climate with hot dry summers and mild wet winters. Brookton receives, on average 430mm rainfall per annum. Average maximum temperatures range from 30°C in January and 17.1°C in July, while average minimum temperatures range from 16.1°C in February to 4.6°C in August.

3. FLORA, FAUNA AND VEGETATION

The survey area lies in the Drummond Botanical Subdistrict within the Southwest Botanical Province as described by Beard (1990). Flora composition has been described by Beard (1990) as predominantly consisting of *Banksia* Low Woodlands on leached sands with *Melaleuca* swamps where ill drained and Woodlands of *Eucalyptus* spp. on less leached soils. This area has been described by Beard (1990) as the Avon Botanical District.

The updated mapping system IBRA (*Interim Biogeographic Regionalisation for Australia*) was developed in 1993-94 and is endorsed by all levels of government as a key tool for identifying land for conservation under *Australia's Strategy for the National Reserve System 2009-2030*. The nationally agreed regionalisation was published in Thackway and Cresswell 1995, *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves*.

The latest version, IBRA7, classifies Australia's landscapes into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The IBRA description of vegetation for this area is best categorised as the Avon Wheatbelt Region.

3.1 FLORA

The site retains a good example of Wandoo Woodland. There are a diverse number of understorey species, which are available in **Appendix A** and a low number of weed species. Some of the species recorded onsite are shown in **Photos 7, 8** & **9** below.

Photo 7: *Leschenaultia biloba*

Photo 8: *Damperia alata*

Photo 9: *Stylidium sp*

3.1.1 Threatened flora

A search of the Department of Parks and Wildlife (DPaW) NatureMap database identified two priority species within a 5 km radius, likely to occur within the area. One Priority 1 (P1) and one Priority 4 (P4) species are listed in **Table 1** below.

Table 1: NatureMap listed species

Species Name	Common Name	Conservation Code
Baeckea sp. Youndegin Hill (A.S. George 15772)		P1
Stylidium tenuicarpum		P4

A search of the EPBC Protected Matters database identified six flora species of significance within a 5 km radius, likely to occur within the area. Three flora species have been listed as Endangered and three species are listed as Vulnerable. These species are listed in **Table 2** below.

Table 2: EPBC listed flora species

Species Name	Common Name	Conservation Code
Diuris micrantha	Dwarf Bee-orchid	Vulnerable
Eleocharis keigheryi	Keighery's Eleocharis	Vulnerable
Pultenaea pauciflora	Narrogin Pea	Vulnerable
Rhizanthella gardneri	Western Underground Orchid, Underground Orchid	Endangered
Thelymitra dedmaniarum	Cinnamon Sun Orchid	Endangered
Verticordia fimbrilepis subsp. fimbrilepis	Shy Featherflower	Endangered

3.1.2 Weeds

Invasive plants are widespread in fragmented landscapes that have been highly modified, and where nutrient enrichment of soils and frequent disturbance encourages the establishment of weeds over native vegetation. Established weeds compete with native plants, affecting their recruitment and survival, reducing the habitat quality for native fauna. Grassy weeds can also increase the flammability of the vegetation, increasing fire frequency and intensity. Once established, weeds become a long-term and potentially costly management issue.

There are a low number of weed species and densities on average across the southern section of the site. Weeds are dominant along the edges of the reserve, adjacent to firebreaks. The Island Section has the highest density of weeds compared to the entire reserve. The Northern Section of the reserve has a higher density of weeds than the Southern Section of the reserve. Weeds control may be applied to the areas along the fence lines, however due to the adjacent farming properties weeds may continue to present an issue along the fence lines. It is important to reduce weeds from entering into the bushland.

Photo 10: Weeds along the fence line within the Southern Section of the reserve

3.2 FAUNA

Due to the location of the reserve and the reduced areas of other natural bushland in the area, this reserve is an important refuge for native animals and is a valuable stepping stone of native vegetation for the area. There are a number of bird species and a healthy population of Kangaroo's. Species recorded onsite are available in **Appendix B.**

Photo 11: Kangaroo recorded in within the Southern Section of the reserve

3.2.1 Threatened Fauna

A search of the Department of Parks and Wildlife (DPaW) NatureMap database identified two priority species within a 5 km radius, likely to occur within the area. One Priority 4 (P4) and one Threatened (T) species are listed in **Table 3** below.

Table 3: NatureMap listed species

Species Name	Common Name	Conservation Code
Hydromys chrysogaster	Water-rat	P4
Westralunio carteri	Carter's Freshwater Mussel	T

The Protected Matters Search Tool was used to determine fauna species protected by the EPBC Act which are considered likely to occur within a 5km radius of the reserve. The search result noted six fauna species of significance likely to occur in the area. Two fauna species have been listed as Endangered and four species are listed as Vulnerable. These species are listed in **Table 4** below.

Table 4: EPBC listed fauna species

Species Name	Common Name	Conservation Code
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo, Karrak	Vulnerable
Calyptorhynchus baudinii	Baudin's Black-Cockatoo, Long-billed Black-Cockatoo	Vulnerable
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered
Leipoa ocellata	Malleefowl	Vulnerable
Rostratula australis	Australian Painted Snipe	Endangered
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable

3.2.2 Feral Animals

Several species of invasive animals have established in the Wheatbelt region and impacted upon native vegetation and fauna. Feral cats (*Felis catus*) and the European fox (*Vulpes vulpes*) are key predators that prey upon ground-dwelling native fauna. The European rabbit (*Oryctolagus cuniculus*) causes direct loss of plant species, and indirect loss of native plant and animal species through changes to soil structure and nutrient dynamics by their digging, burrowing and grazing activities. There is evidence of foxes and rabbits and a feral cat was seen onsite. The site may have a high number of feral animals due to the large size of the reserve and the close vicinity to farming properties.

3.2.3 Local Habitat Condition

Strange Rd Nature reserve has potential habitat for ground dwelling fauna. The site contains fallen logs and leaf litter. The site also has hollows both on the ground and in tress, which would provide suitable habitat for a number of ground dwelling fauna. Further investigations will determine the habitat suitability for specific fauna, including numbats.

3.3 VEGETATION

The original vegetation of the region has been mapped and described by Beard (1979, 1980). The major parts of the Shires of Beverley and Brookton fall into the Avon Botanical District, although a small area along the western boundary of both Shires is part of the Darling District (Dale Subdistrict).The Shire of Brookton includes Jarrah Forrest on its western margin with a mix of cleared farming land and forested country with wandoo (*Eucalyptus wandoo*) and areas of Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) towards the east of their range.

Jarrah and Marri Forest: The Jarrah forest occurs in the higher rainfall western areas on the lateritic plateau (Darling District). Jarrah (*Eucalyptus marginata*) is the dominant tree, and is normally accompanied by Marri (*Corymbia calophylla*). On some sites it will also be associated with Blackbutt (*E. patens*), Wandoo (*E. wandoo*) and Powderbark Wandoo (*E. accedens*). There is also often a lower layer of small trees, including *Banksia grandis*, *Allocasuarina fraseriana* and *Persoonia longifolia*.

Jarrah - Marri - Wandoo - Powderbark - Brown Mallet Woodlands: On the eastern edge of the lateritic plateau (Darling grading into Avon District), woodland replaces the Jarrah forest, due to the declining rainfall. The principal components are Jarrah, Wandoo and Powderbark Wandoo. Jam (*Acacia accuminata*) and Rock sheoak (*Allocasuarina huegeliana*) are common associated species in most areas, but land clearing has eliminated most of the smaller species once present. On the dissected slopes below the plateau, a mixture of Marri - Wandoo woodland occurs. Further east, the plant communities are comprised of scattered shrubs and rock sheoak. There are woodlands of Powderbark Wandoo and brown mallet (*E. astringens*) on lateritic plateau remnants, woodlands of Wandoo and Powderbark on upperslopes, Marri and Wandoo on middle slopes, and York gum on lower slopes close to drainage lines.

3.3.1 Vegetation Complexes

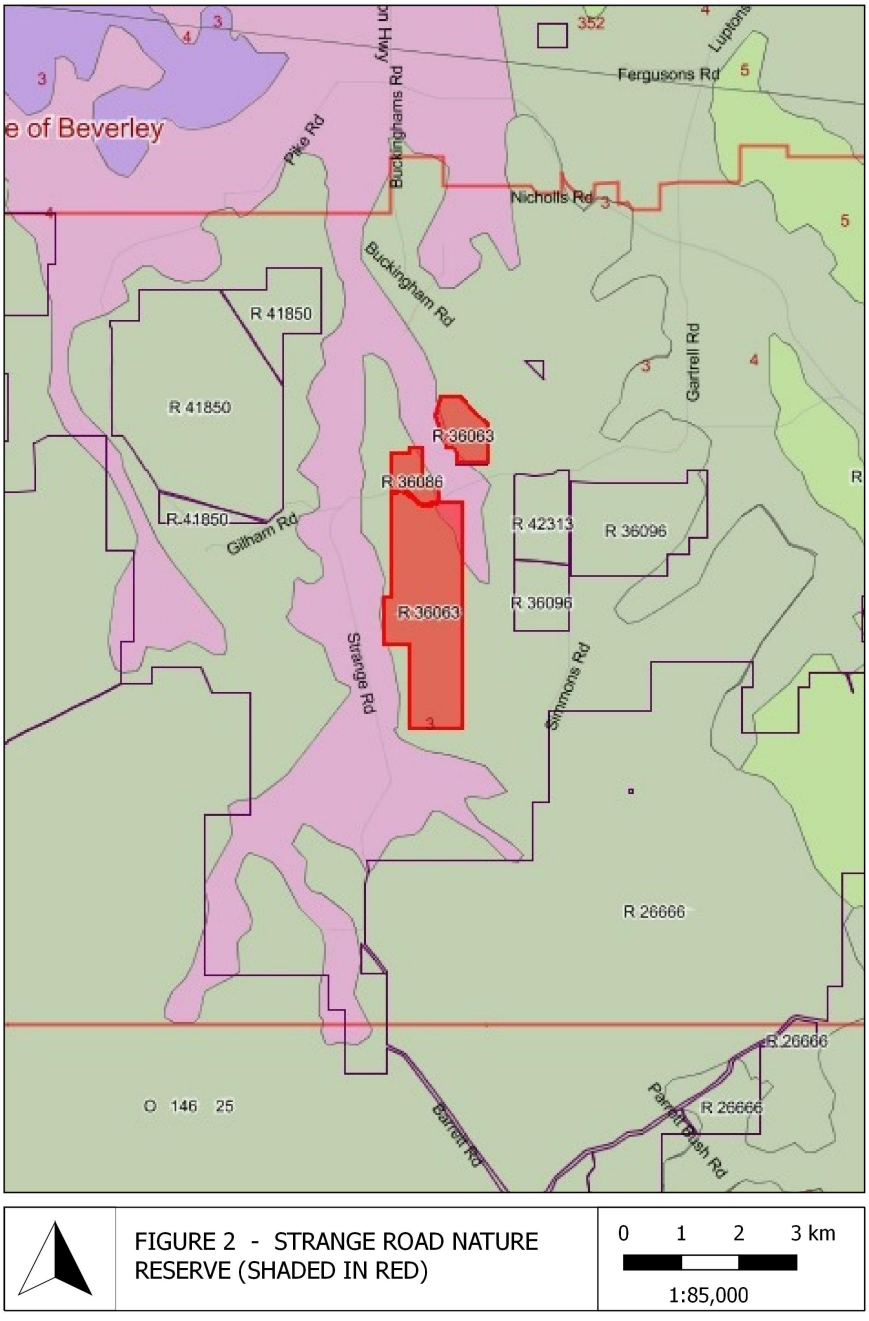
Vegetation complexes are based on the pattern of vegetation at a regional scale as they reflect the underlying key determining factors of landforms, soils and climate. The Perth and Peel Regions are spread over two IBRA regions, the Swan Coastal Plain and Jarrah Forest. The Jarrah Forest IBRA region can be divided into two sub-regions, the Northern Jarrah Forest, and the Southern Jarrah Forest. The Perth and Peel Region extends only to the Northern Jarrah Forest IBRA sub-region.

The following inputs were used to create a data layer of remnant vegetation extent by vegetation complexes for the Swan Coastal Plain and the Jarrah Forest IBRA, including the Perth and Peel Region Scheme areas:

- DAFWA (2014) - Current extent of native vegetation (Remnant vegetation)
- Heddle et al (1980) - Vegetation of the Darling System, Department of Environment and Conservation (south of Moore River)
- Mattiske & Havel (2000) - Vegetation complex mapping for the South West Forest Region and for the Swan Coastal Plain in the Busselton area.

There are 27 and 18 vegetation complexes represented within the Swan Coastal Plain and Jarrah Forest portions of the Perth and Peel Scheme Regions, respectively. The Vegetation complexes recorded at Strange Rd Nature reserve are described below.

Figure 2: Strange Rd Nature Reserve, shaded in red



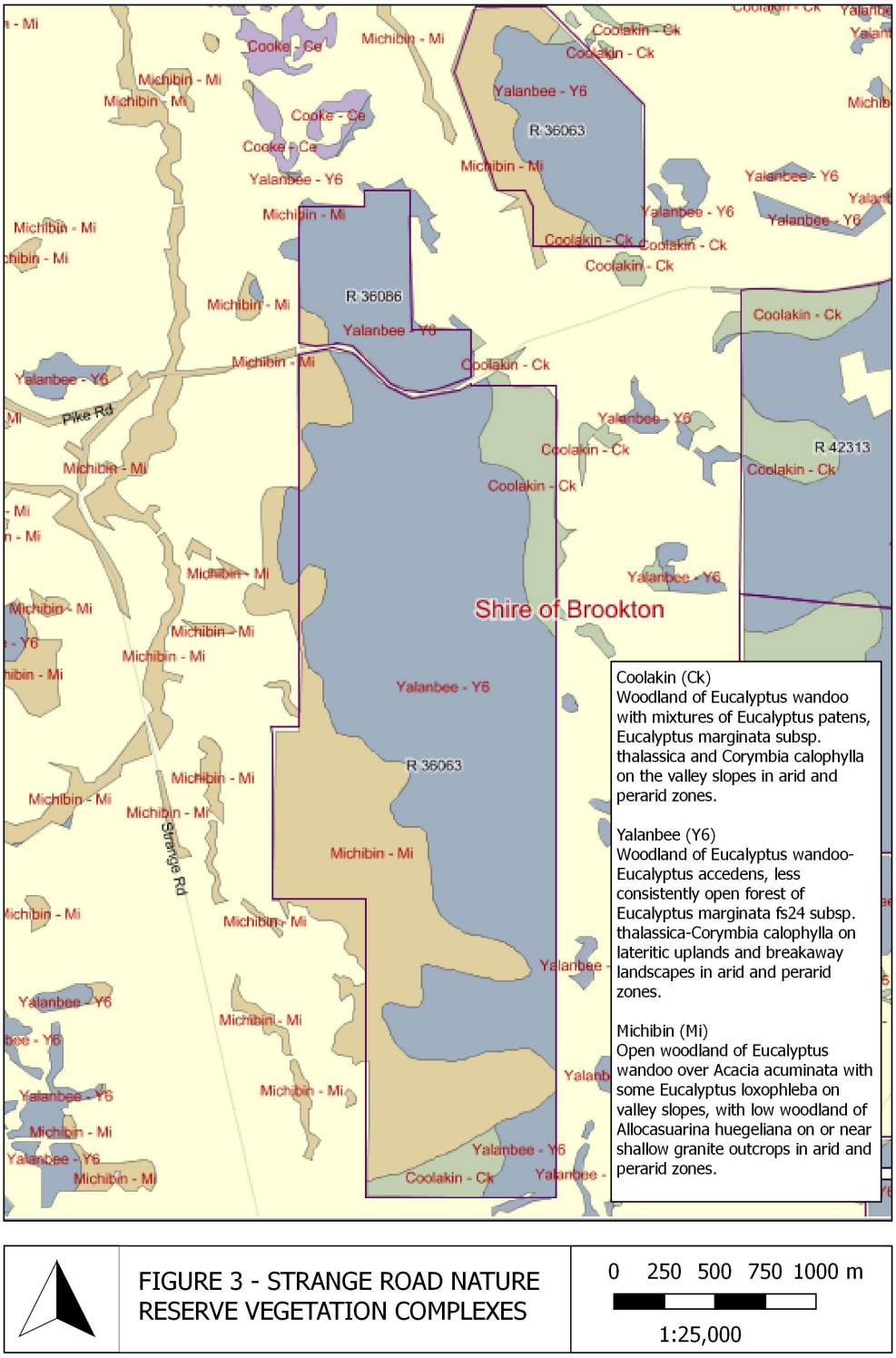
The selected area (shown in **Figure 3**) below retains native vegetation representative of the following vegetation complexes (approximate area in hectares):

Coolakin - Ck 37.06 ha

Yalanbee - Y6 292.47 ha

Michibin - Mi 139.71 ha

Figure 3: Strange Rd Nature Reserve, Vegetation Complexes



3.3.2 Vegetation complexes found within Strange Rd Nature Reserve

Coolakin

Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens, Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones.

Yalanbee (Y6)

Woodland of *Eucalyptus wandoo-Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* fs24 subsp. *thalassica-Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones.

Michibin

Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones.

Photo 12: Wandoo Woodland located within the Southern Section of the reserve

Photo 13: Granite outcrop located within the Southern Section of the reserve

3.3.3 Local Vegetation Communities

During the site visits, vegetation communities were broadly mapped and described by recording the dominant tree species and upper level flora species. The vegetation described on site can be categorised into five broad vegetation communities. These communities are described below in **Table 5** and shown on **Figures 4a, 4b and 4c.**

Table 5: Vegetation Communities

Mapping Code	Community Descriptions
Vegetation Community 1 – Wandoo/Powderbark Wandoo Woodland	
1	Open forest of *Eucalyptus wandoo and Eucalyptus accedens*, over open shrubland of *Banksia sessilis, Banksia squorrosa, Macrozamia riedlei*, over low open shrubland of *Banksia nivea, Hibbertia* spp, *Gastrolobium* sp and *Acacia pulchella.*
Mapping Code	**Community Descriptions**
Vegetation Community 1a – Wandoo/Powderbark Wandoo Woodland (with occurrences of Jarrah and Marri)	
1a	Open forest of *Eucalyptus wandoo and Eucalyptus accedens*, with occurrences of *Eucalyptus marginata* and *Corymbia calophylla* over open shrubland of *Macrozamia riedlei*, and *Leptospermum erubescens*
Mapping Code	**Community Descriptions**
Vegetation Community 2 –Rock Sheoak/Wandoo Woodland	
2	Open forest of *Eucalyptus wandoo* and *Allocasuarina huegeliana* with occurrences of *Eucalyptus marginata* and *Corymbia calophylla* over open shrubland of *Hakea prostrata, Banksia sessilis, Macrozamia riedlei* over very open herbland of **Avena barbata, * Arctotheca calendula and * Lysimachia arvensis*
Mapping Code	**Community Descriptions**
Vegetation Community 3 – Jarrah Marri Woodland	
3	Open forest of *Eucalyptus marginata and Corymbia calophylla*, over open shrubland of *Banksia squarrosa*
Mapping Code	**Community Descriptions**
Vegetation Community 4 – Granite Outcrop	
4	Open forest of *Allocasuarina huegeliana*, over open shrubland of *Melaleuca sp* over very open sedgeland of *Lepidosperma sp.*

3.3.4 Threatened Ecological Communities

The EPBC Act provides for the strong protection of TEC's, which are listed under section 181 of the Act and are described as 'Critically Endangered', 'Endangered' or 'Vulnerable' under section 182. Schedules of protected TECs maintained pursuant to the EPBC Act are based on the same FCT's as adopted by DPaW, however not all TEC's listed by the DPaW are scheduled under the EPBC Act.

An EPBC Act Protected Matters Report indicated there is one known Threatened Ecological Community (TEC) likely to occur in the area, this is listed in **Table 6**.

Table 6: EPBC listed Threatened Ecological Communities

Threatened Ecological Community	Conservation Code	Comments
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community likely to occur in the area

After visiting the site, Del Botanics is of the opinion that a large portion of Strange Road reserve contains eucalypt woodlands that would fit this critically endangered community type; however further surveying would be required to confirm the presence and extent of the community.

3.3.5 Vegetation Condition

Many bushland remnants have been historically subject to ongoing degradation and are especially susceptible to disturbances arising as a result of indirect impacts from surrounding developments and human activity. Degradation is caused by a wide range of factors, including isolation and edge effects, weed invasion, plant diseases, changes in fire frequency and behaviour, landscape fragmentation, increased predation on native fauna by feral animals, decrease in species richness and general modification of ecological function. These issues can affect the biodiversity rating and ecological viability of areas of remnant vegetation and should be assessed in line with conservation values.

The Vegetation Condition was rated according to the Vegetation Condition Scale commonly used in the Perth Metropolitan Region (Government of WA 2000). The definitions are described in **Table 7** below.

Table 7: Vegetation Condition Scale (Taken from Bush Forever (Government of WA 2000))

Vegetation Condition	Definition
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 very 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.

In general, the vegetation condition ranged from "Degraded" to "Very Good" in the study area. Vegetation condition mapping is provided on **Figures 5a, 5b and 5c.**

Photo 14: Wandoo/Powderbark Woodland in Very Good vegetation condition located within the Southern Section of the reserve

Photo 15: Wandoo/Powderbark Woodland, in Good vegetation condition located within the Southern Section of the reserve

Photo 16: Wandoo/Powderbark Woodland, in a Degraded vegetation condition located within the Island Section of the reserve

4. TRACK CONDITIONS, SIGNAGE AND ILLEGAL ACTIVITY

4.1 TRACK CONDITION AND FIREBREAKS

In the Southern Section of the reserve, the eastern boundary along the existing farming property is in good condition. The track is wide enough for a vehicle for approximately 3.9km. There are some areas where fallen branches have restricted access; however, vehicle access is still possible for the length of the eastern boundary of the reserve. The southern boundary for approximately 1km, which is also adjacent to a farming property requires works, however still allows vehicle access along the existing fence line. Firebreaks need to be maintained on the western and northern boundary of the reserve, access is restricted along these tracks. There is a large tree stopping access from the North West corner of the reserve to the southern boundary. There is a track approximately 2.3km's south of the reserve entrance off Strange Rd, which goes through the centre of the reserve. This track is easily accessible and provides a firebreak through the reserve. Track locations are available on **Figures 4 and 5**.

There appears to be no fire breaks around the reserve in the Northern Section and The Island Section. However these two areas are surrounded by farming properties which may act as a sufficient firebreak if regularly maintained. The lack of firebreaks means there is no access around the reserve in these two areas. Access is gained from the adjoining private properties. The Northern Section of the reserve can be accessed from Strange Rd, but is not accessible around the inside of the reserve. The Island Section is only accessible from the adjacent private properties; there is no access into the reserve.

Photo 17: Firebreak on the north east boundary of the Southern Section of the reserve

Photo 18: No Firebreaks or access into The Island Section

4.2 FENCING

The condition of fencing varies around the reserve. The fencing around The Island Section is in good condition; however there is no access into the reserve. This is an issue for any works required in this area.

The Northern Section of the reserve requires maintenance on the fences along the western boundary. The property on the western boundary currently stocks sheep which are a threat to the bushland in the reserve. All fences will need reviewing in this section.

The fencing in the Southern Section of the reserve varies in condition. The fencing around the perimeter is mostly in good condition as it separates farming properties to the reserve. The fencing along the western boundary, mainly in the southern section is in the worst condition. These fences appear to be cut and removed for access into the reserve. These fences will need to be replaced.

Photo 19: Damaged fences along the western boundary of the Southern Section of the reserve

Photo 20: Damaged fences along the western boundary of the Southern Section of the reserve

Photo 21: Damaged fences along the western boundary in the Northern Section of the reserve

4.3 SIGNAGE

During the site visit, two signs were observed along the northern boundary of the Southern Section of the reserve, along Strange Rd. Both signs appear out dated and may need to be updated with relevant information. The signs are shown below in **Photos 22 & 23.** The number of signs appears to be adequate as they are at the two main entrances to the reserve. The Northern Section and The Island Section have no signage.

Photo22: Old signage located within the Southern Section of the reserve

Photo23: Old signage located within the Southern Section of the reserve

4.4 ILLEGAL ACTIVITY

There are no current signs of motorbikes or cars accessing the reserve. There appears to be limited activity in this area with the exception of the western boundary of the Southern Section of the reserve. There are historic signs of wood cutting and rubbish dumping, however these are limited. Evidence of this type of activity was mostly observed in the Southern Section of the reserve. The Northern Section and The Island Section are more isolated and have no signs of illegal activity. The Northern Section of the reserve, along the eastern boundary has had recent clearing, as shown in **Photo 25** below, most likely for a gravel extraction.

Photo 24: Evidence of wood cutting in the Southern Section of the reserve

Photo 25: Recent clearing in the Northern Section of the reserve

5. DIEBACK

Dieback disease caused by the pathogen *Phytophthora cinnamomi* is a major threat to the biodiversity of south-western Australia. The spread of this water mould is facilitated by the movement of soil, water or plant material infested with spores, particularly under warm, moist conditions. Dieback affects a wide range of plant species and about 40% of native plants in WA are considered potentially susceptible to the disease, the plant groups most affected are the banksia family (Proteaceae), heath family (Epacridaceae) and pea family (Fabaceae), all of which have species present in the WA Wheatbelt Woodlands. Jarrah trees are one of the few eucalypt species known to be susceptible to the disease.

It generally occurs in areas that receive 400 mm or more annual rainfall, and especially the high rainfall zone that gets >800 mm annual rainfall. The vegetation most affected includes the Jarrah forests of the Darling Ranges, the taller forests of the far south-west and the kwongkan and *Banksia* shrublands of the Swan Coastal Plain and Esperance Sandplains. Given the relationship of dieback to moisture and rainfall, its threat to the WA Wheatbelt Woodlands is largely potential, as this area receives over 400mm annually.

There are signs that dieback may occur within the Southern Section of the reserve. There are a number of Jarrah deaths within the middle of the reserve with some stressed understorey species. Further testing in this area will be required to confirm or otherwise the presence of dieback. There is no evidence of dieback in the Northern Section or The Island Section; however it would be practical to have these areas assessed as well.

Photo 26: Large number of jarrah deaths in the Southern Section of the reserve

6. FIRE

Prior to European settlement, fires occurred through lightning strikes and Indigenous burning of the landscape. Indigenous burning practices had been adopted for up to 60 000 years and likely comprised a mosaic of frequent, small-scale fires, often during summer months in the more mesic woodlands of the western Wheatbelt. Since European settlement, fires still occur through lightning strikes. However, they now also originate from prescribed burning operations (including escaped from planned fires), arson or accidental ignition due to a range of sources. The nature and impacts of fire is influenced by other threats in the landscape. Fragmentation into small remnants and the surrounding modified land use can affect the intensity and impact of fires across a patch. The type of understorey may promote or suppress fire spread. Frequency of fire is one important consideration in addition to fire intensity and season. Too frequent fires may eliminate sensitive species. For example: obligate seeder species that require fire to stimulate seed germination may die out if recurring fires kill plants before they have a chance to mature and develop new seeds; and fauna may decline due to the loss of food and shelter resources after frequent fires.

The main concern for natural remnants in the Wheatbelt is a lack of fire or much longer intervals between fire events. The lack of fire limits recruitment of plant species, especially those that require heat, smoke or other features of a fire to stimulate germination and establishment of seedlings. It also impacts on fauna by limiting development of habitat diversity, especially opportunities for new tree hollows and logs, or not allowing the regeneration of dense thickets of trees and shrubs, that give shelter to many kinds of fauna.

There are no immediate signs of recent fire activity. Evidence on the vegetation suggests the last fire may have been more than 10 years ago. The Southern Section of the reserve has a fire break around the outside perimeter and approximately half way through the middle of reserve. The firebreaks do need to be maintained and currently will require works to allow access around the entire reserve. It may also be beneficial to add another fire break through the middle of the reserve in the Northern Section from east to west. Due to the reserve being surrounded by cleared farming paddocks the fire risk is reduced.

7. POTENTIAL THREATS

Nationally-listed key threatening processes

The following are EPBC-listed key threatening processes, current as at February 2015, that are relevant to the WA Wheatbelt Woodland ecological community:

- Competition and land degradation by rabbits
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)
- Land clearance
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases
- Novel biota and their impact on biodiversity
- Predation by European red fox
- Predation by feral cats
- Predation, habitat degradation, competition and disease transmission by feral pigs

The threats listed above should be considered when implementing future plans for the conservation and protection of the reserve.

Photo 27: Wandoo Woodland in the Southern Section of the reserve

8. CONCULSIONS AND RECOMMENDATIONS

Strange Rd Nature reserve is a conservation reserve for the protection of the extensive Wandoo – Powderbark vegetation communities. The reserve is currently in a very good condition and provides a valuable habitat for fauna with a diverse number of flora species.

Based on the results of this assessment, Del Botanics proposes the following reserve management recommendations:

- Implement a dieback and hygiene management plan, including periodic dieback survey and treatment;
- Upgraded nature reserve signage;
- Undertake fire break maintenance, as shown on Figures 4c &5c;
- Undertake a Level two flora survey;
- Undertake a Threatened Ecological Community Assessment for *Eucalypt Woodlands of the Western Australian Wheatbelt*;
- Undertake a targeted Declared Rare Flora Search for the species listed below. These species have been selected as a result of a background search of the site; however the search will not be limited to these species but will include any DRF found within the reserve.
- Undertake a Targeted Fauna Search for the species listed below. These species have been selected as a result of a background search of the site; however the search will not be limited to these species but will include any Threatened fauna found within the reserve.

Targeted Flora Search List species

Species Name	Common Name	Conservation Code
Baeckea sp. Youndegin Hill (A.S. George 15772)		P1
Stylidium tenuicarpum		P4
Diuris micrantha	Dwarf Bee-orchid	Vulnerable
Eleocharis keigheryi	Keighery's Eleocharis	Vulnerable
Pultenaea pauciflora	Narrogin Pea	Vulnerable
Rhizanthella gardneri	Western Underground Orchid, Underground Orchid	Endangered
Thelymitra dedmaniarum	Cinnamon Sun Orchid	Endangered
Verticordia fimbrilepis subsp. fimbrilepis	Shy Featherflower	Endangered

Targeted Fauna Search List species

Species Name	Common Name	Conservation Code
Hydromys chrysogaster	Water-rat	P4
Westralunio carteri	Carter's Freshwater Mussel	T
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo, Karrak	Vulnerable
Calyptorhynchus baudinii	Baudin's Black-Cockatoo, Long-billed Black-Cockatoo	Vulnerable
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered
Leipoa ocellata	Malleefowl	Vulnerable
Rostratula australis	Australian Painted Snipe	Endangered
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable

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FIGURES

FIGURE 4a: THE ISLAND SECTION VEGETATION COMMUNITIES

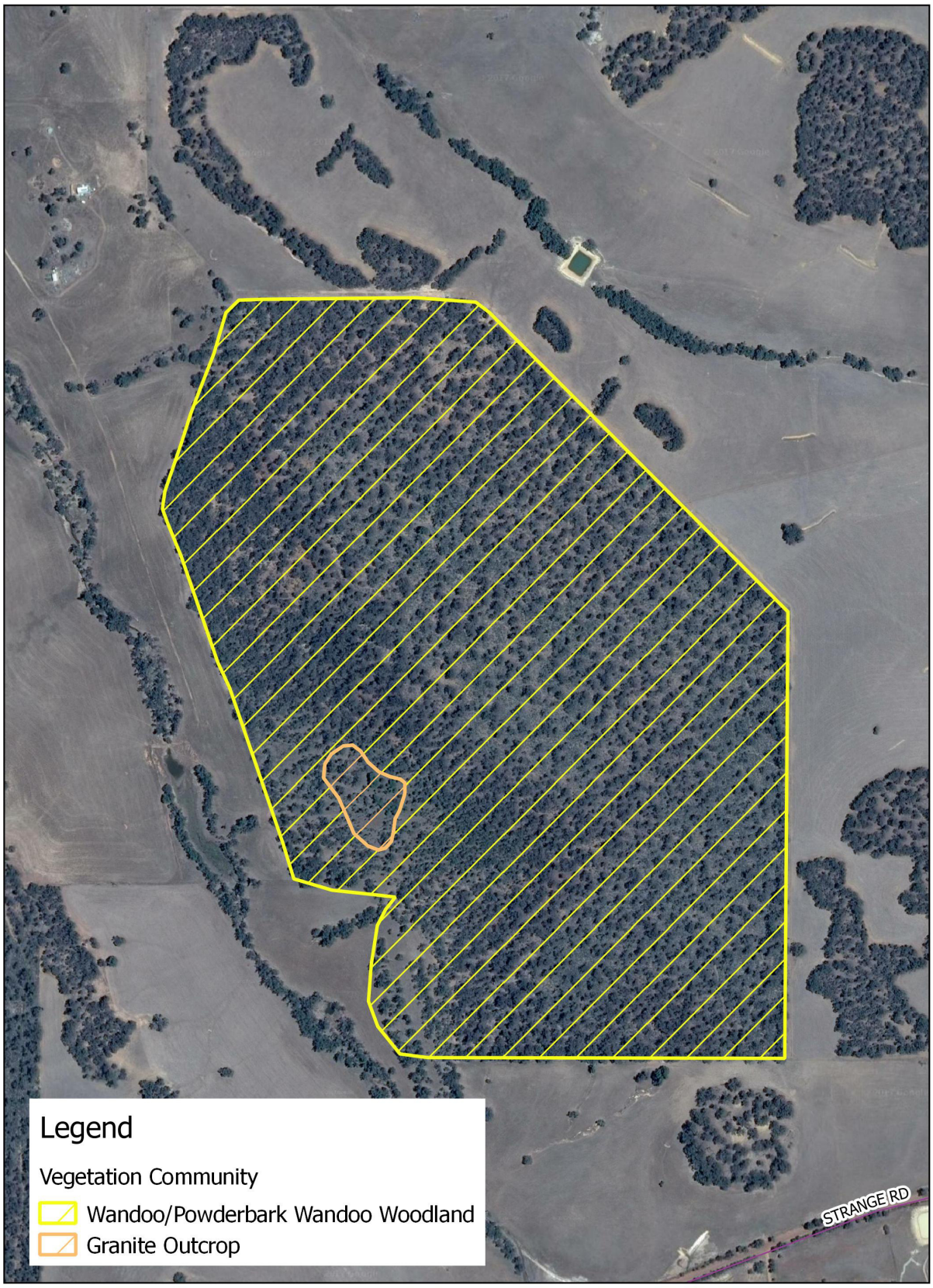

FIGURE 4A - THE ISLAND SECTION VEGETATION COMMUNITIES

0 100 200 300 m

1:8,000

FIGURE 4b THE NORTHERN SECTION VEGETATION COMMUNITIES

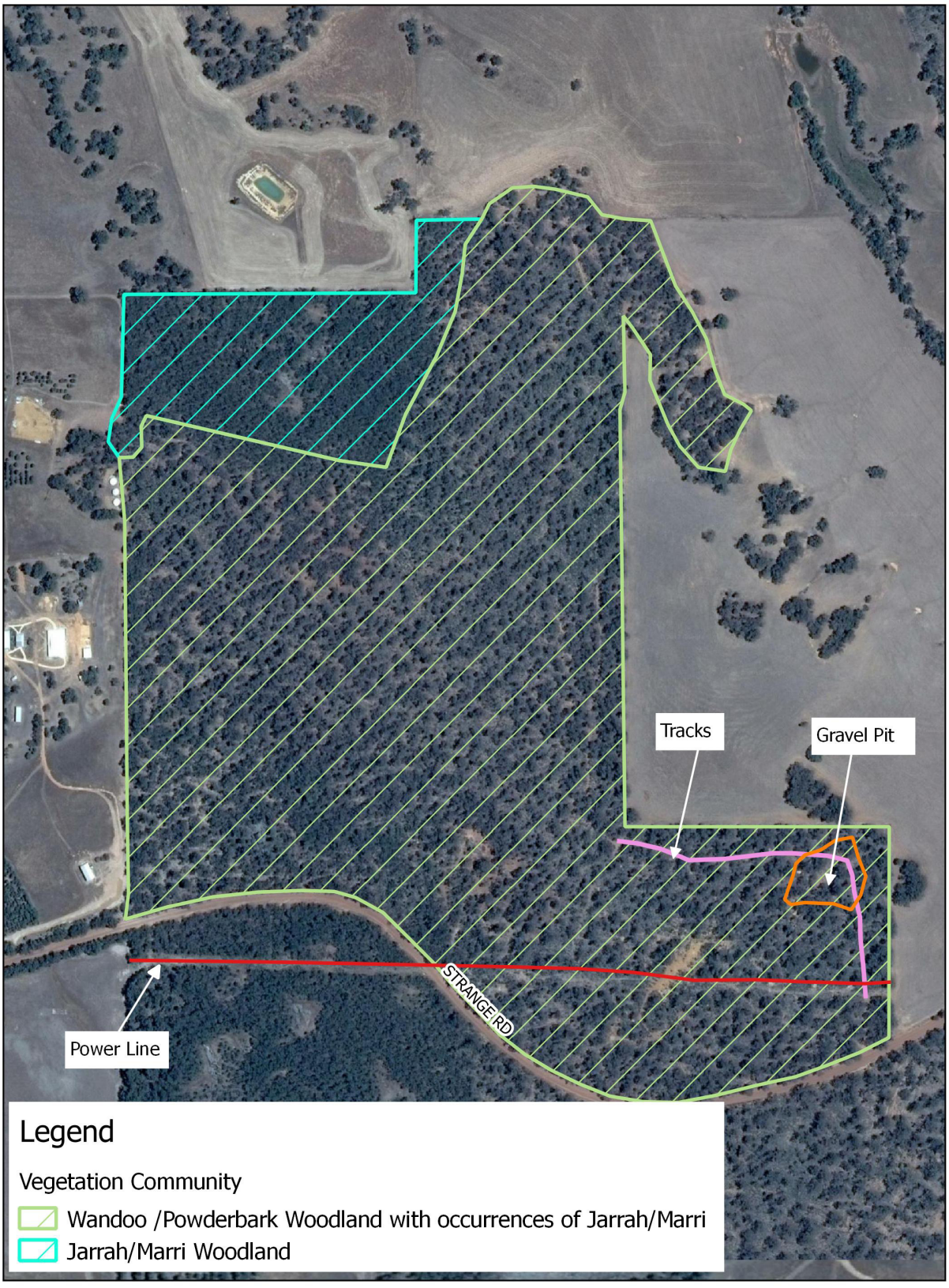

FIGURE 4B - THE NORTHERN SECTION VEGETATION COMMUNITIES

0 100 200 m

1:6,000

FIGURE 4c THE SOUTHERN SECTION VEGETATION COMMUNITIES

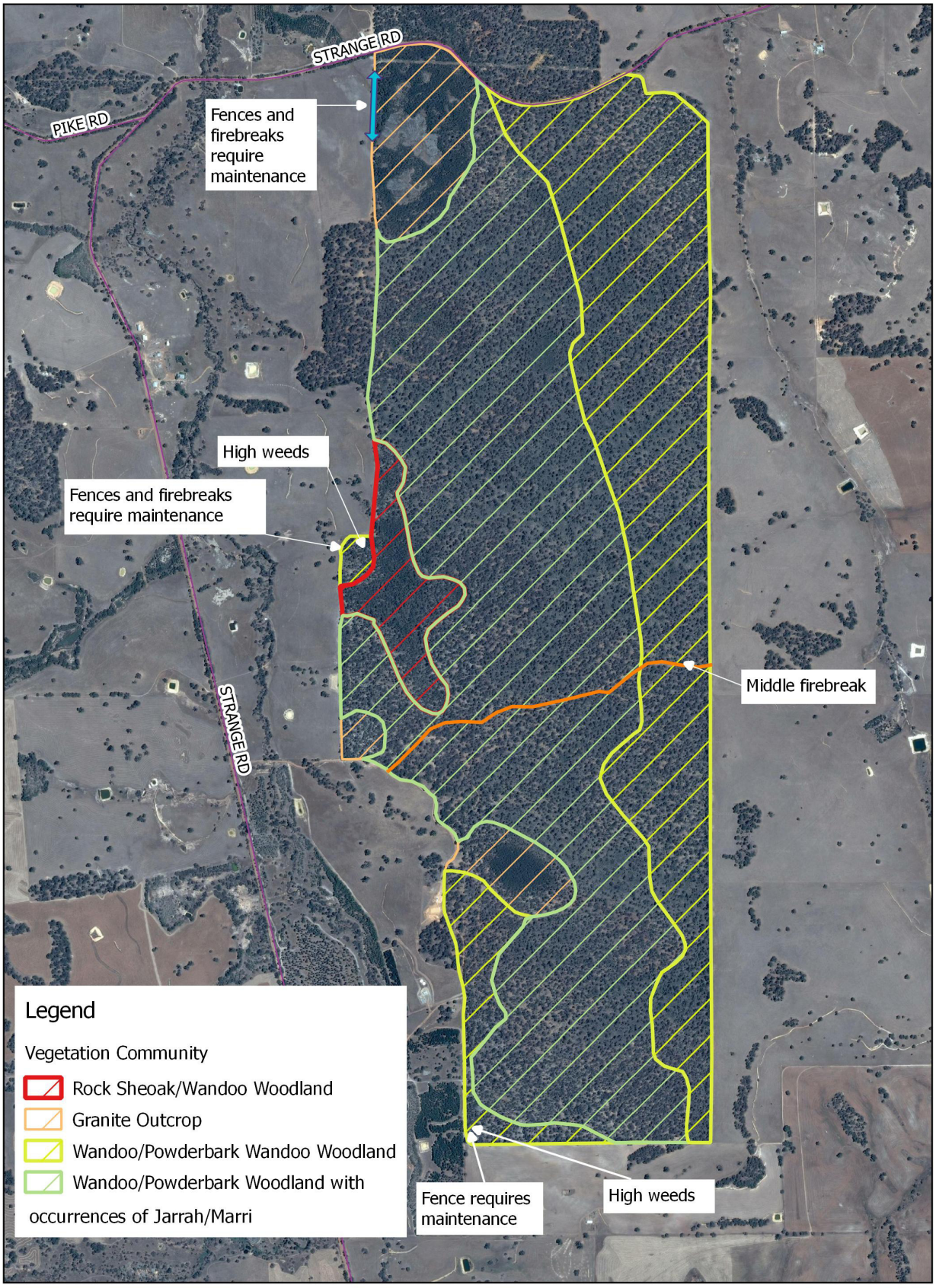

FIGURE 4C - THE SOUTHERN SECTION VEGETATION COMMUNITY

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FIGURE 5a: THE ISLAND SECTION VEGETATION CONDITION

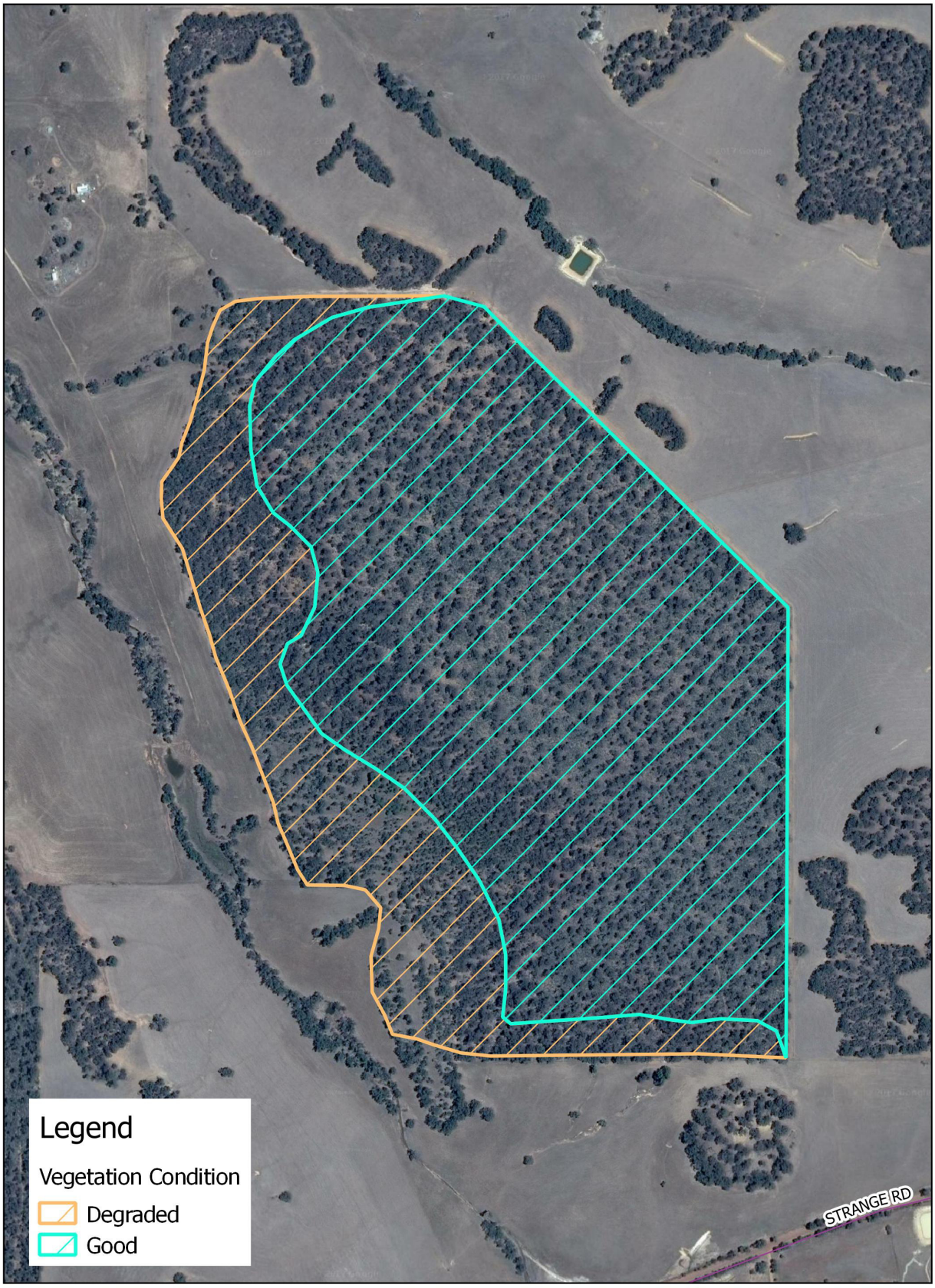

FIGURE 5A - THE ISLAND SECTION VEGETATION CONDITION

0 100 200 300 m

1:8,000

FIGURE 5b THE NORTHERN SECTION VEGETATION CONDITION

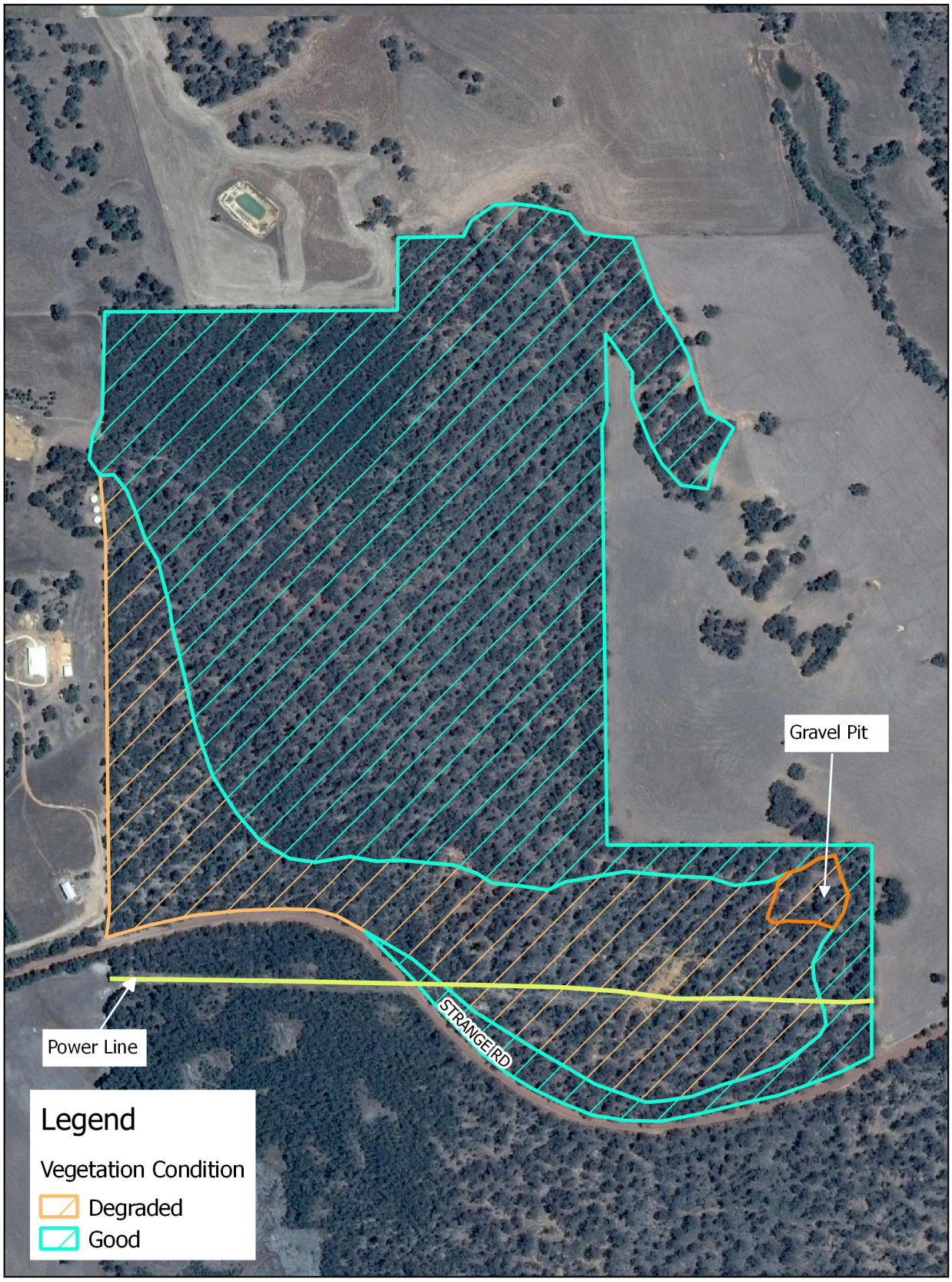

FIGURE 5B - THE NORTHERN SECTION VEGETATION CONDITION

0 100 200 m

1:6,000

FIGURE 5c – THE SOUTHERN SECTION VEGETATION CONDITION

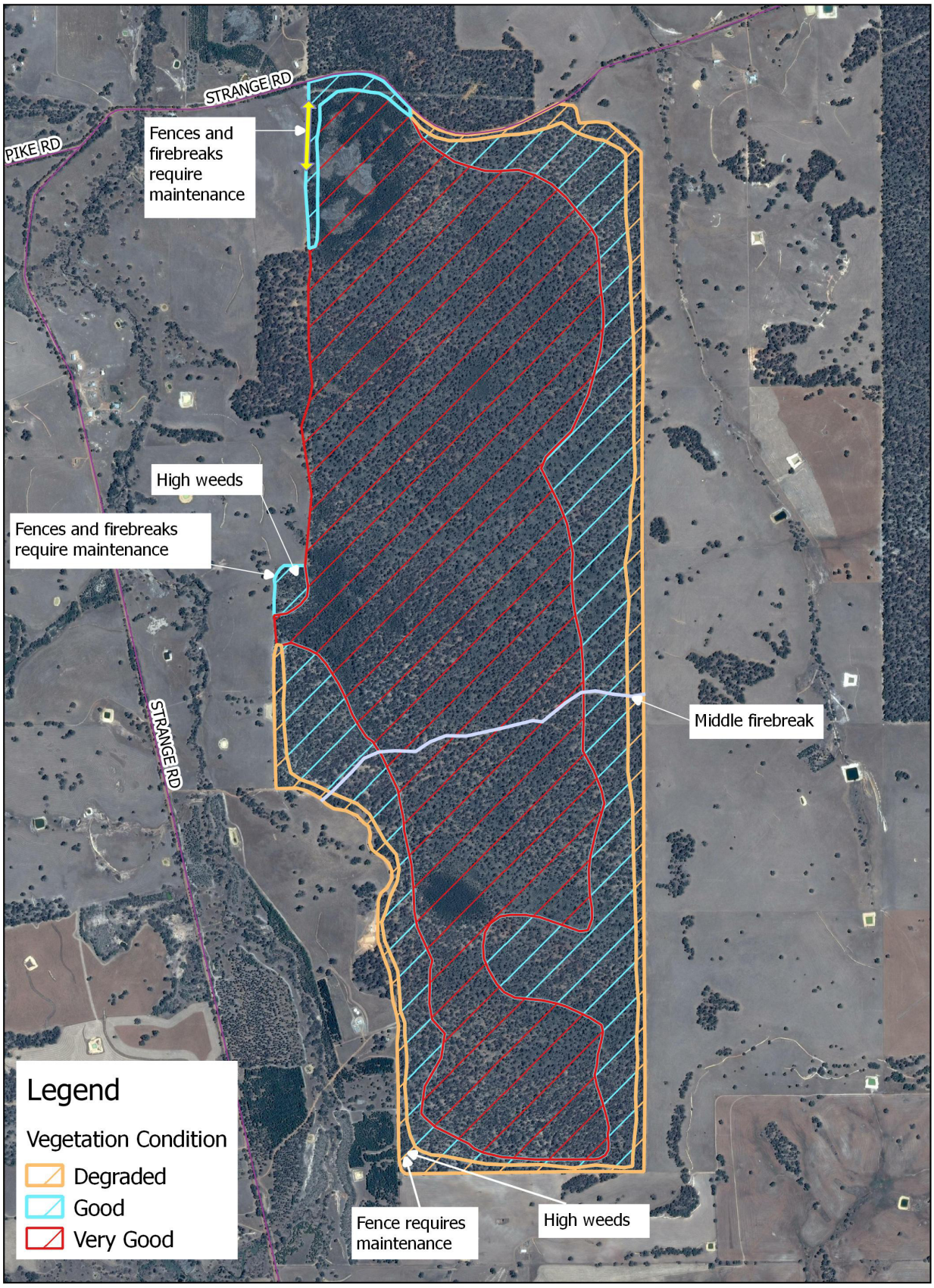

FIGURE 5C - THE SOUTHERN SECTION VEGETATION CONDITION

0 200 400 600 800 m

1:20,000

APPENDIX A
FLORA SPECIES RECORDED

APPENDIX A: Flora species recorded at Strange rd Nature Reserve in October & December 2016

Flora Species known to occur in a 5km radius of the site	Sighted
Aphelia brizula	
**Aira cupaniana* (Silvery Hairgrass)	X
**Arctotheca calendula* (Cape Weed, African Marigold)	X
**Avena barbata* (Bearded Oat)	X
**Briza maxima* (Blowfly Grass)	
**Briza minor* (Shivery Grass)	
**Lysimachia arvensis* (Pimpernel)	X
Acacia acuminata (Jam, Mangard)	
Acacia lasiocalyx (Silver Wattle, Wilyurwur)	
Acacia pulchella	X
Allocasuarina huegeliana (Rock Sheoak, Kwowl)	X
Allocasuarina humilis (Dwarf Sheoak)	X
Andersonia lehmanniana subsp. pubescens	
Asteraceae sp	X
Baeckea sp. Youndegin Hill (A.S. George 15772) P1	
Banksia nivea	X
Banksia prionotes (Acorn Banksia)	
Banksia sessilis (Parrot Bush)	X
Banksia squorrosa	X
Blennospora drummondii	
Bossiaea eriocarpa (Common Brown Pea)	
Burchardia congesta	
Caesia micrantha (Pale Grass Lily)	
Calandrinia calyptrata (Pink Purslane)	
Calytrix violacea	
Cheilanthes sieberi subsp. *sieberi*	
Chorizema aciculare subsp. *aciculare*	
Comesperma integerrimum	
Conospermum ephedroides	
Corymbia calophylla (Marri)	X
Diplolaena sp	X
Eucalyptus accedens (Powderbark)	X
Eucalyptus marginata (Jarrah)	X
Eucalyptus wandoo (Wandoo)	X
Gastrolobium sp (spiky)	X
Gastrolobium spinosum (Prickly Poison)	X
Grevillea bipinnatifida (Fuchsia Grevillea)	X
Hakea prostrata (Harsh Hakea)	X
Hibbertia hypericoides (Buttercups)	X
Hibbertia ovata	X
Hibbertia sp 1	X
Hibbertia sp 2	X
Hyalosperma cotula	X
Lechenaultia biloba (Blue Lechenaultia)	X

Lepidosperma sp	X
Leptospermum erubescens (Roadside Teatree)	X
Macrozamia riedlei (Zamia Palm)	X
Melaleuca sp	X
Neurachne alopecuroidea (Foxtail Mulga Grass)	X
Podolepis sp	X
Santalum acuminatum (Quandong)	X
Stackhousia sp	X

APPENDIX B
FAUNA SPECIES RECORDED

APPENDIX B: Fauna species recorded at Strange rd Nature Reserve in October & December 2016

Fauna Species known to occur in a 5km radius of the site	Sighted	Evidence on site
Aythya australis (Hardhead)		
Acanthiza chrysorrhoa (Yellow-rumped Thornbill)		
Acanthiza inornata (Western Thornbill)		
Agraptocorixa eurynome		
Alboa worooa		
Allodessus bistrigatus		
Anas gracilis (Grey Teal)		
Anas superciliosa (Pacific Black Duck)		
Anisops sp.		
Anopheles (Cellia) annulipes sp. D (KIM-UWA) Y		
Anthochaera lunulata (Western Little Wattlebird)		
Aquila audax (Wedge-tailed Eagle)	X	
Ardea modesta (Eastern Great Egret)		
Artamus cyanopterus (Dusky Woodswallow)		
Austrochiltonia subtenuis		
Barnardius zonarius	X	
Berosus sp.		
Calidris subminuta (Long-toed Stint)		
Candonocypris novaezelandiae		
Chenonetta jubata (Australian Wood Duck, Wood Duck)		
Chironomus aff. *alternans*		
Chironomus occidentalis		
Chironomus tepperi		
Cladopelma curtivalva		
Cladotanytarsus sp.		
Cladotanytarsus sp. A (SAP)		
Cletocamptus dietersi		
Climacteris rufa (Rufous Treecreeper)		
Colluricincla harmonica (Grey Shrike-thrush)		
Coracina novaehollandiae (Black-faced Cuckoo-shrike)	X	
Cracticus tibicen (Australian Magpie)	X	
Dacelo novaeguineae (Laughing Kookaburra)	X	
Felis catus (Domestic Cat)	X	
Macropus fuliginosus (Western Grey Kangaroo)	X	
Malurus cyaneus (Blue Wren)	X	
Oryctolagus cuniculus (European Rabbit)		X
Petroica boodang (Scarlet Robin)	X	
Phaps chalcoptera (Bronzewing pigeon)	X	
Rhipidura leucophrys (Willie Wagtail)	X	
Vulpes vulpes (Red Fox)		X