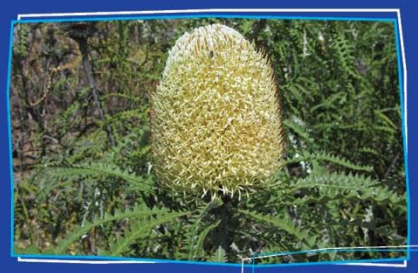
Vegetation, Flora, Fauna and Environmental Considerations, and Targeted Flora Report

Shire of Esperance Strategic Purpose Permit 20/21
Site S – Coramup Road



Report compiled by Shire of Esperance Environmental Team:
Katie White – BSc (Hons), Environmental Officer
Julie Waters – BEnvSc, Environmental Coordinator
Katherine Walkerden – BSc, Environmental Officer
Sophie Willsher - Environmental Field Assistant
Danika Penson - Environmental Field Assistant

Reviewed by Parks and Reserves Manager, Dylan Gleave

May 2021

1 Executive Summary

This 'Vegetation, Flora, Fauna and Environmental Considerations and Targeted Flora Report' has been undertaken in accordance with the 'Environmental Protection Authority (EPA) Technical Guidance, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2016)' as part of the application to the Department of Water and Environmental Regulations (DWER) to clear 2.014 ha within a 7.84 ha footprint of native vegetation for the purpose of resheeting and widening the current road footprint to improve safety standards.

2 Introduction

The Shire of Esperance endeavors to maintain a high level of road safety, being proactive in identifying high risk road designs and progressively upgrading them. The Shire of Esperance manages the largest road network of any local government in Western Australia, encompassing a total of 4 593 km of road. The Shire of Esperance is submitting 'Coramup Road' project as Site S under the '2021 Strategic Purpose Permit' (Figure 1), for the purpose of widening the road while resheeting, to meet current safety requirements for the traffic and class of road. Coramup Road is immediately surrounded by agricultural land, where large trucks and farm machinery use the road to transport goods. The narrow road can be very unsafe and needs to be widened to prevent accidents and threats to human lives. To complete these works, native vegetation up to 2.25 m from the current road footprint on both sides of the road of Coramup road is required to be cleared.

Additionally, included within the 'Site S – Coramup Rd' area is a small area on Blumann Rd, up to 300m west of the Coramup-Blumann Rd intersection is to address the Coramup Creek Bridge, which is likely to collapse in the next flood event. Addressing the structural issues with the bridge before it collapses is a priority, as remediating the bridge after a flood event would require extensive, time and resources and cause greater ecological impacts. The area required over the Coramup Creek Bridge and along Blumanns road is required to be cleared, increasing the active road footprint to 16 m on Coramup road and 22 m on Blumann road and across the bridge.

The Shire of Esperance has already mitigated and reduced impact of clearing vegetation. During the first pass discussions with the road teams, it was proposed to widen Coramup road to 28 m, which was adjusted to 16 m to ensure a suitable width of vegetation remained within the road reserve as a fauna linkage corridor and reduce general degradation, such as erosion, dust and excessive water shedding. Likewise, the proposed 28 m width for clearing for the area along Blumann road was reduced to 22 m, which is the absolute minimum width required for clearing. Further, where feasible clearing will not occur to the full permitted width, conserving vegetation.

The proposed works are located ~15 km north east of Esperance, within the Shire of Esperance managed road reserve of Coramup Rd. Specifically, it is located from 0 to 5 km south of Blumann Rd, with a small section also west from the Coramup-Blumann Rd intersection for 300 m. It is located at straight line kilometre (SLK) 3.58 to 7.29 (Main Roads 2020). A point within the proposed clearing permit area is -33.713555 S, 121.943920 E or 6269103 m N, 402145 m E (UTM Zone 51 H, GDA94).

Figure 1. Location of "Site S – Coramup Rd" approximately 15km east of Esperance at SLK 3.58 to 7.29 (Main Roads 2020)

3 Environmental Background

3.1 Scope

The removal of native vegetation to widen Coramup and Blumann roads under 'Site S – Coramup Rd' project the potential to affect a multiple environmental factors.

Possible impacts include;

- Threatened Flora (TF) and Priority Flora (PF).
- Threatened fauna; specifically, potential feeding, nesting and roosting habitat of endangered Carnaby's Black Cockatoo, *Calyptorhynchus latirostris.*
- Threatened Ecological communities (TEC) and Priority Ecological Communities (PEC), specifically the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 listed 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' (Kwongkan) TEC.

Assessing these impacts involves two approaches; desktop study and field survey. The desktop study gathered background information on the target area. The field survey allows for detailed understanding of vegetation communities, targeted flora surveys for possible TF or PF, environmental condition, presence of PEC and TEC, and overall potential impact of clearing.

3.2 Catchment

'Site S – Coramup Rd' is located within the Bandy Creek catchment area. The application area crosses and runs parallel to Coramup Creek which flows into the Lake Warden Wetland System.

3.3 Climate

The Esperance climate is described as Mediterranean, characterised by cool wet winters and dry warm summers (BoM 2020). The area receives an average annual rainfall of 618 mm.

3.4 Geology

Several geological units were identified within 'Site S – Coramup Road', by Schoknecht et al. (2004). It is described as "Quaternary aeolian sand overlying Tertiary sediments of the Pallinup formation" and "Tertiary sediments with colluvium and alluvium deposits also, granitic rock outcrops".

3.5 Soils

The soil of 'Site S – Coramup Road' is broadly defined as deep uniform sands to gravelly, yellow mottled duplex soils (Schnoknecht et al. 2004). Within the area, there has been four soil types recorded. These include:

- Esperance 9E3f Phase (245Es_9E3f): Deep uniform sand, Podzol > 80 cm (Corinup), Uc2.26, on minor river valleys, 3-8% slope - 2.65 ha
- Esperance 9E2f Phase (245Es_9E2f): Gravelly, yellow mottled duplex soil with < 30 cm of sand over gravel layer (Fleming (shallow)), Dy5.87, on minor river valleys, 3-8% slope - 1.00 ha
- Esperance 2 2b Phase (245Es_2E2b): Gravelly, yellow mottled duplex soil with 30-80 cm of sand over gravel layer (Fleming), Dy5.83, on gently undulating plain, 1-3% slope - 1.46 ha
- Esperance 2E3b Phase (245Es_2E3b): Deep uniform sand, Podzol > 80 cm (Corinup), Uc2.22, on gently undulating plain, 1-3% slope - 2.72 ha

3.6 Topography

During the field survey, topography was observed to be dominated by sandplain and creeklines. Using Schnoknect et al. (2004), the project topography is mapped at a fine scale, traversing two topographic

areas. These include:

- Minor river valleys, 3-8% slope
- Gently undulating plain, 1-3% slope

3.7 Vegetation

The site is located within the Interim Biogeographic Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) Esperance Plains region (Esp2) and Recherche sub-region. The Esp2 region is described as "Proteaceae Scrub and Mallee heaths on sandplain overlying Eocene sediments, rich in endemics. Herbfields and heaths (rich in endemics) on abrupt granite and quartzite ranges that rise from the plan. Eucalyptus woodlands occur in gullies and alluvial foot-slopes".

Beard (1973) mapped two vegetation associations (VA) within the 'Site S – Coramup Road' area – 931 & 6048 (Table 1). Both sites are considered to be extensively cleared, with VA 931 having a remaining <50% and VA 6048 <15% of pre-European distributions. In general both are also poorly represented in the conservation estate. Particularly VA 6048, which as 087% conserved in IUCN protected areas. Both vegetation types are considered to be significant to conserve, and especially VA 6048.

Table 1. Vegetation associations mapped by Beard (1973) within the 'Site S – Coramup Road', and statistics on pre-European remaining areas.
Nt. Acronyms used include Interim Biogeographic Regionalisation of Australia (IBRA), Eastern Mallee bioregion (MaL01), local government area (LGA) and International Union of Conservation Nature (IUCN).

Vegetation Association	**931**	**6048**
Description	Medium Yate woodland	Shrublands; Banksia scrub-heath on sandplain in the Esperance Plains region
Area mapped within site (ha)	0.07	2.56
Pre-European extent in IBRA region ESP2 (%)	48.49%	14.16%
Pre-European extent in LGA (%)	32.95%	14.21%
Current extent conserved in IUCN area (%)	7.93%	0.87%

3.8 Land use

The area directly included in the clearing permit application 'Site S – Coramup road' is currently intact and vegetated mostly 40m wide (but in other areas up to 200m wide) road reserve, managed by the Shire of Esperance. The current road footprint occupies 11.5 m. The surrounding land use is agricultural, primarily cropping and pasture. The area is within private community purposes zoning.

4 Methodology

4.1 Desktop study

A desktop study was completed prior to any site visit. Geographical Information System (GIS) review existing

- Existing site digital orthophotos, as sourced from LandGate (March 2018).
- Western Australian Local Government Association's (WALGA) 'Local Government Mapping (LGMap 2020)' program was used to assess spatial information of geology, topography, soil profiles, native and planted vegetation, water bodies and Interim Biogeographical Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) classification system.
- Data provided by Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Herbarium in July/August 2020 was used to assess threatened flora (TF), priority flora (PF), and threatened (TEC) and priority (PEC) ecological communities within 20 km radius of the site. Specifically, spatial data included;
    - WAHerb extract (DBCA 2020E).
    - Threatened and Priority Flora Database (TPFL; DBCA 2020C).
    - Esperance District Threatened Flora (DBCA 2020B).
    - TEC and PEC 'Likely to Occur' buffer and boundary areas (DBCA 2020D).
    - Department of Agriculture, Water and the Environment Protected Matters Search Tool
    - Index of Biodiversity Surveys for Assessment (IBSA).
- To assess fauna, the following databases were searched with a 20km buffer from the center of the site (-33º43'39"S, 121º56'33"E);
    - Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap data portal
    - DBCA Threatened and Priority Fauna database
    - BirdLife Australia's Atlas and Birdata datasets
    - Department of Agriculture, Water and the Environment Protected Matters Search Tool
    - Atlas of Living Australia database
    - Index of Biodiversity Surveys for Assessment (IBSA).

4.2 Field investigation: possible ecological impacts

The site was initially inspected on 03/09/2020, by the Shire of Esperance's Environmental Coordinator Julie Waters and Environmental Assistant Sophie Willsher. An assessment of possible ecological impacts included historical clearing, artificial water way constructions, impact of fire regimes, regeneration from disturbance, waterlogging, senescence, weeds, erosion, sedimentation, invasive fauna, *Phytophthora cinnamomi* Dieback, and illegal dumping of rubbish.

Vegetation community was also assessed during the field survey. Broad vegetation types defined by structure and composition were recorded and described. Condition of vegetation was assessed using Keighery (1994) categories, as 'Excellent', 'Very Good', 'Good', 'Degraded' or 'Completely Degraded'. This illustrates how healthy vegetation is, determined by number of dead or dying plants, weed cover and other forms of degradation. Additionally, possible environmentally sensitive areas, such as wetlands or granite, were noted. Overall, an assessment of environmental impacts to Department of Water and Environmental Regulation's (DWER) biodiversity values were inspected and valued.

Only a very basic fauna survey was conducted as per EPA (2020) guidelines. Observations of fauna presence, such as call sounds, footprints and scats were also noted, and the area assessed for suitability of endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris)* feeding, roosting and nesting habitat. Additionally, species that corresponded with suitable habitat within 'Site S – Coramup Road' identified in the desktop 20 km radius search were assessed, including Carnaby's Black

Cockatoo and the Malleefowl.

4.3 Field investigation: Assessing Threatened and Priority Ecological Communities

The vegetation community of 'Site S – Coramup Road' was assessed for the presence a TEC or PEC, specifically the Environmental Protection and Biodiversity Conservation Act 1999 listed 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' TEC. The presence of Kwongkan was identified using diagnostic characteristics defined in the 'Approved Conservation Advice for Kwongkan (Commonwealth of Australia 2014)' as;

> 2a) Characterised by Proteaceae species having 30% or greater cover of Proteaceae species across all layers where these shrubs occur (crowns measured as if they are opaque).
> And/or
> 2b) Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated.

PEC's do not have published approved conservation advice. Comparison of the vegetation community occurred using 'Priority Ecological Communities for Western Australia Version 30 (DBCA 2020A)' definitions.

4.4 Field Investigation: Targeted flora survey

The targeted flora survey was undertaken following the Environmental Protection Authority's (EPA) 'Technical Guidance, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2016)'. The entirety of the proposed impact area was surveyed on foot in mid-spring, between 11/09/2020 and 13/11/2020 by a mixture of the Shire of Esperance's environmental team, consisting of Katie White, Julie Waters, Sophie Willsher & Danika Penson. Due to the spring timing, the majority of species were flowering, decreasing the likelihood of missing species. The road was used as a continuous transect. Vegetation up to 3 meters from the edge of the existing road's back-slope was assessed to accurately cover the entire width proposed clearing permit area. Suitable associated habitat for TF or PF identified in the desktop study were particularly focused on, and extensively searched.

Due to the high diversity and complexity of Esperance's flora, all species were recorded to compile an incidental species list (Appendix 8.1, Table 7). All species unknown in the field were collected and identified exsitu, using keys, WA Herbarium's Florabase (DBCA 2021A), manuals and Esperance District Herbarium, to ensure no TF or PF were missed. Material was collected under Katie White's Regulation 61, Biodiversity Conservation Regulations 2018 Licence for Flora Taking, FT61000029, Julie Water's, FB62000139, Danika Penson's FB2000276 and Sophie Willsher's, FB6200278. Any species that were unable to be identified were submitted to the WA Herbarium for identification.

For other PF or TF species identified in the desktop survey as possible to occur, scans of pressed specimens from the local Esperance District Herbarium were taken into the field. Any flora thought to be TF or PF was formally collected, counted and mapped using a Panasonic FS-G1 Toughpad with the program ROAM or a GPS Garmin GPS64. Specimens were then lodged with the WA Herbarium for formal verification. When PF were confirmed, TPFL forms were completed and submitted to the DBCA's district Conservation Officer, and Species and Communities Branch.

5 Results and Discussion

5.1 Ecological Impact

5.1.1 Vegetation Communities

Five vegetation communities were identified within the 'Site S – Coramup Road', as defined by structure and composition (Table 7; Appendix 8.1). The incidental flora list identified a total of 113 native species across all vegetation communities indicating a high diversity for the survey site. It is believed that the Beard (1973) vegetation associations identified in Section 3.6 are an appropriate match for two of the vegetation types observed in the local scale mapping. Vegetation type two "*Banksia speciosa* woodland over *Lamertia inermis* and mixed proteaceous shrubland" matches the Beard VA 6048 "Shrublands; Banksia scrub-heath on sandplain in the Esperance Plains region". Vegetation type one is a similar match to VA 6048, but lacks the presence of Banksia species. None of the identified vegetation types suit the Beard VA 931 "Medium Yate woodland". For the other vegetation types present (three, four and five), a broad Beard VA was assigned, when interrogating the VA's that have been recorded in Esperance.

Table 2. Vegetation communities identified within proposed 'Site S – Coramup Road' project area.

Type	Description	Figure	Beard Vegetation Association	Area (ha)	Diversity (Number of Native species)
A	Open *Nuytsia floribunda* woodland over diverse Proteaceous shrubland	Yes Kwongkan	VA 6048 Shrublands; Banksia scrub-heath on sandplain in the Esperance Plains region	5.008	77
B	*Banksia speciosa* woodland, over *Lambertia inermis* and mixed proteaceous shrubland	Yes Kwongkan	VA 6048 Shrublands; Banksia scrub-heath on sandplain in the Esperance Plains region	1.108	53
D	*Taxandria lineraris* closed shrubland (Riparian)	No	VA 51: Sedgeland; reed swamps, occasionally heath	1.247	37
E	Bullrushes and Juncus within creekline	No	VA 51: Sedgeland; reed swamps, occasionally heath	0.066	11

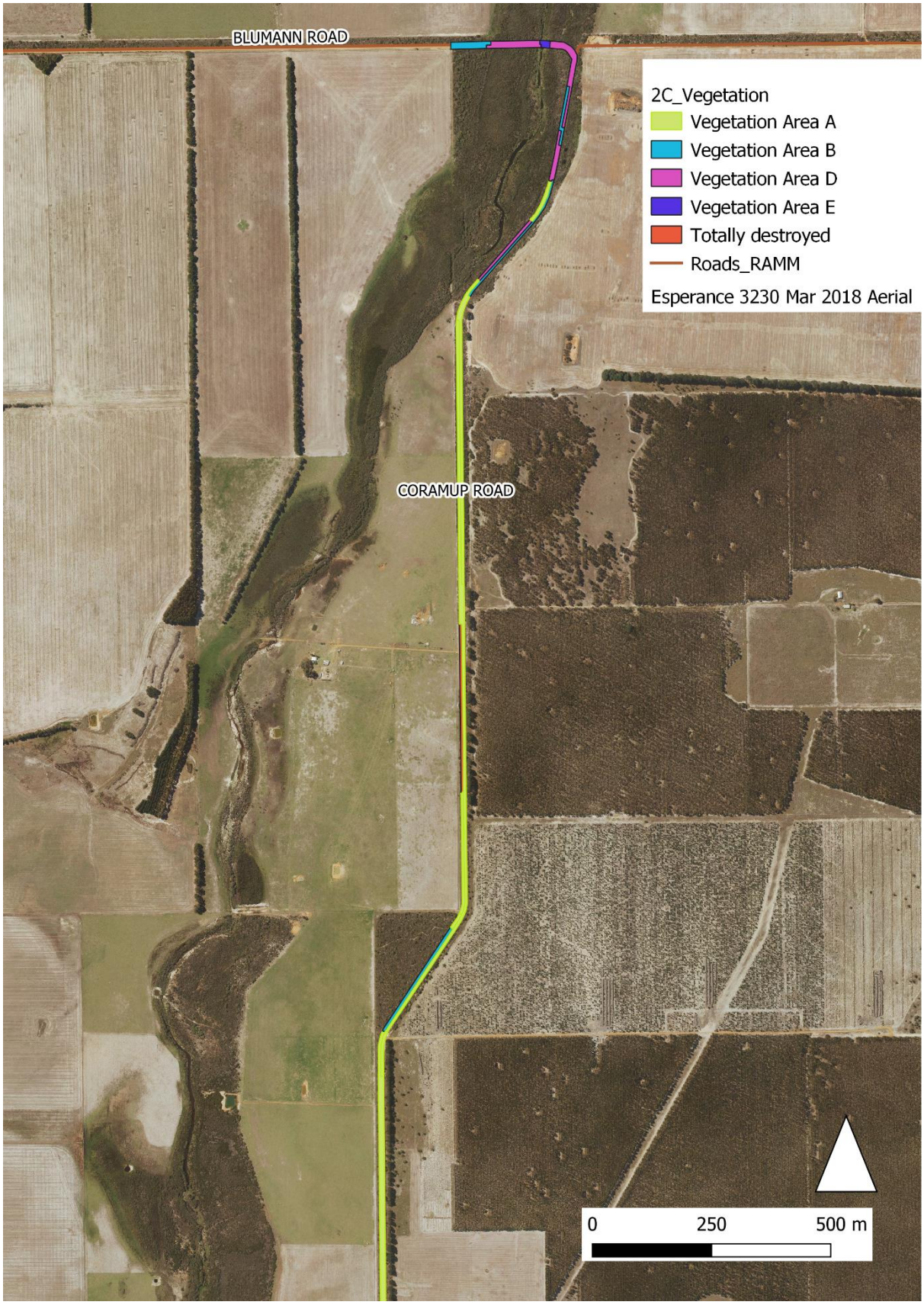


Figure 2. Vegetation types within the 'Site S – Coramup Rd' application area, from SLK 3.45 km along Coramup Rd to 10.42 along Blumann Rd

5.2 Vegetation Condition

Vegetation condition varies greatly from totally destroyed to excellent sporadically throughout the course of the road transect (Figure 3). Condition was influenced by several factors including possible multiple historic fires with inappropriate regimes, high infestation of weeds and other pest species such as rabbits, likely presence of disease in some areas and human impacts such as illegal clearing. It is unlikely proposed works will impact natural hydrological regimes of the area, despite the adjacent creekline, due to the buffer of vegetation that will remain around the creek. At the bridge works, drainage patterns will not be altered, with just infrastructure upgraded. It is also highly unlikely acid sulphate soils will develop, being the incorrect soil type present. Evidence in the form of scats, diggings and burrow suggest high presence of rabbits, foxes and feral cats. Quantifying vegetation condition, there is:

- 0.125ha of vegetation within a 7.84ha footprint (1.6%) is completely degraded,
- 0.285ha of vegetation within a 7.84ha footprint (3.6%) is degraded,
- 4.046 of vegetation within a 7.84 ha footprint (51.6%) is in good condition,
- 1.572ha of vegetation within a 7.84ha footprint (20%) is in very good condition and
- 1.625ha of vegetation within a 7.84ha footprint (20.7%) is in excellent condition.

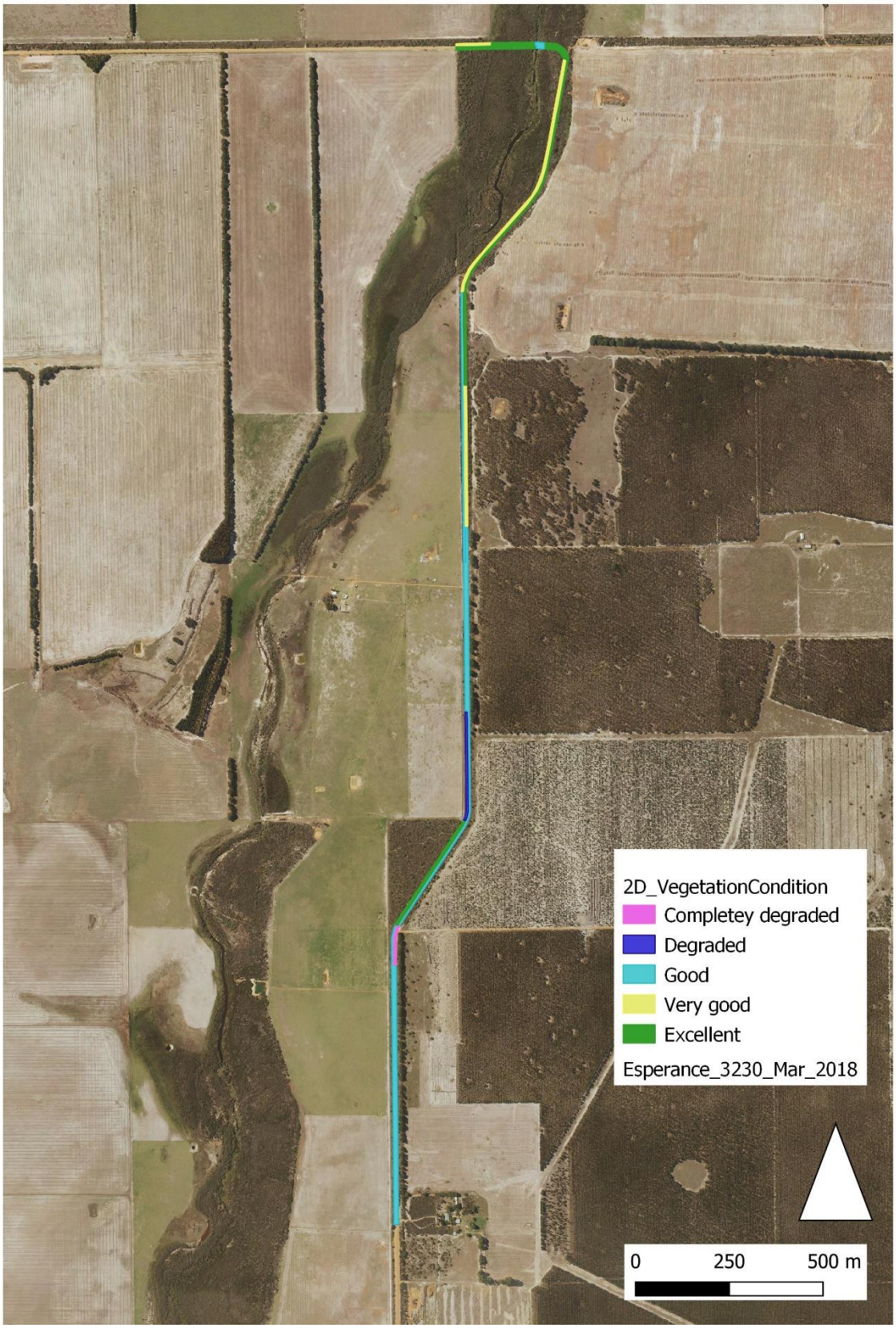


Figure 3. Vegetation condition across 'Site S – Coramup Road' project, ranging from completely degraded to excellent condition, due to primarily to degradation from high weed burden, human clearing and invasive fauna.

There was high weed invasion across the entirety of the proposed 'Site S – Coramup Road' area. Overall, 31 invasive species were identified within the project area (Appendix 8.1), which is significantly high and indicates the extent of degradation caused by invasive species within the site. Of these, the most extensive and of serious concern were African Lovegrass (*Ergrostis curvula)* and Victorian Tea Tree (*Leptospermum laevigatum),* which are a significant environmental weeds. It is highly likely that proposed works will increase the distribution of weeds and degrade vegetation along the entire road reserve where works occur. Ideally, regular wash downs during the course of works to remove weed seeds or follow up herbicide control of invasive species needs to occur. However, this will be extremely expensive to employ contractors and mobilise equipment, which may not be feasible with given budgets.

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2020) data shows no *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the immediate area, which is likely due to the lack of sampling that has occurred on road reserve. Despite this, in field surveys saw likely evidence of Dieback effected Banksia sp. and other Proteaceous species, with scattered deaths present (Figure 4). This may be due to natural senescence from old age. The indicator signs for a plant pathogen were mostly restricted from from SLK 4.01 to 4.45 of Coramup road. This area should be treated with extra precaution to limit the spread of the disease, and suggested to complete these works last or wash down prior to continuing with the road resheet. Proposed works will be conducted using appropriate hygiene measures to limit spreading of the disease, including clearing in dry conditions and clean down of vehicles and machinery before entering the site. However, there is always a possibility that proposed works will extensively spread *P. cinnamomi* dieback along Coramup and Blumann Rd due to proposed works.

Figure 4. Dying *Banksia speciosa* within SLK 4.01 to 4.45 of Coramup Rd and the 'Site S – Coramup Rd' area, this may indicate the presence of dieback, or may be natural senescence.

5.3 Threatened and Priority Ecological Communities

The desktop study identified the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 listed threatened ecological community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' within 'Site S – Coramup Road' project area. No other TEC's or priority ecological communities (PEC) were identified by the desktop study as being within "Site S – Coramup Road" or within a 20 km buffer of the site.

Two vegetation communities, Vegetation A described as 'Open *Nuytsia floribunda* woodland over diverse Proteaceous shrubland' and Vegetation B '*Banksia speciosa* woodland, over *Lambertia inermis* and mixed proteaceous shrubland' met criteria to be considered as Kwongkan TEC. However, due to several degrading factors, only those areas within these vegetation communities in excellent and very good condition were considered as Kwongan TEC (Figure 5). In total, 1.237 ha of vegetation within a 2.48 ha footprint was considered as Kwongkan TEC present within 'Site S – Coramup Road' area.

Figure 5. Vegetation communities of vegetation type A 'Open *Nuytsia floribunda* woodland over diverse Proteaceous shrubland' and vegetation type B *'Banksia speciosa* woodland, over *Lambertia inermis* and mixed proteaceous shrubland' in very good and excellent condition met threatened ecological community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' within 'Site S – Coramup Road' project.

5.4 Threatened and Priority Flora

Two threatened flora (TF) and 44 priority flora (PF) were recorded within a 20 km radius of the proposed impact site (Table 3; DBCA 2020C, DBCA 2020B, DBCA 2020E). Of these 22 PF species had suitable known associated habitat that corresponded with vegetation communities and soil type of 'Site S – Coramup Road' project. There were no confirmed existing records, indicating known populations of TP or PF, directly located within the application area.

Table 3. Threatened or priority flora identified by the desktop study to be present within a 20 km radius of 'Site S – Coramup Road' project area, using Threatened and Priority Flora Reporting (TPFL; DBCA 2020C), WA Herbarium (DBCA 2020E) and Esperance District Threatened Flora (DBCA 2020B).
Nt. Acronyms used in the table include priority flora (P), threatened flora (TF), Biodiversity Conservation (BC) Act 2018, Environmental Protection and Biodiversity Conservation (EPBC) Act 1999, critically endangered (CN) and endangered (EN).

Species	Conservation Status	Associated Habitat	Likely to occur
Adelphacme minima	P3	Open woodland with scattered Nuytsia, Eucalyptus and Banksia. Common sandplain Kwongkan. *Banksia speciosa* with Anarthria. Well drained pale grey sands	Yes
Angizanoths bicolor subsp. *minor*	TF	Granite ephemeral damp areas with Drosera and moss	No
Astartea reticulata	P3	Restricted to damp areas/seasonal wetlands – including road futters	Possible
Astroloma sp. Grass Patch	P2	Grass Patch area. Grey-white fine sand over clay on margins of salt lake	No
Baeckea sp. Gibson	P1	Only known from two locations – Beaumont and Gibson. Crows with *Melaleuca uncinata, Eucalyptus grossa, Acacia lasiocalyx*	Unlikely
Banksia prolata subsp. *calciola*	P4	Limestone directly on the coast	No
Beyeria physaphylla	P1	Only two known populations near Scaddan. Mallee Eucalypt woodland with Melaleuca sp. and mixed Eucalyptus	Unlikely
Brachyloma mogin	P3	Grey clayey sand on swamp flats. Mostly recorded in Albany-Kojonup area. Only a few records in Esperance	Unlikely
Comesperma calcicola	P3	Calcerous or semi-saline clay loam limestone	No
Comesperma griffinii	P2	Yellow or grey sand on plains. Scattered across WA. Assoc veg by Verticordia, fabaceae sp.	Possible
Commersonia rotundifolia	P3	Few scattered populations from Fitzgerald to Gibson. Recorded in Mallee woodland	Unlikely
Conostephium marchantiorum	P3	Across whole of Esperance area. Grey, light yellow sandy soil. Open mallee and scrub heath. Associated Eucalyptus tetragona, Eucalyptus angulosa, Banksia media	Possible
Cyathostemon sp. Esperance	P1	Only 2 records on Quast Rd and 1967 record. Little known	Unknown
Dampiera sericantha	P3	Disturbed gravel. Kwongkan shrublands	Yes
Dampiera triloba	P3	Low woodlands with Banksia and Melaleuca. Mixed shrublands	Yes
Darwinia sp. Gibson	P1	Gibson-Scadan area. Margins of salt lake sand road verges.	No
Daviesia pauciflora	P3	Deep sands	Yes
Eucalyptus dolichorhyncha	P4	Mallee woodlands in Grass Patch area	No

Eucalyptus famelica	P3	Across coastal and subcoastal Hopetoun and Esperance aera. Tolerates saline waterlogged soils in open Mallee community	Unlikely
Eucalyptus foliosa	P3	Small area in Gibson/Scaddan. Grey/white sandy clay flats adjacent to salt lakes	Possible
Eucalyptus litorea	P2	Restricted to Cape arid. Sand dunes around coastal salt lakes.	Unlikely
Eucalyptus merrickiae	TF	Margins of salt lakes in Scaddan area	No
Eucalyptus x missilis	P4	Coastal area. Sand over limestone.	Possible
Eucalyptus preissiana subsp. *lobate*	P4	Coastal limestone rises and sand dunes	No
Eucalyptus semiglobosa	P3	White sand over laterite, silty sand on granite shelf, limestone,	Possible
Frankenia glomerata	P4	White sands, margin of salt lakes, grey sandy loams. Various associated habitats and soils.	Possible
Hibbertia carinata	P1	Well drained gravelly sand, yellow sand with gravel	Possible
Hibbertia turleyana	P1	Gibson area. Long skinny leaves. Sandy soils that may be seasonally inundated. Banksia heath or Mallee shrubland	Possible
Hopkinsia adscendens	P3	Sand. Dry or seasonally damp habitats	Possible
Kunzea salina	P3	Scaddan area on white sand over clay on margins of salt lakes	No
Lepidium fasciculatum	P3	Grows across Southern Aus. Little known on preference	Possible
Leucopogon corymbiformis	P2	Mostyl recorded in Cape Arid. Subcoastal dunes	Unlikely
Leucopogon interruptus	P3	Grey sand over granite	Unlikely
Leucopogon rotundifolius	P3	Various habitats – coastal, gravel	Possible
Lobelia archeri	P1	Non-calcerous sand hill. After fire. Requires open space	Unlikely
Melaleuca dempta	P3	Sub-coastal tertiary sand dunes. Mixed shrublands.	Possible
Myriophyllum muelleri	P4	Ephemeral rock pools	No
Paraclaena parvula	P2	Deep white sands in mallee heath with *Banksia media*	Possible
Patersonia inaequalis	P2	Sandy clay, lateritic or granitic sand	Possible
Persoonia scabra	P3	Granite, limestone, Mixed shrubland with Proteaceae	Possible
Pityrodia chrysocalyx	P3	Salmon Gums area. Sandplains with yellow sands. Associated with Eucalyptus Mallee woodlands with *Banksia media* and Hakea sp.	Unlikely
Pterostylis faceta	P3	Various habitats – Melaleuca Mallee scrubland, Granite, sandy loam	Possible
Schoenus sp. Grey Rhizome	P1	Sandy clay, sand	Possible
Teticornia indefessa	P2	Edge of salt lakes	No

Numerous specimen's unknown to surveyors were collected and verified at the WA Herbarium as non-threatened species, such as *Sphaerolobium macranthum* (Accession #8888; JW01821) and *Dampiera fasciculata* (Accession #8888; JW01721)

5.5 Fauna

Within a 20 km radius of the 'Site S – Coramup Road', 618 fauna have previously been recorded. Of these, 44 species are threatened fauna, priority fauna and fauna protected under international agreement have been recorded (Table 4). Two species have suitable habitat within the proposed clearing permit area, including Carnaby's Black Cockatoo (*Calyptorhynchus latiroastris)* and the Malleefowl (*Leipoa ocellata)*.

Table 4. Potential threatened, priority and protected under international agreement fauna recorded within a 20 km radius of the proposed 'Site S – Coramup Road'. Nt. Acronyms used include priority (P), threatened (T), and protected under international agreement (IA).

Scientific Name	Common Name	Conservation Status	Likelihood of occurring	Associated habitat
Acanthophis antarcticus	Southern Death Adder	P3	Unlikely	Mallee and coastal vegetation.
Actitis hypoleucos	Common Sand piper	IA	No	Shorebird
Apus pacificus	Fork tailed Swift or Pacific Swift	IA	No	Lives close to the coast
Arctocephalus forsteri	New Zealand Fur Seal	S	No	Lives in the ocean
Arenaria interpres	Ruddy Turnstone	IA	No	Shorebird
Calidirs acuminate	Sharp-tailed Sandpiper	IA	No	Shorebird
Calidiris alba	Sanderling	IA	No	Shorebird
Calidris canutus	Red knot	IA	No	Shorebird. Rarely found at inland lakes
Calidris canutus subsp. Rogersi	Red Knot (north eastern Siberia)	T	No	Shorebird. Rarely found at inland lakes
Calidris ferrunginea	Curlew sandpiper	T	No	Shorebird
Calidris melanotos	Pectoral sandpiper	IA	No	Shorebird
Calidris ruficollis	Red-necked stint	IA	No	Shorebird
Calidris tenuirostris	Great Knot	T	No	Lives in coastal mudflats
Calyptorhynchus latiroastris	Carnaby's Cockatoo	T	Yes	Eucalyptus woodlands, shrublands and kwongkan heath
Calyptorhynchus sp.	White-tailed black cockatoo	T	No	Karri forests of the deep south-west of Western Australia
Cereopsis novaehollandiae	Cape Barren Goose	T	No	Associated with offshore islands, improved pastures or clovers, salty ground with native succulents, camps on margins of dams, fresh or brackish swamps and lakes.
Cereopsis novaehollandiae subsp. Grisea	Recherche Cape Barren Goose	T	No	Associated with offshore islands, improved pastures or clovers, salty ground with native succulents, camps on margins of dams, fresh or brackish swamps and lakes.
Charadrius bicinctus	Double-banded plover	IA	No	Shorebird
Charadrius leschenaultia	Greater sand plover	T	No	Shorebird
Charadrius mongolus	Lesser sand plover	T	No	Shorebird
Dermochelys coriacea	Leatherback turtle	T	No	Lives in the ocean
Diomedea exulans	Wandering albatross	T	No	Spends most of its time in flight
Eubalaena australis	Southern Right Whale	T	No	Lives in the ocean

Falco peregrinus	Peregrine falcon	S	No	Broad habitat range, but prefer woodlands or tall trees for nesting
Geotria australis	Pouched lamprey	P3	No	Lives in the ocean
Hydroprogne caspia	Caspian Tern	IA	No	Coastal
Isoodon fusciventer	Quenda, southwestern brown bandicoot	P4	Yes	dense understory around swamps and banksia and jarrah woodlands
Leipoa ocellata	Malleefowl	T	Possible	Semi-arid shrublands and low woodlands dominated by mallee and/or acacia
Limosa lapponica	Bar-tailed godwit	IA	No	Shorebird
Neophioca cinerea	Australian sea-lion	T	No	Lives in the ocean
Notamacropus irma	Western Brush Wallaby	P4	Possible	Open seasonally wet flats with loss grasses and scrubby thickets. Open forest or woodland
Oxyua australis	Blue-Billed Duck	P4	No	Almost entirely aquatic, seldom seen on land.
Plegadis falcinellus	Glossy ibis	IA	No	Well vegetated wetlands, floodplains and mangroves. A non-breeding visitor to south west WA
Pluvialis fulva	Pacific Golden Plover	IA	No	Shorebird
Pluvialis squatarola	Grey Plover	IA	No	Shorebird
Stercorarius antartcticus	Brown Skua	P4	No	Seen offshore, less often closer to the coast
Thalassarche chlororhynchos	Atlantic Yellow-nosed Albatross	T	No	Only coastal and offshore waters
Thalasseus bergii	Crested tern	IA	No	Coastal and offshore waters
Thinornis rubricollis	Hooded plover	P4	No	Ocean beaches and the edges of near-coastal and inland salt lakes
Tringa brevipes	Grey-tailed tatter	P4	No	Shorebird
Tringa glareola	Wood Sandpiper	IA	No	Shorebird
Tringa nebularia	Common greenshank	IA	No	Shorebird
Tringa stagnatilis	Marsh sandpiper	IA	No	Shorebird
Westralunio carteri	Carter's Freshwater mussel	T	No	Widespread in lentic systems

5.5.1 Carnaby's Black Cockatoo, *Calyptorhynchus latirostris*, threatened fauna

Large Tuart and Blue Gum trees are present directly adjacent to the survey area, along the fenceline perimeter of the road reserve and farmland. Carnaby's Black Cockatoo were sighted roosting in these trees when the survey was completed. It is possible Carnaby's Black Cockatoo's nest within the 'Site S – Coramup Road' project area, as large trees are present with hollows. Carnaby's Black Cockatoos forage on Proteaceae species nuts, such as Hakea or Banksia species. Vegetation type's one and two, which both meet Proteaceae dominated kwongkan shrubland TEC criteria, and are dominated by

Banksia, Hakea and Grevillea species are highly suitable vegetation types for the cockatoo. Non-native planted Pine Trees to the south of the project had Carnaby's Cockatoos observed in them as well, and based on both the observations of the species presences, and the suitability of vegetation for foraging, it is likely that clearing activity will have an impact on the Carnaby's habitat.

5.5.2 Quenda, *Isoodon fusciventer*, priority four fauna

Quendas live in dense understorey vegetation, particularly around swamps. Within 'Site S – Coramup Road', vegetation D *Taxandria lineraris* closed shrubland (Riparian) would be suitable for inhabitation by quendas. No quendas or burrows were observed during the survey however this does not indicate their absence, as they are most active during dawn and dusk and usually stay close to vegetation cover.

5.5.3 Western Brush Wallaby, *Notamacropus irma*, Priority 4 fauna

The western brush wallaby's optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland. Vegetation types A, B and D may provide suitable habitat for Western Brush Wallabies, and the surrounding agricultural land also offers potential grazing areas. The area may not be open enough; however it is still possible that they utilise vegetation within the proposed 'Site S – Coramup Road' area.

6 Conclusion; assessment of Department of Water and Environmental Regulations clearing principles

The 'Site S – Coramup Road' project may be at variance to some of the clearing principles that the Department of Water and Environmental Regulations (DWER) assess applications, as listed under Schedule 5 of the Environmental Protection Act 1986 (DWER 2019).

Site 'S – Coramup Road' already has a high weed burden with key weed threats being exceptionally competitive and easy to spread. It is almost certain that development within the road reserves of this project will further the spread of these weeds and could become an issue on Coramup and Blumann roads. *Phytophthora cinnamomi* was not recorded on a desktop survey, however signs of dieback were observed in field, in an isolated patch of the road reserve. Presence of the disease will likely increase with or without the influence of development but strategic management will be implemented to reduce the spread to unaffected areas.

Table 5. Shire of Esperance Assessment against Clearing Principles of the proposed 'Site S - Coramup Road'.

Assessment against Clearing Principles	Conclusion
Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	Biodiversity at this site is high with 113 native species recorded over four vegetation communities
Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Carnaby's cockatoo, *Calyptorhynchus latirostris,* was observed roosting in the planted pine trees in the eastern road reserve. This species would also find suitable foraging habitat in vegetation types A and B.

Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No rare flora was recorded within the application area
Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	2.139ha in a 7.84ha application area meets the definition of TEC "Proteaceae Dominated Kwongkan Shrublands."
Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	There is large areas of uncleared vegetation immediately adjacent to the application area
Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	Some wetland vegetation (vegetation E) is in this application area. However the Coramup Creek creeekline already has a bridge traversing it and additional impacts are small.
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Soil types in the area are unlikely to erode or become degraded due to this road widening.
Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of the vegetation is unlikely to have an impact on the environmental values of Woody Lake Nature Reserve 7km south of the application area.
Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	There may be some temporary deterioration of water quality during bridge reconstruction, however after the bridge is structurally repaired these impacts will be minimal
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Natural flows under the new bridge will be maintained and is likely to improve flow through the bridge reducing the intensity of flooding.

7 References

Adams E. (2012), *Shire of Esperance Threatened and Priority Flora: Field guide,* unpublished for the Department of Environment and Conservation

Beard J.S. (1973), *The vegetation of the Esperance and Malcom areas, Western Australia, 1:250 000 series*, Vegmap Publications Perth

Bureau of Meteorology (2020), *Esperance climate,* Commonwealth of Australia, <http://www.bom.gov.au/>

Commonwealth of Australia (2014), *Approved Conservation Advice for Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia*, Department of Agriculture, Water and the Environment, <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/126-conservation-advice.pdf>

Commonwealth of Australia, *Environmental Protection and Biodiversity Conservation Act 1999* (Cth), < https://www.legislation.gov.au/Details/C2019C00275>

Department of Agriculture and Food of Western Australia (2002), *Beaumont-Condingup Area: Catchment Appraisal 2002 Resource Management Technical Report 238*, Department of Agriculture and Food of Western Australia

Department of Biodiversity, Conservation and Attractions (2020A), *Priority Ecological Communities for Western Australia Version 30,* Government of Western Australia

Department of Biodiversity, Conservation and Attractions (2020B), *Esperance district Threatened and Priority Flora spatial dataset,* Government of Western Australia [20/07/2020]

Department of Biodiversity, Conservation and Attractions (2020C), *Threatened and Priority Flora Database (TPFL) spatial dataset, 19-0720FL,* Government of Western Australia. [20/07/2020]

Department of Biodiversity, Conservation and Attractions (2020D), *Threatened Ecological Communities and Priority Ecological Communities Search Results, for Boundaries and Buffers,,01-0820EC,* Government of Western Australia. [18/08/2020].

Department of Biodiversity, Conservation and Attractions (2020E), *Western Australia Herbarium spatial dataset, 19-0720FL,* Government of Western Australia. [20/07/2020]

Department of Biodiversity, Conservation and Attractions (2021A) *Florabase*, The Flora of Western Australia Online (and collections housed at the WA Herbarium). < https://florabase.dpaw.wa.gov.au/search/advanced.>

Department of Biodiversity, Conservation and Attractions and Western Australian Museum (2020), *NatureMap*, Government of Western Australia. <https://naturemap.dbca.wa.gov.au/>

Department of Environment and Energy (2014), *Draft National Recovery Plan for the Australasian Bittern, Botaurus poiciloptilus*, Commonwealth Government of Australia <https://www.environment.gov.au/system/files/consultations/9a03b781-7f67-4874-a919-cf53cd1eee60/files/draft-recovery-plan-australasian-bittern.pdf>

Department of Parks and Wildlife (2017), *2016 Statewide Vegetation Statistics (formerly the CAR Reserve Analysis – Full Report',* Government of Western Australia

Department of Water and Environmental Regulations (2019), *Procedure: Native vegetation clearing permits, Application, assessment, and management requirements under Part V Division 2 of the Environmental Protection Act 1986*, Government of Western Australia. [October 2019]. < https://dwer.wa.gov.au/sites/default/files/Procedure_Native_vegetation_clearing_permits_v1.PDF>

Environmental Protection Authority (EPA) (2016), Technical Guidance, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, Government of Western Australia. < http://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment>

Environmental Protection Authority 2020, Technical Guidance – Terrestrial vertebrate fauna surveys for Environmental Impact Assessment, EPA, Western Australia. <https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA-Technical-Guidance-Vertebrate-Fauna-Surveys.pdf>

GAIA Resources, State NRM and South Coast Natural Resource Management (2020), *Dieback Information Delivery and Management Service, DIDMS*. < https://didms.gaiaresources.com.au/>

Keighery, B.J. (1994). *Bushland plant survey. A guide to plant community survey for the community*.

Main Roads of Western Australia (2020), *Standard Line Kilometres online application*, Government of Western Australia. < https://mrapps.mainroads.wa.gov.au/gpsslk>

Schoknecht, N., Tille, P. and Purdie, B. (2004) *Soil Landscape Mapping in south-western Australia*, Resource management Technical report 20, Department of Agriculture WA.

Thackway R, Cresswell ID, Shorthouse D, Ferrier S, Hagar T, Pressey T, Wilson P, Fleming M, Howe D, Morgon G, Young P, Copley P, Peters D, Wells P, Miles I, Parkes D, McKenzie N, Thackway R, Kitchin M & Bullen F (1995), *Interim Biodigeographic Regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperative Program,* Australia Nature Conservation Agency. < https://www.environment.gov.au/system/files/resources/4263c26f-f2a7-4a07-9a29-b1a81ac85acc/files/ibra-framework-setting-priorities-nrs-cooperative-program.pdf >

Western Australian Government, *Biodiversity Conservation Act 2018*. < https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s50938.html>

Western Australian Government, *Landgate,* < https://www0.landgate.wa.gov.au/>

Western Australia Local Government Association (WALGA), *Local Government Mapping* spatial database.

Wildflower Society of WA (Inc.). Nedlands, Western Australia.Overhue, T.D., Snell, L.J., Johnston, D.A.W. (1993), *Esperance land resource survey, Western Australia*, Department of Agriculture

8 Appendix

8.1 Incidental species list

Table 7. Species recorded by vegetation type during 'Site S – Coramup Road' surveys

Family	Genus	Species	Common Name	Weed	Vegetation Type			
					A	B	D	E
Anarthriaceae	*Anarthria*	*laevis*			X			
Anarthriaceae	*Anarthria*	*scabra*				X		
Anarthriaceae	*Anarthria*	*scabra*			X	X	X	
Anarthriaceae	*Lyginia*	*imberbis*			X	X		
Asparagaceae	*Laxmannia*	*brachyphylla*	Stilted paperlily		X			
Asparagaceae	*Lomandra*	*hastilis*			X			
Asparagaceae	*Myrsiphyllum*	*aspagoides*	Bridal Creeper	X	X	X	X	
Asteraceae	*Arctotheca*	*calendula*	Cape weed	X	X	X		
Asteraceae	*Blennospora*	*drummondii*	Dwarf beauty-heads			X		
Asteraceae	*Cirsium*	*vulgare*						X
Asteraceae	*Hyalosperma*	*demissum*				X		
Asteraceae	*Hypochaeris*	*glabra*	smooth cats-ear			X		
Asteraceae	*Hypochaeris*	*radicata*	Flat Weed daisy	X	X			
Asteraceae	*Millotia*	*tenuifolia var. tenuifolia*	Soft millotia		X	X		
Asteraceae	*Opercularia*	*vaginata*			X			
Asteraceae	*Sonchus*	*oleraceus*		X	X			
Asteraceae	*Ursinia*	*anthemoides*					X	
Asteraceae	*Ursinia*	*anthemoides*	Ursinia Daisy	X	X	X	X	
Brassicaceae	*Raphanus*	*raphanistrum*	Wild Radish	X	X	X	X	
Brassicaceae	*Raphnus*	*rugosum*	Wild Mustard	X	X			
Casuarinaceae	*Allocasuarina*	*humilis*	dwarf sheoak		X	X	X	
Casuarinaceae	*Allocasuarina*	*thuyoides*	Horned Sheoak		X	X		
Cyperaceae	*Baumea*	*arthrophylla*					X	X
Cyperaceae	*Baumea*	*juncea*	Bare Twigrush			X	X	X
Cyperaceae	*Caustis*	*dioica*	Puzzle Grass		X	X	X	
Cyperaceae	*Ficinia*	*nodosa*						X
Cyperaceae	*Gahnia*	*trifida*	Saw Sedge				X	
Cyperaceae	*Isolepis*	*marginata*			X		X	
Cyperaceae	*Lepidobolus*	*preissianus*			X	X		
Cyperaceae	*Lepidosperma*	*sp.*			X	X	X	
Cyperaceae	*Mesomelaena*	*stygia*			X			
Cyperaceae	*Mesomelaena*	*tetragona*	Semaphore Sedge		X			
Cyperaceae	*Schoenus*	*breviculmis*			X			
Dilleniaceae	*Hibbertia*	*gracilipes*	Australian Butter Cup			X		
Dilleniaceae	*Hibbertia*	*oligantha*			X	X		
Dilleniaceae	*Hibbertia*	*racemosa*			X	X	X	
Droseraceae	*Drosera*	*trichocaulis*				X		

Ericaceae	*Leucopogon*	*carinatus*			X	X		
Ericaceae	*Styphelia*	*melaleucoides*			X			
Ericaceae	*Styphelia*	*prostrata*						
Fabaceae	*Acacia*	*cyclops*	Coastal Wattle		X	X	X	
Fabaceae	*Acacia*	*saligna*	Golden wreath wattle		X	X	X	X
Fabaceae	*Acacia*	*sp.*					X	
Fabaceae	*Aotus*	*sp. Esperance*			X	X		
Fabaceae	*Daviesia*	*aphylla*			X			
Fabaceae	*Gastrolobium*	*spinosum*			X			
Fabaceae	*Gompholobium*	*knightianum*			X			
Fabaceae	*Jacksonia*	*spinosa*			X	X		
Fabaceae	*Jacksonia*	*veinosa*			X			
Fabaceae	*Lupinus*	*cosentinii*			X			
Fabaceae	*Ornithopus*	*sativus*		X	X			
Fabaceae	*Sphaerolobium*	*macranthum*			X			
Geraniaceae	*Erodium*	*cicutarium*	Storksbill Pelargonium	X	X			
Geraniaceae	*Pelargonium*	*capitatum*	Rose Pelargonium	X	X		X	X
Goodeniaceae	*Goodenia*	*incana*			X			
Goodinaceae	*Dampiera*	*fasiculata*			X	X	X	
Haemodoraceae	*Anigozanthos*	*rufus*			X			
Haemodoraceae	*Haemodorum*	*spicatum*	Blood Root		X			
Hemerocallidaceae	*Agristocrinum*	*scabra*			X			
Hemerocallidaceae	*Dianella*	*revoluta*			X			
Iridaceae	*Patersonia*	*lanata*	Woolly patersonia		X			
Iridaceae	*Romulea*	*rosea*	Guildford Grass	X	X			
Iridaceae	*Romulea*	*rosea var. communis*	Morning Star	X	X			
Juncaceae	*Juncus*	*acutus*	spiny rush	X				X
Lauraceae	*Cassytha*	*sp.*			X	X	X	
Loranthaceae	*Nuytsia*	*floribunda*	Christmas Tree, Munji tree, Cabbage Tree		X	X	X	
Myrtaceae	*Astartea*	*astarteoides*					X	
Myrtaceae	*Beaufortia*	*micrantha*	Little Bottle-Brush			X		
Myrtaceae	*Calothamnus*	*gracilis*	One-sided Bottle-Brush		X	X		
Myrtaceae	*Conothamnus*	*aureus*			X	X		
Myrtaceae	*Eucalyptus*	*gomphocephala*	Tuart		X			
Myrtaceae	*Eucalyptus*	*pleurocarpa*	Tallerack		X			
Myrtaceae	*Eucalyptus*	*uncinata*				X	X	
Myrtaceae	*Leptospermum*	*laevigatum*	Victorian Tea Tree or Coast Tea Tree	X	X	X	X	
Myrtaceae	*Leptospermum*	*spinescens*			X			
Myrtaceae	*Lysinema*	*ciliatum*	Native Curry Flower		X			
Myrtaceae	*Melaleuca*	*cuticularis*	saltwater paperbark		X	X	X	

Myrtaceae	*Melaleuca*	*pentagona*	Oval Leaf Honeymyrtle				X	
Myrtaceae	*Melaleuca*	*scabra*	Rough Honeymyrtle		X			
Myrtaceae	*Melaleuca*	*striata*	Sand Honey Myrtle		X	X		
Myrtaceae	*Melaleuca*	*undulata*	hidden honey-myrtle				X	
Myrtaceae	*Oxymyrrhine*	*gracilis*				X		
Myrtaceae	*Phymatocarpus*	*maxwellii*					X	
Myrtaceae	*Rinzia*	*dimorphandra*			X			
Myrtaceae	*Taxandria*	*callistachys*			X	X	X	
Myrtaceae	*Taxandria*	*callistachys*			X			
Myrtaceae	*Taxandria*	*spathulata*			X	X		
Myrtaceae	*Verticordia*	*vicinella*					X	
Orchidaceae	*Caladenia*	*decora*	King Spider			X		
Orchidaceae	*Caladenia*	*flava*	Cowslip orchids		X	X		
Orchidaceae	*Disa*	*bracteata*		X	X			
Orchidaceae	*Elythranthera*	*brunonis*	Purple Enamel Orchid			X		
Orchidaceae	*Microtis*	*media*	common mignonette orchid		X			
Orobanchaceae	*Orobanche*	*minor*						X
Papaveraceae	*Fumaria*	*muralis*		X	X		X	
Pinaceae	*Pinus*	*pinaster*	Pinaster Pine	X	X			
Pinaceae	*Pinus*	*radiata*	Pine	X	X			
Pittosporaceae	*Billardiera*	*fusiformis*	Australian Blue Bell		X	X	X	
Poaceae	*Austrostipa*	*hemipogon*						X
Poaceae	*Avena*	*Fatua*	Wild oats	X	X	X		
Poaceae	*Briza*	*maxima*	Blowfly Grass	X	X	X	X	
Poaceae	*Briza*	*minor*					X	X
Poaceae	*Bromus*	*sp.*	Brome grass	X	X			
Poaceae	*Ehrharta*	*calycina*		X	X	X	X	X
Poaceae	*Ehrharta*	*longiflora*			X		X	
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	X	X	X	X	X
Poaceae	*Holcus*	*lanatus*	Yorkshire Fog	x				X
Poaceae	*Lagurus*	*ovatus*			X			X
Poaceae	*Lolium*	*perenne*			X			X
Poaceae	*Neurachne*	*alopecuroidea*	Foxtail Mulga Grass		X	X		
Poaceae	*Pennisetum*	*clandestinum*	Kikuyu	X	X			X
Poaceae	*Rytidosperma*	*setaceum*	small-flowered wallaby-grass				X	
Poaceae	*Triticum*	*aestivum*	Wheat	X	X			
Polygalaceae	*Comesperma*	*virgatum*				X	X	
Polygonaceae	*Muehlenbeckia*	*adpressa*			x			
Polygonaceae	*Rumex*	*vesicarius*	Ruby dock	X				X
Primulaceae	*Lysimachia*	*arvensis*	Scarlet Pimpernel	X	X	X	X	X
Proteaceae	*Adenanthos*	*cuneatus*	Coastal Jug Flower		X	X	X	

Proteaceae	*Banksia*	*nutans*			X			
Proteaceae	*Banksia*	*obovata*	Wedge-Leaved Dryandra			X		
Proteaceae	*Banksia*	*obtusa*	Honeypot Dryandra		X			
Proteaceae	*Banksia*	*occidentalis*					X	
Proteaceae	*Banksia*	*pulchella*	Teasle banksia		X	X		
Proteaceae	*Banksia*	*speciosa*	Showy Banksia		X	X	X	
Proteaceae	*Conospermum*	*leianthum ssp leianthum*			X			
Proteaceae	*Isopogon*	*polycephalus*	Clustered Coneflower		X	X		
Proteaceae	*Lambertia*	*inermis*	Chiddick, Native Honesuckle		X	X	X	
Restionaceae	*Chordifex*	*crispatus*						
Restionaceae	*Chordifex*	*sphacelatus*				X		
Restionaceae	*Desmocladus*	*flexuosus*			X	X		
Restionaceae	*Desmocladus*	*parthenicus*			X			
Restionaceae	*Hypolaena*	*exsulca*			X	X	X	
Restionaceae	*Hypolaena*	*fastigiata*			X			
Restionaceae	*Hypolaena*	*humilis*			X			
Restionaceae	*Leptocarpus*	*crebriculmis*					X	
Restionaceae	*Loxocaryon*	*striata*	Anarthria sp.1		X	X		
Restionaceae	*Loxocarya*	*striata*					X	
Rubiaceae	*Opercularia*	*vaginata*			X			
Rutaceae	*Boronia*	*spathulata*			X			
Rutaceae	*Cyanothamnus*	*ramosa ssp anethifolia*			X	X		
Solanaceae	*Solanum*	*nigrum*	Black Berry Nightshade	X	X	X		
Stylidiaceae	*Levenhookia*	*pusilla*	Midget Stylewort		X	X		
Typhaceae	*Typha*	*domingensis*						X
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	Grasstree		X	X	X	

8.2 Vegetation types

Figure 6 - Vegetation type A 'Site S – Cormaup Rd', described as 'Open *Nuytsia floribunda* woodland over diverse Proteaceous shrubland'.

Figure 7 - Vegetation type B 'Site S – Cormaup Rd', described as '*Banksia speciosa* woodland, over *Lambertia inermis* and mixed proteaceous shrubland'

Figure 9. Vegetation type D described as "*Taxandria lineraris* closed shrubland (Riparian)"

Figure 10. Vegetation type E described as "Bullrushes and Juncus within creekline"

Figure 11. Evidence of completely destroyed sections

Figure 12. Evidence of completely destroyed sections