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

Shire of Esperance Strategic Purpose Permit 20/21
Site C – Scaddan Road Construction, West of Backmans Rd

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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 3.59 ha of native vegetation in a 14.0 ha footprint for the purpose of upgrading to bitumen due to constant damage around bend in road.

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 'Site C – Scaddan Road Construction, West of Backmans Rd' under the '2021 Strategic Purpose Permit' (Figure 1), for the purpose of upgrading to the bitumen seal to 8 m wide to increase road safety. A whole road reconstruction will occur for this to happen.

The proposed works are located ~40 km north-east of Esperance, within the Shire of Esperance managed road reserve of Scaddan Rd. Specifically, it is located from Backmans Rd to 4 km west of Backmans Rd, at straight line kilometre (SLK) 48.0 to 53.0 (Main Roads 2020). A point within the proposed clearing permit area is -33.6304 S, 122.1917 E (UTM Zone 51 H, GDA94).

To complete these works, native vegetation up to 5m from the current road footprint on both sides of the road is required to be cleared, increasing the active road footprint to 28 m. To mitigate impact of clearing vegetation, where feasible clearing will not occur to the full permitted width, conserving vegetation.

Figure 1. Location of 'Site C – Scaddan Road Construction, West of Backmans Rd' clearing permit application, submitted under the Shire of Esperance's '21/22 Strategic Purpose Permit'.

3 Environmental Background

3.1 Scope

The removal of native vegetation to bituminize the road has 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 C – Scaddan Road Construction, West of Backmans Rd' is present within the Bandy Creek and the Esperance Coastal catchment areas. It is located approximately 27km from the coastline.

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

Three geological units were identified within 'Site C – Scaddan Road Construction, West of Backmans Rd', by Schoknecht et al. (2004). They are described as:

- Sand or gravel plains,
- Quartz sand sheets with pisoliths or pebbles and minor clay,
- Local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium and Aeolian sand.

3.5 Soils

The soil of 'Site C - Scaddan Road Construction, West of Backmans Rd' is dominated by gravelly, yellow mottled duplex soil (Schnoknecht et al. 2004). Within the area, there has been four soil types recorded. These include:

- Gravelly, yellow mottled duplex soil with < 30 cm of sand over gravel layer,
- Yellow sodic, alkaline, duplex soil,
- Deep uniform sand, and
- Grey deep sandy duplex soils with associated duplex sandy gravels and minor pale deep sands and shallow gravels.

3.6 Topography

During the field survey, topography was observed to be dominated by level plains. Using Schnoknect et al. (2004), the project topography is mapped at a fine scale, traversing 4 topographic areas. These include:

- Gently undulating plain
- Level Plan

3.7 Vegetation

The site is located within the Interim Biogeographic Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) Esperance Plains region (Esp02) 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 C – Scaddan Road Construction, West of Backmans Rd' area – VA 47 and VA 6048 (Table 1). Both VA's are poorly represented in WA's reserve system, with only 18.45% of VA 47's pre-European extent and 14.16% of VA 6048's pre-European extent being formally conserved within International Union for Conservation of Nature (IUCN) reserves across Western Australia.

Table 1. Vegetation associations mapped by Beard (1973) within the 'Site C – Scaddan Road Construction, West of Backmans Rd', and statistics on pre-European remaining areas.
Nt. Acronyms used include Interim Biogeographic Regionalisation of Australia (IBRA), Esperance Plains bioregion (Esp2), local government area (LGA) and International Union of Conservation Nature (IUCN).

Vegetation Association		
Name	47	6048
Description	Shrublands; Tallerack mallee-heath	Shrublands; Banksia scrub-heath on sandplain in the Esperence Plains Region
Area mapped within site (ha)	3.14	1.22
Pre-European extent in IBRA region Esp2 (%)	35.05	14.16
Pre-European extent in LGA (%)	13.43	14.21
Current extent conserved in IUCN area (%)	52.27	6.30

3.8 Land use

The area directly included in the clearing permit application 'Site C - Scaddan Road Construction, West of Backmans Rd' is currently intact and vegetated 100 m wide road reserve, managed by the Shire of Esperance. The current road footprint occupies 18 m. The surrounding land use is private agricultural land. The area is within rural zoning. The proposed clearing permit area is approximately 1.5 km south of 4,467 ha Burdett Nature Reserve.

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 (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 Reporting (TPFL; DBCA 2020c).
    - Esperance District Threatened Flora (DBCA 2020a).
    - 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 (DWER, 2020).
- To assess fauna, the following databases were searched with a 20km buffer from the center of the site (-33.6304 S, 122.1917 E);
    - Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap data portal (DBCA & WAM, 2020)
    - DBCA Threatened and Priority Fauna database (DBCA, 2020g)
    - BirdLife Australia's Atlas and Birdata datasets (Birdlife Australia, 2020)
    - Department of Agriculture, Water and the Environment Protected Matters Search ToolFatlas (AWE, 2020)
    - Atlas of Living Australia database (ALA, 2020)
    - Index of Biodiversity Surveys for Assessment (DWER, 2020)

4.2 Field investigation: possible ecological impacts

The site was initially inspected on 28/08/2020, by the Shire of Esperance Environmental Officers', Julie Waters and Katie White. 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 C – Scaddan Road Construction, West of Backmans Rd' identified in the desktop 20 km radius search were assessed, including Carnaby's Cockatoo and Hooded Plover.

4.3 Field investigation: Assessing Threatened and Priority Ecological Communities

The vegetation community of 'Site C – Scaddan Road Construction, West of Backmans Rd' 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 2020f)' 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 22/10/2020 and 23/10/2020 by Katie White, Sophie Willsher and Danika Penson, Shire of Esperance's Environmental Officer and Field Assistants. Due to the timing, the majority of species were flowering, decreasing the likelihood of missing species. The road was used as a continuous transect. Vegetation up to 5 meters from the edge of the existing road's back-slope was assessed to accurately cover the 28 m width proposed clearing permit area. Suitable associated habitat for TF or PF identified in the desktop study were particularly focused on, and extensively searched. A follow up survey was conducted on 24/06/2021 by Julie Waters and Katherine Walkerden to specifically target the mapping and counting of the priority 3 species *Isopogon alcicornis*.

Due to the high diversity and complexity of Esperance's flora, all species were recorded to compile an incidental species list (Appendix 2). All species unknown in the field were collected and identified exsitu, using keys, WA Herbarium's Florabase (DBCA 2020b), 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, Sophie Willsher's; FB2000278, and Danika Penson's; FB62000277. Any species that were unable to be identified were submitted to the WA Herbarium for identification.

Over the course of the 2019 wildflower season, surveyors re-familiarised themselves with key taxonomic indicators and associated habitat, by visiting verified populations of *Acacia bartlei, Darwinia* sp. Gibson*, Kunzea salina* and *Stachystemon vinosus.* 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

Four vegetation communities were identified within the 'Site C - Scaddan Road Construction, West of Backmans Rd', as defined by structure and composition (Table 2). The incidental flora list identified a total of 235 species across all vegetation communities, 33 of these were invasive species. It is believed that the Beard (1973) vegetation associations identified (Section 3.6) are an appropriate match for all vegetation types observed, other than vegetation type B. Vegetation type B didn't match the two vegetation associations Beard (1973) mapped within the survey area, and is more similar to VA931 "Medium woodland; yate".

Table 2. Vegetation communities identified within proposed 'Site C - Scaddan Road Construction, West of Backmans Rd' project area.

Type	Description	Figure	Closest matching Beard Vegetation Association	Area (ha)	Diversity (native species)
A	Open mixed scattered upper-story consisting of Mallee, Tallerack, Nuytsia and Chittick, and diverse shrubland with Melaleuca and a high dominance of Proteaceae species	9	47: Shrublands; tallerack mallee-heath	3.026	178
B	Yate with Melaleuca	10	931: Medium Woodland; yate.	0.0718	24
C	Scattered Tallerack with dense/dominant Allocasuarina shrubland	11	47: Shrublands; tallerack mallee-heath	0.359	82
D	*Banksia speciosa* woodland with Allocasuarina dominated, diverse and mixed shrubland	12	6048: Shrublands; Banksia scrub-heath on sandplain in the Esperance Plains Region	0.1333	50

Figure 2. Map of vegetation types within the 'Site C - Scaddan Road Construction, West of Backmans Rd' area, from SLK 48 km to 53 along Scaddan Road.

5.2 Vegetation Condition

The vegetation condition varies dramatically across 'Site C – Scaddan Road Construction, West of Backmans Rd', ranging from completely degraded to excellent condition (Figure 3). This is primarily due to the extensive weed infestation of particularly African Lovegrass (*Eragrostis curvula*), on the periphery of the road footprint. As well as some impacts of *Phytophthora* dieback (Section 5.3). Additionally, the road reserve bordering the farmland has all been historically cleared, with only scattered native hardy shrubs remaining, consisting almost entirely of dense Tuart, *Eucalyptus gomphocephala* and Pine, *Pinus pinaster* trees. During the targeted flora survey, the adjacent property owner on the southern road reserve was clearing and removing the large invasive trees. Where possible it was evident they were leaving the occasional *Nuytsia floribunda* present. A historical gravel pit at approximately 48.65 SLK has led to disturbance and loss of upper-story species.

Table 3. Vegetation conditions within proposed 'Site C – Scaddan Road Construction, West of Backmans Rd' project area, and the proposed amount of vegetation to be cleared (ha), footprint of each vegetation condition (ha) and proportion that each vegetation condition occupies within the entire footprint (%).

Vegetation Condition	Amount of vegetation to be cleared (ha)	Vegetation condition footprint (ha)	Vegetation condition area proportion of entire footprint (%)
Excellent	0.21	0.62	4.42%
Very good	1.21	3.91	27.93%
Good	0.58	2.22	15.86%
Degraded	1.29	4.64	33.14%
Completely degraded	0.11	2.70	19.28%

Figure 3. Vegetation condition across the 'Site C - Scaddan Road Construction, West of Backmans Rd' project, ranging from completely degraded to excellent condition, due to primarily to degradation from pine tree removal, gravel extraction, machinery disturbance, weed invasion and possible *Phytophthora cinnamomi* Dieback presence.

There was high levels of weed invasion across the entirety of the proposed 'Site C - Scaddan Road Construction, West of Backmans Rd' area. Overall, 33 invasive species were identified within the project area (Appendix 2, Table 8). Of these, the most extensive and of serious concern were African Love Grass, *Eragrostis curvula*, and Golden Wattle, *Acacia pycnantha.* African Love Grass and agricultural weeds were observed across the survey area, and *Acacia pycnantha* was observed to be scattered throughout vegetation type A. *Pinus pinaster* trees lined the fence lines of the adjacent agricultural properties. The weed burden was so high in some sections that it led to the complete breakdown of community structure (Figure 4). Control of *Acacia pycnantha* is recommended prior to consuming road works, as can rapidly become a serious environmental weed. It is highly likely that proposed works will increase the distribution of weeds and degrade vegetation along the entire road

reserve where works occur. It is suggested that the road reconstruction occur from the north-west area and head south-east, from the better condition to the poorer condition area. This will hopefully limit the weed spread into the areas in better condition. 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.

Figure 4. Loss of community structure due to high weed burden at 'Site C – Scaddan Road Construction, West of Backmans Rd'.

5.3 *Phytophthora* Dieback

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2020) data shows no positive or negative *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the immediate area, likely due to the lack of sampling on road reserves in general. However, there were several positive *Phytophthora cinnamomi* sample results in the surrounding area, including on Wittenoom Road, a road which intersects with Scaddan Road approximately 10 km west of the survey area. Many dead Proteaceae species were observed during the survey, including *Banksia speciosa, B. media, B. armata* and Chittick, *Lambertia inermis.* There was no distinct cluster of dead species, and dead plants were sporadically scattered throughout the site. Vegetation types A and D are most susceptible to *P. cinnamomi* dieback due to the high prevalence of Proteaceae species in these vegetation communities, some limited signs of *P. cinnamomi* were present in the site (Figure 5). 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 Scaddan Rd due to proposed works.

Figure 5. Dead *Banksia media* observed in vegetation type A at 'Site C – Scaddan Road Construction, West of Backmans Rd'.

5.4 Threatened and Priority Ecological Communities

The desktop study identified 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)' directly within 'Site C – Scaddan Road Construction, West of Backmans Rd' project area. No other TEC or priority ecological communities (PEC) was identified by the desktop study as being within "Site C – Scaddan Road Construction, West of Backmans Rd" or within a 20km buffer of the site.

The field survey determined that there were two vegetation communities, vegetation types A and D, described as 'Open mixed scattered upper-story consisting of Mallee, Tallerack, Nuytsia and Chittick, and diverse shrubland with Melaleuca and a high dominance of Proteaceae species' and '*Banksia speciosa* woodland with Allocasuaina dominated, diverse and mixed shrubland' met criteria to be considered as Kwongkan TEC. However, due to several degrading factors including historical gravel extraction and weed invasion, only areas within these vegetation communities in very good or excellent condition were considered as Kwongkan TEC (Figure 6). In total, 1.406 ha of vegetation within a 4.42 ha footprint was considered as Kwongkan TEC present within 'Site C – Scaddan Road Construction, West of Backmans Rd' area.

The vegetation community described as 'Swamp Yate, *Eucalyptus occidentalis*, woodlands in seasonally inundated clay basins in the South Coast of Western Australia' is listed as a PEC (DBCA 2020f). Within the 'Site C – Scaddan Road Construction, West of Backmans Rd' project area, the field survey determined that vegetation type B was described as a 'Yate with Melaleuca' community. The one section of vegetation type B within the proposed project area did not have an intact understory, thus did not meet definition of this PEC.

Figure 6. Vegetation communities of vegetation type A and D in excellent or very good condition met threatened ecological community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' within 'Site C – Scaddan Road Construction, West of Backmans Rd' project.

5.5 Threatened and Priority Flora

Three threatened flora (TF) and 39 priority flora (PF) were recorded within a 20 km radius of the proposed impact site (Table 4; DBCA 2020a, DBCA 2020c, DBCA 2020e). Of these, 11 PF species had suitable known associated habitat that corresponded with vegetation communities and soil type of 'Site C – Scaddan Road Construction, West of Backmans Rd' project. There were no confirmed records of threatened or priority flora within the project area.

Table 4. Threatened or priority flora identified by the desktop study to be present within a 20 km radius of 'Site C - Scaddan Road Construction, West of Backmans Rd' project area, using Threatened and Priority Flora Reporting (TPFL; DBCA 2020c), WA Herbarium (DBCA 2020e) and Esperance District Threatened Flora (DBCA 2020a).
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
Acacia bartlei	P3	Flat or gently undulating landscapes, waterlogged depression in brown/grey sandy loam or clay loam. Commonly associated with *Eucalyptus occidentalis.*	Yes
Acacia euthyphylla	P3	Grey/white clay loam, in seasonal swamps or periphery of salt lakes and marshes, in tall myrtaceous shrubland and mallee woodland.	No
Anigozanthos bicolor subsp. *minor*	T	Moist sandy soil in heath communities, shallow soil near granite outcrops. Flowers best after disturbance or fire.	No
Atriplex muelleri	P1	Cracking clays. All extremely old records and mostly mid-Pilbara area.	Unknown
Baeckea sp. *Gibson*	P1	Two populations known near Gibson and Beaumont. Associated species include: *Callitris tuberculata, Eucalyptus grossa, Meleleuca uncinata, Hakea bicornata, Acacia lasiocalyx,* and *Spartochloa scirpoidea.*	No
Beyeria physaphylla	P1	Mallee eucalypt woodland in association with: *Melaleuca tuberculata* var. *macrophylla, M. pulchella, Eucalyptus kessellii, E. rigens, E. halophila, Hakea cinerea,* and *Phymatocarpus maxwelli.*	Unlikely
Boronia baeckeacea subsp. *patula*	P1	Clay-loam in mallee. Distribution Mt Burdett to Mt Heywood.	Unlikely
Brachyloma mogin	P3	Various soil types including brown sand loam, grey clayey sand and swamp flats. Mostly recorded outside of Esperance Area.	Possible
Dampiera sericantha	P1	Sand, sometimes gravel. Plains.	Yes
Darwinia sp. *Gibson*	P1	Margins of salt lakes and road verges, grey-brown sandy loam and white sand. Associated species include: *Melaleuca cuticularis, M. brevifolia, Hypolaena* sp., *Acacia patagiata, Leucopogon* spp., and Samphire.	Unlikely
Darwinia sp. *Mt Burdett*	P4	Open shrub or mallee on sandy loams. Associated species include: *Melaleuca pulchella, Phymatocarpus maxwellii, Micromyrtus elobata, Beaufortia micrantha,* and *Banksia* spp..	Yes
Daviesia pauciflora	P3	Deep sands.	Yes
Eremophila glabra subsp. *Scaddan*	T	Open mallee woodland on grey, brown clayey sand.	Unlikely
Eucalyptus aquilina	P4	Shallow soils over granite. Shallow valleys, creek beds and hillsides	Unlikely
Eucalyptus dolichorhyncha	P4	Flats or slightly rising ground with whitish to yellowish sandy clay soil.	Unlikely

Eucalyptus foliosa	P3	Only found small area north of Esperance around Gibson and Scaddan. Grey/white sandy clay on flats adjacent to salt lakes.	Unlikely
Eucalyptus ligulata subsp. *ligulata*	P4	White sand over laterite, silty sand on edge of granite shelf and limestone. Hillslopes, gullies and cliffs.	Unlikely
Eucalyptus semiglobosa	P3	White sand over laterite, silty sand on edge of granite shelf, limestone, hillslope, gully and cliffs. Mostly quite close to coast.	Unlikely
Eucalyptus sweedmaniana	P2	Restricted to Cape Arid.	No
Gonocarpus pycnostachyus	P3	Known on a few locations on wet depressions near granite outcrops.	No
Goodenia laevis subsp. *laevis*	P3	Mallee woodland over limestone.	Unlikely
Grevillea baxteri	P4	Mixed Kwongkan vegetation with Chittick and Eucalyptus.	Yes
Isopogon alcicornis	P3	Eucalyptus woodland with low sedge and scattered ground cover Banksia. Grey/brown sandy loams in mallee shrubland.	Possible
Kunzea salina	P3	Directly associated with salt lake periphery.	No
Lambertia echinata subsp. *echinata*	CN	Only known in Cape Le Grande NP in dense Chittick thickets.	Unlikely
Leucopogon interruptus	P3	Grey sand over granite. Variety of habitats.	Possible
Melaleuca eximia	P2	Deep gravel, gravelly sand or gravelly clay. Been recorded on granite outcrops.	Unlikely
Melaleuca fissurata	P4	Associated with the border of salt lakes in dense Myrtaceous layer.	No
Melaleuca viminea subsp. *appressa*	P2	Shallow sand over clay, near creeks or wet depressions.	Unlikely
Microtis media subsp. *quadrata*	P4	Widespread across many habitats. Mostly associated with Albany area.	Unlikely
Myoporum turbinatum	P4	In moist sandy soils, along creeks, rivers, pools or margins of saline depressions.	No
Myriophyllum petraeum	P4	Water plant – confined to ephemeral rock pools on granite outcrops.	No
Persoonia cymbifolia	P3	Sandy soils on flats or rock crevices.	Unlikely
Persoonia scabra	P3	White sand or sandy loam. Widespread from coastal to inland Mallee. Sandy heathland environment over gravel, granite or limestone.	Possible
Pultenaea adunca	P3	White/grey sand.	Possible
Pultenaea brachyphylla	P2	Almost entirely recorded west towards Jerramungup area. On pale brown sandy loam, sandy clay, gravel, granite, quartz or laterite on gently undulating loam.	Unlikely
Rumicastrum chamaecladum	P2	Winter wet creek edges.	No
Scaevola archeriana	P1	Mixed habitat – yellow sands with mixed mallee or limestone.	Unlikely

Stachystemon vinosus	P4	Mixed mallee with Myrtaceous shrubland. Likes disturbance. Scaddan Eucalyptus woodland.	Yes
Styphelia rotundifolia	P3	Eucalyptus mallee with mixed Myrtaceous and Fabaceae shrubland. Wide variety of habitats. Often associated with gravel.	Possible
Thysanotus parviflorus	P4	Grey sands.	Yes
Trachymene anisocarpa var. *trichocarpa*	P3	Sandy soils in recently disturbed areas such as burnt sites, woodlands or plains.	Yes

The targeted flora survey identified one PF species, *Isopogon alcicornis* (P3), within the proposed clearing permit footprint (Section 5.5.1). This species had not previously been recorded within the area. Queries of spatial datasets were requested specifically for these species, to interrogate impact of proposed works on species sustainability (DBCA 2021; DBCA 2020a; DBCA 2020c). DBCA do not actively manage or monitor the majority of low priority species, due to their prevalence in the landscape relative to TF. There are 136 species recorded as priority three or four conservation status within the Shire of Esperance boundaries (DBCA 2020a).

Numerous specimen's unknown to surveyors were collected and verified at the WA Herbarium as non-threatened species, such as *Calectasia valida*, thought to potentially be the priority 2 species, *Calectasia jubilaea* (Accession 8652; KW114, Specimen retained by the WA Herbarium).

5.5.1 *Isopogon alcicornis,* Priority 3

A specimen of *Isopogon alcicornis (Figure 7)* was sent to the WA Herbarium for identification confirmation (KW112; Accession 8652 with specimen retained by WA Herbarium). It was confirmed by Michael Hislop on 10/12/20. A Threatened and Priority Reporting Form (TPFL) was completed and sent to Department of Biodiversity, Conservation and Attractions (DBCA) District Flora Conservation Officer and Species and Communities Branch on 15/01/21 (Appendix 3). If proposed works occur, 6 plants will be impacted upon, from a population total of 14 live plants. It is highly likely that more plants would be located within the area 1.5km to the north of the end of the survey area as there was suitable habitat here, however no survey was completed outside the application area.

Figure 7. Photo of *Isopogon alcicornis* found in the field, photo was taken by Katie White on 22/10/2020

Isopogon alcicornis, is a low growing shrub that persists in sandy soils, skeletal loam or granite. The sandy, gravel duplex soils of Scaddan Rd make it an ideal habitat for the plant to grow. *I. alcicornis* is associated with Proteaceae heath, with 28 recorded locations over a distribution range of around 150km from Dalyup east to the Cape Arid region. Many recorded locations are very old and little work has been carried out on this species. Records from the Esperance Wildflower blogspot state both that the species is "in urgent need of further study," and would benefit from more frequent fire events. Scaddan Rd matches the local observations of other *I. alcicornis* populations. It is a distinctive species and not often overlooked in surveys.

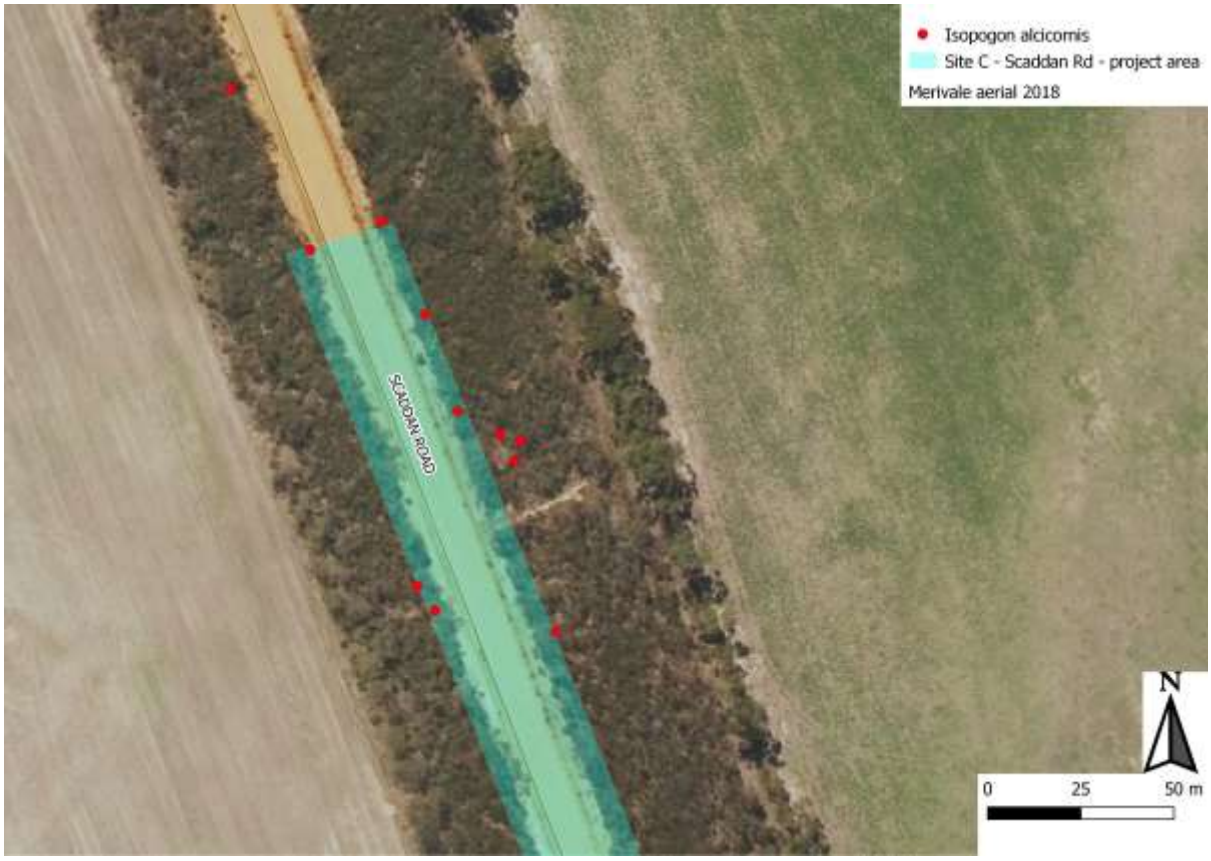

Figure 8. Locations of *Isopogon alcicornis* found at Site C – Scaddan Road Construction, West of Backmans Rd

Table 5. Compiled population data of *Isopogon alcicornis* and new populations discovered by the Shire of Esperance in the 2020 spring season (DBCA 2021).

Site Description	Date	Population Count
12 miles past (S of] Truslove	11/10/1931	
Between Truslove and Esperance, 12 miles past [S of] Truslove	11/10/1931	
(Prope) montem Baring [near Mount Baring]	12/02/1966	
NW of Dalyup, W of Esperance	25/02/1966	
Wittenoom Hills	9/06/1972	
Mount Burdett		
Mount Burdett, E side		
8 km E of Scaddan on Scaddan Road	20/08/1982	
Mallee Heath, 0.2 km SW of Tweedale Road on Muntz Road, reserve 31799. [Ca 15 km NNE of Howick Hill]	/10/1984	
31.1 km E of Scaddan on Norwood Road	5/09/1985	2 plants seen on 1 km walk.
Mount Burdett about 50 km NE of Esperance	26/11/1985	Scattered.
10 km N of Gibson	12/12/1985	Single plant.
8 km SE of Mount Ridley	24/03/1991	Plants spaced over a substantial area making them collectively common.

3.3km E of Esperance-Norseman Hwy on Scaddan East Rd; SE of Scaddan.	24/09/1992	1 plant only; S road reserve (15m wide).
Mt Burdett; Nature Reserve.	25/09/1992	1 plant only seen in 200m walk.
Mount Burdett Nature Reserve, on W slopes peripheral to rock outcrop	30/01/1993	30 only observed over 0.5 ha.
Mt Baring, Cape Arid National Park.	25/04/1993	Rare, 1 plant only seen.
20.7-22.2 km N of Fisheries Rd on Muntz Rd (=0.5-2 km SW of "Tweedale Rd" track) , ca. 32 km NE of Condingup. Beaumont Group Nature Reserve.	14/11/1993	Abundance: Occasional, scattered, 100+ plants.
13.5 km S of Mount Burdett	3/10/1995	Abundance: frequent.
2.3 km S of Speddington Road on rail line. Both sides adjacent salt lakes. NE of Esperance	3/03/2001	20+ plants.
50-100 m E of West Kalgoorlie Esperance Railway, between railway line and cleared farmland, 5.1 km S of Speddingup, 9.7 km N of Gibson	1/07/2003	c. 30 plants adjacent to 60 m of track.
NE of Esperance in vegetation off Scadden Road near junction with Dempster Road, DEFL pop 16 (10c)		
0.7-2 km SW of Tweedale Road on Muntz Road, both sides of road and up to 10 m from road edge	14/12/2007	about 40 plants.
On Eld Road c. 2.7 km E of junction with Burdett Road where Kau Rock Nature Reserve briefly meets with Eld Road	26/06/2013	6 - 20 plants.
Along a firebreak running E from Balladonia Road (5 km N of Fisheries Road), c. 59 km E of Condingup	28/10/2013	5 plants seen.
UCL. 2.6km north along Lake Tay Rd from Cascades Rd, then 1km north west along firebreak track.	11/11/2020	50
UCL. Northover Soak.	17/9/2020	10
Scaddan Road – 3.5km south of Green Rd	12/10/2020	12

5.6 Fauna

Within a 20 km radius of the 'Site C - Scaddan Road Construction, West of Backmans Rd', 141 fauna have previously been recorded. Of these, three species are threatened fauna, priority fauna and fauna protected under international agreement have been recorded (Table 6). Two species have suitable habitat within the proposed clearing permit area, including Carnaby's Cockatoo and Hooded Plover.

Table 6. Potential threatened, priority and protected under international agreement fauna recorded within a 20 km radius of the proposed 'Site C - Scaddan Road Construction, West of Backmans Rd'. 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
Calyptorhynchus latirostris	Carnaby's Cockatoo	T	Yes	Kwongkan shrub or heathland. Presence of Hakea, Banksia and Pine species indicate potential feeding habitat.
Thinornis rubricollis	Hooded Plover	P4	Unlikely	Mainly inhabits ocean beaches, occasionally inhabits inland lakes.
Tringa nebularia	Common Greenshank	IA	No	Estuaries, mudflats, mangrove swamps, lagoons and flooded crops.

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

Carnaby's Black Cockatoo's are unlikely to nest within the 'Site C – Scaddan Road Construction, West of Backmans Rd' project area, as no large trees are present with hollows. Large Blue Gum *Eucalyptus globulus* and Tuart *Eucalyptus gomphocephala* trees are present in the surrounding area, which means Carnaby's Black Cockatoo are likely to frequent the area by roosting in these trees. However, there are no large trees present within any of the vegetation types of 'Site C – Scaddan Road Construction, West of Backmans Rd'. Carnaby's Black Cockatoos forage on Proteaceae species nuts, such as Hakea or Banksia species, and Pine cones. Vegetation types A and D, both classified as Kwongkan TEC, would likely provide foraging grounds due to the prevalence of Proteaceae species in these areas. Additionally, the Pine *Pinus pinaster* trees present in vegetation type A, and in one small section of vegetation type C, are also likely foraged upon by Carnaby's Black Cockatoos. During the flora survey, Carnaby's Black Cockatoos were observed feeding on Pine trees directly adjacent to the road reserve, meaning that the species is known to the area, and a population within this site is likely. Clearing within the proposed 'Site C - Scaddan Road Construction, West of Backmans Rd' would likely have some impact on a population of the Carnaby's Black Cockatoo, by removing some of their foraging habitat.

5.6.2 Hooded Plover, *Thinornis rubricollis,* P4

The western subspecies of the Hooded Plover inhabit ocean beaches, the edges of near-coastal and inland salt-lake, and occasionally estuaries. On salt lakes, Hooded Plovers mainly feed on sand and shell banks, open mud, salt-covered mud and areas covered in shallow water. In coastal habitats, foraging occurs from the water's edge to the base of the foredune. Breeding mainly occurs on the shores of inland salt lakes or in coastal dunes. It is possible that Hooded Plovers inhabit the salt lakes in the nearby Burdett South Nature Reserve, however it is unlikely that they utilise the proposed 'Site C – Scaddan Road Construction, West of Backmans Rd' area for foraging or breeding purposes.

No evidence of invasive fauna, such as scats or digging, were observed. However, it is highly likely that foxes, rabbits and feral cats are extensive throughout the area.

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

The 'Site C – Scaddan Road Construction, West of Backmans Rd' 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).

Table 7. Shire of Esperance Assessment against Clearing Principles of the proposed 'Site C – Scaddan Road Construction, West of Backmans Rd'.

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 195 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.	The vegetation contains foraging habitat for Carnaby's Black Cockatoo due to the presence of vegetation high in Proteaceous species. No other fauna species are likely to be impacted upon.
Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	One priority species was observed in the area. However this species has a wide distribution and the removal of these 6 plants is unlikely to effect the existence of this poluation where plants exist outside the impact area or of the species as a whole.
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.	1.4 hectares of vegetation met the definition of Kwongkan TEC, other areas within the site failed to meet the definition of Kwongkan TEC, no other TEC's or PEC's within the Shire of Esperance were relevant to the study area.
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.	The immediate surroundings of the site were highly cleared agricultural land, with the intact vegetation within the site likely playing contributing to ecological linkages in the area. However the amount of vegetation being cleared and the fact that this is a 100m wide road reserve which will still exist as a wildlife corridor after road widening does not constitute being a significant impact.
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.	Vegetation in this area was not growing in association with watercourses or wetlands.
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Vegetation within this area will be providing limited function as windbreaks and erosion control for the agricultural areas surrounding it.
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.	The project is 1600 metres away from an A class reserve for the Protection of Flora & Fauna. The relatively low amount of native vegetation cleared will have little effect on the ecological linkages to this reserve.

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.	Unlikely to have any significant impacts.
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Unlikely to have any significant impacts.

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8 Appendix

8.1 Appendix 1 - Vegetation types

Figure 9. Vegetation type A identified in 'Site C - Scaddan Road Construction, West of Backmans Rd' project, described as 'Open mixed scattered upper-story consisting of Mallee, Tallerack, Nuytsia and Chittick, and diverse shrubland with Melaleuca and a high dominance of Proteaceae species'.

Figure 10. Vegetation type B identified in 'Site C - Scaddan Road Construction, West of Backmans Rd' project, described as 'Yate with Melaleuca'.

Figure 11. Vegetation type C identified in 'Site C - Scaddan Road Construction, West of Backmans Rd' project, described as 'scattered Tallerack with dense/dominant Allocasuarina shrubland'.

Figure 12. Vegetation type D identified in 'Site C - Scaddan Road Construction, West of Backmans Rd' project, described as '*Banksia speciosa* woodland with Allocasuaina dominated, diverse and mixed shrubland'.

8.2 Appendix 2 - Incidental species list

Table 8. Incidental species by vegetation type recorded from 'Site C - Scaddan Road Construction, West of Backmans Rd'.

Family	Genus	Species	Common Name	Weed	Cons Stat	Vegetation Type			
						A	B	C	D
Anarthriaceae	*Anarthria*	*scabra*							X
Anarthriaceae	*Lyginia*	*imberbis*				X		X	
Apiaceae	*Trachymene*	*pilosa*	Native Parsnip					X	X
Apiaceae	*Xanthosia*	*huegelii*				X			
Asparagaceae	*Laxmannia*	*brachyphylla*	Stilted paper Lily						X
Asparagaceae	*Lomandra*	*mucronata*				X			
Asparagaceae	*Lomandra*	*nigricans*						X	
Asparagaceae	*Thysanotus*	*patersonii*	Twining Fringe Lily			X		X	
Asparagaceae	*Tricoryne*	*elatior*	Yellow Autumn Lily					X	X
Asphodelaceae	*Bulbine*	*semibarbata*	Leek Lily				X	X	
Asteraceae	*Arctotheca*	*calendula*	Cape Weed	X		X	X	X	
Asteraceae	*Centaurea*	*melitensis*	Maltese Cockspur	X		X			
Asteraceae	*Hypochaeris*	*radicata*	Flat weed	X					X
Asteraceae	*Pseudognaphalium*	*luteoalbum*	Jersey Cudweed	X				X	
Asteraceae	*Senecio*	*quadridentatus*	Cotton Fireweed					X	
Asteraceae	*Sonchus*	*oleraceus*		X		X	X	X	X
Asteraceae	*Ursinia*	*anthemoides*	Ursinia Daisy	X		X		X	X
Asteraceae	*Vittadinia*	*gracilis*					X		
Asteraceae	*Waitzia*	*suaveolens*	Yellow Paper Daisy					X	
Brassicaceae	*Sinapis*	*arvensis*	Wild Mustard	X				X	
Campanulaceae	*Monopsis*	*debilis var depressa*		X		X		X	
Campanulaceae	*Wahlenbergia*	*capensis*	Cape bluebell	X				X	
Casuarinaceae	*Allocasuarina*	*humilis*				X		X	X
Casuarinaceae	*Allocasuarina*	*lehmanniana ssp. ecarinata*				X			
Casuarinaceae	*Allocasuarina*	*thyoides*	Horned Sheoak			X		X	
Chenopodiaceae	*Atriplex*	*semibaccata*				X			
Cucurbitaceae	*Cucumis*	*myriocarpus*	prickly paddy melon	X		X			
Cupressaceae	*Callitris*	*roei*				X			
Cyperaceae	*Caustis*	*dioica*	Puzzle grass			X		X	
Cyperaceae	*Cyathochaeta*	*equitans*						X	
Cyperaceae	*Cyperus*	*tenellus*				X			
Cyperaceae	*Isolepis*	*marginata*				X	X		
Cyperaceae	*Lepidosperma*	*sp.*				X			

Cyperaceae	*Lepidosperma*	*sp.*				X			
Cyperaceae	*Lepidosperma*	*squamatum*				X		X	
Cyperaceae	*Mesomelaena*	*stygia ssp. stygia*				X	X	X	
Cyperaceae	*Mesomelaena*	*tetragona*	Semaphore Sedge					X	
Cyperaceae	*Netrostylis*	*sp. Mt. Madden*				X			
Cyperaceae	*Tricostularia*	*aphylla*							X
Dasypogonaceae	*Calectasia*	*valida*				X			
Dilleniaceae	*Hibbertia*	*acerosa*				X		X	
Dilleniaceae	*Hibbertia*	*andrewsiana*				X			X
Dilleniaceae	*Hibbertia*	*gracilipes*				X		X	
Dilleniaceae	*Hibbertia*	*racemosa*	Stalked guinnea flower			X			
Droseraceae	*Drosera*	*drummondii*				X		X	
Droseraceae	*Drosera*	*trichocaulis*							X
Ericaceae	*Andersonia*	*parviflora*							X
Ericaceae	*Conostephium*	*drummondii*				X			
Ericaceae	*Leucopogon*	*sp. Coujinup*				X			
Ericaceae	*Lysinema*	*ciliatum*	curry flower			X			
Ericaceae	*Styphelia*	*epacridis*				X			
Ericaceae	*Styphelia*	*lissanthoides*				X			
Ericaceae	*Styphelia*	*sp. Cascades*				X			
Ericaceae	*styphelia*	*breviflora*				X			
Ericaceae	*Styphelia*	*intertexta*				X			
Euphorbiaceae	*Stachystemon*	*polyandrus*				X			
Fabaceae	*Acacia*	*aemula*				X			X
Fabaceae	*Acacia*	*crispula*							
Fabaceae	*Acacia*	*curvula*				X			
Fabaceae	*Acacia*	*cyclops*	Coastal Wattle			X	X	X	
Fabaceae	*Acacia*	*flavipila var flavipila*				X			
Fabaceae	*Acacia*	*gonophylla*				X			
Fabaceae	*Acacia*	*lasiocarpa var. bracteolata*				X			
Fabaceae	*Acacia*	*latipes subsp. latipes*				X		X	
Fabaceae	*Acacia*	*myrtifolia*	Red stemmed Acacia			X			
Fabaceae	*Acacia*	*pachyphylla*				X			
Fabaceae	*Acacia*	*pritzeliana*				X			
Fabaceae	*Acacia*	*pycnantha*	Golden Wattle	X		X			
Fabaceae	*Acacia*	*saligna*	Orange Wattle			X			
Fabaceae	*Aotus*	*sp. Esperance*							X
Fabaceae	*Bossiaea*	*preissi*	yes			X			
Fabaceae	*Chorizema*	*aciculare*	Needle leaf Chorizema			X		X	

Fabaceae	*Chorizema*	*obtusifolium*				X			X
Fabaceae	*Daviesia*	*lancifolia*				X			
Fabaceae	*Daviesia*	*teretifolia*						X	
Fabaceae	*Daviesia*	*veinosa*				X			
Fabaceae	*Gastrolobium*	*discolor*				X			
Fabaceae	*Gastrolobium*	*punctatum*				X			
Fabaceae	*Gastrolobium*	*spinosum*	Prickly Poison			X			
Fabaceae	*Gompholobium*	*knightianum*				X			
Fabaceae	*Gompholobium*	*viscidulum*				X			
Fabaceae	*Goodenia*	*scapigera*				X			
Fabaceae	*Hovea*	*pungens*	Devils Pins			X			
Fabaceae	*Jacksonia*	*capitata*	J.alata			X			
Fabaceae	*Ornithopus*	*compressus*	Yellow Serradella	X			X	X	
Fabaceae	*Ornithopus*	*sativus*	french (pink) serradella	X				X	
Fabaceae	*Pultenaea*	*indira ssp. indira*				X			
Fabaceae	*Templetonia*	*sulcata*	Centipede Bush			X			
Fabaceae	*Trifolium*	*arvense*	Hare's Foot Clover	X				X	
Geraniaceae	*Storksbill Pelargonium*		Storksbill Pelargonium	X		X	X	X	X
Goodeniaceae	*Anthotium*	*humile*				X			
Goodeniaceae	*Coopernookia*	*strophiolata*				X			
Goodeniaceae	*Dampiera*	*lavandulacea*				X			
Goodeniaceae	*Dampiera*	*parvifolia*	Many-bracted Dampiera			X			
Goodeniaceae	*Goodenia*	*concinna*				X			
Goodeniaceae	*Goodenia*	*incana*				X			
Goodeniaceae	*Goodenia*	*pterigosperma*				X			
Goodeniaceae	*Goodenia*	*trinervis*				X			
Goodeniaceae	*Scaevola*	*thesioides var filifolia*				X			
Haemodoraceae	*Anigozanthos*	*rufus*	Red kangaroo paw			X			
Haemodoraceae	*Conostylis*	*breviscapa*							X
Haemodoraceae	*Conostylis*	*seorsiflora*				X		X	X
Haemodoraceae	*Haemodorum*	*spicatum*							X
Haloragaceae	*Glischrocaryon*	*angustifolium*				X		X	
Hemerocallidaceae	*Agrostocrinum*	*scabra*	Blue Grass Lilly			X		X	X
Hemerocallidaceae	*Cheiranthera*	*filifolia*	Finger Flower			X		X	
Hemerocallidaceae	*Dianella*	*brevicaulis*	Australian Blue Bell			X		X	
Hemerocallidaceae	*Dianella*	*revoluta*	Australian Blue Bell			X			

Iridaceae	*Freesia*	*laxa*	Freesia			X			
Iridaceae	*Patersonia*	*juncea*	Rush-leaved Patersonia						X
Iridaceae	*Patersonia*	*lanata*	Wooly Patersonia			X			X
Iridaceae	*Patersonia*	*occidentalis*	Purple Flag			X		X	
Junaceae	*Juncus*	*microcephalus*	articulatus	X		X			X
Junaceae	*Juncus*	*pallidus*				X			
Junaceae	*Juncus*	*radula*					X		
Loranthaceae	*Nuytsia*	*floribunda*	Cabbage Tree, Christmas Tree, Munji			X		X	X
Malvaceae	*Thomasia*	*angustifolia*				X			
Malvaceae	*Thomasia*	*petalocalyx*				X			
Myrtaceae	*Beaufortia*	*empetrifolia*				X			
Myrtaceae	*Beaufortia*	*micrantha*				X			
Myrtaceae	*Beaufortia*	*schaeuri*	South Coast Beaufortia			X			
Myrtaceae	*Calothamnus*	*gracilis*	One-sided Bottle Brush			X		X	X
Myrtaceae	*Calothamnus*	*quadrifidus*	One-sided Bottle Brush			X	X		
Myrtaceae	*Calytrix*	*decandra*	Pink starflower						X
Myrtaceae	*Calytrix*	*lechenaultii*				X			
Myrtaceae	*Calytrix*	*tetragona*				X			
Myrtaceae	*Chamelaucium*	*axillare*	Esperance Wax			X		X	
Myrtaceae	*Chamelaucium*	*ciliatum*				X			
Myrtaceae	*Conothamnus*	*aureus*				X		X	X
Myrtaceae	*Cyathostemon*	*ambiguus*				X		X	
Myrtaceae	*Darwinia*	*vestita*	Pom pom Darwinia			X			
Myrtaceae	*Eucalyptus*	*cornuta*					X		
Myrtaceae	*Eucalyptus*	*angulosa*	Square fruited mallee			X			
Myrtaceae	*Eucalyptus*	*globulus*		X		X			
Myrtaceae	*Eucalyptus*	*gomphocephala*	Tuart	X				X	
Myrtaceae	*Eucalyptus*	*leptocalyx*	Hopetoun mallee			X	X		
Myrtaceae	*Eucalyptus*	*pleurocarpa*	Tallerack			X		X	
Myrtaceae	*Eucalyptus*	*rigidula*	Stiff leaved mallee			X		X	
Myrtaceae	*Eucalyptus*	*tumida*				X			
Myrtaceae	*Eucalyptus*	*uncinata*				X			
Myrtaceae	*Leptospermum*	*spinescens*				X			
Myrtaceae	*Melaleuca*	*brevifolia*				X			
Myrtaceae	*Melaleuca*	*calycina*				X			

Myrtaceae	*Melaleuca*	*cuticularis*						X	
Myrtaceae	*Melaleuca*	*pulchella*	Crab Claw Melaleuca			X			X
Myrtaceae	*Melaleuca*	*scabra*				X		X	X
Myrtaceae	*Melaleuca*	*societatis*					X		
Myrtaceae	*Melaleuca*	*striata*				X			X
Myrtaceae	*Melaleuca*	*suberosa*	Corky Melaleuca, Toothbrush Melaleuca			X			
Myrtaceae	*Melaleuca*	*subfalcata*				X			
Myrtaceae	*Melaleuca*	*thapsina*				X			
Myrtaceae	*Melaleuca*	*tuberculata*				X		X	
Myrtaceae	*Melaleuca*	*undulata*	hidden honey myrtle				X		
Myrtaceae	*Micromyrtus*	*elobata*				X		X	
Myrtaceae	*Phymatocarpus*	*maxwelli*				X		X	X
Myrtaceae	*Taxandria*	*spathulata*				X			X
Myrtaceae	*Verticordia*	*minutiflora*				X			X
Myrtaceae	*Verticordia*	*plumosa var. gradiflora*				X		X	
Onagraceae	*Oenothera*	*sp.*	Evening Primrose	X				X	
Orchidaceae	*Lyperanthus*	*serratus*	Rattlebeak Orchid			X		X	
Orchidaceae	*Microtis*	*media*	Mignonette orchid			X		X	X
Orchidaceae	*Thelymitra*	*graminea*							X
Oxalidaceae	*Oxalis*	*glabra*	Finger-leaf Oxalis	X				X	
Pinaceae	*Pinus*	*pinaster*	Pinaster pine	X		X			
Pittosporaceae	*Billardiera*	*fusiformis*	Australian Blue Bell			X			X
Poaceae	*Austrostipa*	*hemipogon*				X		X	X
Poaceae	*Avena*	*fatua*	Wheat	X				X	
Poaceae	*Briza*	*maxima*	Blow Fly Grass	X			X	X	
Poaceae	*Briza*	*minor*	Little Blowfly Grass	X			X	X	
Poaceae	*Bromus*	*catharticus*	Prairie grass	X		X	X		
Poaceae	*Ehrharta*	*calycina*	full of fungal spores	X		X			
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	X		X	X	X	X
Poaceae	*Lolium*	*rigidum*	Wimmera ryegrass	X				X	
Poaceae	*Neurachne*	*alopecuroidea*	Mulga Foxtail			X		X	
Poaceae	*Romulea*	*rosea*	Guildford Grass	X				X	

Poaceae	*Triticum*	*sp.*	Wild oats	X			X	X	
Poaceae	*Vulpia*	*myuros*	Silver Grass					X	
Polygonaceae	*Muelenbeckia*	*adpressa*	Climbing Lignum				X		
Polygonaceae	*Rumex*	*crispus*	Dock	X		X	X		
Primulaceae	*Lysimachia*	*arvensis*		X				X	
Proteaceae	*Adenanthos*	*cuneatus*	Jug Flower			X		X	X
Proteaceae	*Banksia*	*armata*	Prickly Dryandra			X		X	
Proteaceae	*Banksia*	*nutans*				X			X
Proteaceae	*Banksia*	*obovata*	Wedge Leaf Dryandra			X			
Proteaceae	*Banksia*	*obtusa*	Honey Pot Banksia					X	
Proteaceae	*Banksia*	*pectinata*	Comb-leaved Grevillea			X			X
Proteaceae	*Banksia*	*pilostylis*				X			
Proteaceae	*Banksia*	*pteridifolia*	Tangled honey pot			X			
Proteaceae	*Banksia*	*pulchella*	Nodding Banksia			X			
Proteaceae	*Banksia*	*repens*	Creeping Banksia			X			
Proteaceae	*Banksia*	*speciosa*							X
Proteaceae	*Comesperma*	*leianthum ssp. leianthum*				X			
Proteaceae	*Grevillea*	*concinna ssp. concinna*				X		X	
Proteaceae	*Grevillea*	*pectinata*				X			
Proteaceae	*Hakea*	*adnata*				X			
Proteaceae	*Hakea*	*cinerea*	Ashy Hakea			X			
Proteaceae	*Hakea*	*corymbosa*	Cauliflower Hakea			X			
Proteaceae	*Hakea*	*denticulata*	Stinking Roger			X			
Proteaceae	*Hakea*	*laurina*	Pin Cushion Hakea				X		
Proteaceae	*Hakea*	*lissocarpha*	Honey Bush			X			
Proteaceae	*Hakea*	*marginata*				X			
Proteaceae	*Hakea*	*nitida*	Frog Hakea			X			
Proteaceae	*Isopogon*	*alcicornis*	Elkhorn Conehead		P3	X			
Proteaceae	*Isopogon*	*polycephalus*	Clustered Conehead			X		X	X
Proteaceae	*Isopogon*	*trilobus*	Barrel Coneflower			X			
Proteaceae	*Lambertia*	*inermis ssp. inermis*	Chittick, Native Honeysuckle			X		X	X
Proteaceae	*Petrophila*	*fastigiata*				X			

Proteaceae	*Petrophile*	*linearis*	pixie mops			X			
Proteaceae	*Synaphea*	*media*				X		X	
Proteaceae	*Synaphea*	*petiolaris*				X			
Proteaceae	*Synaphea*	*sp. aff. platyphylla*				X			
Restionaceae	*Chordifex*	*crispatus*				X			
Restionaceae	*Chordifex*	*sphacelatus*				X		X	X
Restionaceae	*Desmocladus*	*myriocladus*				X			
Restionaceae	*Hypolaena*	*exsulca*				X			X
Restionaceae	*Lepidobolus*	*chaetocephalus*				X		X	X
Rhamnaceae	*Spyridium*	*polycephalum*				X			
Rubiaceae	*Operculum*	*vaginata*	Dog Weed			X		X	
Rutaceae	*Boronia*	*crassifolia*				X			
Rutaceae	*Boronia*	*spathulata*				X			X
Rutaceae	*Cyanothamnus*	*ramosus subsp. anethifolia*				X			X
Sapindaceae	*Dodonaea*	*caespitosa*				X			
Solanaceae	*Solanum*	*nigrum*	Deadly Nightshade	X		X	X	X	
Stylidiaceae	*Levenhookia*	*pusilla*						X	
Stylidiaceae	*Stylidium*	*repens*				X		X	
Thymelaeaceae	*Pimelea*	*imbricata var piligera*				X			
Xanthorrhoeaceae	*Chaemescilla*	*corymbosa*	Blue Squill			X		X	X
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	Grass Tree			X			

8.3 Appendix 3 - TPFL Forms

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Isopogon alcicornis — **TPFL Pop. No:**

OBSERVATION DATE: 12/10/20 — **CONSERVATION STATUS:** P3 — New population ☒

OBSERVER/S: Katie White and Danika Penson — **PHONE:** 0458 441 432

ROLE: Environmental Officer — **ORGANISATION:** Shire of Esperance

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place): ~37 km north-east of Esperance townsite. On Scaddan Rd, ~3.5 km south of Green Road intersection. On north-east side of road reserve

Reserve No:

DBCA DISTRICT: South Coast — **LGA:** Esperance — Land manager present: ☐

DATUM: GDA94 / MGA94 ☒; AGD84 / AMG84 ☐; WGS84 ☐; Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required) DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6280696.5 m N

Long / Easting: 4242058.6 m E

ZONE: 51H

METHOD USED: GPS ☐ Differential GPS ☐ Map ☐

No. satellites: ___ Map used: ___

Boundary polygon captured: ☐ Map scale: ___

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☒
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole ___ to ___	Specify other: ___

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²): ___

EFFORT: Time spent surveying (minutes): ___ No. of minutes spent / 100 m²: 30

POP'N COUNT ACCURACY: Actual ☒ Extrapolation ☐ Estimate ☐ Count method: ___ (Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	Mature:	Juveniles:	Seedlings:	Totals:
Alive	12			
Dead				

Area of pop (m²): ___

Note: Pts record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size ___ Data attached ☐ Total area of quadrats (m²): ___

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☒ Flower ☒

Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: 100%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme. Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	Current Impact (N-E)	Potential Impact (L-E)	Potential Threat Onset (S-L)
• Road widening - prooposed to widen in 21/22 financial year. Wil involve clearing of of 8 plants	?M	M-H	S
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ☐

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:	ROCK TYPE:	LOOSE ROCK: (on soil surface; eg gravel, quartz fields)	SOIL TYPE:	SOIL COLOUR:	DRAINAGE:
Crest ☐	Granite ☐	0-10% ☐	Sand ☐	Red ☐	Well drained ☒
Hill ☐	Dolerite ☐	10-30% ☐	Sandy loam ☐	Brown ☒	Seasonally inundated ☐
Ridge ☒	Laterite ☐	30-50% ☐	Loam ☐	Yellow ☐	Permanently inundated ☐
Outcrop ☐	Ironstone ☐	50-100% ☐	Clay loam ☐	White ☐	Tidal ☐
Slope ☒	Limestone ☐		Light clay ☐	Grey ☐	
Flat ☐	Quartz ☐		Peat ☐	Black ☐	
Open depression ☐	Specify other:		Specify other: Gravel	Specify other:	
Drainage line ☐					
Closed depression ☐					
Wetland ☐					

Specific **Landform** Element: (Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☒ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: 1. Banksia woodland (B. attenuata, B. ilicifolia); 2. Open shrubland (Hibbertia sp., Acacia spp.); 3. Isolated clumps of sedges (Mesomelaena tetragona)

1. Open mixed scattered upper story of Mallee, Lambateria inermis, Eucalyptus pleurocarpa, Nuytsia
2. floribunda and highly diverse Kwongkan shrubland
3.
4.

ASSOCIATED SPECIES:
Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☒ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: Year: **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☒

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd:

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd:

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

KW112, Accession 8652. WA Herbarium confirmed 10/12/20. Specimen retained by WA herbarium

DRF PERMIT/ LICENCE No: FT61000029 Note if only observing plants (i.e. no specimens or plant material is taken) then no permit/licence is required. For further information on permit and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☒ Field notes ☐ Other:

COPY SENT TO: Regional Office ☒ District Office ☒ Other:

Submitter of Record: Katie White Role: Environmental Officer Signed: KW Date: 15/01/21

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au
RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.
Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ☐