

Rehabilitation Plan
CPS 8884/1
Site B – Shao Lu Rd Gravel Pit



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1 Executive Summary

This 'Rehabilitation Plan' has been undertaken in accordance with the 'DWERS Guide to Preparing Revegetation Plans for Clearing Permits' as part of the Shire of Esperance's CPS 8884/1 Strategic Purpose Permit application to the Department of Water and Environmental Regulation (DWER). 'Site B - Shao Lu Rd Gravel Pit' under CPS 8884/1, proposes clearing 5.19 ha of native vegetation for the purpose of gravel extraction.

2 Location

The site is located on the western road reserve of Shao Lu Rd, located ~2 km north of Fisheries Rd, at straight line kilometre (SLK) 2.10 (Main Roads 2020) (Figure 1). A point within the clearing permit area is -33.727378 S, 122.896005 E (GDA94). Regionally, it is located ~95 km east of Esperance town-site and 34 km east of Condingup town-site. The road reserve is vested with the Shire of Esperance.



Figure 1. Location of 'Site B – Shao Lu Rd Gravel Pit' clearing permit application, submitted under the Shire of Esperance's '2020 Strategic Purpose Permit'.

2.1 Revegetation area:

The entire proposed clearing permit area is currently intact vegetation, and will therefore all need to be rehabilitated. In total, an area of 5.19 ha is required to be rehabilitated. Rehabilitation is required as an approval condition for CPS 8884/1.

2.2 Revegetation objective:

The 200 m wide Shao Lu road reserve is an important wildlife corridor for fauna. It contains 2.037 ha of the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 listed 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan) Threatened Ecological Community'. The environmental values specific to this area include conserving the high diversity of Proteaceous species in the area and the critical role Kwongkan plays for Carnaby Black Cockatoo, *Calyptorhynchus latirostris*, foraging grounds.

The Shire of Esperance aims to restore the ecological values of the ecosystem present at 'Site B – Shao Lu Rd Gravel Pit' site, post gravel extraction by rehabilitating areas to become self-sustaining and representative of the original vegetation unit.

3 Background information of the Pre-Clearing Environment

3.1 Hydrology, Climate, Geology, Soils and Topography

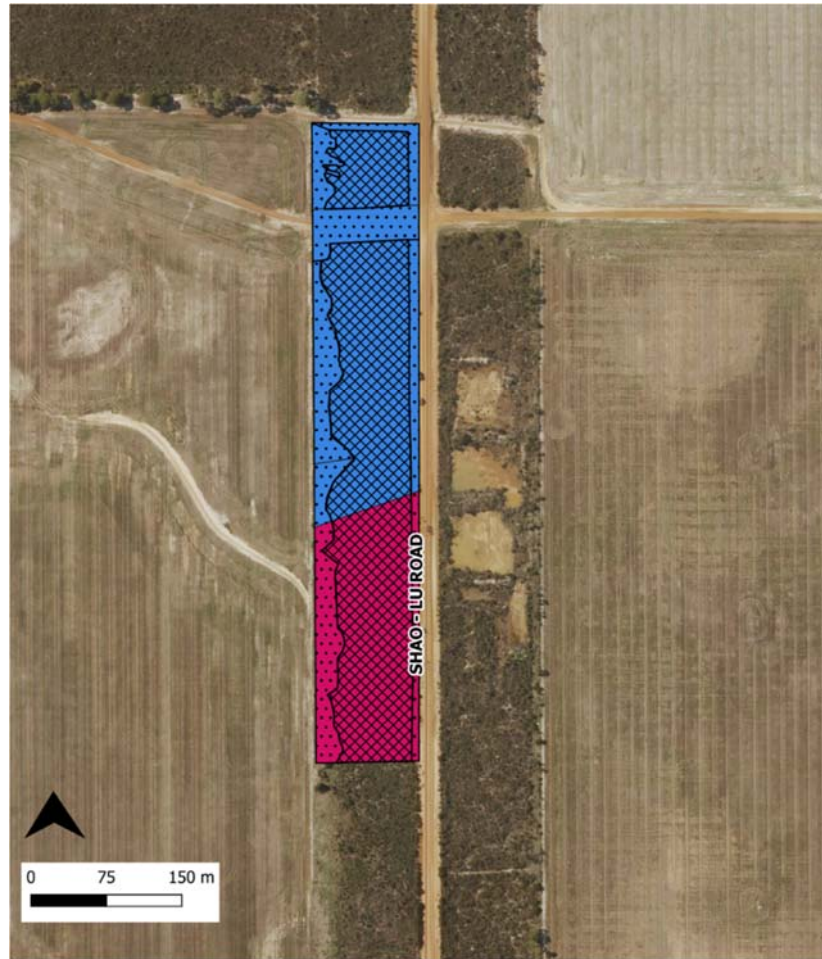
The 'Site B - Shao Lu Rd gravel pit' is located within the Blackboy creek catchment area. The climate of the Esperance region is described as Mediterranean, characterized by cool wet winters and dry warm summers. The area receives an average annual rainfall of 500 mm (BoM 2019). The geology of 'Site B – Shao Lu Rd Gravel Pit' is described by Schoknecht et al. (2004) as Tertiary marine sediment of the Pallinup formation over Proterozoic granite and gneiss. Topography of the site is described as dominated by a level plain (Schoknecht et al. 2004). The soil substrate is alkaline grey deep sandy duplex soils and grey deep sandy (gravelly) duplex soils, with associated pale deep sands. It is located within the Esperance 6 soil sub-system.

3.2 Vegetation Community

The site is located in the Interim Biogeographic Regionalisation for Australia (IBRA) 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 plain. Eucalyptus woodlands occur in gullies and alluvial foot-slopes". Beard (1973) described this area as Vegetation Association (VA) 1047 (WALGA LGMap 2019). VA 1047 is described as 'shrublands; with *Eucalyptus incrassata* Mallee-heath'. 71.25% of pre-European extent remains in the Esp2 IBRA bioregion and 84.96% in the Shire of Esperance area (DPaW 2017). In total, 54.77% of the pre-European extent of VA 1047 is formally conserved within the International Union for Conservation of Nature (IUCN) reserves across Western Australia.

The site was surveyed on 01/10/2019 by Shire of Esperance's Environmental Officer's Julie Waters and Katie White. Results of this survey are in the previously submitted 'Vegetation, Flora, Fauna and Environmental Considerations Report, Site B – Shao Lu Rd Gravel Pit (2020)'. Two vegetation communities were identified within the 'Site B – Shao Lu Gravel Pit' area, as defined by structure and composition (Figure 2). The southern 2.031 ha of the area is described as '*Eucalyptus angulosa* Mallee, with mixed heathland' (Figure 3), and the northern 3.17 ha is described as '*Eucalyptus angulosa* Mallee, with mixed Proteaceae dominated heathland, dominated by *Banksia repens* and *Anarthria laevis*' (Figure 4). It is believed that the vegetation communities observed during the field survey match the broad Beard (1973) description of the area.

The site has a high species richness, with a total of 79 native species identified within the clearing permit area (Appendix 2).



- Vegetation Condition
- ⊠ Excellent
 - ⊠ Poor
 - RAMM Road Centreline Summary
- Vegetaion Community
- Eucalyptus angulosa mallee, with mixed heath
 - Eucalyptus angulosa mallee, with mixed, and Proteaceae dominated heathland

Figure 2. Vegetation communities and condition identified in the field survey of 'Site B – Shao Lu Gravel Pit' area.



Figure 3. Vegetation community described as '*Eucalyptus angulosa* Mallee, with mixed heathland' at 'Site B – Shao Lu Rd Gravel Pit'.



Figure 4. The vegetation community present, described as '*Eucalyptus angulosa* Mallee, with mixed Proteaceae dominated heathland, dominated by *Banksia repens* and *Anarthria laevis*', meeting Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia" (Kwongkan) Threatened Ecological community (TEC) criteria within the 'Site B – Shao Lu Rd Gravel Pit' area.

3.3 Threatened Ecological Communities

The field survey determined that the northern vegetation community, which was described as '*Eucalyptus incrassata* Mallee, with mixed Proteaceae dominated heathland, dominant under-story of *Banksia repens* and *Anarthria laevis*', met the Federally listed "Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia" (Kwongkan) Threatened Ecological community (TEC) criteria (Figure 4). Foliage cover of Proteaceae species was greater than 30%. Additionally, a total of 15 Proteaceous species were recorded within the application area. Seven of these are diagnostic species listed in Table 1 of the Approved Conservation Advice for Kwongkan TEC (Commonwealth of Australia 2014). However, the periphery of the northern area along farmland and roads was in such a degraded to poor state that it was not considered in good enough quality to consist as Kwongkan TEC. Therefore, overall a total of 2.037 ha (39% of the application area) of Kwongkan TEC was present within the 'Site B – Shao Lu Rd Gravel Pits' area (Figure 2).

The southern vegetation community, '*Eucalyptus incrassata* mallee with mixed heathland' did not meet the criteria to be considered Kwongkan TEC, most notably lacking the dominance of *B. repens* and *B. armata*.

3.2 Vegetation Condition

The proposed 'Site B - Shao Lu gravel pit' is located within an intact vegetated 200 m wide road reserve on the western side of Shao Lu Road. Of the 5.201 ha of vegetation proposed to be cleared, 3.533 ha was identified as being in excellent condition (Figure 2). Along the periphery of intact vegetation, there was extensive weed invasion and scattered rubbish. These areas included adjacent farmland to the west of the site, the existing driveway dissecting the site, and less so from the road itself to the east. These areas were then considered to be in degraded to poor condition. In total 1.688 ha was considered in degraded to poor condition. No other degrading factors, such as invasive animals or historical clearing was observed.

Agricultural land surrounds the road reserve, which has contributed to the invasion of many agricultural weeds along the disturbed periphery. This may prove a challenge that requires adaptive management during rehabilitating the site.

3.4 *Phytophthora* Dieback

Very limited data collection on the presence of *Phytophthora cinnamomi* Dieback has been conducted on roadsides in Western Australia. No positive or negative sample points are collated on the Dieback Information Delivery and Management System (DIDMS; GAIA Resources, State NRM & SCNRM 2020). Vegetation is largely *P. cinnamomi* dieback susceptible, dominated by Proteaceae species. All susceptible species were extremely healthy, showing no signs of stress or key Dieback infection indicators. It is therefore probable the site remains un-infected by *P. cinnamomi*.

3.5 Other Ecological impacts

No wetland species or observed water bodies were present within the area. It is highly unlikely that clearing vegetation will result in a significant change to the water table or natural hydrological regimes. No signs of recent fire were present, and it is likely the site is long unburnt.

4 Implementation Plan

To meet the objectives of a successful scientific-based Revegetation Plan for CPS 8884/1 'Site B - Shao Lu Rd Gravel Pit', numerous factors need to be considered and will be implemented, including the reference site, weed control, pest and disease hygiene practices, site preparation, species selection, completion criteria, monitoring and adaptive management practices in the need of contingency measures. These are outlined in Sections 4.1 to 4.4, with key points highlighted below:

- Revegetation works will consist of spreading the stockpiled cleared vegetation and topsoil containing the natural stored soil seed bank directly from the site accumulated during gravel extraction works.
- Revegetation works will be carried out over April-June prior to the onset of the main winter rains in the year post clearing.
- The site will be monitored at 18, 30 and if required 42 months after the rehabilitation is completed, to be measured as successful against the completion criteria.

4.1 Pre-clearing vegetation assessment

The comprehensive vegetation community, ecological value and targeted flora surveys conducted in 2019/2020 and outlined in 'Vegetation, Flora, Fauna and Environmental Considerations Report, Site B –

Shao Lu Rd Gravel Pit (2020)' will be used as the baseline data for the site to assess against the completion criteria. No other reference site is required due to sufficient information on pre-clearing state.

4.2 Rehabilitation Methodology

The site will be cleared in approximately five sections at approximately one hectare areas. A dozer will be used to remove vegetation, topsoil and the overburden (consisting of approximately 300 mm deep of soil). This valuable layer that contains large reservoirs of the soil seed bank and live clonal tissue will be stockpiled separately for re-spreading over the site at the completion of gravel extraction activities. The gravel layer within the soil profile will then be mined and stockpiled until used offsite in neighbouring road projects. Although the clearing will be completed in sections, the gravel resource at this location is estimated to be approximately 2500 cubic metres and is likely to be cleared in one calendar year.

The large trees at the west of the site will be kept insitu, this will help act as a wind buffer for many agricultural weeds that rely on wind for seed dispersal from the neighbouring agricultural land, and assist in maintaining bird habitat.

Rehabilitation works will commence at the site between April – June, following the removal of gravel from the site. This will involve spreading the stockpiled topsoil containing the soil seed bank from prior to clearing evenly across the site. The dozer will batter the edges of the extracted area to avoid erosion and attempt to blend the area into the natural contours of the surrounding road reserve. Weedy soil skimmed off prior to gravel extraction will be deep buried close to the driveway, which post rehabilitation will likely experience a high weed burden due to the close proximity to this degrading factor. The site will be ripped to a depth of 200-350mm deep in a north-south direction and topsoil spread over the area. No direct tube stock planting or direct seeding will occur immediately, and only be used as a contingency technique if this method fails.

4.3 Weed Control

Weed invasion for the pre-clearing state was limited to the periphery of the site and was mainly dominated by agricultural weeds, such as Wild Radish and Cape Weed (Appendix 1, Table 3). Many of these species are short-lived annuals and with minimal management will be controlled and will not impact on revegetation success. The only environmental weed of concern within the site was the Golden Wattle, *Acacia pycnantha*, which quickly outcompetes Esperance natives and can dominate the landscape. The following steps will be taken to minimise the risk of introduction and spread of weeds at the site:

- *Acacia pycnantha* trees will be removed following best practice methods prior to clearing, and monitored to ensure no germination from the soil seed bank. If *A. pycnantha* plants are present post-rehabilitation then they will continue to be removed, either manually or chemically.
- All machinery, plant and equipment shall be cleaned down and free of soil and vegetative matter prior to entering and leaving the site.
- Overburden created during clearing the areas in poor condition with a high weed burden (the areas near the intersecting driveway and on the western side near the paddock) will be stockpiled separately and managed as a separate stockpile. This will then be managed by spraying following germination rains (both summer and winter) and later deep burying when soil is being respread to limit weed burden. This area will be cleared in a single operation and machinery cleaned after complete and prior to entering weed free areas.

4.4 Disease Hygiene Management

There are a large number of plant pathogens that can be spread by moving infected soil and plant material. Specifically, of focus is *Phytophthora* Dieback, such as *P. cinnamomi*. The project falls within the rainfall zone in which *Phytophthora* dieback may occur. Hygiene measures to minimise the risk of diseases are a standard part of Shire of Esperance's practices when clearing vegetation, including:

- All machinery, plant and equipment shall be free of soil and vegetative matter prior to entering and leaving the site.
- The movement of soil shall be avoided in wet conditions.

There is an assumption that no dieback is currently present at the site (based on DIDMS information and healthy looking Proteaceous species observed at the site during initial survey). The Shire of Esperance will use best practice clean down to ensure dieback is not introduced into the site due to our operations, however given that the site is on a public road, and accessible by the public, we cannot guarantee that dieback will not be introduced into the site by a member of the public and this may impact upon completion criteria.

5 Completion criteria

Prior to clearing, 39% of the site met the criteria for the 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' threatened ecological community (TEC) criteria, due to Criterion 2a of Proteaceous species having a foliage cover of greater than 30% (Commonwealth of Australia 2014). Rehabilitation is considered to successful return the site to pre-clearing ecological values when the rehabilitated vegetation once again meets the Kwongkan TEC criteria. However, Criterion 2b, described as 'two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated' will be used as a measure of whether the returning vegetation meets Kwongkan TEC criteria. The use of diagnostic species is for situations in which the cover of Proteaceae species is reduced due to recent disturbance, such as gravel extraction.

Table 1. Completion criteria following the SMART (specific, measurable, achievable, relevant, time-bound) principles for the rehabilitation of 'Site B – Shao Lu Rd Gravel Pit'.

Criterion	Baseline Floristic data	Completion Target	Completion Criteria
1	39% of the site area meets the key diagnostic characteristics and condition thresholds for Kwongkan TEC (CoA 2014). A total of 15 Proteaceous species were recorded within the application area	30% of the Site meets the Key diagnostic characteristics and condition thresholds for Kwongkan TEC, using criterion 2b of the Approved Conservation advice for Kwongkan TEC. Note criterion 2b is used due to the disturbance.	30% of the revegetation site has two or more diagnostic Proteaceae species present (See appendix 2) that are likely to form a significant vegetative component.
2	A total of 15 Proteaceous species were recorded within the application area	66% of Proteaceous species return to the site	A total of at least 10 Proteaceous species present throughout the site.
3	<i>Eucalyptus angulosa</i> is present as the dominant	Return of dominant tree species	<i>Eucalyptus angulosa</i> is present in the rehabilitation area

	tree species although at low density		scattered throughout at a density of one plant per 400m ²
4	<i>Acacia pycnantha</i> is present at the site but in low density	Significant Environmental weed species are absent from the revegetation site.	No <i>Acacia pycnantha</i> plants are found in the rehabilitation area

6 Monitoring

Monitoring of the rehabilitated area following gravel extraction will determine if completion criteria have been achieved and if contingency measures are required (Section 7). The methodology for monitoring will involve onsite visual assessments to determine whether revegetation has been implemented as planned and that completion criteria have been met, as outlined in Table 1. Three permanent photo points will be set up in the area. Monitoring will occur annually by the Shire of Esperance's Environmental Officers, who have a tertiary level education in Environmental Science or similar qualifications. Monitoring will coincide with the inspection period of the calendar year Annual Compliance report for CPS 8884/1, normally conducted between January and March. This will continue for up to three years following the rehabilitation event or rehabilitation has been deemed successful.

7 Contingency measures

Where the rehabilitation is deemed unsuccessful by comparison to the completion criteria (Section 5), contingency measures will be undertaken, until the completion criteria are met sufficiently. This is an adaptive process and dependent on what completion criteria has failed. A few standard techniques are outlined below:

- If the composition of species does not meet criteria, such as return of up to 10 Proteaceous species, then specific species will be infill planted or seeded during the next revegetation season from April to June.
- If listed environmental weeds exist in the site then herbicide and or manual control will be applied to affected areas.

7.1 Species selection

Keystone and dominant species will be selected as a contingency measure if respreading topsoil and stockpiled vegetation has unsuccessful germination and does not meet the completion criteria. The incidental species list from the October 2019 survey (Appendix 1) will be the basis for determining species selection for seed and tubestock seedlings, based on availability. Seed can also be collected from the adjacent road reserve or the 240 ha Crown Reserve 32802 immediately to the north of the area as these contain similar vegetation types and are local province.

8 Reporting

The Annual Compliance Report for CPS 8884/1 will include a report on revegetation activities, outlining the measurable targets outlined in Table 1 as the completion activities and results of the monitoring. The Annual Compliance report for clearing permits administered by DWER are generally required to be submitted to DWER by 30th June, covering from the 1st January to 31st December of the preceding year.

9 Responsibilities

Table 2. Responsible roles at the Shire of Esperance to implement the Revegetation Activities outlined in the Rehabilitation Plan for 'Site B – Shao Lu Gravel Pit' under CPS 8884/1

Role	Responsible Actions
Rural Maintenance Supervisor	Revegetation implementation, record keeping and internal reporting
Environmental Coordinator / Environmental Officer	Monitoring rehabilitation and assessment against completion criteria Reporting externally (completed through annual reporting of CPS 8884/1)

10 References

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Appendix 1 Incidental species list

Table 3. Flora species present within 'Site B - Shao Lu Road Gravel Pit' application area. (October 2019)

Family	Genus	Species	Common Name	Invasive
Anarthriaceae	<i>Arnarthria</i>	<i>laevis</i>		
Asparagaceae	<i>Lomandra</i>	<i>hastilis</i>		
Asteraceae	<i>Arcotheca</i>	<i>calendula</i>	Capeweed	x
Asteraceae	<i>Argentipallium</i>	<i>niveum</i>		
Asteraceae	<i>Conyza</i>	<i>sp.</i>	Fleabane	
Asteraceae	<i>Ursinia</i>	<i>anthemoides</i>	Ursinia Daisy	
Brassicaceae	<i>Raphanus</i>	<i>raphanistrum</i>	Wild Raddish	x
Casuarinaceae	<i>Allocasuarina</i>	<i>humillis</i>		
Casuarinaceae	<i>Allocasuarina</i>	<i>thyoides</i>	Horned Sheoak	
Cyperaceae	<i>Mesomelaena</i>	<i>stygia</i>		
Cyperaceae	<i>Tricostularia</i>	<i>aphylla</i>	Curled Sedge	
Dilleniaceae	<i>Hibbertia</i>	<i>andrewsiana</i>		
Dilleniaceae	<i>Hibbertia</i>	<i>gracilipes</i>	Esperance Butter Cup	
Droseraceae	<i>Drosera</i>	<i>menziesii</i>	Pink Rainbow	
Ericaceae	<i>Leucopogon</i>	<i>carinatus</i>		
Ericaceae	<i>Lysinema</i>	<i>ciliatum</i>	Native Curry Flower	
Euphorbiaceae	<i>Monotaxis</i>	<i>paxii</i>		
Euphorbiaceae	<i>Stachystemon</i>	<i>virgatus</i>		
Fabaceae	<i>Acacia</i>	<i>cochlearis</i>	Rigid Wattle	
Fabaceae	<i>Acacia</i>	<i>cyclops</i>	Coastal Wattle	
Fabaceae	<i>Acacia</i>	<i>pycnantha</i>	Golden Wattle	x
Fabaceae	<i>Chorizema</i>	<i>obtusifolium</i>		
Fabaceae	<i>Daviesia</i>	<i>incrassata subsp. recurva</i>		
Fabaceae	<i>Daviesia</i>	<i>major</i>	Bitter Pea	
Fabaceae	<i>Daviesia</i>	<i>teretifolia</i>	Bitter Pea	
Fabaceae	<i>Hovea</i>	<i>trisperma</i>		
Fabaceae	<i>Ornithopus</i>	<i>compressus</i>	Yellow Serradella	x
Fabaceae	<i>Sphaerolobium</i>	<i>daviesioides</i>	Prickly Globe-pea	
Fabaceae	<i>Trifolium</i>	<i>sp.</i>	Clover	x
Geraniaceae	<i>Erodium</i>	<i>sp.</i>	Stork's Bill	x
Goodeniaceae	<i>Dampiera</i>	<i>lavandulaceae</i>		
Goodeniaceae	<i>Dampiera</i>	<i>sacculata</i>	Pouched Dampiera	
Goodeniaceae	<i>Goodenia</i>	<i>incana</i>	Hoary Goodenia	
Goodeniaceae	<i>Lechenaultia</i>	<i>tubiflora</i>	Heath Leschenaultia	
Haloragaceae	<i>Glischrocaryon</i>	<i>sp.</i>	Globular Pop Flower	
Hemerocallidaceae	<i>Dianella</i>	<i>brevicaulis</i>	Flax Lilly	

Iridaceae	<i>Patersonia</i>	<i>juncea</i>	Rush leaved Patersonia	
Malvaceae	<i>Malva</i>	<i>sp.</i>	Mallow	x
Myrtaceae	<i>Beaufortia</i>	<i>empetrifolia</i>	South Coast Beaufortia	
Myrtaceae	<i>Calothamnus</i>	<i>gracilis</i>	One-sided Bottle Brush	
Myrtaceae	<i>Calytrix</i>	<i>decandra</i>	Pink Starflower	
Myrtaceae	<i>Calytrix</i>	<i>leschenaultii</i>		
Myrtaceae	<i>Cyathostemon</i>	<i>ambiguus</i>		
Myrtaceae	<i>Darwinia</i>	<i>vestita</i>	Pom-pom Darwinia	
Myrtaceae	<i>Eucalyptus</i>	<i>angulosa</i>	Ridge-fruited Mallee	
Myrtaceae	<i>Leptospermum</i>	<i>spinescens</i>		
Myrtaceae	<i>Melaleuca</i>	<i>pulchella</i>	Claw Flower	
Myrtaceae	<i>Melaleuca</i>	<i>rigidifolia</i>		
Myrtaceae	<i>Melaleuca</i>	<i>scabra</i>	Rough Honey Myrtle	
Myrtaceae	<i>Melaleuca</i>	<i>suberosa</i>	Corky Honey Myrtle	
Myrtaceae	<i>Melaleuca</i>	<i>thymoides</i>		
Myrtaceae	<i>Melaleuca</i>	<i>tuberculata</i> subsp. <i>macrophylla</i>		
Myrtaceae	<i>Taxandria</i>	<i>marginata</i>		
Myrtaceae	<i>Verticordia</i>	<i>densiflora</i>	Compacted Feather flower	
Myrtaceae	<i>Verticordia</i>	<i>minutiflora</i>		
Orchidaceae	<i>Cyanicula</i>	<i>gemmata</i>	Blue China Lady	
Orchidaceae	<i>Disa</i>	<i>bractea</i>	South African Orchid	x
Orchidaceae	<i>Diuris</i>	<i>laxiflora</i>	Bee Orchid	
Orchidaceae	<i>Elythranthera</i>	<i>brunonis</i>	Purple Enamel Orchid	
Orchidaceae	<i>Thelymitra</i>	<i>sp.</i>	Sun Orchid	
Pittosporaceae	<i>Billardiera</i>	<i>fusiformis</i>	Australian Bluebell	
Poaceae	<i>Briza</i>	<i>maxima</i>	Blowfly grass	x
Poaceae	<i>Ehrharta</i>	<i>longiflora</i>	Veld Grass	x
Poaceae	<i>Hordeum</i>	<i>leporinum</i>	Barley Grass	x
Poaceae	<i>Neurachne</i>	<i>alopecuroidea</i>	Foxtail Mulga Grass	
Proteaceae	<i>Banksia</i>	<i>obovata</i>	Wedge-leaved Banksia	
Proteaceae	<i>Banksia</i>	<i>obtusa</i>	Shining Honeypot	
Proteaceae	<i>Banksia</i>	<i>pulchella</i>	Teasel Banksia	
Proteaceae	<i>Banksia</i>	<i>repens</i>	Creeping Banksia	
Proteaceae	<i>Hakea</i>	<i>cinerea</i>	Ashy Hakea	
Proteaceae	<i>Hakea</i>	<i>corymbosa</i>	Cauliflower Hakea	
Proteaceae	<i>Hakea</i>	<i>marginata</i>		
Proteaceae	<i>Hakea</i>	<i>obliqua</i>	Needles and Cork Hakea	
Proteaceae	<i>Hakea</i>	<i>Pandanocarpa</i> subsp. <i>crassifolia</i>		
Proteaceae	<i>Hakea</i>	<i>prostrata</i>	Harsh Hakea	

Proteaceae	<i>Hakea</i>	<i>trifurcata</i>	Two Leaved Hakea	
Proteaceae	<i>Hakea</i>	<i>varia</i>	Variable Hakea	
Proteaceae	<i>Isopogon</i>	<i>polycephalus</i>	Clustered Cone Flower	
Proteaceae	<i>Petrophile</i>	<i>fastigiata</i>		
Proteaceae	<i>Petrophile</i>	<i>linearis</i>	Pixie Mops	
Restionaceae	<i>Desmocladius</i>	<i>flexuosus</i>		
Restionaceae	<i>Desmocladius</i>	<i>lateriflorus</i>		
Restionaceae	<i>Hypolaena</i>	<i>fastigiata</i>		
Rubiaceae	<i>Opercularia</i>	<i>vaginata</i>	Dog Weed	
Rutaceae	<i>Boronia</i>	<i>crassifolia</i>		
Rutaceae	<i>Boronia</i>	<i>ramosa</i> subsp. <i>anethifolia</i>		
Rutaceae	<i>Boronia</i>	<i>spathulata</i>	Pink Boronia	
Stylidiaceae	<i>Stylidium</i>	<i>pilliferum</i>	Common Butterfly Triggerplant	
Xanthorrhoeaceae	<i>Chamaescilla</i>	<i>corymbosa</i>	Blue Squill	
Xanthorrhoeaceae	<i>Xanthorrhoea</i>	<i>platyphylla</i>	Grass Tree	

Appendix 2 - Key diagnostic characteristics of the Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia

(Adapted from Approved Conservation Advice for Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia (Commonwealth of Australia, 2014).

A patch must include the following key diagnostic characteristics to be considered the ecological community:

1) Occurs within the Southeast Coastal Floristic Province (*sensu* Hopper and Gioia, 2004; relating to south west Australian phytogeographic boundaries. Includes the islands of the Recherche Archipelago).

AND

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),

OR

2b) Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated (see list of diagnostic species in Table 1). The use of diagnostic species is for situations in which the cover of Proteaceae species is reduced due to recent disturbance (e.g. fire).

Table 4: List of diagnostic species (Esperance (east))

<i>Adenanthos cuneatus</i>
<i>Banksia alliacea</i>
<i>Banksia armata</i>
<i>Banksia cirsioides</i>
<i>Banksia media</i>
<i>Banksia nivea</i>
<i>Banksia nutans</i>
<i>Banksia obovata</i>
<i>Banksia occidentalis</i>
<i>Banksia petiolaris</i>
<i>Banksia pilostyllis</i>
<i>Banksia plumosa</i>
<i>Banksia prolata</i>
<i>Banksia pulchella</i>
<i>Banksia speciosa</i>
<i>Banksia tenuis</i>
<i>Grevillea concinna</i>
<i>Hakea cinerea</i>
<i>Hakea corymbosa</i>
<i>Hakea drupacea</i>
<i>Hakea nitida</i>
<i>Hakea obliqua</i>
<i>Hakea pandanocarpa</i>
<i>Hakea trifurcata</i>
<i>Isopogon formosus</i>
<i>Isopogon heterophyllus</i>
<i>Isopogon polycephalus</i>
<i>Isopogon trilobus</i>
<i>Lambertia inermis</i>