Vegetation, Flora, Fauna and Environmental Considerations Report

Shire of Esperance 2023-24 Strategic Purpose Permit
Site E – Merivale Road, SLK 33.54 - 45.41

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Acknowledgement of country

The Shire of Esperance acknowledges the Kepa Kurl Wudjari people of the Nyungar nation and Ngadju people who are the traditional custodians of this land and their continuing connection to land, waters and community. We pay our respects to Elders past, present and emerging, and we extend that respect to other Aboriginal Australians today.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1. Incidental Species List
2. Threatened and Priority Flora Report Forms
3. Threatened and Priority Flora Species with the Potential to occur within the Merivale Road, SLK 33.54 - 45.41 Survey Area
4. Threatened and Priority Fauna Species with the Potential to occur within the Merivale Road, SLK 33.54 - 45.41 Survey Area
5. State Threatened and Priority Flora and Fauna definitions
6. Commonwealth Definition of Threatened Flora and Fauna Species
7. State Threatened Ecological Community definitions
8. State Definition of Priority Ecological Communities
9. Commonwealth Definition of Threatened Ecological Communities
10. Categories and Control measures of Declared Pest (Plant) Organisms in Western Australia
11. Definitions of Vegetation Condition Scale
12. Cockatoo foraging habitat scoring template
13. EPBC Act Protected Matters Report
14. Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins - Community Description

LIST OF ABBREVIATIONS

BAM Act: Biosecurity and Agriculture Management Act 2007 (WA)
BC Act: Biodiversity Conservation Act 2016 (WA)
BOM: Bureau of Meteorology
DBCA: Department of Biodiversity, Conservation and Attractions
EP Act: Environmental Protection Act 1986 (WA)
EPA: Environmental Protection Authority
EPBC Act: Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
IBRA: Interim Biogeographical Regionalisation for Australia
IUCN: International Union of Conservation Nature
LGA: Local Government Area
NVIS: National Vegetation Information System
PEC: Priority Ecological Community
PF: Priority Flora (Under BC Act)
SOE: Shire of Esperance
SLK: Straight Line Kilometres (Main Roads WA)
TEC: Threatened Ecological Community
TF: Threatened Flora (Under BC Act)
TPFL: Threatened and Priority Flora Database (DBCA)
TPRF: Threatened and Priority Flora Report Form
WAH: Western Australian Herbarium (PERTH)
WAOL: Western Australian Organism List

Executive Summary

The Shire of Esperance Environmental Team was commissioned by the Shire of Esperance Asset Operations Department to undertake a review of the flora, vegetation and fauna values on the proposed Merivale Road, SLK 33.54 - 45.41 project in 2022-23 as part of their Strategic Purpose Permit application.

A total of 212 vascular plant taxa, representative of 138 genera and 45 families, were recorded within Merivale Road, SLK 33.54 - 45.41 survey area. Of these 161 were native species and 51 were introduced. The majority of taxa recorded were representative of the Myrtaceae (34 taxa), Proteaceae (26 taxa) and Fabaceae (25 taxa) families (see Appendix 1 for the complete incidental species list).

Seven vegetation communities were identified within the 'Site E – Merivale Road, SLK 33.54 - 45.41', consisting of Vegetation Type A: *Eucalyptus occidentalis* open forest over *Melaleuca* spp. dominated open shrubland with Juncus pallidus rushland; Vegetation Type B: *Nuytsia floribunda* open woodland over *Lambertia inermis* dominated myrtaceous and proteaceous shrubland with *Xanthorrhoea platyphylla*; Vegetation Type C: *Melaleuca cuticularis* and *Acacia saligna* dominated wetland with *Juncus pallidus rushland;* Vegetation Type D: *Banksia speciosa* closed low forest with *Agonis baxteri* dominated sparse shrubland and sparse sedgeland; Vegetation Type E: Open shrub Mallee with *Eucalyptus pleurocarpa* over mixed myrtaceous and proteaceous shrubland; Vegetation Type F: Open Mallee and *Melaleuca cuticularis* forest with *Taxandria callistachys* and *Juncus pallidus*; and Vegetation Type G: *Melaleuca cuticularis* open woodland with *Taxandria callistachys* dominated tall closed shrubland with *Leptocarpus crebriculmis* dominated open rushland. The vegetation communities mapped and species recorded in the Merivale Road, SLK 33.54 - 45.41 survey area was partially consistent with the historical mapping of Beard (1973), with fine scale vegetation types not begin consistent with historical mapping. Most of the vegetation communities are well represented at a local and regional scale, with the exception of Beard vegetation association Esperance 4801, which is highly cleared.

One priority flora species pursuant to the Biodiversity Conservation Act (2016) and as listed by the Department of Biodiversity, Conservation and Attractions (DBCA) was recorded within the Merivale Road, SLK 33.54 - 45.41 survey area. No plant taxa listed as Threatened pursuant to Schedule 1 of the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 were recorded during the survey within the proposed Merivale Road, SLK 33.54 - 45.41 survey area.

Table 1: Summary of Priority flora species recorded in Site E – Merivale Road, SLK 33.54 - 45.41 project area.

Species	Conservation Code	Total taking	Total in maintenance zone	Total Plants
Astartea eobalta	P2	19	20	401

A total of 1.358 ha of the EBPC listed 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' Threatened Ecological Community (TEC) was present within Site E - Merivale Road, SLK 33.54 - 45.41. There was also one vegetation unit that was consistent with the State Listed Priority Ecological Community (PEC) "Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins". No other TECs or PECs were located within site E - Merivale Road, SLK 33.54 - 45.41.

The site contains 1.477 ha of high quality native foraging habitat for the EPBC listed Carnaby's cockatoo (*Calyptorhynchus latirostis*). The project area contained vegetation that may provide suitable habitat for five other listed threatened fauna species (Sharp-tailed sandpiper, Common greenshank, Quenda, Australian bittern and Recherche cape Barren goose) that likely to be impacted upon by this proposal.

As Shire Environmental Coordinator signs off on project work packs the following recommendation will be included within the internal SOE approval process for the road project:

- Minimise clearing to minimum amount required;
- Avoid larger habitat trees (larger trees and trees with hollows) wherever possible;
- Minimise soil disturbance during clearing and practice standard vehicle hygiene to ensure introduced (exotic) species do not become established within the Merivale Road, SLK 33.54 - 45.41 survey area;
- All vehicles and construction equipment to be cleaned prior to start of the project;
- Works to be carried out in the dry (summer) months to minimise spread of dieback.

These have been addressed in the attached Weed and Dieback Plan (Section 8.1), and provided these measures are implemented, there should be no impediments to the widening of Merivale Road, SLK 33.54 - 45.41.

1 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 'Merivale Road, SLK 33.54 - 45.41' project as Site E under the '2023/24 Strategic Purpose Permit' (Figure 1), for the purpose of road and drainage upgrades.

1.1 Location and Scope of Project

The proposed works are located ~34 km east of Esperance, within the Shire of Esperance managed road reserve of Merivale Rd. Specifically, it is located from the intersection of Merivale and Jim's Oven Road to the intersection of Merivale and Rancho X Road, at straight line kilometre (SLK) 33.54 to 45.41 (Main Roads 2022). A point within the proposed clearing permit area is 441011m E, 6258813 m N (UTM Zone 51 H, GDA94).

To complete these works clearing of 3.024 ha of native vegetation for the purpose of road safety and drainage upgrades. To mitigate impact of clearing vegetation, road widths and elevation changes have been kept to a minimum to reduce final road footprint therefore reducing clearing while improving road geometry and safety for the road user.

The project includes bituminisation and minor upgrades to Merivale Road with significant upgrades to drainage infrastructure. To complete these works, native vegetation along several bends will be cleared and native patches of native vegetation will be cleared throughout the length of the project for the installation of additional spoon drains and sumps.

Figure 1. Location of Site E – Merivale Road, SLK 33.54 - 45.41.

1.2 Environmental Legislation and Guidelines

The Commonwealth (federal) legislation relevant to this survey:

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The following Western Australian (state) legislation is relevant to this survey:

- Biodiversity Conservation Act 2016 (BC Act);
- Biodiversity Conservation Act 2016 Biodiversity Conservation (Listing of Native Species) (Flora) Order 2022;
- Biodiversity Conservation Act 2016 Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2022;
- Biosecurity and Agriculture Management Act 2007 (BAM Act); and
- Environmental Protection Act 1986 (EP Act).

Western Australian guidelines relevant to this survey are:

- Environmental Factor Guideline: Flora and Vegetation (Environmental Protection Authority [EPA] 2016);
- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016);
- A guide to the assessment of applications to clear native vegetation, Under Part V Division 2 of the Environmental Protection Act 1986 (DWER, 2014); and
- Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA, 2020).

International Agreements relevant to this survey are:

- Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974 (Japan-Australia Migratory Bird Agreement – JAMBA);
- Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986 (China-Australia Migratory Bird Agreement – CAMBA);
- Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds 2007 (Republic of Korea-Australia Migratory Bird Agreement – ROKAMBA); and
- Convention on Wetlands of International Importance 1971 (Ramsar Convention).

2 OBJECTIVES

The objective of this survey was to undertake a flora, fauna and vegetation assessment of the Merivale Road, SLK 33.54 - 45.41 survey area. This is inclusive of the following:

- Undertake a desktop study of the flora, fauna and vegetation of the Merivale Road, SLK 33.54 - 45.41 survey area, with an emphasis on threatened and priority flora, threatened and priority ecological communities (TECs and PECs) and Threatened and Priority fauna;
- Review the historical literature of the Merivale Road, SLK 33.54 - 45.41 survey area;
- Undertake a detailed survey of the Merivale Road, SLK 33.54 - 45.41 survey area, and collect and identify the vascular plant species present;
- Review the conservation status of the vascular plant species recorded by reference to current literature and listings by the Department of Biodiversity, Conservation and Attractions (DBCA) and plant collections held at the Western Australian State Herbarium (WAH), and listed by the Department of Climate Change, Energy, the Environment and Water under the EPBC Act;
- Define and map the vegetation communities in the Merivale Road, SLK 33.54 - 45.41 survey area;
- Define and map the location of any threatened and priority flora located within the Merivale Road, SLK 33.54 - 45.41 survey area;
- Define any management issues related to flora, fauna and vegetation values;
- Provide recommendations on the local and regional significance of the vegetation communities; and
- Prepare a report summarising the findings.

3 METHODS

3.1 Desktop Assessment

Desktop information was collated for all areas within a 20 km buffer zone of the site using DBCA datasets sourced under agreement. These data sources are listed below:

- Western Australian Herbarium data (WAH);
- Threatened and Priority Flora Database (TPFL);
- DBCA's Esperance District Threatened Flora spatial dataset;
- Threatened and Priority Ecological Communities (TECs & PECs);

- Threatened, Specially Protected and Priority fauna; and
- Black cockatoo roost and breeding sites.

Additionally, the EPBC Act Protected Matters Search Tool (PMST), was also checked to identify the possible occurrence of Threatened and Priority flora, fauna and ecological communities within the Merivale Road, SLK 33.54 - 45.41 area. Search parameters were 'by polygon' and a 20 km buffer was applied to the search area; standard used in this IBRA subregion. Historical and State documentation and datasets consulted include:

- Vegetation mapping of the region, principally the coarse-scale vegetation associations of Beard (1973);
- Vegetation Extent by Statewide Pre-European mapping statistics (GoWA, 2020);
- Soil landscape mapping (DAFWA);
- Dieback Information Data Management System (DIDMS; Gaia Resources);
- Shire of Esperance Weed Mapping Data;
- Existing site digital orthophotos (Merivale 2018)
- Drone orthomosaic (2023)
- Atlas of Living Australia (ALA) database;
- Hydrographic Catchments (DWER); and
- Crown Reserves (Landgate).

3.2 Field Survey

The site was initially inspected on 2nd of November 2022, by Julie Waters (SOE Environmental Coordinator), Katherine Walkerden (SOE Environmental Officer). A general assessment of possible ecological impacts included historical clearing, impact of fire regimes, regeneration from disturbance, waterlogging, senescence, weeds, erosion, sedimentation, invasive fauna, *Phytophthora* Dieback, and illegal dumping of rubbish.

A detailed field assessment of the flora and vegetation of the Merivale Road, SLK 33.54 - 45.41 survey area was undertaken by Shire of Esperance staff from 2nd November to 4th of November 2022 in accordance with methods outlined in Technical Guidance – Flora and vegetation surveys for environmental impact assessment (EPA 2016). All staff held valid collection licences to collect flora for scientific purposes, issued under the BC Act.

The methodology for assessing threatened and priority flora consisted of traversing by foot the entire Merivale Road, SLK 33.54 - 45.41 survey area. 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. Staff used handheld Garmin GPS units, recording all species, and collecting all but the very common, well known species.

For PF or TF species identified in the desktop survey as possible to occur, scans of pressed specimens from either the WAH or local Esperance District Herbarium were taken into the field. Suitable associated habitat for TF or PF identified in the desktop study were particularly focused on, and extensively searched. If suspected or known conservation significant flora species were encountered, a specimen

was collected for subsequent identification with GPS coordinates and plant numbers recorded for the population. During the survey, a field herbarium for Merivale Road, SLK 33.54 - 45.41 was also constructed for surveyor reference.

All species unknown in the field were collected, pressed and dressed in accordance with WAH instructions, and later identified by SOE's three Environmental staff, using keys, WA Herbarium's Florabase, literature and Esperance District Herbarium. Any species that were unable to be identified were submitted to the WAH for identification. Nomenclature of the species recorded is in accordance with the WAH.

A follow up survey was conducted on 11th of January 2023 by Katherine Walkerden to specifically target the identification and counting of *Astartea eobalta* (P2), a second follow up survey was conducted on the 13th of February 2024 by Katherine Walkerden and Julie Waters.

The vegetation communities of 'Site E – Merivale Road, SLK 33.54 - 45.41' was assessed for the presence TECs and PECs (DBCA 2023a) comparing that to descriptions in approved conservation advice for these communities.

Specifically, the site was assessed for the 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' TEC, which is listed as 'Endangered' under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999). 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 35 (DBCA 2023c)' definitions.

As Site E – Merivale Road, SLK 33.54 - 45.41 is a long linear site, quadrant-based data was not used to determine if the site meet the TEC definitions, this was due to the inability to site an appropriately sized quadrant (As per Table 1, Technical Guidance – Flora and vegetation surveys for Environmental Impact Assessment (EPA 2016) within the narrow road verge area.

Only a basic fauna survey was conducted as per EPA (2020) guidelines. Observations of fauna presence, such as call sounds, footprints and scats were noted, and the area assessed for suitability of habitat within 'Site E – Merivale Road, SLK 33.54 - 45.41' for fauna species identified in the desktop survey. Carnaby's Black Cockatoo (*Calyptorhynchus latirostris)* feeding, roosting and nesting habitat was also assessed using EPBC Act referral guidelines (2022).

3.3 Survey Timing

According to Table 3 in the Technical Guidance – Flora and vegetation surveys for Environmental Impact Assessment (EPA 2016), the primary survey timing for the South-west and Interzone Botanical Province

is Spring (September-November). As all surveys at Merivale Road, SLK 33.54 - 45.41 were conducted in November, it falls within this period.

The 2022 spring rainfall was above average, and hence spring flowering continued for an extended period in 2022.

A targeted survey was conducted in January and February to target the counting of Priority 2 *Astartea eobalta.* This species is summer flowering and the survey was conducted during the peak flowering period for this species.

3.4 Vegetation Descriptions

Vegetation communities present within the survey area were assessed during the field survey. Broad vegetation types defined by structure and composition were recorded and described using the National Vegetation Information System (NVIS; ESCAVI 2003) classification system.

Condition of vegetation was assessed using Table 2 of the Technical Guidance – Flora and vegetation surveys for Environmental Impact Assessment (EPA 2016) categories, as 'Excellent', 'Very Good', 'Good', 'Degraded' or 'Completely Degraded'. This illustrates how healthy vegetation is, determined by vegetation structure, weed cover, presence of dieback, historical clearing, grazing and other signs of disturbance.

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.

3.5 Survey Limitations

A general assessment was made of the survey against a range of factors that may have limited the outcomes and conclusions of this report (Table 2). Based on this assessment, the present survey has not been subject to constraints which would affect the thoroughness of the survey, and the conclusions which have been formed.

Table 2: Potential limitations affecting the conclusions made in this report

Potential Survey Limitation	Impact on Current Survey
Availability of contextual information at a regional and local scale	**Not a limitation:** Reference resources such as Beard's mapping, together with online flora and vegetation information, have provided an appropriate level of information for the current survey. The vegetation of the Esperance shire has previously been mapped by Beard (1973).
Resources (i.e. were there adequate resources to complete the survey to the required standard).	**Not a constraint:** Adequate resources were made available by Shire of Esperance to complete the surveys.
Competency/experience of team carrying out survey; experience in the bioregion surveyed	**Not a limitation:** Botanists had extensive experience working within the Shire of Esperance and wider areas. Two of the botanists have consistently worked within this bioregion for more than 15 years. Botanists were familiar with flora in the area. Any unknown or potential

	threatened or priority flora species were collected and identified, utilising resources available at the Western Australian Herbarium and consultation with expert taxonomists.
Proportion of flora collected and identification issues	**Potential limitation:** While many plants were in flower during the survey, a proportion of plants encountered during the survey were sterile and may impact the chance of identification of some specimens to species level. Orchid species may not emerge each year if conditions are not favourable. Although these may affect the completeness of the species list, it is not expected to have a significant effect on mapping reliability, nor on the identification of threatened and priority species in the area as the majority were perennial species. Surveys were only undertaken in one year.
Effort and extent of survey	**Potential limitation:** The survey area was thoroughly covered. The threatened and priority flora search undertaken by botanists by means of foot-traverse between vegetation quadrat sites ensured thorough coverage of the survey area. Flora that was unknown or resembled threatened or priority flora were collected, the location and habitat noted, and the number of plants estimated.
Mapping reliability	**Not a constraint.** Handheld GPS units were used for the survey, which for a majority of field conditions have an accuracy level of ± 5 m.
Survey timing, rainfall, season of survey	**Not a limitation:** The EPA (2016a) recommends that flora and vegetation surveys in the South – West Botanical Province be conducted in Spring (September-November). The main survey has been conducted in November which falls within this period. A targeted survey was conducted in January for *Astartea eobalta,* this survey coincided with the peak flowering period for the species.
Disturbances (fire/flood/clearing)	**Not a limitation:** The Merivale Road, SLK 33.54 - 45.41 survey area exhibits significant disturbance from historical clearing and weed invasion. There were no recent fires in any of the surveyed areas.

4 DESKTOP ASSESSMENT RESULTS

4.1 Climate

The Esperance climate is described as Mediterranean, characterised by cool wet winters and dry warm summers (BoM 2024). The Condingup area receives an average annual rainfall of 630 mm. The Shire of Esperance received an unusually high level of rainfall in 2022, resulting in an extended flowering period.

4.2 Catchment

The project is present within the Esperance Coast Basin. It is located approximately 11km from the coast.

4.3 Geology, Soils and Topography

Four geological units were identified within 'Site E – Merivale Road, SLK 33.54 - 45.41, by Schoknecht et al. (2004). These were:

- Tertiary marine sediments of the Pallinup formation;
- Quaternary aeolian sand overlying Tertiary sediments of the Pallinup formation;
- Tertiary marine sediment of the Pallinup formation over Proterozoic granite and gneiss; and
- Quaternary sediments with aeolian sands intruding from coastal dunes over Tertiary sediments.

Within the area, there has been 11 soil types recorded. These were:

- Gravelly, yellow mottled sandy duplex soils over gravel layer at 30-80cm;
- Deep uniform sand, Podzol > 80 cm (Corinup), Uc2.22;
- Pale deep sands;
- Deep uniform sand, Podzol > 80 cm (Corinup), Uc2.27;
- Solonetzic, columnar, yellow, motled duplex soil (Boyatup), Dy5.42;
- Solonetzic, columnar, yellow, motled duplex soil (Boyatup), Dy5.43;
- Yellow, mottled, duplex soil (Dempster), Dy5.83;
- Solonetzic, yellow, duplex soil (Baylemup), Dy4.43;
- Semi-wet deep sands and deep sandy duplex soils with some grey deep sandy duplex soils;
- Highly saline and seasonally inundated soils; and
- Wet soils and semi-wet soils.

Using Schnoknect et al. (2004), the project topography is mapped at a fine scale, traversing eight topographic areas. These were:

- Level plain, <1% slope
- Gently undulating plain, 1-3% slope
- Longitudinal dunes, 2-6% slope
- Gently undulating, 1-2% slope
- Depressions
- Well defined depressions
- Seasonally inundated shallow depressions
- Seasonally wet and waterlogged shallow closed drainage depressions

4.4 Regional Vegetation

The site is located within the Interim Biogeographic Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) Esperance Plains region and Recherche sub-region (Esp2). 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 one vegetation association (VA) within the 'Site E – Merivale Road, SLK 33.54 - 45.41' area, Esperance 4801 (Table 2). The vegetation association was highly cleared at all levels with only 11% of its original extent remining. The vegetation association is also poorly represented in conservation estate with 3% of the vegetation associations pre-European is in IUCN areas.

Table 2. Vegetation associations mapped by Beard (1973) within the 'Site E – Merivale Road, SLK 33.54 - 45.41', and statistics on pre-European remaining areas.

Vegetation Association	
Name	Esperance 4801
Description	Shrublands; heath with scattered Nuytsia
Pre-European extent in IBRA sub-region Esp2	11.17 %
Pre-European extent in LGA	11.17 %
Current extent conserved in IUCN area	29.72 %
Pre-European Extent in IUCN area	3.32 %

4.5 Surrounding Land Use

The area directly included in the clearing permit application 'Site E – Merivale Road, SLK 33.54 - 45.41' is currently intact and vegetated 60 m wide road reserve, managed by the Shire of Esperance. The surrounding land use is agricultural. The area is within rural zoning.

The site was 5.7 km north from Cape Le Grand National Park, the closest conservation reserve. No conservation vested reserves were within 5 km of the site.

4.6 Potential Threatened and Priority Flora

Four threatened flora (TF) and 48 priority flora (PF) were recorded within a 20 km radius of the proposed impact site (Appendix 3). Of these, no TF species and 12 PF species had suitable known associated habitat that corresponded with vegetation communities and soil type of 'Site E – Merivale Road, SLK 33.54 - 45.41' project.

4.7 Potential 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 E – Merivale Road, SLK 33.54 - 45.41' project area. No other TEC's or priority ecological communities (PEC) were identified by the desktop study as being within 'Site E – Merivale Road, SLK 33.54 - 45.41' or within a 20 km buffer of the site.

4.8 Potential Threatened and Priority Fauna

25 conservation listed fauna were recorded within a 20 km radius of the proposed impact site (Appendix 4). The EPBC protected matters search tool recorded nine conservation listed fauna. Of these 7 had suitable habitat within project area.

4.9 *Phytophthora* Dieback

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2022) data shows no *Phytophthora cinnamomi* or other *Phytophthora* sp. dieback sample results in the immediate area, with the closest positive result being 3.7km from the project area. A majority of the site was mapped as a dieback dispersion risk in the DIDMS '2016 Disease Hazard Dispersion Model'.

5 FIELD SURVEY RESULTS AND DISCUSSION

5.1 Flora

A total of 212 vascular plant taxa, representative of 138 genera and 45 families, were recorded within Merivale Road, SLK 33.54 - 45.41 survey area. Of these 161 were native species and 51 were introduced. The majority of taxa recorded were representative of the Myrtaceae (34 taxa), Proteaceae (26 taxa) and Fabaceae (25 taxa) families (see Appendix 1 for the complete incidental species list).

Numerous specimen's unknown to surveyors were collected and verified at the WAH as non-threatened species, such as *Tricostularia aphylla* (Accession 10518; KSW08823, Specimen retained).

A number of plant specimens collected could not be identified accurately to species level due to the absence of sufficient taxonomic characters to enable accurate identification. The principal reasons for not being able to fully identify some of the collected specimens to species level were because plant material was sterile or lacked sufficient taxonomic features to permit accurate identification to species level. In these cases, the species is identified as, for example, *Caladenia* sp.

5.2 Threatened and Priority Flora

No TF species were identified within the clearing footprint. In addition, the targeted flora survey identified one PF species, *Astartea eobalta*, within the proposed clearing permit footprint (Figures 2-4). Queries of spatial datasets were requested specifically for this species, to interrogate impact of proposed works on species sustainability (DBCA 2021; DBCA 2023d; DBCA 2023e).

5.2.1 *Astartea eobalta,* Priority 2

Two specimens of *Astartea eobalta* was sent to the WAH for identification confirmation (KSW0123 & KSW00223; Accession 10048. They were confirmed as *Astartea eobalta* by Mike Hislop on 15/03/2023. Both specimens were retained by WAH. A later specimen (KSW00624) has yet to be sent off. Three Threatened and Priority Flora Reporting Forms (TPRF) were completed and sent to Department of Biodiversity, Conservation and Attractions (DBCA) District Flora Conservation Officer and Species and Communities Branch on 05/02/2024 and 22/02/2024 (Appendix 2). If proposed works occur, 20 plants will be cleared, an additional 19 plants are currently growing in the maintenance zone and will be likely impacted by regular maintenance activities. There was a total of 401 plants from 3 populations.

There are eleven known records of *A. eobalta* in the WAH, with the herbarium records being the primary source for population dynamics (Table 3). Two additional *Astartea eobalta* populations have been found which have not yet been databased by the WAH, this includes a record collected by the Shire of Esperance and a record collected by Biodiverse Solutions. (DBCA 2024). *Astartea eobalta* has a narrow geographic distribution with an 83 km East to West geographic distribution and a 20 km North to South range, occurring in the high rainfall areas between Cape Le Grand and Cape Arid.

It is likely that known and recorded populations of *A. eobalta* are extremely under-representative of true population numbers and don't reflect the true conservation status of the species. Due to it being a recently formed new species (Rye, 2013), no monitoring by DBCA or other parties has been completed. *A. eobalta* also has a cryptic element to identification, with extremely similar physiological features as non-threatened *Astartea asteroides*. Additionally, *A. eobalta* will always be under-represented in collections, flowering outside of spring when the vast majority of flora surveys are conducted. Lastly, observed suitable habitat of *A. eobalta* consisted of periphery of ephemeral swamps, of which there are large amounts of suitable habitat along the coastline east of Esperance.

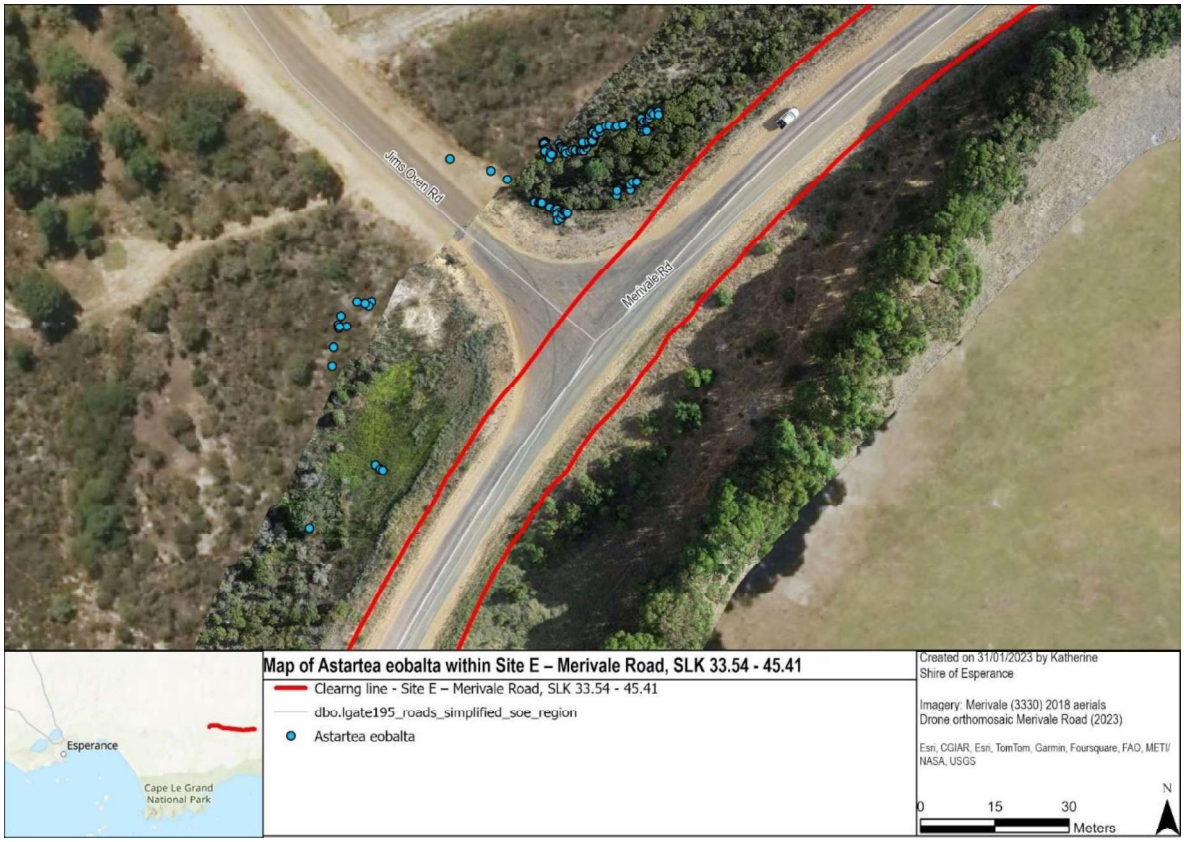

Figure 2. Location of Priority 2 species *Astartea eobalta* near intersection of Jims Oven Road between SLK 33.69 to 33.79 within 'Site E – Merivale Road, SLK 33.54 - 45.41'.

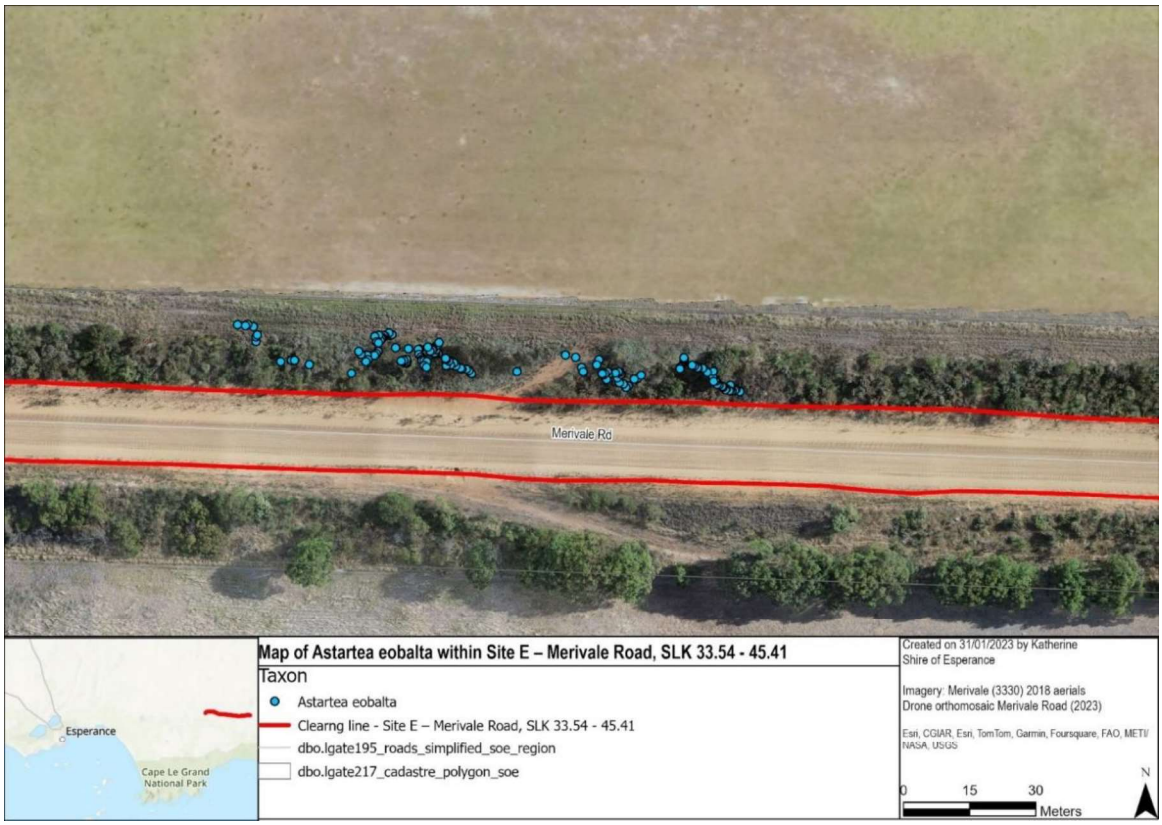

Figure 3. Location of Priority 2 species *Astartea eobalta* between SLK 34.54 to 34.65 within 'Site E – Merivale Road, SLK 33.54 - 45.41'.

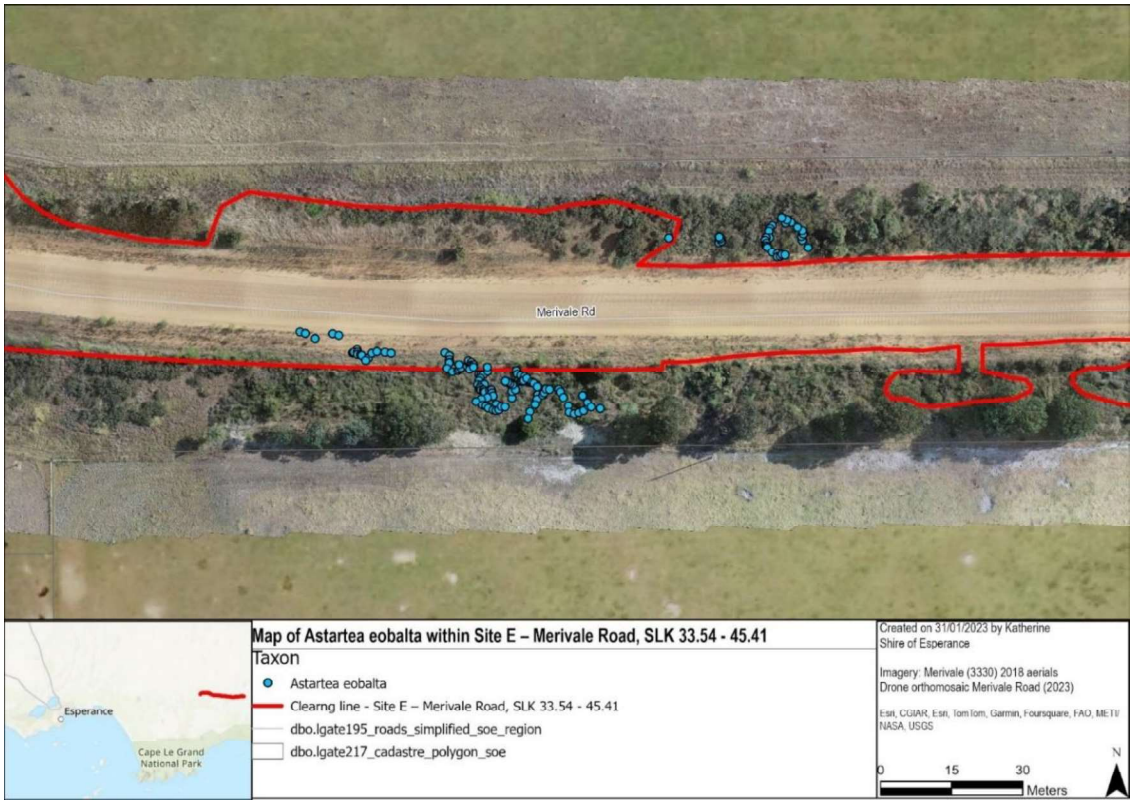

Figure 4. Location of Priority 2 species *Astartea eobalta* between SLK 37.47 to 37.58 within 'Site E – Merivale Road, SLK 33.54 - 45.41'.

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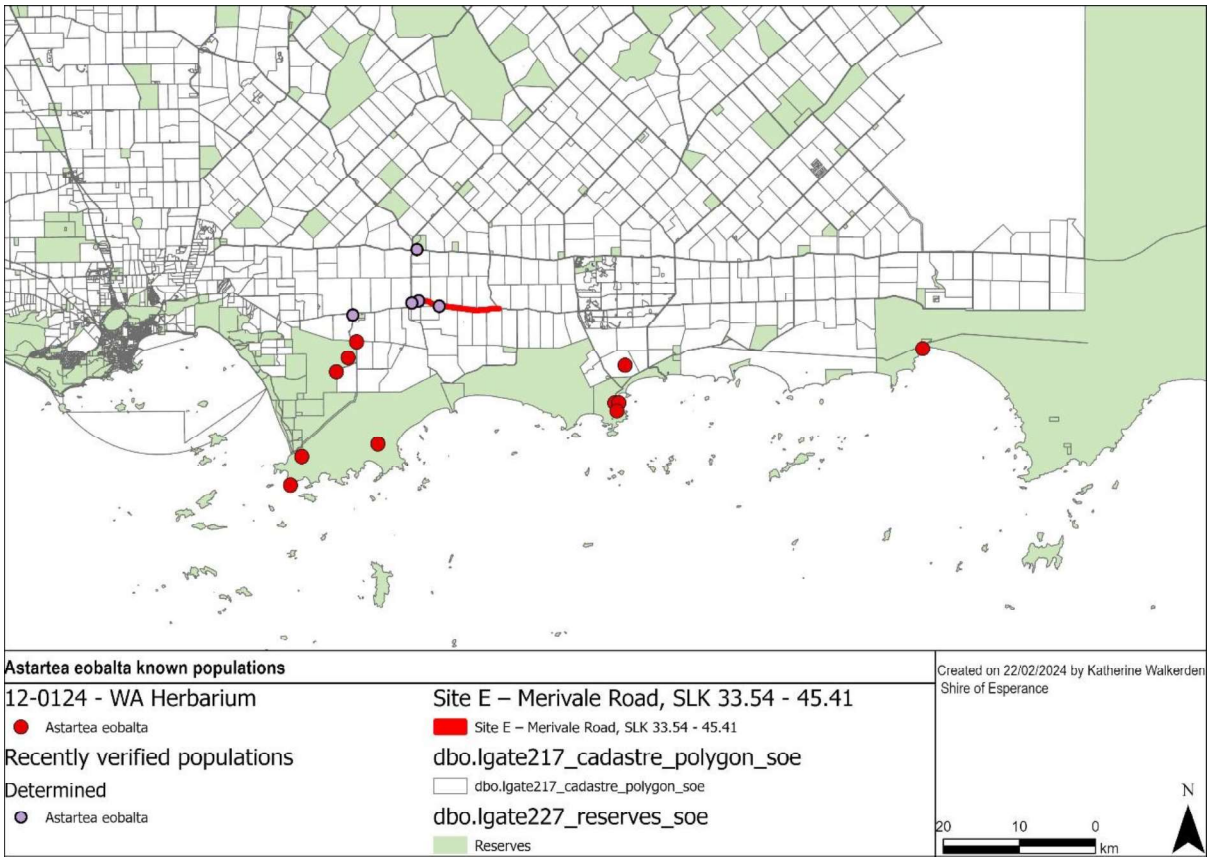

Figure 5. Location of Priority 2 species *Astartea eobalta*. With WA Herbarium data extract in red, and recently confirmed populations in purple.

Table 3. Known records of Priority 2 *Astartea eobalta.*

Site Description	Population Count and Date	Sheet no. / Specimen no.
Fisheries Rd, 650 to 750 m east of Coolinup Road intersection. On Southern road reserve.	1200-1500	KW266 Accession 10571
Cape Le Grande Road, SLK 0.22. Eastern side of road in swale.	Around two dozen plants, limited to small area.	KSW079 Accession 9640
150 Metres North of Nares Island Road along closed 4WD track. Within R41097.	~ Dozen (2022). Population is likely to expand as it recolonises closed 4WD track.	PERTH 09366075
Cape Le Grand Rd, located 4.4 km south of Merivale Rd intersection	13 - 3 will be taken as part of this project (2019).	KW039 Accession 8281. *Specimen not retained by WA Herbarium.
Farm laneway on private property, located east of Duke of Orleans Bay Rd at ~8 km south of Merivale Rd intersection.	21 to 50 plants (2005). Site was revisited in 2019 to gain familiarity with species. Population remained undisturbed from original survey, and at least 8 plants were	PERTH 07484518

	observed incidentally. A full survey was not conducted.	
Cape Le Grand Rd, 6.7 km north of National Park sign, 3.2 km south of Merivale Rd intersection	1 plant (2003). 0 plants (2019).	PERTH 06586228
Orleans Bay Rd, ~ 8.9 km south of Merivale Rd intersection. Located within approved CPS 7188/2 clearing permit area.	80 plants – 40 plants will be impacted by proposed impacts under CPS 7188/2 (2019).	KW040 Accession 8281
Cape Le Grand National Park. Inland from western side of road to Le Grand beach, and 0.5 km south from its junction with the Frenchman's Peak turnoff.	No data on population (1994).	PERTH 06172598
Dolphin Cove, Cape Arid National Park.	Common to dominant in area (1989).	PERTH 03369714
Along Le Grand Rd, located 6 km north of border to Cape Le Grand National Park.	No data on population (1983).	PERTH 06172601
8.6 miles from Cape Le Grand on Esperance Road.	No data on population (1966).	PERTH 06172628
Cape Le Grand Rd, 25.5 miles from Esperance.	No data on population (1962).	PERTH 06172636
New Orleans Bay	No data on population (1944).	PERTH 03428451

5.3 Weeds

There was significant weed invasion across the majority of the proposed 'Site E – Merivale Road, SLK 33.54 - 45.41' area. Overall, 51 non-native species were identified within the project area (Appendix 1) with a majority of these being in the Poaceae family (15 taxa), Asteraceae (7 taxa) and Fabaceae (6 taxa). Of these, the most extensive and of serious concern was *Gaudium laevigatum*. This is a priority environmental weed in the Shire of Esperance's Environmental Weed Strategy 2009-2018 (Field 2009).

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.

Weed management strategies are currently being discussed operationally, such as spraying material stockpiles in agricultural private property prior to use and periodic spraying of road verges for a 12-month period after road construction.

Several non-native species had been planted by neighboring landowners, these include *Corymbia ficifolia, Eucalyptus globusum* and *E. gomphocephala*. However, these species did not appear to be naturalizing.

5.4 Phytophthora Dieback

Several vegetation types within the reserve contained healthy vegetation that was highly vulnerable to *Phytophthora cinnamomi* infection, this includes vegetation types B, D & E. Dieback could not be interpreted throughout large sections of the Road reserve due to the degraded condition of the vegetation. It is clear that vegetation within portions of the site is free of dieback, but is almost certainly present within large sections of the site, given the heavy use of Merivale Road and frequent waterlogging of the road. *Phytophthora* dieback is likely a contributing factor to the degraded nature of vegetation with the reserve.

The drainage works being conducted will likely reduce the dieback dispersal risk from and into the project area due to reduced waterlogging of the gravel road surface. 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.

5.7 Vegetation Communities

Seven vegetation communities were identified within the 'Site E – Merivale Road, SLK 33.54 - 45.41', as defined by structure and composition (Table 4). It is believed that the Beard (1973) vegetation associations identified in Section 4.4 are an appropriate match for two of the vegetation types observed. Esperance_4801 was suitable for vegetation Type B & G. Vegetation types C & F matched vegetation association Espernce_41. Vegetation type A suited Esperance_931. Vegetation type D did not match any of the nearby mapped vegetation associations, but was similar to Esperance_7048.

Table 4. Vegetation communities identified within proposed 'Site E – Merivale Road, SLK 33.54 - 45.41' project area.

Type	Description	Figure	Closest Matching Beard Vegetation Association	Area (ha)
A	*Eucalyptus occidentalis* open forest over *Melaleuca* spp. dominated open shrubland with *Juncus pallidus* rushland.	7	Esperance _931	0.360
B	*Nuytsia floribunda* open woodland over *Lambertia inermis* dominated myrtaceous and proteaceous shrubland with *Xanthorrhoea platyphylla.*	8	Esperance _4801	1.408
C	*Melaleuca cuticularis* and *Acacia saligna* dominated wetland with *Juncus pallidus* rushland.	9	Esperance_41	0.704
D	*Banksia speciosa* closed low forest with *Agonis baxteri* dominated sparse shrubland and sparse sedgeland.	10	Esperance_7048	0.164
E	Open shrub Mallee with *Eucalyptus pleurocarpa* over mixed myrtaceous and proteaceous shrubland.	11	Esperance _4801	0.119
F	Open Mallee and *Melaleuca cuticularis* forest with *Taxandria callistachys* and *Juncus pallidus*.	12	Esperance_41	0.174

G	*Melaleuca cuticularis* open woodland with *Taxandria callistachys* dominated tall closed shrubland with *Leptocarpus crebriculmis* dominated open rushland.	13	Esperance_41	No clearing in this vegetation type

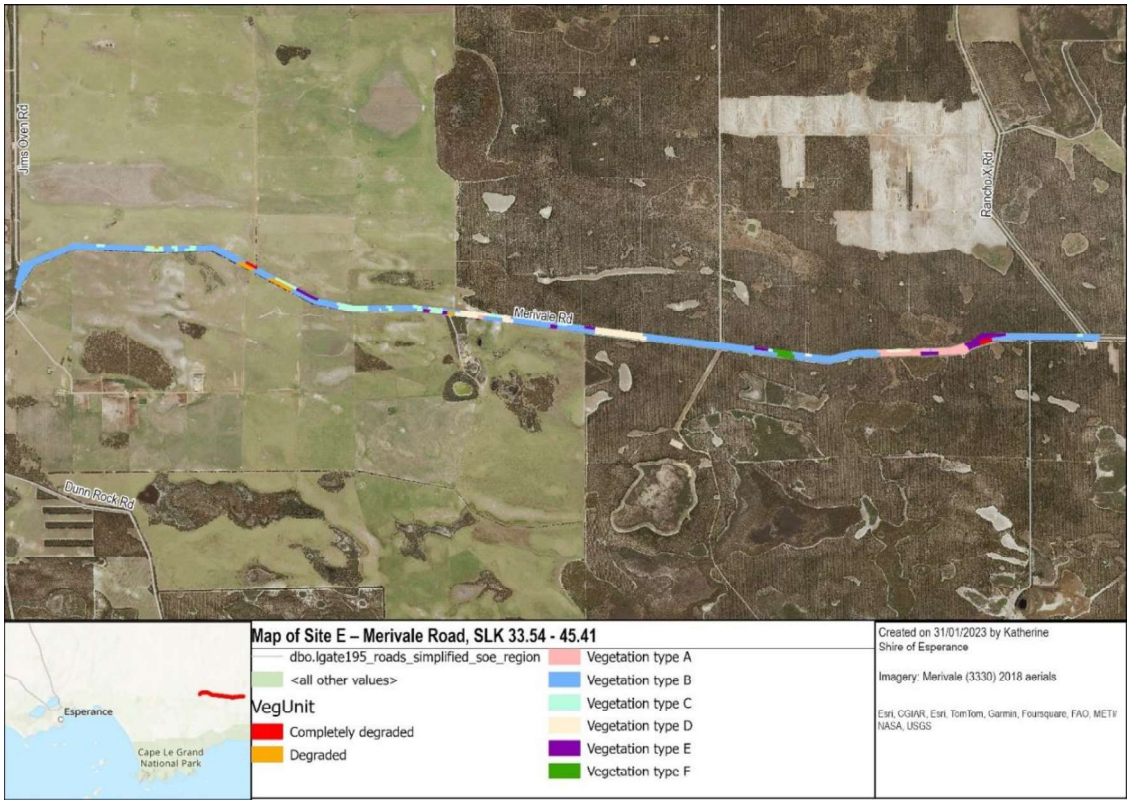

Figure 6. Vegetation types within the 'Site E – Merivale Road, SLK 33.54 - 45.41' area.

Figure 7. Vegetation type A identified in the project, described as *Eucalyptus occidentalis* open forest over *Melaleuca* spp. dominated open shrubland with *Juncus pallidus* rushland.

Figure 8. Vegetation type B identified in the project, described as *Nuytsia floribunda* open woodland over *Lambertia inermis* dominated myrtaceous and proteaceous shrubland with *Xanthorrhoea platyphylla.*

Figure 9. Vegetation type C identified in the project, described as *Melaleuca cuticularis* and *Acacia saligna* dominated wetland with *Juncus pallidus.*

Figure 10. Vegetation type D identified in the project, described as *Banksia speciosa* closed low forest with *Agonis baxteri* dominated sparse shrubland and sparse sedgeland.

Figure 11. Vegetation type E identified in the project, described as Open shrub Mallee with *Eucalyptus pleurocarpa* over mixed myrtaceous and proteaceous shrubland.

Figure 12. Vegetation type F identified in the project, described as Open Mallee and *Melaleuca cuticularis* forest with *Taxandria callistachys* and *Juncus pallidus.*

Figure 13. Vegetation type G identified in the project, described as *Melaleuca* cuticularis open woodland with *Taxandria callistachys* dominated tall closed shrubland with *Leptocarpus crebriculmis* dominated open rushland.

5.8 Vegetation Condition

Vegetation condition within the project area varies dramatically with vegetation varying between an excellent and degraded condition with a majority of the vegetation in a very good (1.558 ha) or good condition (1.076 ha). The western half of the project area (SLK 33.54 - 39.9) was in a significantly worse condition than the eastern half of the site. Throughout the site there had been significant historical clearing for firebreaks, fence lines, crossovers and drainage being apparent, significant plantings of exotic species for windbreaks had also occurred. Significant weed invasion had occurred throughout the project area.

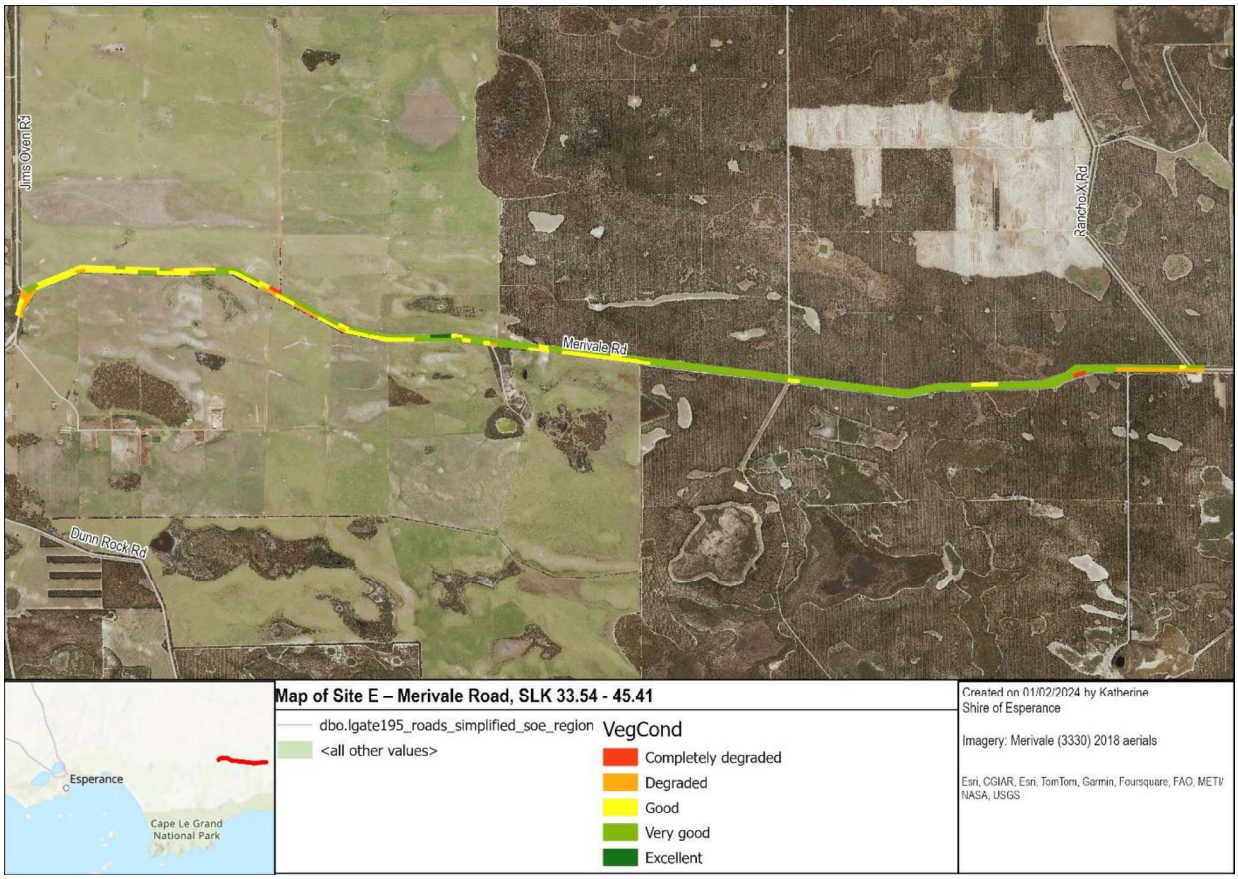

Figure 14. Vegetation condition across 'Site E –Merivale Road, SLK 33.54 - 45.41' project, ranging from an Excellent condition to a Completely degraded condition.

Table 5. Quantifying vegetation to be cleared by vegetation type and condition.

Vegetation Type	Excellent	Very Good	Good	Degraded	Total
A	-	0.360	-	-	**0.360**
B	0.043	0.555	0.596	0.214	**1.408**
C	-	0.278	0.389	0.037	**0.704**
D	-	0.135	0.029	-	**0.164**
E	-	0.057	0.062	-	**0.119**
F	-	0.174	-	-	**0.174**
G	-	-	-	-	**-**
-	-	-	-	0.096	**0.096**
Total	**0.043**	**1.558**	**1.076**	**0.347**	**3.024**

5.9 Threatened Ecological Communities

Two vegetation communities, Vegetation type B and E described met criteria to be considered as Kwongkan TEC. However, due to historical clearing and weed invasion degrading factors, only areas within these vegetation communities in good condition or better were considered as Kwongkan TEC (Figure 15). In total, 1.358 ha of vegetation was considered as Kwongkan TEC present within 'Site E – Merivale Road, SLK 33.54 - 45.41' 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 2023f). Within the 'Site E – Merivale Road, SLK 33.54 - 45.41' project area, vegetation type A was described as *'Eucalyptus occidentalis* open forest over *Melaleuca spp*. open shrubland with *Juncus spp.* rushland.' Both occurrences of Vegetation type A were consistent with the initial description of the 'Swamp Yate PEC', this totals 0.360 ha of clearing.

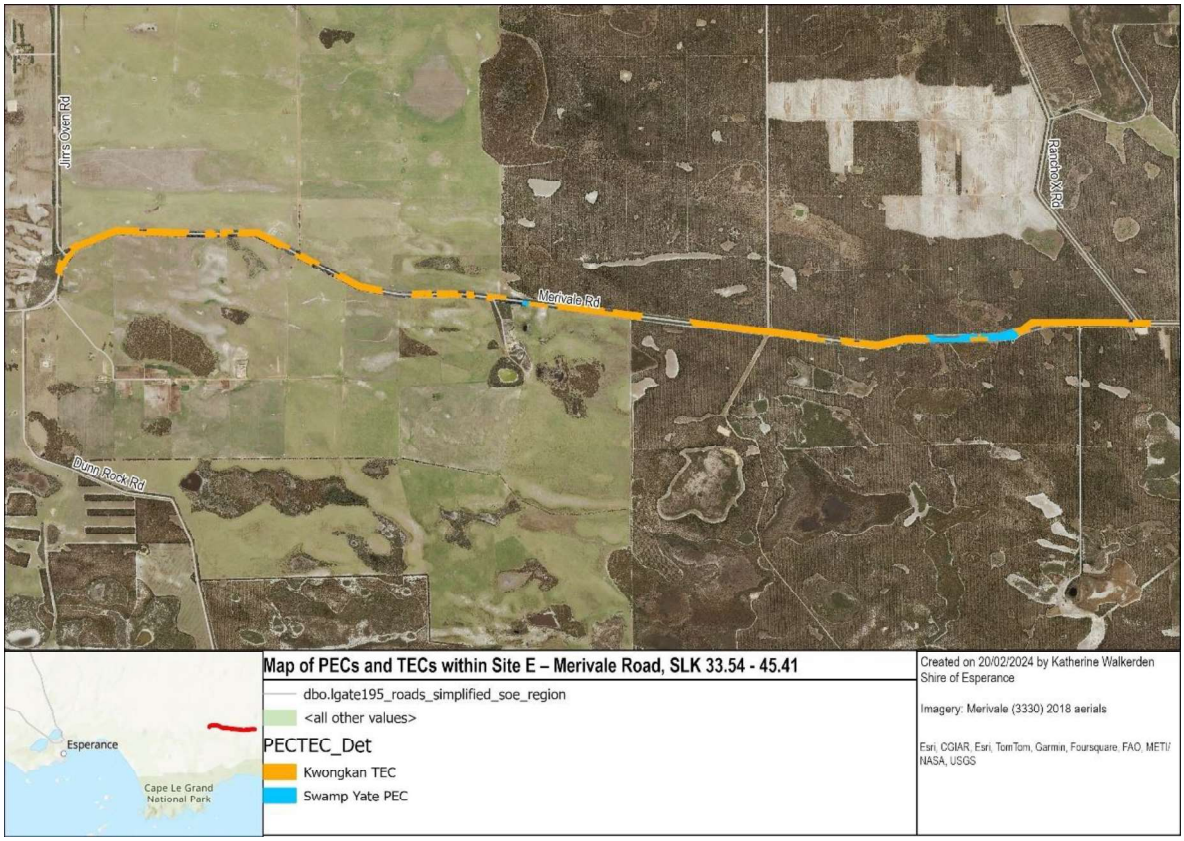

Figure 15. Map of threatened ecological community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' and Priority Ecological Community (PEC) 'Swamp Yate, *Eucalyptus occidentalis*, woodlands in seasonally inundated clay basins in the South Coast of Western Australia' within 'Site E – Merivale Road, SLK 33.54 - 45.41' project.

Table 6. Comparison between potential occurrence of the Swamp Yate PEC and listing documentation criteria "Swamp Yate, *Eucalyptus occidentalis*, woodlands in seasonally inundated clay basins in the South Coast of Western Australia" (Appendix 14) within vegetation type A 'Site E – Merivale Road, SLK 33.54 - 45.41'

Criterion 1: Abiotic Factors i) Occurs on valley floor; ii) Basin is more or less circular; iii) Seasonally inundated.	**Criterion 2:** Centre of basin inhabited by *Eucalyptus occidentalis* low woodland (often with an understory of *Melaleuca cuticularis*).	**Criterion 4:** Fringing the wetland is *dense rushes and sedges.*	**Criterion 3:** Peripheral to the central basin is a waterlogged zone of *E. occidentalis* associated with heath to open scrub and/or small trees. *Melaleuca calycina*, *M. glaberrima, M. incana, M. pulchella*, *Taxandria callistachys*;	**Swamp Yate PEC (Yes / No)** **Area (ha) within Site**
i) Vegetation type occurs on a valley floor ii) Basins were roughly circular iii) Vegetation type was seasonally inundated	Vegetation type A was dominated by *Eucalyptus occidentalis,* patches of the vegetation type contained a *Melaleuca cuticularis* understorey.	There were dense sections of *Juncus pallidus* rushland and areas of dense restiad sedgeland.	There were sections with a dense understorey of *Melaleuca tenella*, *Melaleuca cuticularis* or *Taxandria callistachys*	Consistent at both occurrences of Vegetation type A. 0.360 ha

5.10 Fauna

Of the species identified within the Desktop survey, only seven species had potentially suitable habitat within the proposed clearing permit area. The various wetland associated vegetation types provided some marginal habitat to various conservation listed bird species. Vegetation types B, D and E provided suitable foraging habitat for Carnaby's Cockatoos.

During the field survey invasive fauna including foxes and rabbits were seen throughout the area. There were also thousands of small froglets (*Crinia* spp.), as well as numerous tiger snakes (*Notechis scutatus*) and crown snakes (*Elapognathus coronatus*).

5.10.1 Australasian bittern, *Botaurus poiciloptilus,* Endangered

The Australian bittern has a confirmed record 10km from the project area and was recorded on the EPBC Act protected matters tool. Australasian bitterns' preferred habitat comprises wetlands with dense vegetation, especially where there is a mosaic of cover, from 0.5–3.5 metres in height, where they forage in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. They favour freshwater habitats with permanent or seasonal water,

particularly those dominated by sedges, rushes and/or reeds. Several patches of vegetation type A and C contained dense Juncus rushes. The wetlands present within Merivale road reserve is only a small remnant sections of wetland with most of the wetland having been on neighbouring private property.

5.10.2 Sharp-tailed sandpiper, *Calidris acuminata,* Migratory

The Sharp-tailed sandpiper has a confirmed record 2.91km from the project area. The species is known to forage within a diverse range of wetlands. Their foraging habitat is described as "lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms, paddocks, sedgelands and other ephemeral wetlands. Vegetation within vegetation type A and C provided potentially suitable habitat for the Sharp-tailed sandpiper. Neighbouring inundated pasture likely provides significant habitat for the species.

5.10.3 Long-toed stint*, Calidris subminuta,* Migratory

The Long-toed Stint was recorded 19.72 km from the project area. There was only a single record within the Esperance region which had been recorded at Tjaltjraak Boodja Park in 2006. Given the lack of records within the region it is unlikely that the project area provides suitable habitat.

5.10.4 Recherche Cape Barren goose, *Cereopsis novaehollandiae grisea,* Vulnerable

The closest known record of the Recherche Cape Barren goose was 12.84 km from the project area. The Cape Barren goose roosts and nest on islands within the Recherche Archipelago and forages on the mainland over summer, the species will forage on herbs and grasses, the project area provides some suitable foraging recourses for the Cape Barren goose, however neighbouring pasture will likely provide significantly higher quality foraging opportunities.

5.10.5 Quenda, *Isoodon fusciventer,* Priority 4

The closest known record of the Quenda was 13.37 km form the project area. The Quenda's habitat is described as scrubby, often swampy, vegetation with dense cover up to 1 m high. Quenda's often feed in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover.

Portions of the site are likely to be utilised by the Quenda, with the site providing suitably dense scrubby vegetation and the swampy areas the species utilises, the neighbouring pasture is also likely to be utilised by the species.

5.10.6 Common greenshank, *Tringa nebularia,* Migratory

The closest known record of the Common greenshank was 6.83 km from the project area, the species was also listed on the EPBC protected matters tool. The species was known to forage in a wide variety of habitats, this includes "embayment's, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats, rock platforms, swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats". Wetland vegetation within vegetation type A and C provides potentially suitable habitat for this species.

5.10.7 Carnaby's Black-Cockatoo, *Zanda latirostris*, threatened fauna

The Shire of Esperance Black-Cockatoo assessment was conducted in accordance with the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo *Zanda latirostris* (Endangered), Baudin's Cockatoo *Zanda baudinii* (Endangered) and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* (Vulnerable) (Department of Agriculture, Water and the Environment, 2022). The only black cockatoo species likely to occur within the Shire of Esperance is Carnaby's Cockatoo, with the Forest Red-tailed Black Cockatoo and Baudin's Cockatoo restricted to the forested areas of the south-west (CoA, 2012; DPAW, 2013). The Shire of Esperance forms part of the non-breeding range of the Carnaby's Cockatoo, with the closest breeding areas located approximately 180 km west of the project area in the Ravensthorpe-Hopetoun area, in pockets of suitable mature eucalypt woodland (DPAW, 2013). Several roosting sites are known to occur within Esperance and the wider region, with tall trees such as *Eucalyptus occidentalis (*Swamp Yate), *E. gomphocephala (*Tuart), other eucalypts, and introduced pines favoured (DAWE 2022).

As vegetation type B, D & E contained a potential foraging habitat, the foraging quality scoring tool was undertaken on Site E - Merivale Road, SLK 33.54 - 45.41 (Appendix 13), only vegetation in a good or better condition was considered suitable for Carnaby's Cockatoo, this included a total of 1.477 ha.

Pinus pinaster had been heavily planted as wind breaks along Merivale Road. There was also large numbers of *Pinus pinaster* plantations present in private property surrounding the project area. These *Pinus pinaster* trees provide significant roosting and foraging habitat in close proximity to the project area.

Foraging species for Carnaby's were found in Groom 2010, Valentine & Stock 2008 and Johnston 2011. Given that the site contained 1.477 ha of high-quality foraging habitat, a referral for assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may be required.

Vegetation type A contained suitable native night roosting habitat with *Eucalyptus occidentalis* being outlined as a preferred native night roosting tree for the species in the EPBCA act referral guidelines, particularly when in close proximity to wetlands, this would include clearing 0.36 ha of suitable night roosting habitat, note that this area does not contain any confirmed roosting habitat.

6 REVIEW OF 10 CLEARING PRINCIPLES FOR NATIVE VEGETATION

The 'Site E – Merivale Road, SLK 33.54 - 45.41' 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).

7.1 Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Biodiversity at this site is high with 161 native species recorded over 7 vegetation communities.

7.2 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 project area contained potentially suitable habitat for six conservation listed fauna species.

There was a total of 1.477 ha of potential Carnaby's Black cockatoo foraging habitat being cleared for the project, there was also a total of 0.36 ha of suitable night roosting habitat proposed to be cleared. The project may require EPBC act referral for significant impact to the species.

7.3 Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Three populations of the Priority 2 species, *Astartea eobalta* were found in the project area. 20 plants are proposed to be cleared during this project from a total population of 401 plants. Given the small amount of clearing in relation to the total population size and that the species regularly re-sprouts after road grading there is unlikely to be any significant impact to the population.

7.4 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.

Vegetation type B and E met criteria to be considered as EPBC listed Kwongkan TEC. However, due to historical clearing and weed invasion degrading factors, only areas within these vegetation communities in good condition or better were considered as Kwongkan TEC. In total, 1.358 ha of vegetation was considered as Kwongkan TEC present.

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 2023f). Within the 'Site E – Merivale Road, SLK 33.54 - 45.41' project area, both occurrences of vegetation type A were consistent with the initial description of the 'Swamp Yate PEC', this totalled of 0.360 ha.

7.5 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 providing important ecological linkages in the area. However, the amount of vegetation being cleared and the fact that this is a 60m wide road reserve which will still exist as a wildlife corridor after road and drainage works does not constitute being a significant impact.

7.6 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 types A, C and F are associated with wetlands. If the project were to proceed this would involve the clearing of 1.238 ha of wetland associated vegetation.

7.7 Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Vegetation within the area will be providing protection from wind and water erosion, given the relatively small amount of vegetation being cleared there is unlikely to be any significant impact on land degradation.

7.8 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 site was 5.7 km from Cape Le Grand National Park, the closest conservation reserve. No conservation vested reserves were within 5 km of the site. The relatively low amount of native vegetation proposed to be cleared will have little effect on the ecological linkages to conservation areas within the Merivale area.

7.9 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.

The road reserve currently experiences significant waterlogging issues, with the additional drainage measures there is likely to be a reduction of sediment from the road reserve entering nearby wetlands.

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

The road reserve experiences significant waterlogging, which has resulted in significant maintenance issues. A majority of clearing for the proposed project is to establish additional drainage and sumps, aiming to reduce flooding within the road reserve.

7 RECOMMENDATIONS

As Shire Environmental Coordinator signs off on project work packs the following recommendation will be included within the internal SOE approval process for the road project:

- Minimise clearing to minimum amount required;
- Avoid larger habitat trees (larger trees and trees with hollows) wherever possible;
- Minimise soil disturbance during clearing and practice standard vehicle hygiene to ensure introduced (exotic) species do not become established within the Merivale Road, SLK 33.54 - 45.41 survey area;
- All vehicles and construction equipment to be cleaned prior to start of the project;
- Works to be carried out in the dry (summer) months to minimise spread of dieback;

7.1 Weed and Dieback Management Plan

7.1.1 Operational Dieback Hygiene Management

A substantial number of plant pathogens can be spread by moving infected soil, plant material and water, including the notorious water- and soil-borne protozoan, *Phytophthora*, a genus of many species of which two are particularly prominent in the Esperance region, *P. cinnamomi* and *P. psuedocryptogea*.

Dieback Information Database Mapping System (DIDMS) indicated that there were positive *Phytophthora cinnamomi* samples within 5 km of the project area and a majority of the site was listed as a dieback dispersion risk in the DIDMS '2016 Disease Hazard Dispersion Model'. A majority of the site was uninterpretable due to the highly degraded nature of the vegetation. It is clear that vegetation within portions of the site is free of dieback, but dieback is almost certainly present within large sections of the site, given the heavy use of Merivale road and frequent waterlogging of the road. Standard Shire of Esperance disease hygiene management practices include the following:

a) Ensuring all machinery, plant and equipment are free of soil and vegetative matter prior to entering and leaving the site; and

b) Ensuring soil is moved only during dry conditions; and

c) Ensuring all workers have footwear free of soil and plant material.

7.1.2 Weed Management

There was significant weed invasion across the majority of the proposed project area, with numerous areas being completely dominated by invasive species. The entire site contained some weed invasion. Several systematic strategies to minimise the risk of weed introduction and establishment within the proposed project area include:

a) Regular wash-downs of machinery, plant and equipment;

b) Personnel ensuring that their clothes, socks and footwear are cleaned of any soil and plant material (especially seeds) prior to entering site;

8 LIST OF PERSONNEL

The following Shire of Esperance Staff were involved in this project.

Name	Julie Waters
Position	Environmental Coordinator
Project Involvement	Desktop and Field Survey, Specimen Identification, GIS Mapping Data Interpretation and Report writing
Qualifications	BEnvSc (Hons)
Experience	20 years working in environmental field including Flora Conservation Officer for previous DBCA, and 15 years' experience as a botanist in the region
Scientific Licence	FT61000787

Name	Katherine Walkerden
Position	Environmental Officer
Project Involvement	Desktop and Field Survey, Specimen Identification, GIS Mapping, Data Interpretation and Report writing
Qualifications	BSc, MEnvSc
Experience	Three years' experience as a botanist in the region
Scientific Licence	FT61000788

Name	Rosamund Mary Hoggart
Position	Environmental Assistant
Project Involvement	Specimen Identification
Qualifications and Experience	BSc (Hons)Ag
	15 years' experience as a botanist in the region and is highly regarded by Esperance Wildflower Society and her peers in Esperance as one of the best botanists in Esperance.
Scientific Licence	N/A

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10 APPENDICES

Appendix 1: Incidental Species List

Family	Genus	Species	Invasive	WA Conservation Status	Herbarium Reference
Anarthriaceae	*Anarthria*	*laevis*			
Anarthriaceae	*Anarthria*	*scabra*			
Anarthriaceae	*Lyginia*	*imberbis*			
Apiaceae	*Xanthosia*	*huegelii*			
Asparagaceae	*Laxmannia*	*minor*			
Asparagaceae	*Laxmannia*	*omnifertilis*			
Asparagaceae	*Lomandra*	*hastilis*			
Asteraceae	*Cotula*	*coronopifolia*			
Asteraceae	*Erigeron*	*bonariensis*	X		
Asteraceae	*Hypochaeris*	*radicata*	X		
Asteraceae	*Pseudognaphalium*	*luteoalbum*	X		
Asteraceae	*Sonchus*	*asper*	X		
Asteraceae	*Sonchus*	*oleraceus*	X		
Asteraceae	*Symphyotrichum*	*squamatum*	X		
Asteraceae	*Ursinia*	*anthemoides*	X		
Brassicaceae	*Brassica*	*rapus*	X		
Campanulaceae	*Monopsis*	*debilis*	X		
Campanulaceae	*Wahlenbergia*	*capensis*	X		
Casuarinaceae	*Allocasuarina*	*humilis*			
Casuarinaceae	*Allocasuarina*	*thuyoides*			
Centrolepidaceae	*Aphelia*	*sp. Albany*			
Centrolepidaceae	*Centrolepis*	*aristata*			
Centrolepidaceae	*Centrolepis*	*strigosa*			
Cyperaceae	*Caustis*	*dioica*			
Cyperaceae	*Cyathochaeta*	*equitans*			
Cyperaceae	*Cyperus*	*tenellus*	X		
Cyperaceae	*Ficinia*	*nodosa*			
Cyperaceae	*Isolepis*	*marginata*			
Cyperaceae	*Lepidosperma*	*squamatum*			
Cyperaceae	*Machaerina*	*articulata*			
Cyperaceae	*Machaerina*	*juncea*			
Cyperaceae	*Mesomelaena*	*tetragona*			
Cyperaceae	*Schoenus*	*brevisetis*			
Cyperaceae	*Schoenus*	*laevigatus*			
Cyperaceae	*Tricostularia*	*aphylla*			KSW20022 ACC9
Cyperaceae	*Tricostularia*	*compressa*			
Dilleniaceae	*Hibbertia*	*andrewsiana*			
Dilleniaceae	*Hibbertia*	*gracilipes*			

Dilleniaceae	*Hibbertia*	*racemosa*			
Droseraceae	*Drosera*	*drummondii*			
Droseraceae	*Drosera*	*glanduligera*			
Droseraceae	*Drosera*	*neesii*			
Droseraceae	*Drosera*	*trichocaulis*			
Ericaceae	*Leucopogon*	*carinatus*			
Ericaceae	*Leucopogon*	*obovatus*			
Ericaceae	*Lysinema*	*ciliatum*			
Ericaceae	*Oligarrhena*	*micrantha*			
Ericaceae	*Styphelia*	*sp. Coujinup*			
Euphorbiaceae	*Poranthera*	*microphylla*			
Fabaceae	*Acacia*	*aemula*			
Fabaceae	*Acacia*	*cochlearis*			
Fabaceae	*Acacia*	*cyclops*			
Fabaceae	*Acacia*	*lasiocarpa var bracteolata*			
Fabaceae	*Acacia*	*myrtifolia*			
Fabaceae	*Acacia*	*saligna*			
Fabaceae	*Acacia*	*varia var parviflora*			
Fabaceae	*Aotus*	*sp. Esperance*			
Fabaceae	*Bossiaea*	*preissii*			
Fabaceae	*Bossiaea*	*praetermissa*			
Fabaceae	*Chorizema*	*aciculare*			
Fabaceae	*Chorizema*	*obtusifolium*			
Fabaceae	*Daviesia*	*dilatata*			
Fabaceae	*Daviesia*	*teretifolia*			
Fabaceae	*Daviesia*	*apiculata*			
Fabaceae	*Gompholobium*	*baxteri*			
Fabaceae	*Gompholobium*	*knightianum*			
Fabaceae	*Gompholobium*	*marginata*			
Fabaceae	*Gompholobium*	*tomentosum*			
Fabaceae	*Hovea*	*trisperma*			
Fabaceae	*Jacksonia*	*capitata*			
Fabaceae	*Jacksonia*	*spinosa*			
Fabaceae	*Johnsonia*	*acaulis*			
Fabaceae	*Kennedia*	*coccinea subsp. esotera*			
Fabaceae	*Kennedia*	*sp. South Coast*			
Fabaceae	*Lotus*	*subbiflorus*	X		
Fabaceae	*Medicago*	*polymorphus*	X		
Fabaceae	*Ornithopus*	*sativus*	X		
Fabaceae	*Trifolium*	*arvense*	X		
Fabaceae	*Trifolium*	*campestre*	X		
Fabaceae	*Trifolium*	*dubium*	X		

Geraniaceae	*Erodium*	*cicutarium*	X		
Geraniaceae	*Pelargonium*	*capitatum*	X		
Goodeniaceae	*Dampiera*	*fasciculata*			
Goodeniaceae	*Dampiera*	*parvifolia*			
Goodeniaceae	*Goodenia*	*incana*			
Goodeniaceae	*Goodenia*	*pterigosperma*			
Goodeniaceae	*Goodenia*	*trinervis*			
Goodeniaceae	*Lechenaultia*	*formosa*			
Goodeniaceae	*Lechenaultia*	*tubiflora*			
Haemodoraceae	*Anigozanthos*	*rufus*			
Haemodoraceae	*Conostylis*	*seorsiflora*			
Haemodoraceae	*Haemodorum*	*spicatum*			
Haloragaceae	*Glischrocaryon*	*angustifolium*			
Hemerocallidaceae	*Agrostocrinum*	*scabrum*			
Hemerocallidaceae	*Chamaescilla*	*corymbosa*	X		
Hemerocallidaceae	*Tricoryne*	*tenella*			
Iridaceae	*Gladiolus*	*undulatus*	X		
Iridaceae	*Patersonia*	*lanata*			
Iridaceae	*Patersonia*	*occidentalis*			
Iridaceae	*Romulea*	*rosea*	X		
Juncaceae	*Juncus*	*capitatus*	X		
Juncaceae	*Juncus*	*microcephalus*	X		
Juncaceae	*Juncus*	*pallidus*			
Lauraceae	*Cassytha*	*glabella forma dispar*			
Lentibulariaceae	*Utricularia*	*tenella*			
Loranthaceae	*Nuytsia*	*floribunda*			
Menyanthaceae	*Ornduffia*	*parnassifolia*	X		
Myrtaceae	*Agonis*	*baxteri*			
Myrtaceae	*Astartea*	*astarteoides*			
Myrtaceae	*Astartea*	*eobalta*		P2	KSW00123, KSW00223; ACC 10048
Myrtaceae	*Beaufortia*	*empetrifolia*			
Myrtaceae	*Calothamnus*	*gracilis*			
Myrtaceae	*Calothamnus*	*quadrifidus*			
Myrtaceae	*Calytrix*	*hirta*			
Myrtaceae	*Conothamnus*	*aureus*			
Myrtaceae	*Corymbia*	*ficifolia*	X		
Myrtaceae	*Cyathostemon*	*ambiguus*			
Myrtaceae	*Darwinia*	*vestita*			
Myrtaceae	*Eucalyptus*	*angulosa*			
Myrtaceae	*Eucalyptus*	*globulosum*	X		
Myrtaceae	*Eucalyptus*	*gomphocephala*	X		
Myrtaceae	*Eucalyptus*	*micranthera*			

Myrtaceae	*Eucalyptus*	*pleurocarpa*			
Myrtaceae	*Eucalyptus*	*uncinata*			
Myrtaceae	*Eucalyptus*	*utilis*			
Myrtaceae	*Eucalyptus*	*varia subsp. varia*			
Myrtaceae	*Eucalyptus*	*occidentalis*			
Myrtaceae	*Gaudium*	*laevigatum*	X		
Myrtaceae	*Hypocalymma*	*strictum*			
Myrtaceae	*Melaleuca*	*cuticularis*			
Myrtaceae	*Melaleuca*	*incana subsp. tenella*			
Myrtaceae	*Melaleuca*	*pentagona var latifolia*			
Myrtaceae	*Melaleuca*	*scabra*			
Myrtaceae	*Melaleuca*	*striata*			
Myrtaceae	*Melaleuca*	*thymoides*			
Myrtaceae	*Melaleuca*	*tuberculata var macrophylla*			
Myrtaceae	*Melaleuca*	*undulata*			
Myrtaceae	*Melaleuca*	*calycina*			
Myrtaceae	*Melaleuca*	*pulchella*			
Myrtaceae	*Micromyrtus*	*elobata subsp. elobata*			
Myrtaceae	*Phymatocarpus*	*maxwellii*			
Myrtaceae	*Taxandria*	*callistachys*			
Myrtaceae	*Taxandria*	*spathulata*			
Myrtaceae	*Thryptomene*	*saxicola*			
Myrtaceae	*Verticordia*	*vicinella*			
Onagraceae	*Oenothera*	*stricta*	X		
Orchidaceae	*Disa*	*bracteata*	X		
Orchidaceae	*Microtis*	*media*			
Pinaceae	*Pinus*	*pinaster*	X		
Pittosporaceae	*Billardiera*	*fusiformis*			
Poaceae	*Austrostipa*	*mollis*			
Poaceae	*Austrostipa*	*variabilis*			
Poaceae	*Avena*	*fatua*	X		
Poaceae	*Briza*	*maxima*	X		
Poaceae	*Briza*	*minor*	X		
Poaceae	*Bromus*	*hordeaceus*	X		
Poaceae	*Dactylis*	*glomerata*	X		
Poaceae	*Ehrharta*	*calycina*	X		
Poaceae	*Eragrostis*	*curvula*	X		
Poaceae	*Hordeum*	*leporinum*	X		
Poaceae	*Lagurus*	*ovatus*	X		
Poaceae	*Lolium*	*sp.*	X		
Poaceae	*Cenchrus*	*clandestinus*	X		
Poaceae	*Polypogon*	*maritimus*	X		

Poaceae	*Rytidosperma*	*setaceum*	X		
Poaceae	*Tribolium*	*uniolae*	X		
Poaceae	*Vulpia*	*fasciculata*	X		
Polygalaceae	*Comesperma*	*confertum*			
Polygonaceae	*Polygonum*	*aviculare*	X		
Polygonaceae	*Rumex*	*acetosella*	X		
Potamogetonaceae	*Potamogeton*	*drummondii*			
Primulaceae	*Anagallis*	*arvensis*	X		
Proteaceae	*Adenanthos*	*cuneatus*			
Proteaceae	*Banksia*	*nivea*			
Proteaceae	*Banksia*	*nutans*			
Proteaceae	*Banksia*	*obovata*			
Proteaceae	*Banksia*	*occidentalis*			
Proteaceae	*Banksia*	*pulchella*			
Proteaceae	*Banksia*	*repens*			
Proteaceae	*Banksia*	*speciosa*			
Proteaceae	*Conospermum*	*teretifolium*			
Proteaceae	*Grevillea*	*oligantha*			
Proteaceae	*Hakea*	*cinerea*			
Proteaceae	*Hakea*	*corymbosa*			
Proteaceae	*Hakea*	*obliqua*			
Proteaceae	*Hakea*	*prostrata*			
Proteaceae	*Hakea*	*ruscifolia*			
Proteaceae	*Hakea*	*sulcata*			
Proteaceae	*Hakea*	*trifurcata*			
Proteaceae	*Hakea*	*varia*			
Proteaceae	*Isopogon*	*polycephalus*			
Proteaceae	*Lambertia*	*inermis var inermis*			
Proteaceae	*Petrophile*	*squamata*			
Proteaceae	*Petrophile*	*teretifolia*			
Proteaceae	*Stirlingia*	*anethifolia*			
Proteaceae	*Synaphea*	*favosa*			
Proteaceae	*Synaphea*	*media*			
Proteaceae	*Synaphea*	*oligantha*			
Restionaceae	*Chordifex*	*laxus, female*			
Restionaceae	*Hypolaena*	*exsulca*			
Restionaceae	*Leptocarpus*	*crebriculmis, female*			
Rhamnaceae	*Stenanthemum*	*notiale subsp. notiale*			
Rubiaceae	*Opercularia*	*vaginata*			
Rutaceae	*Boronia*	*spathulata*			
Rutaceae	*Cyanothamnus*	*ramosus*			
Solanaceae	*Solanum*	*nigrum*	X		
Stylidiaceae	*Levenhookia*	*pusilla*			
Stylidiaceae	*Levenhookia*	*stipitata*			

Thymelaeaceae	*Pimelea*	*angustifolia*			
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*			
Zamiaceae	*Macrozamia*	*dyeri*			

Appendix 2: Threatened and Priority Flora Report Form

Astartea eobalta SLK 34.54-34.65.

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

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 www.dbca.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Astartea eobalta **TPFL Pop. No:**

OBSERVATION DATE: 11/01/2023 **CONSERVATION STATUS:** P2 **New population** ☒

OBSERVER/S: Katherine Walkerden **PHONE** 0416558774

ROLE: Environmental Officer **ORGANISATION:** Shire of ESperance

EMAIL: katherine.walkerden@esperance.wa.gov.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):

Merivale Road Reserve. Northern Side of Road. SLK 34.54-34.65.

Reserve No:

DBCA DISTRICT: Esperance **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: 6259781

Long / Easting: 435226

ZONE: 51

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 34.54 to 34.65	Specify other:

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

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

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	139			
Dead				

Area of pop (m²):

Note: Pls 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: 90 %

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)
•			
•			
•			

Please return completed form to **Species And Communities Program** 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 Program.

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

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

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:	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 (Mistegrona)

1. Melaleuca cuticularis over mixed wetland with dense Rushes. Associated species include Hakea varia, Eragrostis curvula, Melaleuca calycina, Acacia cyclops
2.
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.)

FLORA AUTHORISATION / LICENCE No: FT61000788 Note if only observing plants (i.e. no specimens or plant material is taken) then no authorisation/licence is required. For further information on authorisation and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: KSW00223 WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other:

LODGEMENT: WA Herb Lodgement No: ACC 10048

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

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

Please return completed form to **Species And Communities Program** 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 Program

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

Astartea eobalta SLK 37.47-37.58.

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

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 www.dbca.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Astartea eobalta **TPFL Pop. No:**

OBSERVATION DATE: 11/01/2023 **CONSERVATION STATUS:** P2 **New population** ☒

OBSERVER/S: Katherine Walkerden **PHONE** 0416558774

ROLE: Environmental Officer **ORGANISATION:** Shire of ESperance

EMAIL: katherine.walkerden@esperance.wa.gov.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):

Merivale Road Reserve. Both sides of Road. SLK 37.47-37.58.

Reserve No:

DBCA DISTRICT: Esperance **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: 6259086

Long / Easting: 438038

ZONE: 51

METHOD USED: GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐ National park ☐ Conservation park ☐ Timber reserve ☐ State forest ☐ Water reserve ☐ Private property ☐ Pastoral lease ☐ UCL ☐ Rail reserve ☐ MRWA road reserve ☐ SLK/Pole 34.54 to 34.65 Shire road reserve ☒ Other Crown reserve ☐ Specify other:

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

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

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	143			
Dead				

Area of pop (m²):

Note: Pls 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: 90 %

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)
•			
•			
•			

Please return completed form to **Species And Communities Program** 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 Program.

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

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
- Crest ☐
- Hill ☐
- Ridge ☐
- Outcrop ☐
- Slope ☐
- Flat ☐
- Open depression ☐
- Drainage line ☐
- Closed depression ☒
- Wetland ☐

ROCK TYPE:
- Granite ☐
- Dolerite ☐
- Laterite ☐
- Ironstone ☐
- Limestone ☐
- Quartz ☐

Specify other:

LOOSE ROCK: (on soil surface; eg gravel, quartz fields)
- 0-10% ☒
- 10-30% ☐
- 30-50% ☐
- 50-100% ☐

SOIL TYPE:
- Sand ☐
- Sandy loam ☐
- Loam ☐
- Clay loam ☐
- Light clay ☐
- Peat ☐

Specify other:

SOIL COLOUR:
- Red ☐
- Brown ☐
- Yellow ☐
- White ☐
- Grey ☐
- Black ☐

Specify other:

DRAINAGE:
- Well drained ☐
- Seasonally inundated ☒
- Permanently inundated ☐
- Tidal ☐

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 (Mistragona)

1. Allocasuarina humilis, Hakea varia and Xanthorhrea preissii over dense restionaceae sedges.
2.
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.)

FLORA AUTHORISATION / LICENCE No: FT61000788 Note if only observing plants (i.e. no specimens or plant material is taken) then no authorisation/licence is required. For further information on authorisation and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: KSW00123 Collectors No: WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other:

LODGEMENT: WA Herb Lodgement No: ACC 10048

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

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

Submitter of Record: _____ Role: _____ Signed: _____ Date: ___/___/___

Please return completed form to **Species And Communities Program** 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 Program.
Record entered by:_____ Sheet No.:_____ Record Entered in Database ☐

Astartea eobalta SLK 33.71-33.79

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

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 (TFRF) manual on the DBCA website at www.dbca.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Astartea eobalta **TPFL Pop. No:**

OBSERVATION DATE: 13/02/2024 **CONSERVATION STATUS:** P2 **New population** ☒

OBSERVER/S: Katherine Walkerden, Julie Waters **PHONE** 0416558774

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

EMAIL: Katherine.Walkerden@esperance.wa.gov.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):

Intersection of Jims Oven and Merivale Road

Reserve No:

DBCA DISTRICT: Esperance **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: 434400

Long / Easting: 6259554

ZONE: 51

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:

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	118			
Dead				

Area of pop (m²):

Note: Pls 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: 90%

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)**
•			
•			

Please return completed form to **Species And Communities Program** 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 Program.

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

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.4 March 2021

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:	Specify other:	
Drainage line ☒					
Closed depression ☒					
Wetland ☐					

Specific **Landform** Element: [redacted]
(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 (Mistetragona)

1. Melaleuca cuticularis open woodland with Taxandria callistachys dominated tall closed shrubland with Leptocarpus crebriculmis dominated open rushland.
2. [redacted]
3. [redacted]
4. [redacted]

ASSOCIATED SPECIES:
Other (non-dominant) spp: [redacted]

* 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: [redacted]

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

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

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

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.) [redacted]

FLORA AUTHORISATION / LICENCE No: FT61000788, FT61000787 Note if only observing plants (i.e. no specimens or plant material is taken) then no authorisation/licence is required. For further information on authorisation and licensing requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: KSW00624 Collectors No: WA Herb. ☒ Regional Herb. ☐ District Herb. ☐ Other: [redacted]

LODGEMENT: WA Herb Lodgement No: [redacted]

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

COPY SENT TO: Regional Office ☐ District Office ☒ Other: [redacted]

Submitter of Record: Katherine Walkerden Role: Environemntal Officer Signed: [redacted] Date: 22/02/2024

Please return completed form to **Species And Communities Program** 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 Program.
Record entered by:_____ Sheet No.:_____ Record Entered in Database ☐

Appendix 3: Description of Threatened and Priority Flora Species with the Potential to occur within the Merivale Road, SLK 33.54 - 45.41 Survey Area

Threatened or priority flora identified by the desktop study to be present within a 20 km radius of 'Site E – Merivale Road, SLK 33.54 - 45.41' project area, using Threatened and Priority Flora Reporting (TPFL; DBCA 2023d), WA Herbarium (DBCA 2023e) and Esperance District Threatened Flora (DBCA 2021). 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	Distance from site (km)
Anigozanthos bicolor subsp. minor	T	Moist sandy soil in heath communities. Has been found in shallow soils near granite outcrops.	No	7.41
Eucalyptus insularis subsp. continentalis	T	Granite outcrops. Cape Le Grande.	No	6.60
Lambertia echinata subsp. echinata	T	Below and between rock outcrops, slopes, hill crests. Grows in gravelly sandy loam, brown sandy loam, white-grey sand, granite, laterite.	No	7.66
Myoporum velutinum	T	In moist sandy soils, along creeks, rivers, pools or margins of saline depressions.	No	7.22
Atriplex muelleri	P1	Cracking clays. Mostly mid-Pilbara area. Single Esperance record is of a drawing. Atriplex muelleri has never been confirmed to occur in Esperance,	No	1.54
Lobelia archeri	P1	Upper slopes of tall non-calcereous sand hills (some found lower after fire). Requires open spaces to survive, quickly displaced by other vegetation.	No	15.45
Acacia incanicarpa	P2	Loamy sand. Granitic slopes & ridges. Only known from Cape Le Grand National Park.	No	11.63
Aldrovanda vesiculosa	P2	Associated with ephemeral swamps and wetlands.	Yes	8.93
Astartea eobalta	P2	Associated with winter wet seasonal swamps and peaty soil.	Yes	0.00
Bentleya diminuta	P2	Mostly recorded on disturbed road edges. Associated with Mallee of mixed composition.	No	12.55

		Recorded on various soil types, including sandy clay loam, gravel and limestone.		
Comesperma lanceolatum	P2	White sand. Marine plains, sand dunes, quartzite ridges.	No	13.40
Conostylis seorsiflora subsp. longissima	P2	Nuytsia over mixed heath.	Yes	10.97
Lasiopetalum maxwellii	P2	Sandy soils. Granite slopes.	Yes	7.09
Lepyrodia fortunata	P2	Associated with peaty swampy sand and seasonally inundated swamps.	Yes	11.94
Leucopogon corymbiformis	P2	Associated with deep sand. Scattered Nuytsia floribunda or Banksia speciosa over mixed heath.	Yes	14.69
Melaleuca eximia	P2	Deep gravel, gravelly sand or gravelly clay. Been recorded on granite outcrops and hills.	No	19.56
Patersonia inaequalis	P2	Sandy clay, lateritic or granitic sand.	No	12.13
Platysace haplosciadia	P2	Sandy clay over ironstone. Seasonally wet areas.	No	4.87
Rumicastrum chamaecladum	P2	Recorded on clay loam and winter-wet creek edges.	No	6.96
Scaevola paludosa	P2	Grows on sandy soils. base of granite or edge of wetland.	Yes	16.50
Styphelia multiflora	P2	Granite outcrops, creek lines, coastal dunes. Myrtaceous and proteaceous shrubland or heath. Only known from Cape Le Grande and Cape arid.	No	11.26
Utricularia helix	P2	Shallow sandy clay swamps. Only known from Cape Le Grand	No	6.58
Utricularia westonii	P2	Shallow sandy clay swamps. Only known from Cape Le Grand	No	6.58
Acacia euthyphylla	P3	Grey white sand, clay loam, margins of salt lakes and marshes, seasonal swamps	No	12.11
Acacia nitidula	P3	Granitic sandy gravelly soils.	No	11.06
Alyogyne sp. Great Victoria Desert (D.J. Edinger 6212)	P3	This species has minimal collections. It has been recorded across a variety of habitats, including recently burnt red sand in Great Victoria Desert, black soil fresh-water swamp at	No	12.11

		Condingup, and gravel at Tarrin Rock.		
Comesperma calcicola	P3	Calcareous or semi-saline clay loams, limestone – areas around saline waters	No	12.10
Daviesia pauciflora	P3	Various habitats including flats. Associated with deep sands, white or grey sand over laterite or limestone.	No	5.90
Eucalyptus famelica	P3	Associated with coastal dunes on low ground, saline waterlogged soils. Associated vegetation is open Mallee community.	No	6.15
Eucalyptus semiglobosa	P3	White sand over laterite, silty sand on edge of granite shelf, limestone. Hillslopes, gullies, cliffs.	No	6.50
Gonocarpus pycnostachyus	P3	Wet depressions near granite outcrops.	No	8.33
Hibbertia hamata	P3	Hillsides, granite area. Associated with Allocasuarina and Nuytsia communities	No	13.35
Leucopogon apiculatus	P3	Skeletal sandy or stony soils over quartzite or granite. Granite outcrops and hills, quartzite ridges, rocky slopes.	No	14.22
Leucopogon florulentus	P3	Closest herbarium record is in Jerramungup. TPFL record of this species is likely incorrect.	No	12.30
Leucopogon interruptus	P3	Grey sand over granite	No	14.66
Persoonia scabra	P3	White sand or sandy loam. Widespread from coastal to inland Mallee. Sandy heathland environment over gravel, granite or limestone.	Yes	12.87
Poa billardierei	P3	Single Esperance record in Cape Le Grand. Coastal dunes.	No	15.35
Stylidium roseonanum	P3	Prefers swamps. Mostly records occur in the west, towards Albany.	No	14.58
Styphelia rotundifolia	P3	Eucalyptus mallee with mixed Myrtaceous and Fabaceae shrubland. Wide variety of habitats. Often associated with gravel.	Yes	17.55

Trachymene anisocarpa var. trichocarpa	P3	Fine windblown clay, mixed with windblown sand or larger alluvial grains eroded from granite outcrops.	No	5.11
Utricularia oppositiflora	P3	Shallow seasonal swamps and depressions, and creek lines in heathlands. Cape Le Grande	No	6.58
Verticordia verticordina	P3	Growing on granite, or limestone soils in low heathlands.	No	7.14
Acrotriche parviflora	P4	Upland flats and slopes, hillcrests, near creek lines, adjacent to salt lakes, base of breakaways.	No	19.56
Caladenia exstans	P4	Brown or red loam, granite. Yate flats, shallow soil pockets on coastal granite outcrops.	No	7.92
Eucalyptus aquilina	P4	Shallow soils over granite, shallow valleys, creek beds and hillsides	No	8.06
Eucalyptus ligulata subsp. ligulata	P4	Hill, slopes. Sand over granite. Clayey sand.	No	8.06
Eucalyptus missilis x	P4	Sand over limestone or granite. Coastal sites.	No	6.58
Gonocarpus simplex	P4	Peaty sand. Swamps, seasonally inundated areas.	Yes	10.17
Microtis quadrata	P4	Grows in seasonally wet depressions and in swampy mounds in near-coastal areas.	Yes	6.72
Myriophyllum petraeum	P4	Strictly confined to ephemeral rock pools on granite outcrops.	No	7.78
Pleurophascum occidentale	P4	Shallow soils at the edge of exposed granite.	No	14.16
Thysanotus parviflorus	P4	Grey sand	Yes	13.79

Appendix 4: Description of Threatened and Priority Fauna Species with the Potential to occur within the Merivale Road, SLK 33.54 - 45.41 Survey Area

Scientific Name	Common Name	WA Conservation status	EPBC conservation status	Distance (km)	EPBC protected matters tool	Habitat	Likely to occur
Actitis hypoleucos	Common Sandpiper	MI	MI	12.84		Coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats	No
Ardenna carneipes	Flesh-footed Shearwater	VU	MI	19.44		Coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats	No
Botaurus poiciloptilus	Australasian bittern	EN	EN	10.08	X	Shallow vegetated freshwater or brackish swamps	Yes
Calidris acuminata	Sharp-tailed sandpiper	MI	MI	2.91		Grassy edges of shallow inland freshwater wetlands. They are also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches.	Yes
Calidris alba	Sanderling	MI	MI	13.71		Forages at sandy beaches at the edge of the waves, on sandbars and spits. They roost on bare sand in the dunes or behind piles of kelp.	No
Calidris ferruginea	Curlew Sandpiper	CR	CR	-	X	Occurs In sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains.	No

Calidris ruficollis	Red-necked stint	MI	MI	13.71		Coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	No
Calidris subminuta	Long-toed Stint	MI	MI	19.72		Occurs in inland and coastal wetlands, where it is often found in well-vegetated areas such as fields and flooded meadows. Single Esperance record.	Yes
Calidris tenuirostris	Great knot	CR	MI	13.71		Intertidal mudflats and sandflats in sheltered coasts, including bays harbours and estuaries	No
Calyptorhynchus latirostris	Carnaby's cockatoo	EN	EN	5.58	X	Kwongkan shrub or heathland. Presence of Hakea, Banksia and Pine species indicate potential feeding habitat.	Yes
Caretta caretta	loggerhead turtle	EN	EN	17.84		Marine	No
Cereopsis novaehollandiae grisea	Recherche Cape Barren goose	VU	VU	12.84	X	During breeding season (May-June), found in grassy areas, tussock grass of bushes. During rest of year, found on beaches, coastal pastures and on the shores of brackish lakes.	Yes
Dasyurus geoffroii	Chuditch, Western Quoll	VU	VU	-	X	Open forest, low open forest, woodland, and open shrub	No
Falco hypoleucos	Grey Falcon	VU	-	-	X	Arid and semi-arid zones where rainfall is less than 500mm. Timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses	No
Hydroprogne caspia	Caspian Tern	MI	MI	12.84		Usually forages in open wetlands, including lakes and rivers.	No
Isoodon fusciventer	Quenda, southwestern brown bandicoot	P4		13.37		Scrubby, often swampy, vegetation with dense cover up to 1 m high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover	Yes
Ixobrychus dubius	Australian little bittern	P4		10.50		Diverse freshwater habitats, mainly where tall rushes, reeds, Typha (cumbungi), shrub thickets or other dense cover is inundated by at least 30cm of water.	No

Leipoa ocellata	Malleefowl	VU	VU	-	X	Semi-arid shrublands and low woodlands dominated by mallee and/or acacia.	No
Limosa lapponica	Bar-tailed godwit	MI	MI	19.59		Coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	No
Neophoca cinerea	Australian sea-lion	EN	EN	16.13		Marine.	No
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CR	CR	-	X	Intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	No
Numenius phaeopus	Whimbrel	MI	MI	17.87		Found mainly on the coast, on tidal and estuarine mudflats, especially near mangroves.	No
Pezoporus flaviventris	Western ground parrot	CR	CR	11.23		coastal heathland with a diverse range of low-growing shrubs.	No
Plegadis falcinellus	Glossy ibis	MI	MI	11.94		Feeds in very shallow water and nest in freshwater or brackish wetlands with tall dense stands of emergent vegetation such as reeds, papyrus or rushes) and low trees or bushes.	No
Sternula nereis nereis	Fairy tern	VU	VU	19.07		Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on beaches at night.	No
Thalasseus bergii	Crested tern	MI	MI	12.84		Marine	No
Thinornis rubricollis	Hooded plover, hooded dotterel	P4		11.73		Inhabits ocean beaches and the edges of near-coastal and inland salt-lakes.	No
Tringa brevipes	Grey-tailed tattler	MI and P4	MI	13.71		Common in large tidal flat systems.	No
Tringa glareola	Wood sandpiper	MI	MI	8.08		Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically	No

						associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees,	
Tringa nebularia	Common greenshank	MI	MI	6.83	X	Coastal and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	Yes

Appendix 5: State Threatened and Priority Flora and Fauna Definitions

Category	Definition
T – Threatened	Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice under the WC Act). Threatened flora are further ranked by the DBCA to align with IUCN Red List categories and criteria: **CR:** Critically Endangered – considered to be facing an extremely high risk of extinction in the wild (Schedule 1); **EN:** Endangered – considered to be facing a very high risk of extinction in the wild (Schedule 2); or **VU:** Vulnerable – considered to be facing a high risk of extinction in the wild (Schedule 3). **EX:** Presumed Extinct – taxa that have been adequately searched for and there is no reasonable doubt that the last individual has died (Schedule 4)
P1 – Priority 1 (Poorly known taxa)	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2 – Priority 2 (Poorly known taxa)	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3 – Priority 3 (Poorly known taxa)	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4 – Priority 4 (Rare, Near Threatened and other taxa in need of monitoring)	**1. Rare** - Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. **2. Near Threatened** - Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. **3.** Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy

Appendix 6: Commonwealth Definition of Threatened Flora and Fauna Species (Environment Protection and Biodiversity Conservation, EPBC Act 1999)

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

Appendix 7: State Definition of Threatened Ecological Communities

Category Code	Category
PTD	**Presumed Totally Destroyed** An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies: (i) records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; (ii) all occurrences recorded within the last 50 years have since been destroyed.
CE	**Critically Endangered** An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria: (i) The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; (ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area; (iii) The ecological community is highly modified with potential of being rehabilitated in the immediate future.
E	**Endangered** An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria: (i) The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; (ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area; (iii) The ecological community is highly modified with potential of being rehabilitated in the short term future.
V	**Vulnerable** An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria: (i) The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; (ii) The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; (iii) The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.

Appendix 8: State Definition of Priority Ecological Communities

Category Code	Category
P1	**Poorly-known ecological communities** Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	**Poorly-known ecological communities** Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within Significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 9: Commonwealth Definition of Threatened Ecological Communities

Three categories exist for listing threatened ecological communities under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Listing Category Code	Explanation of Category
Critically endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium term future.

Appendix 10: Categories and Control of Declared (Plant) Pests in Western Australia

Control Category	Control Measures
C1 (Exclusion) '(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented' Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.	In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C2 (Eradication) '(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible'. Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.	In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C3 (Management) '(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to — (i) alleviate the harmful impact of the declared pest in the area; or (ii) reduce the number or distribution of the declared pest in the area; or (iii) prevent or contain the spread of the declared pest in the area.' Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.	In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to — (a) alleviate the harmful impact of the declared pest in the area for which it is declared; or (b) reduce the number or distribution of the declared pest in the area for which it is declared; or (c) prevent or contain the spread of the declared pest in the area for which it is declared.

Appendix 11: Definition of Vegetation Condition Scale

For the south west and interzone botanical provinces

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

Appendix 12: Carnaby's Cockatoo foraging habitat scoring template

Adapted from Tables A1 and A2 of Department of Agriculture, Water and the Environment (2022)

Starting score	**Carnaby's Cockatoo**		
10	**Start at a score of 10** if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. ***This tool only applies to sites equal to or larger than 1 hectare in size.**		
Attribute	**Subtractions**	**Context adjustor (attributes reducing functionality of foraging habitat)**	**Vegetation type B, D & E**
Foraging potential	**-2**	**Subtract 2** from your score if there is no evidence of feeding debris on your site.	**0 –** There was large areas of suitable native and exotic foraging habitat within and immediately surrounding the project area.
Connectivity	**-2**	**Subtract 2** from your score if you have evidence to conclude that there is no other foraging habitat within 1km of your site.	**0 -** The project area from SLK 38.5-45.41 was surrounded by *Pinus pinaster* plantations providing large areas of high-quality exotic foraging habitat. SLK 33.54 -38.5 had minimal additional foraging habitat with most patches of remnant vegetation on private property being wetland associated vegetation that were not suitable for agriculture, the majority of foraging habitat within 1km from the area is the remaining sections of the road reserve.
Proximity to breeding	**-2**	**Subtract 2** if you have evidence to conclude that your site is more than 12km from breeding habitat.	**-2** Carnaby's Cockatoo is not known to breed in the Esperance region

Proximity to roosting	**-1**	**Subtract 1** if you have evidence to conclude that your site is more than 20km from a known night roosting habitat.	**-1** the project is 21km from the closest confirmed roosting site. However, *Eucalyptus gomphocephala*, *Eucalyptus globulus* and *Pinus pinaster* have been planted as wind breaks within the Road reserve and significant *Pinus pinaster* plantations surround the project area providing suitable exotic roosting habitat. Vegetation type A also contains large *Eucalyptus occidentalis* trees providing suitable native roosting habitat.
Impact from significant plant disease	**-1**	**Subtract 1** if your site has disease present (e.g. *Phytophthora* spp. or Marri canker) and the disease is preferred food plants present.	**-1** There is likely *Phytophthora cinnamomi* present within the project area.
Total score	**Enter score**		**6**
Other considerations for assessment of foraging habitat	- The presence, extent and density (including foliage cover and flowering density) of all plant species that provide foraging, including non-native food sources used - The distribution and size of foraging habitat in proximity (e.g. up to 12 km) to the impact site. - Site degradation (such as cleared, disturbed or degraded areas). - The fire history of the impact site. - Landscape characteristics around the impact site, including details of roosting and breeding habitat in proximity (e.g. up to 20km for roosting and 12km for breeding); and - The location and details of watering points that could support the use of the foraging habitat.		Numerous dams and freshwater wetlands surround the project area providing significant water recourses for the Carnaby's Cockatoo. The vegetation within the project area is highly disturbed within vegetation primarily being in a 'very good' or 'good' condition.

Appraisal	To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.	

Appendix 13: EPBC Act Protected Matters Report

Listed Threatened Ecological Communities

Community Name	Threatened Category	Rank	Text
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Likely	Community likely to occur within area

Listed Threatened Species

Scientific Name	Common Name	Class	Threatened Category	Migratory Status
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Bird	Critically Endangered	Migratory
Calidris ferruginea	Curlew Sandpiper	Bird	Critically Endangered	Migratory
Anigozanthos bicolor subsp. minor	Little Kangaroo Paw, Two-coloured Kangaroo Paw, Small Two-colour Kangaroo Paw	Plant	Endangered	
Botaurus poiciloptilus	Australasian Bittern	Bird	Endangered	
Tringa nebularia	Common Greenshank, Greenshank	Bird	Endangered	Migratory
Lambertia echinata subsp. echinata	Prickly Honeysuckle	Plant	Endangered	
Ricinocarpos trichophorus	Barrens Wedding Bush	Plant	Endangered	
Zanda latirostris	Carnaby's Black Cockatoo, Short-billed Black-cockatoo	Bird	Endangered (listed as Calyptorhynchus latirostris)	
Falco hypoleucos	Grey Falcon	Bird	Vulnerable	
Cereopsis novaehollandiae grisea	Cape Barren Goose (south-western), Recherche Cape Barren Goose	Bird	Vulnerable	
Leipoa ocellata	Malleefowl	Bird	Vulnerable	
Dasyurus geoffroii	Chuditch, Western Quoll	Mammal	Vulnerable	
Calidris acuminata	Sharp-tailed Sandpiper	Bird	Vulnerable	Migratory
Aphelocephala leucopsis	Southern Whiteface	Bird	Vulnerable	

Appendix 14: Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins - Community Description

Description obtained from: Ecologia for Grange Resources Limited (2008) Southdown Magnetite Proposal. Regional Flora and vegetation assessment. Unpublished Report

Swamp Yate (*Eucalyptus occidentalis*) woodland in seasonally-inundated basins

Community Description

The centre of these sumplands was usually inhabited by Swamp Yate (*Eucalyptus occidentalis*) low woodland often with an understorey of the Saltwater Paperbark (*Melaleuca cuticularis*). Peripheral to the central seasonally-inundated basin of these wetlands there was often a waterlogged zone of E. occidentalis associated with *Kunzea recurva* heath to open scrub and/or the small trees *Melaleuca preissiana* and *Banksia littoralis* and a number of mallees (primarily *Eucalyptus decipiens subsp. adesmophloia*). Fringing the wetland there was usually an *Anarthria laevis* sedgeland. However in the wetlands where there was shallow laterite, the sedgeland was usually replaced with a Pericalymma ellipticum heath.

The understorey shrubs of this vegetation were typically very open. *Melaleuca cuticularis, Kunzea recurva* and *Hakea nitida* generally formed an open tall shrub layer. *Hakea denticulata, Hakea laurina, Hakea varia, Exocarpos sparteus, Agonis theiformis, Lambertia inermis* and *Nuytsia floribunda* were also sometimes present in the seasonally waterlogged areas fringing the sumplands. Other common shrub taxa, recorded at low density across the sampled sites were *Isopogon trilobus, Acacia pulchella var. glaberrima, Taxandria spathulata, Astartea glomerosa, Astartea aspera, Beaufortia empetrifolia, Melaleuca concinna* and *Conothamnus aureus*. Other mid and low shrub species recorded at lower abundance included *Acacia biflora, Acacia luteola, A. subcaerulea, Adenanthos cuneatus, Banksia baueri, Banksia dryandroides, Bossiaea praetermissa, Daviesia inflata, Dryandra falcata, Dryandra mucronulata subsp. mucronulata, Dryandra tenuifolia var. tenuifolia, Gompholobium confertum, Hibbertia lineata, Leucopogon conostephioides, Melaleuca subtrigona, Petrophile squamata subsp. squamata, Petrophile media, Spyridium majoranifolium, Stirlingia anethifolia and Thomasia stelligera. The perennial herbs Villarsia parnassifolia, Anthotium humile, Stylidium corymbosum, Goodenia filiformis* and *Velleia trinervis* were abundant in the wetlands in good condition. These herbs inhabited the shallowly-inundated zone of the wetland and were most apparent when the water receded and the herbs were in flower in late summer. A dense ground layer was generally present in the seasonally waterlogged fringe of the sumplands and this was dominated by rushes and sedges including *Anarthria laevis, Baumea juncea, Gahnia ancistrophylla, Lepidosperma striatum, Schoenus laevigatus, Schoenus subfascicularis and Tricostularia compressa.* A suite of native grasses was also recorded including *Amphipogon amphipogonoides, Austrostipa hemipogon, Cyperochloa hirsuta, Deyeuxia quadriseta and Neurachne alopecuroidea.* Naturalised alien grasses and herbs were prevalent in the more disturbed wetlands and these included **Aira caryophyllea, *Cirsium vulgare, *Conyza parva, *Conyza sumatrensis, *Hordeum leporinum, *Hypochaeris glabra, Juncus pallidus,*Lagurus ovatus, *Pennisetum clandestinum, *Pseudognaphalium luteoalbum, *Rumex crispus, *Solanum nigrum* and **Vulpia myuros var. megalura*