RECONNAISSANCE FLORA, VEGETATION AND BASIC FAUNA SURVEY REPORT

CBH Dowerin Receival Site

Dowerin, WA 6461

Final v. 2

05/04/2024

BUSHFIRE | ENVIRONMENTAL | WATER | GIS

DOCUMENT CONTROL

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Client: Cooperative Bulk Handling (CBH)

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Executive Summary

Cooperative Bulk Handling (CBH) commissioned Bio Diverse Solutions as Environmental Consultants to undertake a spring reconnaissance flora and vegetation survey and a basic fauna assessment for an area adjacent to the Dowerin CBH receival site, in the Shire of Dowerin. The survey area, totalling 4.30 ha, is composed of a block of remnant vegetation situated on the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road and a small area encompassing the road reserve south of the rail line on Rifle Range Road. The purpose of this survey is to provide environmental assessment for the proposed expansion works of the existing grain receival site.

Five vegetation units were identified within the survey area. The condition of the vegetation units ranged from 'Completely Degraded' to 'Very Good', largely due to disturbance from the adjacent railway track and road and invasion of agricultural weeds. Eighty-three species of Priority and Threatened flora were identified in the desktop assessment, two were assessed to be "Likely" and 41 were assessed to be "Possible" to occur. Eighty-seven species of flora were identified within the survey area, 22 introduced or non-native species were present. One species of Priority flora was identified within the survey area; P3 *Bossiaea atrata.* The Vegetation Unit 4: *Eucalyptus loxophleba subsp. loxophleba* Woodland [EucloxW] met the diagnostic criteria of the Threatened (TEC) and Priority (PEC) Ecological Community 'Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)', however did not satisfy minimum patch size requirements to be classified as TEC/PEC.

Fifty fauna species were identified in the desktop assessment, of which 22 were assessed as possible to occur. Fifty-three fauna species were detected during the survey, none of which were Threatened or Priority fauna identified in the likelihood of occurrence (LOO) analysis. There was evidence of five introduced species within the survey area, this, in addition to lack of quality feeding and breeding habitat, was considered a limitation of occupancy of the area for the species listed in the LOO.

1. Introduction, Scope and Background Information

Cooperative Bulk Handling (CBH), herein referred to as 'the client', commissioned Bio Diverse Solutions as Environmental Consultants to undertake a spring reconnaissance flora and vegetation survey and a basic fauna assessment of the Dowerin CBH Receival Site for proposed expansion works; this survey will henceforth be referred to as the 'spring survey'.

This report is preceded by an out-of-season reconnaissance flora, vegetation and basic fauna survey report completed by Bio Diverse Solutions in winter 2022 (BDS, 2022), herein referred to as the 'original survey', which occurred in an adjacent area. This report is accompanied by a targeted flora and vegetation survey report concurrently being completed by Bio Diverse Solutions in both the original survey area and the spring survey area (BDS, 2023), herein referred to as the 'targeted survey'.

The scope of works include:

- Desktop assessment of the survey area, of all publicly available database searches (including DBCA Threatened and Priority flora data) for Threatened flora, vegetation communities and Threatened fauna data;
- A spring reconnaissance flora and vegetation survey across the survey area to identify vegetation types, condition, possible ecological communities and conservation significant flora (if present) or habitat;
    - This included a likelihood of occurrence assessment for all conservation significant flora species identified in desktop searches;
    - TPFL forms for new populations of Priority or Threatened flora to be submitted to DBCA;
- Identification and mapping of the vegetation condition within the survey area using the EPA (2016) condition scale, including the location of any Weeds of National Significance or Declared Pests;
- Identification of flora species, including herbarium identification if required;
- Basic fauna survey to map fauna habitat in the area, identify areas likely to provide habitat for conservation significant species and opportunistic sampling of fauna species (including conservation significant);
    - This included a likelihood of occurrence assessment for all conservation significant fauna species identified in desktop searches;
- Prepare a report on survey outcomes, consistent with EPA Guidelines; and
- Provide the client with the IBSA Data package (as required to be submitted by the client).

1.1. Location and Development Proposal

The 'survey area' is defined as two areas, totalling approximately 4.30 ha, located 4.5 km southwest of the Dowerin townsite and approximately 1.1 km down the road from the CBH Dowerin receival site on Irvine Road, in the Shire of Dowerin. The survey area is composed of a block of remnant vegetation situated on the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road and a small area encompassing the road reserve south of the rail line on Rifle Range Road, see Figure 1. The survey area is adjacent to the area surveyed in the original survey (BDS, 2022) and is also included in the area surveyed in the targeted survey (BDS, 2023). These areas could be impacted if the client's proposed expansion works occur.

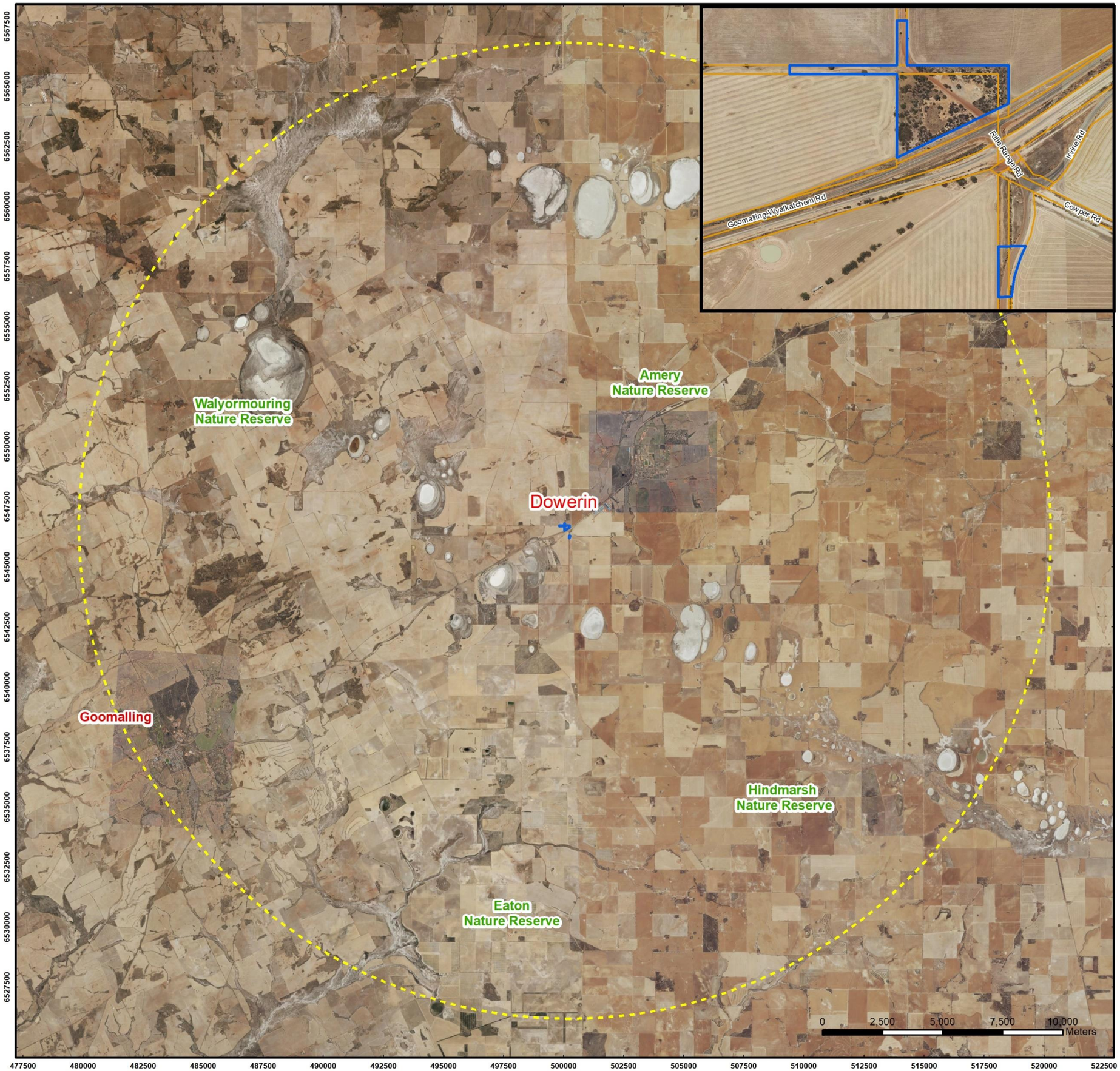
The 'study area' consists of the 20-30 km radius around the survey area, with a 20 km radius presented in Figure 1, used for desktop assessment and indications of likelihood of occurrence (LOO) of threatened or priority flora and ecological communities. The various search radii used to characterise the study area were determined by data supplied by various database sources. Analysis of the study area provides a broader local context and assessment in relation to the survey area.

1.2. Alignment to Legislation, Guidelines and Policies

This survey and subsequent report are aligned to the following legislation, guidelines and policies:

- *Environmental Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act). Administered by the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW);
- *Biodiversity Conservation Act 2016* (WA; BC Act). Administered by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA);
- *Environmental Protection Act 1986* (WA; EP Act). Administered by the Western Australian Department of Water and Environmental Regulation (DWER);
- *Biosecurity and Agriculture Management Act 2007* (WA; BAM Act);
- Environment Protection Authority (EPA, 2016) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment;

- EPA (2020) Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact;
- Commonwealth of Australia (CoA, 2013) Draft Survey Guidelines for Australia's Threatened Orchids;
- Department of the Environment, Water, Heritage and the Arts (DEWHA, 2010) Survey Guidelines for Australia's Threatened Birds;
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC, 2011) Survey Guidelines for Australia's Threatened Mammals; and
- Department of Agriculture, Water and the Environment (DAWE, 2022) Referral guideline for 3 WA Threatened black cockatoo species.



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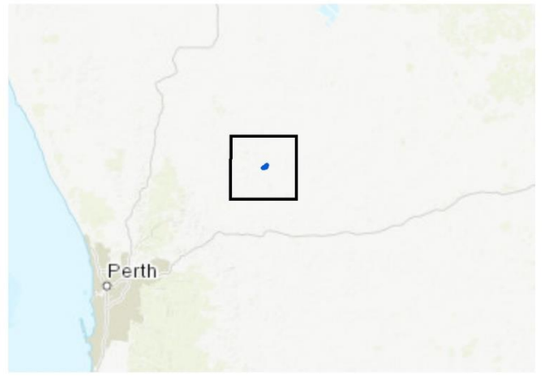

Overview Map Scale 1:5,000,000

Legend

Reconnaissance flora and vegetation and basic fauna

20 km Study Area

Scale
1:155,000@ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Dowerin, WA 6461

Figure 1: Survey Area Locality

	QA Check	*Drawn by*
	CvdM	**MW, WB, MH**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-003**	**28/09/2023**

1.3. Geology and soils

Database searches shows the survey area lies within the Kwolyin System (258Ky). The Kwolyin System is described as "Gently undulating granitic terrain of the Kellerberrin batholith with large outcrops of granite, dominated by duplex soils with minor sandplain. York Gum/ Salmon gum woodlands with minor Wandoo, Jam, Sheoak and heath." (DPIRD, 2023a).

The Northern Zone of Ancient Drainage Zone is described as "An ancient plain with low relief on weathered granite. There is no connected drainage, salt lake chains occur as remnants of ancient drainage systems which now only function in very wet years. Lateritic uplands dominated by yellow sandplain." (DPIRD, 2023b). The soil type within the application area is mapped as the Kwolyin, Nembudding Subsystem (258KyNE), described as "Rises and low hills, in the northern Zone of Ancient Drainage, with alkaline red loamy duplex (mostly shallow) and yellow sandy earth. Mallee scrub and woodland." (DPIRD, 2023c).

1.4. Climate

The closest open Bureau of Meteorology (BoM) site with continuous rainfall and temperature data is Cunderdin Airfield (Station No. 10286; BoM, 2023a, 2023b). The average annual temperature at Cunderdin Airfield ranges from 4.5-34.9°C (BoM, 2022b). The average summer temperature ranges between 14.9-34.9°C, whilst average winter temperatures range between 4.5-18.5°C. The annual mean rainfall between 1996 to 2023 is 308.4 mm (BoM, 2022a). On average the months of May to August are the months with the highest rainfall (Figure 2). There was significantly higher than average rainfall recorded in the months of March, April and June of 2023 and September and November 2022, and significantly lower than average rainfall recorded in January, February, May, July and August of 2023 (Figure 2). The total rainfall in the year previous to the survey (September 2022 to August 2023) was 302.6 mm which is 5.8 mm below average and equates to 1.88% decrease compared to average rainfall.

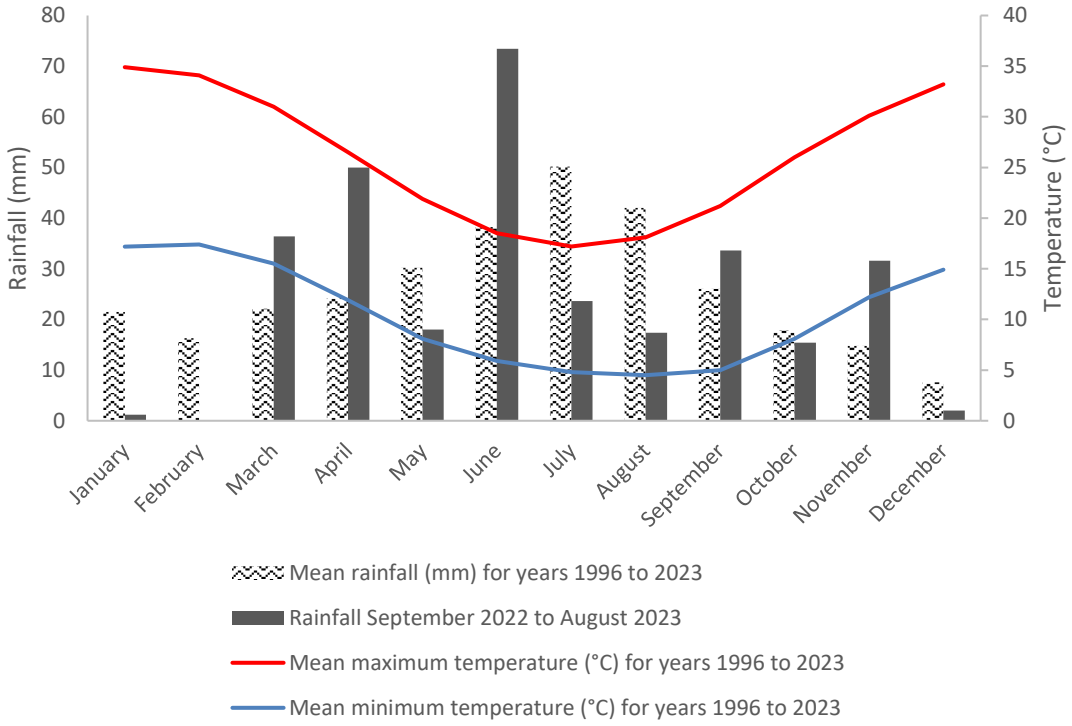


Figure 2: Rainfall and temperature data for Cunderdin Airfield BoM Weather Station (10286).

1.5. Habitat Connectivity

Habitat connectivity assessments rely on a bioregional and landscape-scale approach to evaluate habitat for fauna movement and ecological linkage across a region. Habitat connectivity is largely reliant on remnant vegetation, recognising it plays a very important role in developing corridors between protected areas to assist in achieving long-term biodiversity management outcomes (Wilkins et al., 2006). The survey area lies within a highly modified landscape consisting of agricultural properties. There is a small reserve located adjacent to the northwest corner of the survey area (R4243). There are other smaller areas

of remnant vegetation present within the surrounding agricultural properties. The vegetation present within the road reserves ultimately link these small patches of vegetation providing some linkage of native vegetation throughout the broader landscape.

1.6. Water and Wetlands

The survey area does not lie within any Public Drinking Water Source areas (DWER, 2023). The survey area lies within the Northern Zone of Ancient Drainage (HZ07_NAD) Hydrological Zone (DPIRD, 2022). The Northern Zone of Ancient Drainage is described as "An ancient plain of low relief & lateritic uplands on weathered granite. Ranges & stony plains in the north-east. No connected drainage, remnant salt lake chains occur in ancient drainage systems which now only function in very wet years." (DPIRD, 2022). The survey area lies within the Swan Avon Mortlock Catchment (DWER, 2018a) and within the Lake Dowerin Sub-catchment (DWER, 2018b). The Mortlock Basin 035a and 035b, and an unnamed wetland are to the southwest of the survey area, which form part of the Swan Avon Mortlock 46 Wetland Suite. Directly adjacent to this is the Mortlock 48 A01 Wetland Suite (DBCA, 2017). Directly to the north of the survey area within Reserve 4243 are two water reservoirs (DBCA, 2017).

1.7. Environmentally Sensitive Areas

The survey area does not contain any Environmentally Sensitive Areas (ESAs), the nearest site lying approximately 50km to north east (DWER, 2021).

1.8. Remnant Vegetation

The survey area lies within the Avon Wheatbelt Bioregion and Avon Wheatbelt 1 - Ancient Drainage subregion (AW01). Beecham (2001) describes the Avon Wheatbelt Bioregion as "an area of active drainage dissecting a Tertiary plateau in Yilgarn Craton. Gently undulating landscape of low relief. Proteaceous scrubheaths, rich in endemics, on residual lateritic uplands and derived sandplains; mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands on Quaternary alluvials and eluvials." The AW01 subregion is described as "an ancient peneplain with low relief, gently undulating landscape. There is no connected drainage; salt lake chains occur as remnants of ancient drainage systems that now only function in very wet years. Lateritic uplands are dominated by yellow sandplain" (Beecham, 2001).

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd et al. 2002) in the 1970s, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford & Barrett, 2010). Vegetation units were regarded as associations and were grouped into Vegetation Systems representing a particular pattern of association distribution within a given area. A GIS search of J.S. Beards (Beard et al., 2013) vegetation classification places the study area within two Vegetation Associations (DPIRD, 2019), refer to Table 1 and Figure 3.

Table 1: Vegetation Associations mapped within the survey area (Beard et al., 2013).

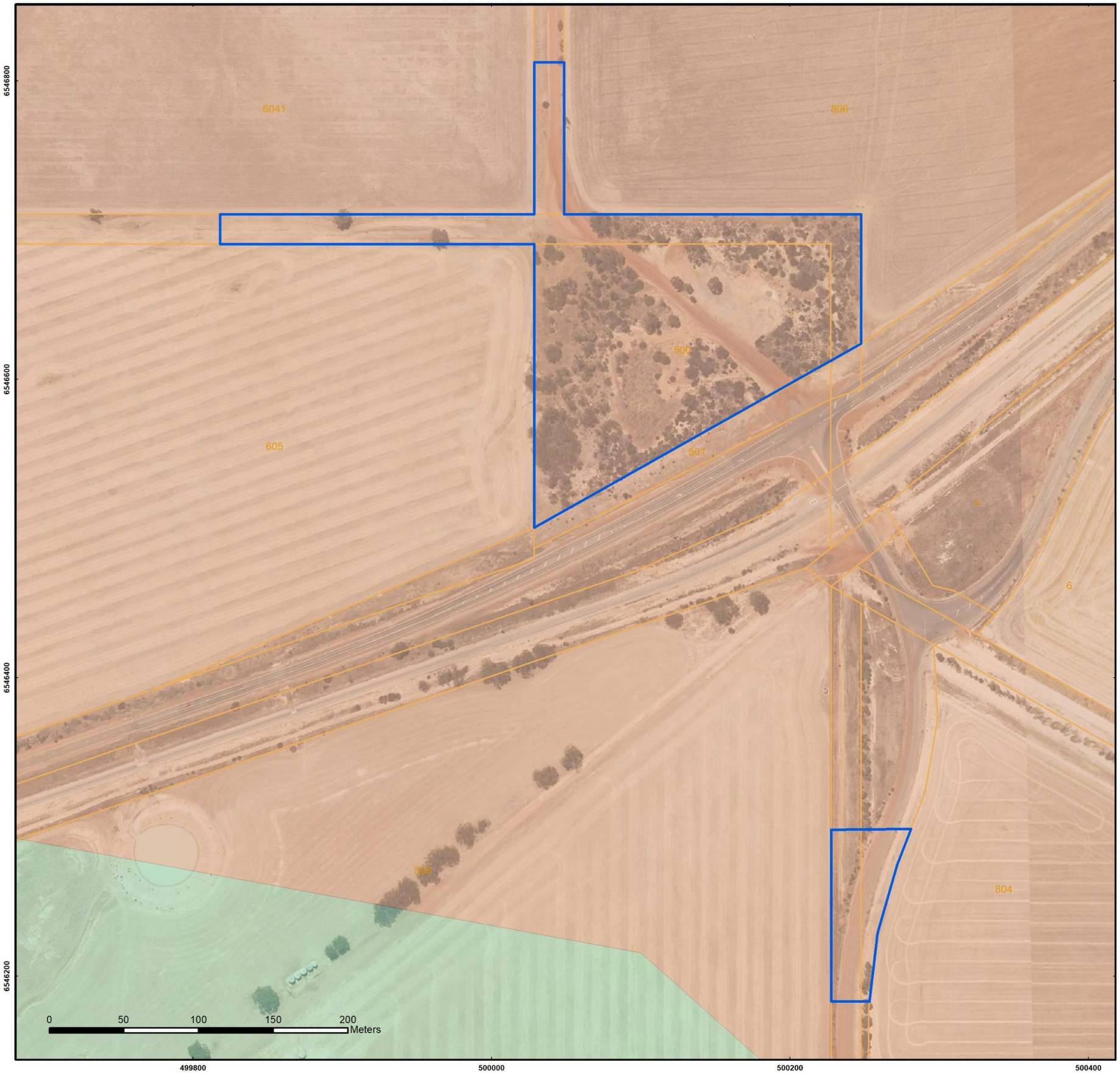
Details	Vegetation Association	
System Association Name	Guangan.	Goomalling.
Vegetation Association Number	1049.	694.
Structure Description	Woodland other.	Scrub-heath.
Floristic Description	Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *E. salubris*, *E. oleosa*. Riverine; rivergum *E. camaldulensis*. Tropical; messmate, woolyb.	Mixed heath with scattered tall shrubs Acacia spp., Proteaceae and Myrtaceae.
Remnant Vegetation by Beard Association Rarity in LGA	5.36% remaining (GoWA, 2019).	5.72% remaining (GoWA, 2019).
Remnant Vegetation by Beard Association Rarity in IBRA Region	6.79% remaining (GoWA, 2019).	7.27% remaining (GoWA, 2019).

1.9. Heritage

The survey is located within the Ballardong Nyoongar nation (Horton, 1996), and not located within a registered heritage site (DPLH, 2023). It is recognised that there has been a large scale loss of cultural knowledge and information, and the survey area may contain additional heritage values that are not recognised through Department of Planning, Lands and Heritage (DPLH, 2023).

1.10. Dieback

The Dieback Information Delivery and Management System (DIDMS; SCNRM, 2023) does not have any recorded disease confidence mapping or known disease point mapping within the survey area. It is important to note that the publicly available data provided in DIDMS is indicative only and it is stated by SCNRM that "the extent of infestations are underestimated, as not all areas have been surveyed and disease boundaries are likely to extend into mapped disease-free areas since surveys were conducted" (SCNRM, 2020).



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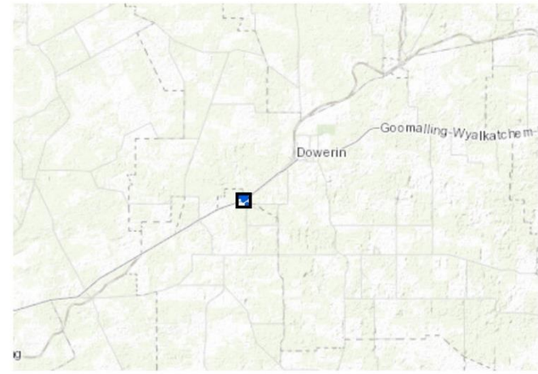

Overview Map Scale 1:400,000

Legend

- Reconnaissance flora and vegetation and basic fauna
- Cadastre

Pre-European Vegetation (DPIRD, 006)

- GOOMALLING_694
- GUANGAN_1049

Scale
1:2,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Figure 3: Desktop Vegetation Data

	QA Check	*Drawn by*
	CvdM	**MW, WB, MH**
STATUS **FINAL**	*FILE* **CBH0018-003**	*DATE* **31/10/2023**

2. Methodology – Desktop Assessment

2.1. Flora and Vegetation

Desktop inventory of potential conservation significant flora species and TEC/PECs likely to occur within 20-30 km of the survey area was undertaken using the following databases:

- 20 km Protected Matters Search Tool (DCCEEW, 2023);
- 30 km Flora DBCA database records (DBCA, 2023a); and
- 20 km TEC/PEC DBCA database records (DBCA, 2023b).

The conservation significance of flora species has been assessed using data from the following sources:

- EPBC Act. Administered by DAWE;
- BC Act. Administered by DBCA;
- *DBCA priority and threatened ecological community list* (DBCA, 2023c). A non-legislative list maintained by DBCA for management purposes; and
- *DBCA Priority Flora list* (DBCA, 2023d). A non-legislative list maintained by DBCA for management purposes.

2.2. Fauna

A desktop inventory of conservation significant fauna species known to occur within 20-30 km of the survey area was undertaken using the following databases:

- 20 km Protected matters search tool (DCCEEW, 2023); and
- 30 km Fauna DBCA database records (DBCA, 2023e).

The conservation significance of fauna species has been assessed using data from the following sources:

- EPBC Act. Administered by DAWE; and
- BC Act. Administered by DBCA.

Desktop assessment for the Black Cockatoo habitat consisted of reviewing DBCA locational records and a range of publicly available datasets relevant to Black Cockatoo breeding, roosting and foraging areas. These included:

- Carnaby's Cockatoo Confirmed (DBCA_050; DBCA, 2023f) and Unconfirmed Roost Sites (DBCA_051; DBCA, 2023g).
- Carnaby's Cockatoo Confirmed (DBCA_52; DBCA, 2023h) and Unconfirmed Roost Sites Buffered 6km (DBCA_053; DBCA, 2023i).
- Black Cockatoo Breeding Sites - Buffered (DBCA_063; DBCA, 2023j).
- Black Cockatoo Roosting Sites – Buffered (DBCA_064; DBCA, 2023k).

3. Methodology – Field Survey

3.1. Flora and Vegetation Survey

The aim of this reconnaissance survey was to provide context and gather knowledge of the survey area. This type of survey aims to verify the desktop information obtained, and to characterise the flora and vegetation units present within the survey area. The flora and vegetation survey was undertaken by Ellen Hickman (Senior Botanist), Charlize van der Mescht (Ecologist) and Marisa Wearing (Field Technician) on the 11th of September 2023. The survey area was surveyed on foot using traverses and relevés. Meandering traverses were surveyed by foot, the intent of the traverses was to identify and map the different vegetation types, their condition category and to undertake more intensive targeted surveys within suitable habitat for conservation significant species. Where areas contained suitable habitat for conservation significant flora these were more intensely surveyed. Four relevés were systematically surveyed within representative vegetation types to enable analysis of and categorisation across the survey area. One quadrat was surveyed to gain a more in-depth understanding of the vegetation composition and for analysis relating to areas of vegetation meeting TEC/PEC criteria. The quadrat surveyed was 10x10 m square understorey and 20x20 m upper storey as per *Approved Conservation Guidelines for Wheatbelt Woodlands* (DoEE, 2015).

Information collected within each relevé included:

- Location: coordinates of the relevé using a handheld GPS unit.
- Date, site and veg code.
- Site description: landform, slope, soil colour and type and hydrology.
- Vegetation description: dominant and non-dominant species present within the different growth forms and percentage cover.
- Vegetation condition.
- Photo of the general area.

3.2. Flora and Vegetation Survey Limitations and Constraints

An assessment of potential survey limitations was undertaken as per the EPA (2016) document *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment,* refer to Table 2 below. Limitations were primarily nil-minor in nature, and did not affect the validity of results presented in the reconnaissance survey.

Table 2: Assessment of potential flora and vegetation survey limitations.

Limitation	Significance of limitation	Comment
Experience of personnel	Nil	Dr. Ellen Hickman has over 30 years' experience surveying and documenting flora, having previously worked with the DBCA (then CALM) surveying, documenting and managing the threatened flora of WA. Charlize van der Mescht has been employed by Bio Diverse Solutions since 2019. She has over 4 years' experience with flora and vegetation surveys in the South West, South Coast, Midwest, Esperance-Goldfields and Wheatbelt regions. She has a BSc in Environmental Science and Masters in Environmental Management, and is now Environmental Team Leader at Bio Diverse Solutions. Marisa Wearing has been employed by Bio Diverse Solutions since 2022. In that time, she has gained valuable experience as a technical officer, working alongside senior botanists and other experts in their field. She has a Certificate III in Conservation and Ecosystem Management.

Table 2 continued.

Limitation	Significance of limitation	Comment
Survey Timing	Nil	The Shire of Dowerin is part of the Avon Wheatbelt botanical province in which the peak flowering period is September to November. The survey was undertaken in September, within this window to capture as many flowering species as possible. Of the species identified in the LOO that were likely to occur and were not flowering during the survey period, the majority are shrubs or trees that have sufficient taxonomic information available for identification whilst not flowering.
Access restrictions	Minor	No access restrictions were encountered during the reconnaissance survey.
Availability of contextual information	Nil	Publicly available desktop and background information was readily available to give a broad contextual understanding of the site. Database searches were conducted through DBCA (DBCA, 2023a; DBCA 2023b) providing more comprehensive context of potential conservation significant species potentially present within the survey area.
Survey effort and extent	Nil	Eighty-five taxa were identified during the survey and four relevé data sets collected to gain as complete a picture as possible of flora species and vegetation units present at the site. The survey effort expended for the reconnaissance survey was appropriate to meet the technical guidance for the respective survey level (EPA, 2016), refer to Figure 12, Appendix A for survey effort.
Disturbances that may affect results	Minor	The primary form of disturbance within the survey area is the presence of roads and proximity to an active railway line; these areas regularly experience varying levels of traffic. As this type of disturbance is regular and continuous it was assessed to not significantly affect or misrepresent results of the survey. No signs of other disturbances such as fire or a stochastic event were noted at the time of the survey.
Identification issues	Minor	The survey was undertaken during the peak flowering season for the Avon Wheatbelt. Of the 87 taxa identified, the vast majority contained sufficient taxonomic information for identification (such as nuts, fruit, leaf structure or flowers). One species could only be identified to the genus level; *Eucalyptus* sp. This was judged as a minor limitation as the *Eucalyptus sp.* did not bear resemblance to any of the threatened species identified in the LOO as likely to occur in the survey area. In addition, *Lepidosperma costale s. lat*. was identified to a species complex level (as denoted by "s. lat") by Dr. Russell Barrett, an expert on *Lepidosperma* sp. As none of the associated species are considered conservation significant it is judged as a minor limitation.

3.3. Basic Fauna and Targeted Black Cockatoo Survey

Field survey work was carried out by Dr. Karlene Bain (Wildlife Ecologist) on the 11th September 2023. The aim of the basic fauna survey was to assess and map habitat for significant fauna species within the survey area, assess the likelihood of occupancy for significant fauna species, record the presence of conservation significant taxa, and undertake an opportunistic inventory of fauna species within the survey area. In addition, a targeted survey was undertaken for black cockatoos, including targeted searches for individuals, census of calls, and searches for indirect indicators of presence and searches for critical habitat elements.

A total 6.46 km of traverses were walked in a manner that ensured that all remnant vegetation patches were surveyed, a representative variety of vegetation units onsite were encountered, and habitats and micro-niches likely to be important to conservation significant taxa were targeted. The overall type, quantity, and quality of habitat suitable for threatened species was assessed and mapped.

Basic fauna survey techniques applied included:

- Surveys for indicators of species presence such as scats, latrines, tracks, diggings, burrows, log hollows, earth burrows, active dens, incubation mounds, breeding hollows, characteristic nests, feeding debris.
- Census of calls for birds and frogs.
- Opportunistic diurnal detections of calls.
- Hand searches within micro-niches undertaken for reptiles and short-range endemic invertebrates, such as within rock piles, leaf litter, under rocks, bark, and logs.
- Searches for important elements of habitat and potentially suitable habitat resources such as rock refuges, areas of deep leaf litter, active and potential breeding hollows, feeding resources, den resources, incubation mounds, termite galleries, shelter sites, wetland resources.
- Particular emphasis was placed on habitat requirements and potential indicators of presence for threatened, priority and migratory species identified in the desktop assessment (Table 21, Appendix B).

Targeted survey techniques applied for black cockatoos included:

- Census of calling individuals throughout the survey period to detect feeding individuals, pairs, or flocks.
- Diurnal searches for evidence of feeding (chewed nuts or cones).
- Searches for plant species likely to be used as food resources.
- Searches for hollow-bearing trees, potential breeding hollows, and any evidence of active breeding hollows for Carnaby's Cockatoo, as evidenced by chewing around the hollow entrance, nest remains (eggshells, feathers faecal material), or bird activity within or near the hollow.
- Systematic searches for active or potential nest trees (significant trees). Significant trees for cockatoos were defined as those with a diameter measured at breast height (1.3 m above the ground; DBH) of >300 mm. Where these trees were present, they were measured at DBH using a diameter tape, photographed, and the presence or absence of potential or active breeding hollows determined.
- Where present, hollows were photographed, the entrance type (chimney, side, or elbow) and dimensions of the hollow were recorded and hollows were assessed for signs of use, based on evidence such as chewing around the hollow entrance, and activity at the base of the tree, e.g., feathers, faecal material, feeding debris.
- Systematic searches for potential and active roosting sites, as evidenced by the presence of birds, feathers and faecal material.

3.4. Fauna Survey Limitations and Constraints

An assessment of potential survey limitations was undertaken as per the EPA (2020) document *Technical Guide- Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, refer to Table 3 below. Limitations were primarily nil-minor in nature, and did not affect the validity of results presented in the reconnaissance survey.

Table 3: Assessment of potential fauna survey limitations.

Limitation	Significance of limitation	Comment
Experience of personnel	Nil	Dr Karlene Bain has 26 years of fauna survey experience through roles in biodiversity survey, research and management working with State Government, State Natural Resource Management groups, Regional NRM groups, Research Institutions, and Private Industry.
Species detection probability (eg, Survey timing, cryptic species, etc.)	Minor	In the wheatbelt region the typical breeding season for Baudin's Cockatoo is October to March and for Carnaby's Cockatoo it is July to September (DAWE, 2022). As the survey was conducted in September, just before the period for Baudin's and during for Carnaby's, this factor was assessed to have a minor limitation on detecting breeding individuals. Cockatoos also use a range of areas for foraging and roosting, the use of activity indicators such as feeding debris (nuts) and faecal material negate this limitation and enable determination of presence/regularity with which an area is visited. Of the conservation significant species assessed as possible to occur pre-survey, likelihood of detection for the majority was rated high. Three species were assessed to be at a moderate likelihood of detection: • *Egernia stokesii badia (*Western spiny-tailed skink); • *Dasyurus geoffroii (*Chuditch, western quoll); and • *Kwonkan eboracum (*Yorkrakine trapdoor spider). Two were assessed to be at a low likelihood of detection: • *Phascogale calura (*Red-tailed Phascogale, Kenngoor); and • *Phascogale tapoatafa subsp. Wambenger (*South-western Brush-tailed Phascogale, Wambenger). This was evaluated as a minor limitation as habitat constraints identified in the field indicated it was unlikely for the above species to occur in the survey area. See Table 21, Appendix B for full LOO analysis and species detection probabilities.
Access restrictions	Minor	No access restrictions were encountered during the reconnaissance survey.
Availability of contextual information	Nil	Publicly available desktop and background information was readily available to provide a broad contextual understanding of the site. Database searches were conducted through DBCA (DBCA, 2023e-k), providing more comprehensive context of potential conservation significant species potentially present within the survey area.
Survey Effort and Extent	Nil	The basic fauna survey and targeted components of the survey were deemed appropriate given the scope was to identify the general presence of fauna species and fauna habitat in the survey area. See Figure 12, Appendix A for survey effort.

Table 3 continued.

Limitation	Significance of limitation	Comment
Disturbances that may affect results	Nil	The primary form of disturbance within the survey area is the presence of roads and proximity to an active railway line. These areas regularly experience varying levels of traffic. As this type of disturbance is regular and continuous it is unlikely to have resulted in a significant limitation on detection probability or species occurrence during the survey period. No signs of other disturbances such as fire or a stochastic event were noted at the time of the survey
Scope	Nil	The scope was a basic terrestrial fauna survey to generally assess the presence/evidence of fauna species within the survey area, map the fauna habitat, undertake opportunistic inventory of species including priority conservation species. Additional targeted assessment of significant trees was undertaken to identify breeding, roosting or foraging habitat for black cockatoos.
Significant tree survey limitations	Minor	Identifying hollows from the ground has limitations, as the full characteristics of a hollow are not evident, for example the internal dimensions such as depth. As such the entrance dimensions and size of the branch/trunk into which the hollow was forming were used as indicators of the potential internal dimensions. The relative visibility of the canopy can also be limiting in identifying potential hollows, particularly where hollows are upward facing or obscured by foliage.

4. Results – Desktop Assessment

4.1. Threatened and Priority Flora

The full desktop assessment species list compiled from all available data (Table 19 in Appendix B) is based on observations from a broader area than the survey area and is likely to include species that would not occur in the actual survey area due to a lack of suitable habitat. The data also includes very old records and in some cases the species in question may have become locally or regionally extinct. Criteria for assessing likelihood of occurrence of species are presented in Table 18 in Appendix B, conservation categories for Threatened and Priority flora are presented in Tables 22 and 23 in Appendix C. Protected matters search tool (PMST) database searches are provided in Appendix E.

As a result of the above-mentioned database searches 51 Threatened and 32 Priority species were identified within the study area (20-30 km buffer). Of these, two were assessed to be "Likely" and 41 were assessed to be "Possible" to occur. Refer to Table 19 in Appendix B for LOO analysis. Species and their conservation listing, that have previously been recorded within a 20 km radius of the survey area are presented in Figure 4 (note as the LOO is based on a 30 km radius not all species are represented in the map).

4.2. Threatened and Priority Ecological Communities

Database results indicate that eight TEC/PECs may be present within the study area, see Figure 4. Of these, five were assessed to be "Likely" to occur, see Table 4. Refer to Table 20 in Appendix B for LOO analysis. Conservation categories for TEC/PECs are presented in Tables 24 and 25 in Appendix C. Protected matters search tool (PMST) database searches are provided in Appendix E.

Table 4: Summary of TEC/PECs assessed as likely to occur based on desktop assessment and their relative location and size within the study area.

TEC/PEC	Status		Location in study area
	EPBC Act 1999	BC Act 2016	
Eucalyptus Woodlands of the Western Australian Wheatbelt	T-CR	P3	Encompassing the remnant block of vegetation on the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road and throughout the study area. Totalling 10,116.5 ha within the study area.
York Gum Woodlands of the Wheatbelt	T-CR	P3	There are two medium sized patches towards the outer areas in the west and south of the study area. Totalling 627.7 ha within the study area.
Salmon Gum Woodlands of the Wheatbelt	T-CR	P3	There are four small patches throughout study area. Totalling 313.8 ha within the study area.
Red Morrel Woodlands of the Wheatbelt	T-CR	P1	There are two medium sized patches towards the outer areas in the west of the study area. Totalling 382.6 ha within the study area.
Gimlet Woodlands of the Wheatbelt	-	P3	Totalling 313.9 ha within the study area.

Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)

Wheatbelt Woodlands is listed as a Priority 3 (P3) PEC under the BC Act and an Endangered TEC under the EPBC Act. The survey area lies within the Avon Wheatbelt IBRA Bioregion and Merredin IBRA subregion (AVW01), within the boundaries of the location criteria for Wheatbelt Woodlands, furthermore desktop assessment maps this PEC/TEC within the survey area. It is therefore a possibility that Wheatbelt Woodlands may be present within the survey area.

Wheatbelt Woodlands is comprised of Eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the Goldfields. The

woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse eucalypt tree canopy are not part of the ecological community (DoEE, 2016). Wheatbelt Woodlands is recognised by the below key diagnostic features and minimum condition thresholds as outlined in the approved conservation advice guidelines (DoEE, 2015):

1) Occurs within the IBRA Avon Wheatbelt subregions Merredin (AVW01) and Katanning (AVW02), Western Mallee subregion (MAL02) and jarrah forest subregions Northern Jarrah Forest (JAF01) and Southern Jarrah Forest (JAF02) when adjacent to the Avon Wheatbelt.
2) Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10% (crowns measured as if opaque).
3) Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015). These are species that typically have a single trunk. One or more tree species are dominant or co-dominant within the patch of the ecological community. If other species are present in the tree canopy, then these do not occur as dominant in the tree canopy.
4) Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table A1 of Appendix A of approved conservation guidelines (DoEE, 2015).

Condition thresholds for the ecological community are described in Table 5. General notes on the condition thresholds of the ecological community are outlined in the Approved Conservation Guidelines for Wheatbelt Woodlands (DoEE, 2015).

Table 5: Condition thresholds for Wheatbelt Woodlands TEC diagnostic criteria.
Note: Condition is referenced to Keighery (1994) and Relative Conservation Value (RCV) is related to Roadside Conservation Committee (Stack et al., 2014).

Category and Comment	Cover of exotic plants (weeds) AND	Mature trees AND	Minimum patch size (non-roadside patches) OR	Minimum patch width (roadsides only)
A: patches likely to correspond to condition of Pristine / Excellent / Very Good or a High RCV	Exotic plants account for 0 to 30% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees may be present or absent.	>2ha	>5m
B: Patches likely to correspond to a condition of Good or a Medium-High RCV AND retains important habitat features.	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy	Mature trees are present, >5 trees/ha.	>2ha	>5m
C: Patches likely to correspond to a condition of Good or a Medium-High RCV.	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees either absent or <5 trees/ha.	>5ha	>5m
D: Patches likely to correspond to a condition of Degraded to Good or medium-low RCV BUT retains important habitat features	Exotic plant species account for 50-70% of total vegetation cover in the understorey layers i.e., below the tree canopy.	Mature trees present at >5 trees/0.5ha.	>5ha	>5m

York Gum Woodlands of the Wheatbelt

York Gum Woodlands of the Wheatbelt is listed as a Priority 3 (P3) PEC under the BC Act and as Critically Endangered TEC under the EPBC Act. This ecological community is part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of York Gum (*Eucalyptus loxophleba)*. The survey area lies within the Avon Wheatbelt IBRA Bioregion and Merredin IBRA subregion (AVW01), within the boundaries of the location criteria for Wheatbelt Woodlands. It is therefore a possibility that York Gum Woodlands may be present within the survey area.

Salmon Gum Woodlands of the Wheatbelt

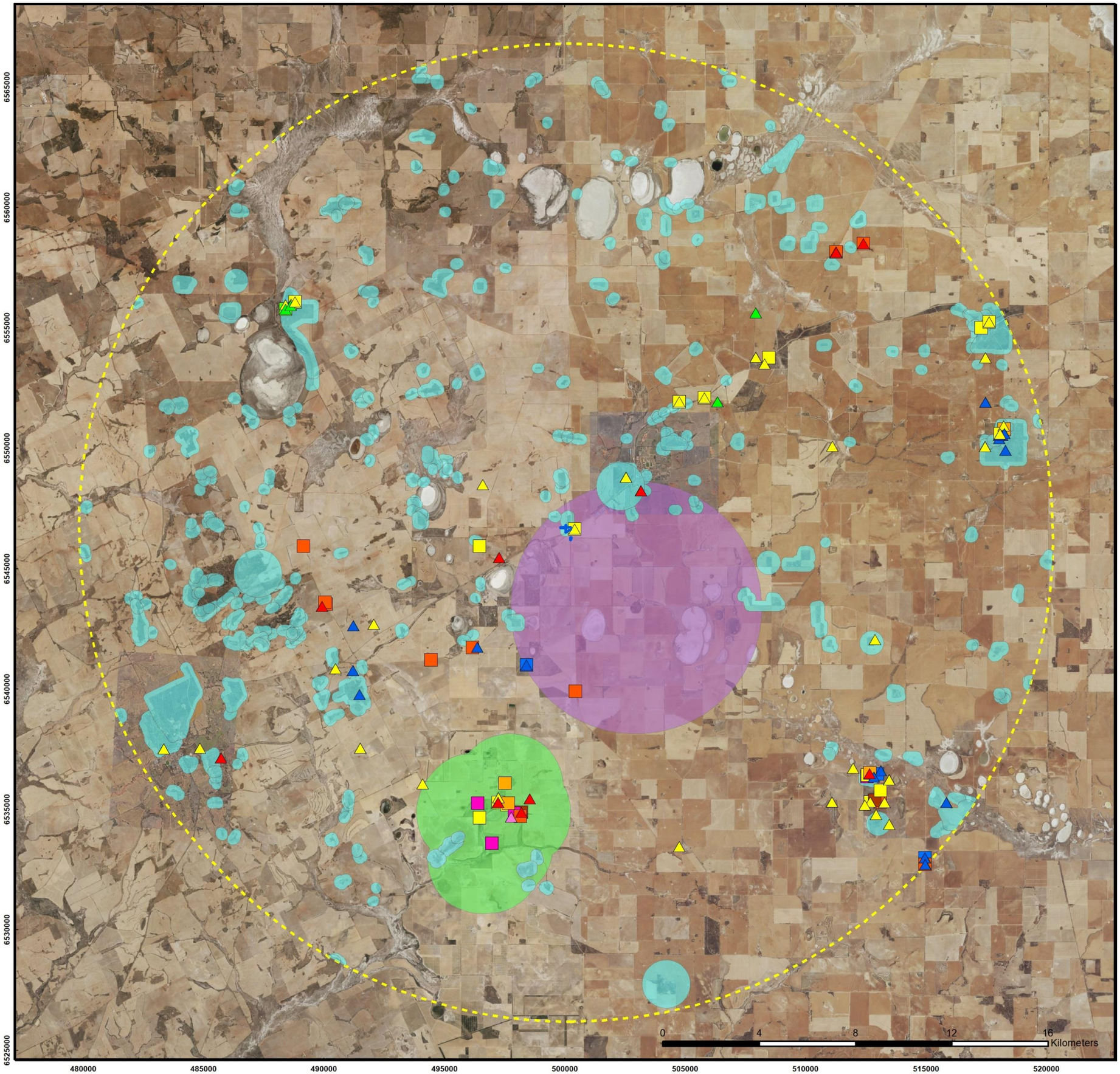
Salmon Gum Woodlands of the Wheatbelt is listed as a Priority 3 (P3) PEC under the BC Act and as Critically Endangered TEC under the EPBC Act. This ecological community is part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of salmon gum (*Eucalyptus salmonphloia)*. The survey area lies within the Avon Wheatbelt IBRA Bioregion and Merredin IBRA subregion (AVW01), within the boundaries of the location criteria for Wheatbelt Woodlands. It is therefore a possibility that Salmon Gum Woodlands may be present within the survey area.

Red Morrel Woodlands of the Wheatbelt

Red Morrel Woodlands of the Wheatbelt is listed as a Priority 1 (P1) PEC under the BC Act and as Critically Endangered TEC under the EPBC Act. This ecological community is part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of red morrel (*Eucalyptus longicornis*), sometimes with salmon and York gum. The survey area lies within the Avon Wheatbelt IBRA Bioregion and Merredin IBRA subregion (AVW01), within the boundaries of the location criteria for Wheatbelt Woodlands, furthermore desktop assessment maps this PEC/TEC within the survey area. It is therefore a possibility that red morrel Woodlands may be present within the survey area.

Gimlet Woodlands of the Wheatbelt

Gimlet Woodlands of the Wheatbelt (Gimlet Woodlands) is listed as a Priority 3 (P3) PEC under the BC Act. This ecological community is part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of gimlet (*Eucalyptus salubris)*. The survey area lies within the Avon Wheatbelt IBRA Bioregion and Merredin IBRA subregion (AVW01), within the boundaries of the location criteria for Wheatbelt Woodlands, furthermore desktop assessment maps this PEC within the survey area. It is therefore a possibility that Gimlet Woodlands may be present within the survey area.



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Overview Map Scale 1:8,000,000

Legend

20 km Study Area

Threatened & Priority Flora (WAHerb)

- P1
- P2
- P3
- P4
- T

Threatened & Priority Flora (TPFL)

- P1
- P2
- P3
- P4
- CR EN
- EN
- VU

Threatened & Priority Ecological Communities (BC, EPBC)

- CR EN, EN
- P1
- P1, CR EN
- P3, CR EN

Scale
1:155,000 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Dowerin Receival Site
Dowerin, WA 6461

Figure 4: Desktop Flora & TEC/PEC Data

	QA Check	*Drawn by*
	CvdM	**WB, MH**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-003**	**30/10/2023**

4.3. Fauna

The full desktop assessment species list compiled from all available data (Table 21, Appendix B) is based on observations from a broader area than the survey area and is likely to include species that would not occur in the actual survey area due to a lack of suitable habitat. The data also includes very old records and in some cases the species in question may have become locally or regionally extinct. Criteria for assessing likelihood of occurrence of species are presented in Table 18 in Appendix B, conservation categories for Threatened and Priority fauna are presented in Tables 22 and 23 in Appendix C. PMST database searches are provided in Appendix E.

The desktop assessment identified 50 species of conservation significance within the study area (20-30 km buffer). Of these, 23 were Threatened taxa under the BC Act and/or EPBC Act (critically endangered, endangered or vulnerable), 18 were Priority listed or specially protected taxa, six were migratory species protected under international agreements and three were extinct or presumed extinct. Of the 23 Threatened taxa, one taxon is also a migratory species protected under international agreements. Species that have previously been recorded within a 20 km radius of the survey area are presented in Figure 5 (note as the LOO is based on a 30 km radius not all species are represented in the map).

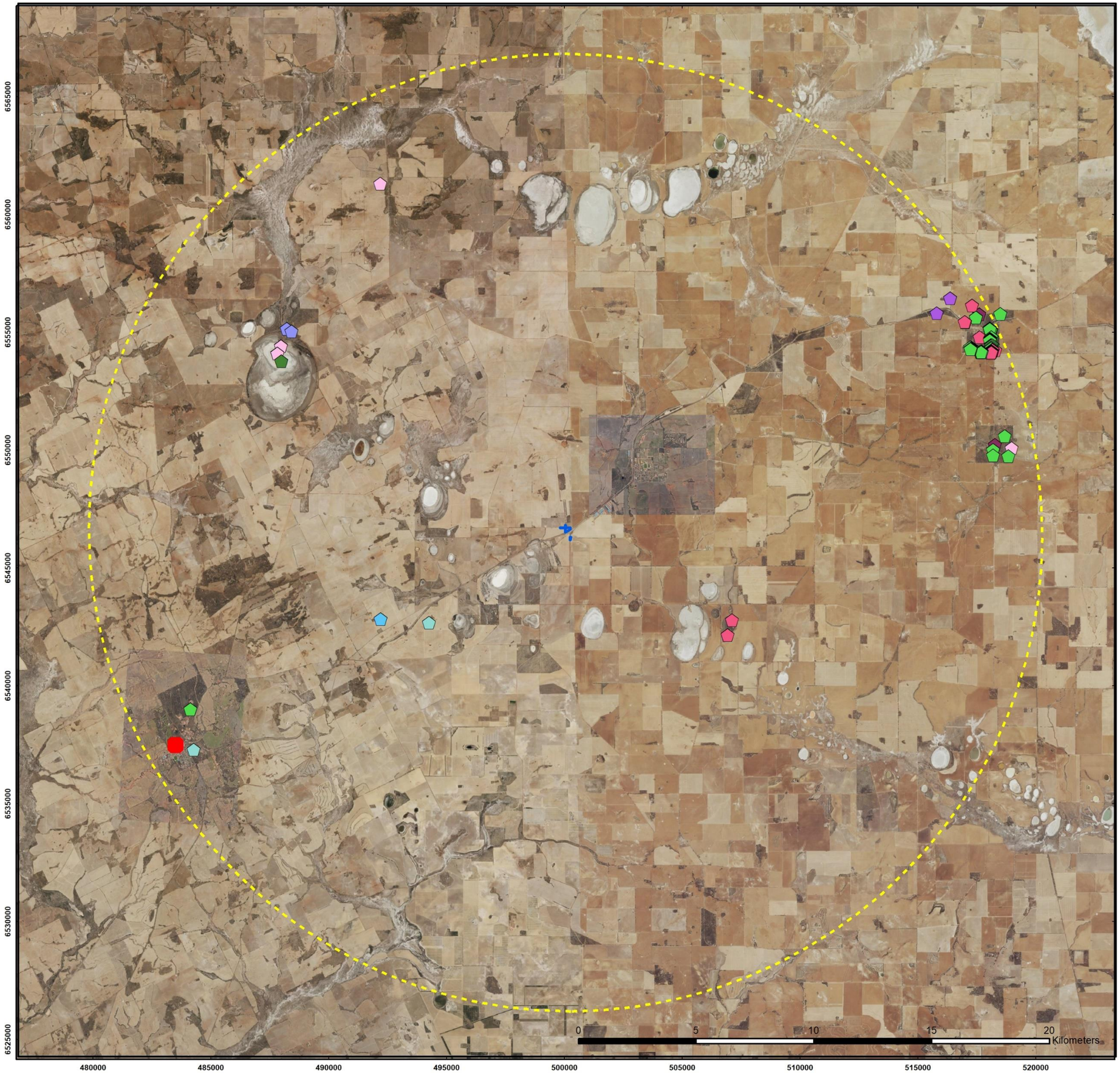
Of the 50 species identified, 22 were assessed as 'Possible' to occur prior to the survey being undertaken, based on potential habitat being present within the survey area, see Table 6. Refer to Table 21 in Appendix B for full LOO analysis.

Table 6: Species assessed as 'Possible' to occur pre-survey.

Scientific Name	Vernacular	Status (WA) / EPBC Act
Birds		
Leipoa ocellata	Malleefowl	VU/VU
Aphelocephala leucopsis	Southern whiteface	-/VU
Apus pacificus	Fork-tailed swift	MI/MI
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN/EN
Falco hypoleucos	Grey falcon	VU/VU
Ninox connivens subsp. connivens	Barking owl	P3/-
Pezoporus occidentalis	Night parrot	CR/EN
Tyto novaehollandiae subsp. novaehollandiae	Masked owl (southwest)	P3/-
Invertebrates		
Aganippe castellum	Tree-stem trapdoor spider	P4/ -
Idiosoma mcclementsorum	Julimar shield-backed trapdoor spider	P2/-
Idiosoma mcnamarai	Central-eastern Wheatbelt shield-backed trapdoor spider	P1/-
Idiosoma nigrum	Shield-backed trapdoor spider, black rugose trapdoor spider	EN/VU
Idiosoma schoknechtorum	Mortlock River shield-backed trapdoor spider	P3
Kwonkan eboracum	Yorkrakine trapdoor spider	CR/-
Teyl sp. (BY Main 1953/2683, 1984/13)	Minnivale trapdoor spider	CR/-
Mammals		
Dasyurus geoffroii	Chuditch, western quoll	VU/VU
Isoodon fusciventer	Quenda, southwestern brown bandicoot	P4/-

Table 6 continued.

Scientific Name	Vernacular	Status (WA) / EPBC Act
Mammals		
Notamacropus irma	Western brush wallaby	P4/-
Phascogale calura	Red-tailed phascogale, kenngoor	CD/VU
Phascogale tapoatafa subsp. wambenger	South-western brush-tailed phascogale, wambenger	CD/-
Pseudomys occidentalis	Western mouse	P4/-
Reptiles		
Egernia stokesii badia	Western spiny-tailed skink	VU/EN



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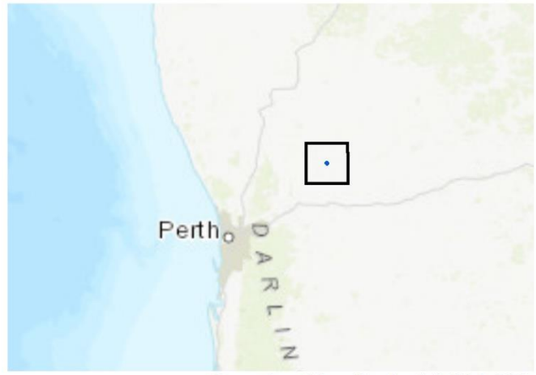


Overview Map Scale 1:8,000,000

Legend

- Survey Area
- Buffer 20km

Black Cockatoo Roosting Locations

- Known

Threatened & Priority Fauna (BC, EPBC)

- CR
- CR, MI
- EN
- EN, EN
- EN, VU
- EX, EX
- MI, MI
- OS
- P4
- VU, EN
- VU, VU

Scale
1:158,000 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH
Dowerin Receival Site
Dowerin, WA 6461

Figure 5: Desktop Fauna Data.

	QA Check	*Drawn by*
	CvdM	**MW, MH**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-003**	**29/09/2023**

5. Results – Field Survey

5.1. Flora Diversity

This survey identified 87 taxa. Thirty families were recorded, of which Poaceae was the most common (13 species), followed by Asteraceae (nine), Chenopodiaceae (nine), Fabaceae (nine) and Myrtaceae (seven). Sixty-five genera were recorded, of which *Acacia* was the most common (seven species), followed by *Eucalyptus* (five). Of the 87 species found, 22 were non-native. The full species list is found in Table 27 in Appendix B.

The site had varying amounts of species richness between different vegetation units and conditions (Table 7; see section 5.2 and 5.3 for additional information on vegetation units and condition). It is noted that species richness is the simplest measure of diversity, and only provides a broad indication of diversity within a community. No formal analysis, such as the Shannon-Weiner Diversity Index or Simpson's index, has been conducted to factor in abundance, structural diversity or change in species composition.

Table 7: Species richness in vegetation units as represented in relevés and based on number of species.

Vegetation Unit:	Species Richness:
R1: [1: Unclassifiable vegetation unit], Degraded	26
R2: [2: AASh], Very Good	51
R3: [3: MSL], Very Good	18
R4: [4: EucloxW], Good	7
[5: Eucwan], Completely Degraded	1

Identification was undertaken through the most relevant, current and available taxonomic literature, keys and herbarium reference specimens available (AVH, n.d.; Euclid, n.d.; WAH 1998 -). All resources used were the most current to knowledge. Nomenclature used through this report follows the most recent scientific names as adopted in the Census of Plants of Western Australia curated by the Western Australian Herbarium (WAH, 1998-).

5.2. Vegetation Units

Five vegetation units were identified within the survey area during the survey period; vegetation descriptions can be found in the following sections, with relevé data presented in Appendix D. Tables 8-11 present photographs of vegetation units and Figure 6 shows their extent.

Approximately 1.38 ha of cleared areas were also present throughout the survey area, occurring as bare ground or access roads. Minor, invasive herbs or agricultural grasses were often present within these bare areas.

1. Vegetation Unit: Unclassifiable vegetation unit

Vegetation Unit 1 consists of a shrubland characterised by *Acacia sp.* and an understorey dominated by invasive species. This vegetation unit is represented by R1 which is situated in an isolated patch along Rifle Range Road. This vegetation is in a Degraded state with a high number of non-native species; based on the species observed it is composed of 42% native species. Due to this state of degradation and disturbance the vegetation unit is unable to be classified. See Table 8 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): M ^^*Acacia assimilis,Acacia dielsii,Acacia multispicata*\^^shrub\3\c;G ^^ *Eragrostis curvula,Bromus diandrus,Avena barbata*\^^*tussock grass\1\c*

Vegetation Description (Muirs, 1977): *Acacia assimilis* Scrub, over *Acacia dielsii, Acacia multispicata* Heath, over *Arctotheca calendula* Open Herbs, over *Eragrostis* curvula*, Bromus diandrus, Avena barbata* Low Grass.

Table 8: Summary of Unclassifiable vegetation unit.

Area:	0.17 ha
Site description:	Gently sloping site with light brown, clay loam soil, with good drainage.
Condition:	Degraded
Sample sites:	R1 (refer to Appendix D).
Photo:	

2. Vegetation Unit*:* Allocasuarina/Acacia Shrubland [AASh]

Vegetation Unit 2 consists of a shrubland characterised by *Allocasuarina acutivalvis*, *Allocasuarina campestris* and *Acacia multispicata,* with an understorey composed of native and non-native species. This vegetation unit is represented by R2 which is situated in a block of remnant vegetation. A total of 51 species were found, of which 76% were native. Poaceae was the most common family recorded with eight species. See Table 9 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Allocasuarina acutivalvis*\^shrub\6\i;M ^*Grevillea hookeriana,*^*Allocasuarina campestris,Acacia multispicata*\^^*shrub**3**c;G* ^*Dampiera lavandulacea,Bromus diandrus,Dianella revoluta*\^*forb,grass**1**d.*

Vegetation Description (Muirs, 1977): *Allocasuarina acutivalvis* Scrub, over *Grevillea hookeriana, Allocasuarina campestris* Low Scrub, over *Ecdeiocolea monostachya* Very Open Tall Sedges, over *Dampiera lavandulacea* Dense Herbs, over *Bromus diandrus, Avena barbata, Austrostipa elegantissima* Very Open Low Grass.

Table 9: Summary of Allocasuarina/Acacia Shrubland [AASh] vegetation unit.

Area:	0.86 ha
Site description:	Flat with light brown, clay loam soil, with good drainage.
Condition:	Very Good and Good.
Sample sites:	R2 (refer to Appendix D).

Table 9 continued.

Photo:	

3. Vegetation Unit: Mallee Shrubland [MSL]

Vegetation Unit 3 consists of a shrubland characterised by *Eucalyptus subangusta* subsp. *subangusta*., *Allocasuarina campestris and Acacia acuminata*. R3 is situated in a block of remnant vegetation, within a section of vegetation in Very Good condition. Vegetation condition within other sections of this vegetation unit ranges from Degraded to Completely Degraded. Eighteen species were found, with no non-native species present within the sample site. Fabaceae was the most common family recorded with five species. See Table 10 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Eucalyptus subangusta* subsp. *subangusta*\^mallee\6\i:M ^*Acacia acuminata,^Allocasuarina campestris*\^*shrub*\3\c;G ^*Ecdeiocolea monostachya,Austrostipa elegantissima*\^*sedge,grass*\2\c.

Vegetation Description (Muirs, 1977): *Eucalyptus subangusta subsp. subangusta* Open Tree Mallee, over *Acacia acuminata* Thicket, over *Allocasuarina campestris* Heath, over *Ecdeiocolea monostachya* Tall Sedges, over *Panaetia lessonii, Waitzia acuminata, Diuris suffusa* Very Open Herbs, over *Austrostipa elegantissima* Very Open Low Grass.

Table 10: Summary of Mallee Shrubland [MSL] vegetation unit.

Area:	1.45 ha
Site description:	Flat site with light brown, clay loam soil, with good drainage.
Condition:	Very Good, Degraded, Completely Degraded
Sample sites:	R3 (refer to Appendix D).

Table 10 continued.

Photo:	

4. Vegetation Unit: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]

Vegetation Unit 4 consists of a woodland characterised by a *E. loxophleba* subsp. *loxophleba*. R4 is situated in a block of remnant vegetation. Seven species were found, one species is non-native. Poaceae was the most common family recorded with three species. See Table 11 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Eucalyptus loxophleba* subsp. *loxophleba*\^tree\6\d;G ^^*Ehrharta longiflora,Amphipogon caricinus,Austrostipa elegantissima*\^^grass\1\d.

Vegetation Description (Muirs, 1977): *Eucalyptus loxophleba subsp. loxophleba* Dense Low Forest, over *Dodonaea bursariifolia, Rhagodia drummondii* Open Dwarf Scrub, over *Enchylaena lanata* Open Dwarf Scrub, over *Dianella revoluta* over Open Herbs, over *Ehrharta longiflora, Amphipogon caricinus, Austrostipa elegantissima* Very Open Low Grass.

Table 11: Summary of *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW] vegetation unit.

Area:	0.29 ha
Site description:	Flat site with dark brown, clay loam soil, with good drainage.
Condition:	Good, Degraded
Samples	R4 (refer to Appendix D).
Photo:	

5. Vegetation Unit: *Eucalyptus wandoo* [Eucwan]

Vegetation Unit 4 consists of *Eucalyptus wandoo*. This is defined as a vegetation unit as it is distinct from the surrounding vegetation, consists of one tree species, covers a small area and is in a Completely Degraded condition. No relevé was recorded within the vegetation unit.

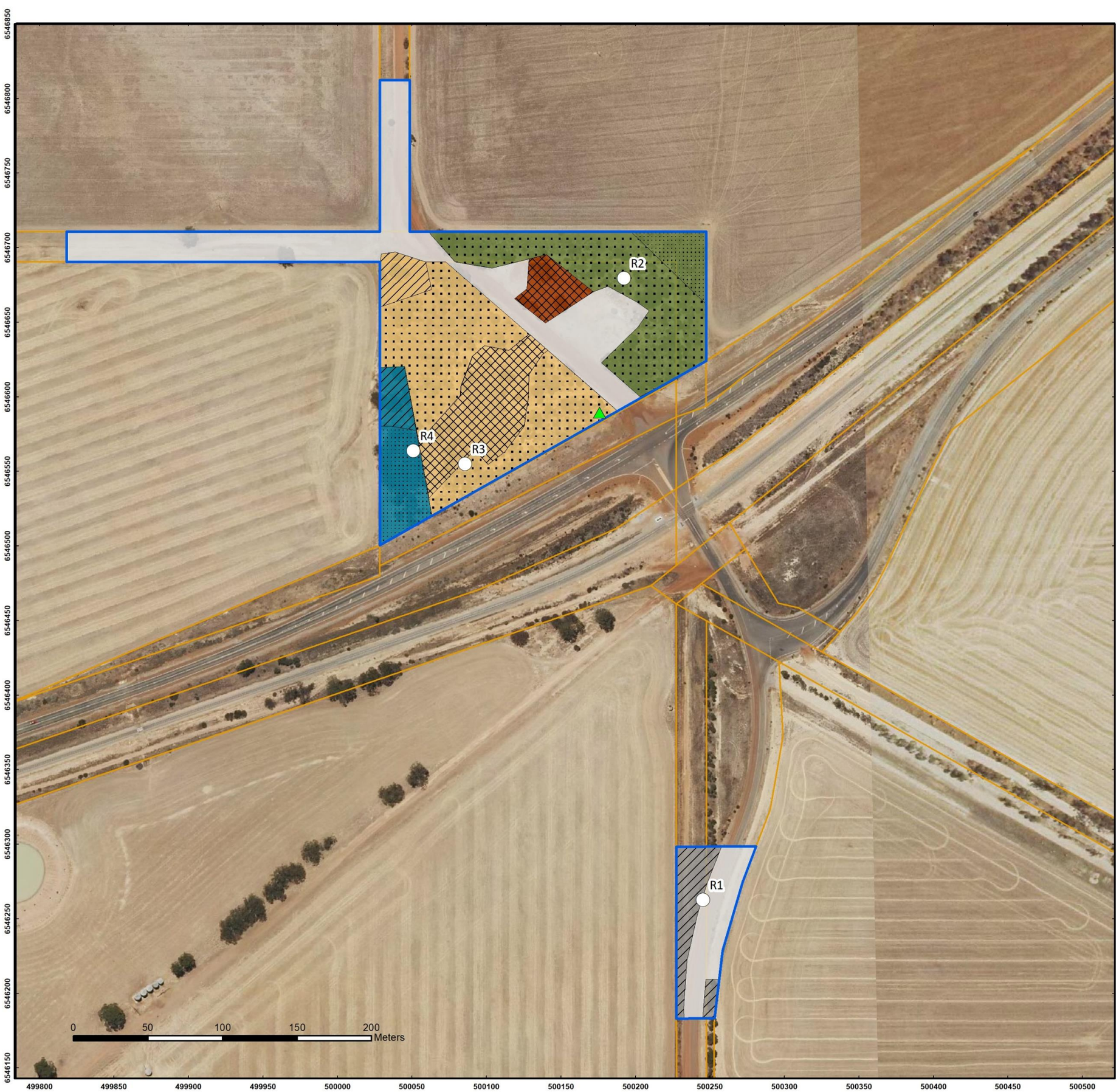
5.3. Vegetation Condition

Vegetation condition throughout the survey area has been mapped using the condition rating scale (adapted from Keighery, 1994) outlined in *EPA Flora and Vegetation Survey Technical Guidance* (2016). Refer to Table 12 and Figure 6.

The vegetation ranged from Completely Degraded to Very Good condition throughout the reconnaissance survey area. These classification levels are related to degradation of structure and vegetation integrity by processes such as clearing, fire, weeds, grazing, Phytophthora Dieback and vehicle tracks. See Table 12 and Figure 6 for vegetation units and their condition rating. Areas rated as Degraded or Completely Degraded were associated with high occurrences of weeds and evidence of disturbance to the point that vegetation structure was altered. Where condition was Good or Very good, there were less to no occurrences of non-native species and vegetation structure was largely intact.

Table 12: Vegetation condition rating.

Vegetation unit	Condition rating	Area (ha)
1: Unclassifiable vegetation unit	Degraded	0.17
2: Allocasuarina/Acacia Shrubland [AASh]	Very Good	0.74
	Good	0.12
3: Mallee Shrubland [MSL]	Very Good	0.93
	Degraded	0.09
	Completely Degraded	0.43
4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]	Good	0.08
	Degraded	0.21
5: *Eucalyptus wandoo* [Eucwan]	Completely Degraded	0.13
Cleared		1.38
Total		**4.28 ha**



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Overview Map Scale 1:100 000

Legend

- Cadastre
- Reconnaissance survey area
- Relevé
- *B. atrata*

Vegetation Unit

- 1: Unclassifiable vegetation unit
- 2: AASh
- 3: MSL
- 4: EucloxW
- 5: Eucwan
- Cleared

Vegetation Condition

- Very Good
- Good
- Degraded
- Completely Degraded

Scale
1:2,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Figure 6: Vegetation Units & Condition.

	QA Check	Drawn by
	CvdM	**MH**
STATUS	FILE	DATE
FINAL	**CBH0018-003**	**7/12/2023**

5.4. Weeds and Disturbance

Of the 87 flora species recorded within the survey area, 22 species are non-native. There were seven non-native species of the family Poaceae and six of the Asteraceae family present. Between the sample sites, percentage of non-native species ranged from 42 to 100% (Table 13). Higher occurrences of non-native species were associated with lower vegetation condition ratings and occurring in isolated patches.

Table 13: Vegetation unit, condition and percentage of native species. (*denotes where no relevé was conducted within vegetation unit so no numerical value can be assigned).

Vegetation unit:	Vegetation condition:	Percentage of native species:
R1: [1: Unclassifiable vegetation unit]	Degraded	42%
R2: [2: AASh]	Very Good	76%
R3: [3: MSL]	Very Good	100%
R4: [4: EucloxW]	Good	86%
[5: Eucwan]	Completely Degraded	*

The full suite of weed species recorded is listed below in Table 14, with their corresponding ratings under the Australian Weeds Strategy Weeds of National Significance (WoNS; IPAC, 2017), Environmental Weed Strategy of Western Australia (EWSWA; Department of Conservation and Land Management [CALM], 1999) and the BAM Act. The ratings given under the EWSWA relate to determining the significance of a weed, based on the criteria of invasiveness, impacts, potential for spread and socioeconomic and environmental values, and can be either 'High', 'Moderate', 'Mild', or 'Low' (CALM, 1999). Under the EWSWA (CALM, 1999) the species found in the survey area are listed between Low to High (or not listed). Under the BAM Act 2016 all species are listed as 'Permitted – s11', except *Echium plantagineum* and *Moraea flaccida*, listed as 'Declared Pest – s22(2)' and no species were classed as a WoNS.

Table 14: Weed species recorded within the survey area.

Family	Species	Vernacular	EWSWA (CALM, 1999)	BAM Act 2016 (GoWA, 2016)	WoNS (IPAC, 2017)
Aizoaceae	*Mesembryanthemum crystallinum*	Iceplant	Moderate	Permitted - s11	-
Aizoaceae	*Mesembryanthemum nodiflorum*	Slender iceplant	-	Permitted - s11	-
Asteraceae	*Arctotheca calendula*	Cape weed	Moderate	Permitted - s11	-
Asteraceae	*Monoculus monstrosus*	Stinking roger	-	Permitted - s11	-
Asteraceae	*Erigeron bonariensis*	Fleabane	-	-	-
Asteraceae	*Hypochaeris glabra*	Smooth cats-ear	Moderate	Permitted - s11	-
Asteraceae	*Sonchus asper*	Rough sowthistle	-	Permitted - s11	-
Asteraceae	*Ursinia anthemoides*	Ursinia	Moderate	Permitted - s11	-
Boraginaceae	*Echium plantagineum*	Paterson's curse	TBA	Declared Pest - s22(2)	-
Brassicaceae	*Brassica tournefortii*	Wild turnip	High	Permitted - s11	-

Table 14 continued.

Family	Species	Vernacular	EWSWA (CALM, 1999)	BAM Act 2016 (GoWA, 2016)	WoNS (IPAC, 2017)
Fabaceae	*Lupinus angustifolius*	Narrowleaf lupin	-	Permitted - s11	-
Geraniaceae	*Erodium botrys*	Long storkbill	Low	Permitted - s11	-
Iridaceae	*Moraea setifolia*	Thread iris	-	Permitted - s11	-
Iridaceae	*Moraea flaccida*	One-leaf Cape tulip	-	Declared Pest - s22(2)	-
Iridaceae	*Romulea rosea*	Guildford grass	High	Permitted - s11	-
Poaceae	*Avena barbata*	Wild oats	Moderate	Permitted - s11	-
Poaceae	*Bromus diandrus*	Great brome	High	Permitted - s11	-
Poaceae	*Eragrostis curvula*	African lovegrass	High	Permitted - s11	-
Poaceae	*Hordeum leporinum*	Barley grass	Moderate	Permitted - s11	-
Poaceae	*Lolium rigidum*	Wimmera ryegrass	Moderate	Permitted - s11	-
Poaceae	*Ehrharta longiflora*	Annual veldt grass	-	Permitted - s11	-
Poaceae	*Briza maxima*	Blowfly grass	Moderate	Permitted - s11	-

5.5. Threatened and Priority Flora

Bossiaea atrata (Priority 3; P3) was first recorded in 2022 in the original survey area (BDS, 2022) and was also found within the spring survey area, see Figure 6. A targeted search for this species is included within the scope of the targeted survey (BDS, 2023), and only the findings relating to the reconnaissance survey are discussed herein. No other Threatened or Priority species were identified in the spring reconnaissance survey.

5.6. Threatened and Priority Ecological Communities (TEC/PEC)

One vegetation unit in the reconnaissance survey area bore resemblance to Wheatbelt Woodland TEC/PEC; Vegetation Unit 4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]. A targeted survey for this TEC/PEC was included within the scope of the targeted survey (BDS, 2023), and only the findings relating to the reconnaissance survey are discussed herein. No other TEC/PECs were identified in the spring reconnaissance survey.

5.7. Fauna Survey Results

A total of 53 taxa were detected during the survey, including: 25 birds, five mammals, four reptiles, and 19 invertebrates. Refer to full fauna species list in Table 28 in Appendix D.

5.8. Conservation listed fauna

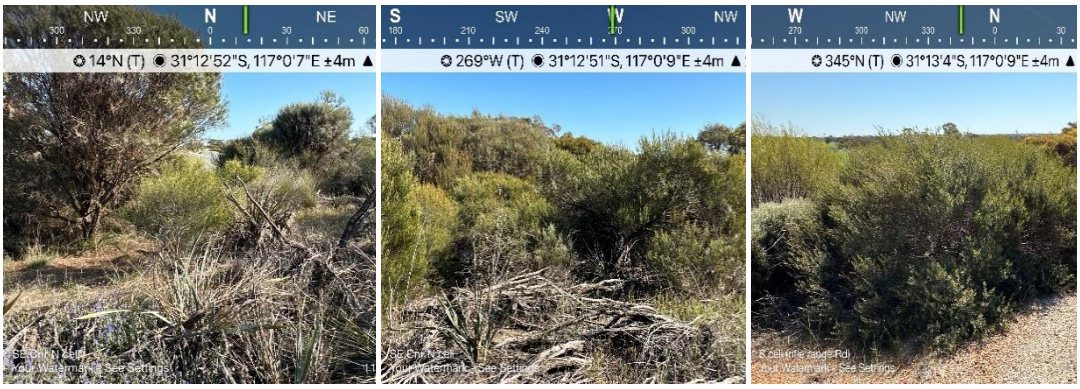
None of the 53 taxa detected were listed as threatened fauna, however potential habitat was identified within the survey area for the 12 species listed species in Table 15. See Figure 7 for photos of potential habitat.

Table 15: Conservation listed species likely to occur and potential habitat in survey area.

Species	Details of potential habitat
Southern Whiteface Fork-tailed Swift	Potential foraging habitat was detected for the southern whiteface and fork-tailed swift in the open woodland and shrubland areas. The southern whiteface is readily detected due to their ground foraging behaviour, and the fork-tailed swift is also readily detected due to its tendency to flock in large numbers, feed aerially and feed in characteristic circular flight patterns. The two species were not present at the time of survey, and it is unlikely that the survey area is important for them.
Forest red-tailed black cockatoo Baudin's Cockatoo Carnaby's Cockatoo	Low quality foraging, roosting, and breeding habitat for the three black cockatoo species was present within the Eucalyptus woodland pockets. Five hollow bearing trees, 2 of which contain suitable hollows for cockatoos, as well as 8 potential habitat trees were recorded within the survey area. High occupancy rate of hollows by feral bees, the limited availability of food, and the lack of water source undermine the potential suitability of the site for these species. There was no evidence of historical or recent use of these areas by any of the three cockatoo species.
Grey Falcon	Low quality foraging habitat was present for the grey falcon within the woodland and shrubland areas. There was no evidence of the characteristic nests of this species and no calling individuals detected. If the area is used it would be as transient foraging habitat.
Idiosoma species: Julimar shield-backed trapdoor spider Central-eastern Wheatbelt shield-backed trapdoor spider Shield-backed trapdoor spider Mortlock River shield-backed trapdoor spider Black rugose trapdoor spider	Potential habitat was present for the four species of Idiosoma associated with the clay soils beneath the woodland and shrubland. The soils were dry and compact throughout the survey area and the only trapdoor species detected was a *Conothele sp.*, with most burrows detected defunct. For the Julimar shield-backed trapdoor spider (*I. mcclementsorum*) and the Central-eastern Wheatbelt shield-backed trapdoor spider (*I. mcnamarai*) the survey area is outside of the known range for the species. The survey area is within the known range for the black rugose trapdoor spider (*I. nigrum*) and on the edge of the known range for the Mortlock River shield-backed trapdoor spider (*I. schoknechtorum*). Where present the burrows of this genus are readily detected. None were detected within the survey area.
Red-tailed phascogale South-western brush-tailed phascogale	Potential low-quality habitat was identified for the red-tailed phascogale and south-western brush-tailed phascogale associated with the Eucalyptus woodland. Two hollow bearing trees containing hollows suitable for use by this species were documented within the survey area. There was no evidence (scratching) that they were being used by mammals, and the presence of high fox activity and low canopy connectivity undermines the suitability of habitat for these species.

a)

b)



c)

Figure 7: Examples of potential habitat and habitat elements for threatened fauna within the survey area.

a) Eucalypt woodland. Potential foraging habitat for southern whiteface, fork-tailed swift, grey falcon, low quality feeding, roosting and breeding habitat for the three black cockatoos, and low quality feeding and breeding habitat for the red-tailed and southwestern brush-tailed phascogale. b) Mixed shrubland. Low quality potential foraging habitat for southern whiteface and grey falcon, and potential habitat for the black rugose trapdoor spider c) artificial rock piles and senescent fallen shrub debris providing refuge for small reptiles, small mammals and invertebrates.

5.9. Detected species

Of the 53 species detected within the survey area, two species are considered short range endemics (SRE) including the trapdoor spider *Conothele sp.* which was associated with compact clay soils within open shrubland, and the harvestman *Megalopsalis tanisphyros* which was detected beneath bark within the Eucalyptus woodland.

Of the detected species, five are introduced, indicating the relatively disturbed nature of the survey area. Among these introduced species are the red fox, rabbit, laughing turtle dove, domestic sheep, and European honeybee. The high activity levels of the red fox in the survey area is likely to be a limiting factor in the occupancy of habitat by native fauna, especially small ground dwelling mammals and reptiles, and ground nesting birds, as a result of predation and competition for resources. The presence of the European honeybee is likely to be limiting factor in the suitability of hollows for bird or arboreal mammal species. Figure 8 and 9 provides some examples and locations of species and activity indicators detected within the survey area.

Figure 8: Examples of evidence of fauna presence within the survey area.

a) *Conothele* sp. (SRE) b) *Megalopsalis tanisphyros* (SRE) c) *Apricia jovialis* d) black-faced woodswallow e) spotted muscleman tree ant f) scat from *Ctenotus sp.* g) red fox scat h) red fox print h) red fox kill

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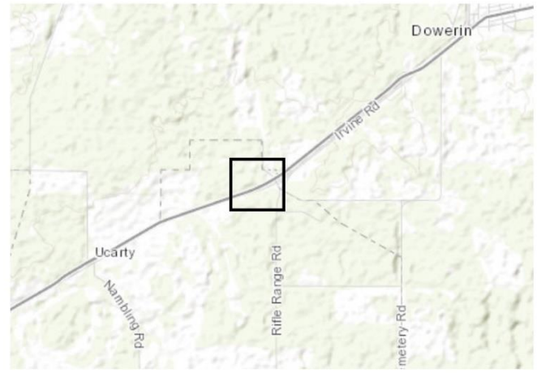

Overview Map Scale 1:100 000

Legend

- Cadastre
- Reconnaissance survey area

Fauna Habitat

- Rock Refuge
- Significant Tree

Fauna Habitat Units

- Eucalyptus Woodland
- Shrubland
- Cleared

Scale
1:2,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Figure 9: Fauna and fauna habitat

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5.10. Significant trees

Thirteen significant trees, with a DBH >300mm, were found in the survey area. See Table 17 and Figure 10 and 11 for related details and pictures of the significant trees present.

Table 16: Dimensions of hollow-bearing trees and significant trees for cockatoos within the survey area.

ID	DBH (mm)	Hollow Dimensions (cm)	Hollow Type	Hollow Height from Ground (m)
1	358	No Hollows	-	-
2	320	No Hollows	-	-
3	477	Hollows Forming	-	-
4	740	10x4	Elbow	2
5	543	No Hollows	-	-
6	278	15x12	Chimney	1
7	235	12x12	Chimney	4
8	366	No Hollows	-	-
9	318	No Hollows	-	-
10	379	No Hollows	-	-
11	349	No Hollows	-	-
12	1079	15x18	Chimney	10
13	768	12x18	Elbow	2

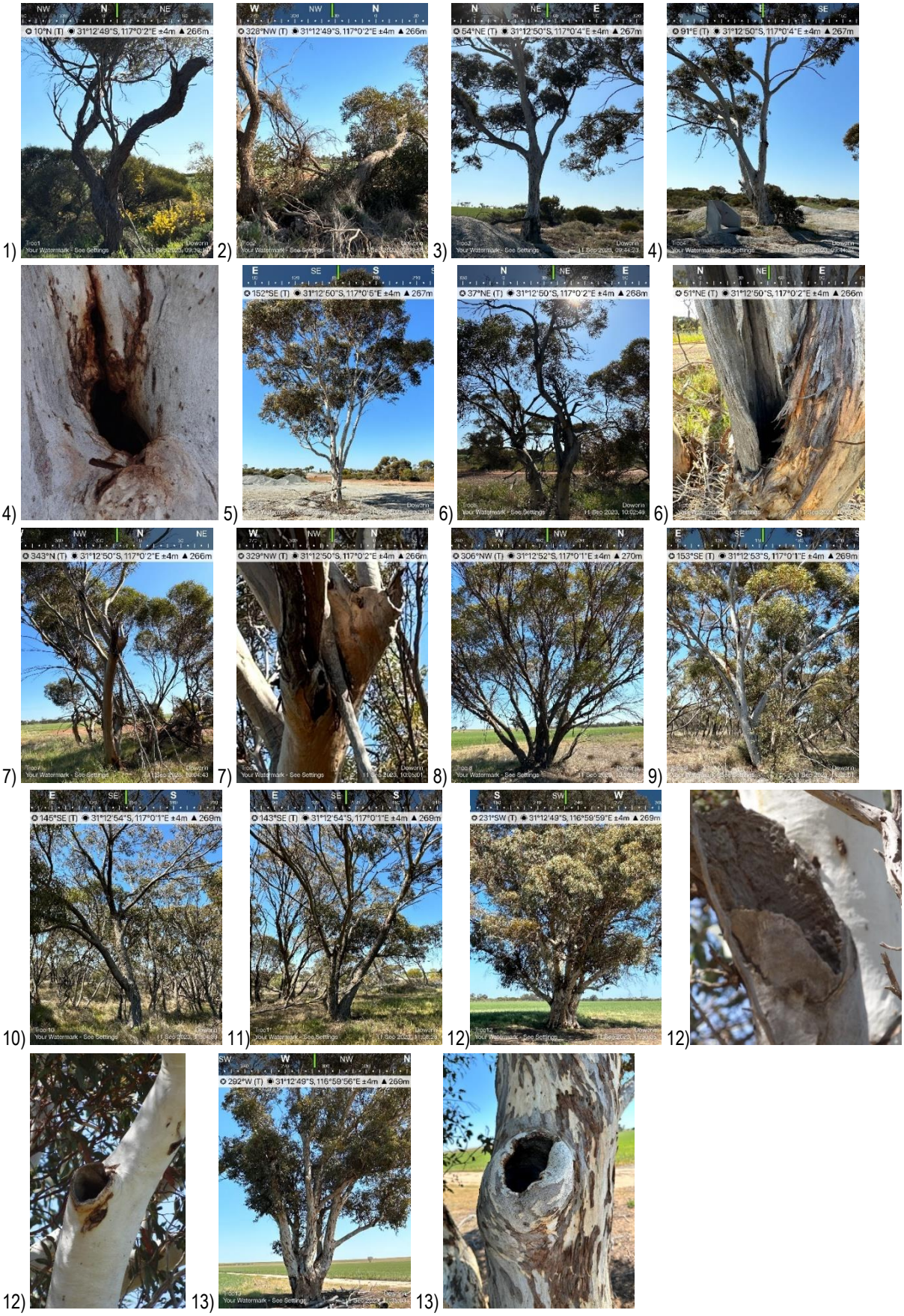

Figure 10: Photographs of hollow-bearing trees and significant trees for cockatoos and phascogales within the survey area. Significant trees are defined as those with a DBH >300 mm.

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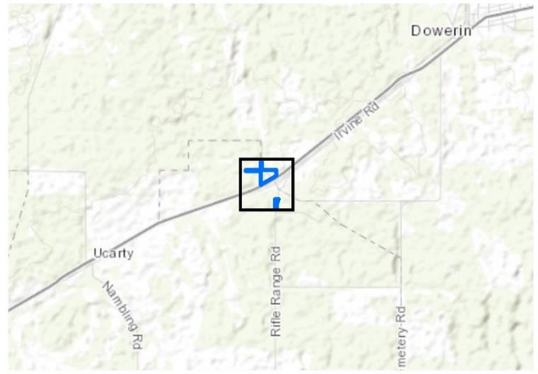

Overview Map Scale 1:100 000

Legend

- Cadastre
- Reconnaissance survey area

Significant trees

- Hollow-bearing tree suitable for *C. latirostris*
- Hollow-bearing tree suitable for *C. latirostris*, *P. calura* and *P. tapoatafa* subsp. *wambenger*
- Roosting potential

Fauna Habitat Units

- Eucalyptus Woodland
- Shrubland
- Cleared

Scale
1:2,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
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Figure 11: Significant trees

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	CvdM	**MH**
STATUS **FINAL**	FILE **CBH0018-003**	DATE **20/03/2024**

6. Discussion

6.1. Vegetation, Threatened and Priority Flora and Ecological Communities

The scope of this reconnaissance survey is to provide context and broadly identify and classify flora and vegetation units within the survey area. If conservation significant species or ecological communities are detected this type of survey can then provide a basis for further more detailed surveys in the future.

This survey identified 5 vegetation units:

1: Unclassifiable vegetation unit;
2: Allocasuarina/Acacia Shrubland [AASh];
3: Mallee Shrubland [MSL];
4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]; and
5: *Eucalyptus wandoo* [Eucwan].

Within these vegetation units there are varying degrees of species richness, condition and weeds. Overall, there are indications of disturbance and degradation likely related to the road/rail traffic and agricultural land use adjacent to the survey area, evidenced by the presence of agricultural weeds and/or loss of vegetation structure to some degree in all vegetation units, excepting Vegetation Unit 3:MSL, where the section in very good condition had no non-native species present. The fragmented nature of the vegetation in context to the broader area likely contributes to degradation also. The above is demonstrated in the survey area; the smaller southern site (Vegetation Unit 1: Unclassifiable) exhibits higher levels of degradation, likely related to its isolation, smaller size and increased exposure to disturbance, compared to the northern site consisting of a larger block of remnant vegetation. Conversely, some sections within vegetation units exhibit Good and Very Good condition, with lower counts of weed species and more intact vegetative structure, namely Vegetation Units 2: AASh, 3: MSL and 4: EucloxW.

Vegetation Unit 4: EucloxW bore resemblance to the TEC/PEC Wheatbelt Woodland. Further targeted analysis for Wheatbelt Woodland TEC/PEC was conducted and is presented in a targeted flora and TEC/PEC report (BDS, 2023).

A total of 87 flora species were recorded in this survey, of which 22 were non-native. A number of weed species were recorded, none were classed as a WoNS. Under the EWSWA (CALM, 1999) the species found in the survey area were listed between Low to High (or not listed) and under the BAM Act 2016 all species were listed as 'Permitted – s11', except *Echium plantagineum* and *Moraea flaccida;* listed as 'Declared Pest – s22(2)'.

During the reconnaissance survey one occurrence of a conservation significant species was recorded; *B. atrata* (P3). This species was initially identified in the original survey and is included in the scope of the targeted survey (BDS, 2023), thus will not be discussed here.

6.2. Basic Fauna Survey

The aim of the basic fauna survey was to assess and map the fauna habitat within the survey area, assess the likelihood of Threatened or Priority fauna being present within the survey area and/or particular vegetation units, record actual presence of Threatened and Priority listed species, and undertake opportunistic inventory of fauna species encountered whilst traversing the survey area on foot. Part of the targeted fauna survey was to provide the client with information on the presence of breeding, foraging and roosting habitat for black cockatoos within the survey area. Thirteen significant trees were recorded within the survey area, of which five bore hollows. Of the hollows present only two hollows were suitable for black cockatoos or phascogales. The lack of availability of habitat, combined with the lack of quality feed and other habitat constraints indicate it is unlikely that they provide important habitat for conservation significant species (see Table 16 for more details).

A number of potential habitats and niches were found for 12 of the conservation significant species listed in the LOO, however no evidence of their occurrence was present. A total of 53 species were detected within the survey area, of which two species are short range endemics (SREs). Twenty-five are in the class Aves (birds), 11 Insecta (insects), eight Arachnida (spiders), five Mammalia (mammals) and four Reptilia (reptiles).

Of the detected species, five are introduced, indicating the relatively disturbed nature of the survey area. Among these introduced species are the red fox, rabbit, laughing turtle dove, domestic sheep, and European honeybee. The high activity levels of the red fox in the survey area is likely to be a limiting factor in the occupancy of habitat by native fauna, especially small ground dwelling mammals and reptiles, and ground nesting birds, as a result of predation and competition for resources. The presence of the European honeybee is likely to be limiting factor in the suitability of hollows for bird or arboreal mammal

species. In addition, the fragmented nature of the survey area in context to the wider landscape, is another constraint for many species due to low connectivity and ecological linkage between other areas of remnant vegetation that potentially have more/higher quality feeding resources and more favourable habitats.

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8. Appendices

Appendix A – Maps

Appendix B –Threatened or Priority Values, Likelihood of Occurrence Analysis

Appendix C – Conservation Status Definitions and Condition

Appendix D – Species Lists and Relevé Data

Appendix E – EPBC Act PMST reports

Appendix A

Maps

Albany Office:
29 Hercules Crescent
Albany, WA 6330
(08) 9842 1575

Denmark Office:
7/40 South Coast Highway
Denmark, WA 6333
(08) 9848 1309

Esperance Office:
2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:3,500,000

Legend

- Survey Area
- Flora and vegetation survey effort
- Fauna survey effort

Scale
1:2,500 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH
Dowerin Receival Site
Dowerin, WA 6461

Figure 12: Survey Effort

	QA Check	*Drawn by*
	CvdM	**MH**
STATUS **FINAL**	*FILE* **CBH0018-003**	*DATE* **03/11/2023**

Appendix B

Likelihood of Occurrence Analysis

Table 17: Criteria for assessing the likelihood of occurrence of Threatened or Priority flora and fauna within the study area.

Likelihood	Criteria
Present	Species is recorded within the survey area.
Likely	Species has been previously recorded in close proximity and suitable habitat occurs within the survey area.
Possible	Species previously recorded within 10 km and suitable habitat occurs in the survey area.
Unlikely	The species has been recorded locally through database searches. However, suitable habitat for the species does not occur at the survey area or suitable habitat may occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations. Species is unlikely to occur due to the site lacking critical habitat, only containing marginally suitable habitat, and/or the survey area is considerably degraded. The species has not been recorded in the survey area despite adequate survey effort.
Highly Unlikely	No suitable habitat within the survey area or the survey area is outside the species' natural distribution.

Table 18: Potential Threatened or Priority flora located within the study area and likelihood of occurrence analysis (post survey).
Species are sorted by likelihood of presence. Numerous resources specific to Threatened and Priority flora listed below were used in the likelihood assessment

Family	Species	Vernacular	Status (WA)	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome
Fabaceae	*Acacia campylophylla*		P3	Dense, rigid, spreading shrub, 0.1-0.6 m high. Fl. Yellow.	Lateritic gravelly soils.	Jul to Aug	Likely	Detected during previous survey, but not relocated during this survey due to restricted access to survey area.
Fabaceae	*Bossiaea atrata*		P3	Compact, dense, intricately-branched, rigid, spinescent herb, to 1.2 m high. Fl. orange-yellow-red-brown.	White sand or sandy loam over laterite or clay, quartzite sand, clay.	May to Aug	Likely	Present - at least 5 plants observed within Mixed Shrubland vegetation community.
Cyperaceae	*Lepidosperma* sp. Meckering (R. Davis WW 27-32)		P3	Caespitose Sedge. 0.4m high.	Eucalypt, Acacia and Sheoak Low Open Forest over grassland. Gentle Slopes, grey sandy loam over gravel. Clay.	Sept to Oct	Possible	Four *Lepidosperma* spp. were collected during the survey. Specimens were identified Dr Russell Barrett and confirmed to not be this species.
Dasypogonaceae	*Calectasia pignattiana*	Stilted tinsel lily	T - VU	Rhizomatous, prickly herb, to 0.5 m high. Fl. blue-purple.	Sand to sandy clay over granite or laterite, gravel. Plains and gentle slopes.	Aug to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Ericaceae	*Conostephium wonganense*		P1	Erect shrubs to 1.2m high, multi-stemmed at ground level. Fl. dark purple to white.	Known only from Wongan Hills area. Yellow sandy loam in open mallee over medium density shrubs.	Jun to Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Ericaceae	*Styphelia caudata*		P3	Spreading shrubs to 1m high, single stemmed at ground level. Fl. white.	Sand or light loamy soils, sometimes over laterite, in heath or open mallee woodland.	Apr to Jul	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Ericaceae	*Styphelia tamminensis*		P2	Erect spreading shrub to 0.6m high. Fl. white.	White/yellow sandplains, on hill slope. In open heath.		Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Acacia ataxiphylla* subsp. *magna*	Large-fruited tammin wattle	T - EN	Spreading to ascending shrub, 0.3-0.6 m high. Fl. yellow.	Sandy soils. Lateritic ironstone rises, flats.	Jun to Jul	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Acacia cochlocarpa* subsp. *velutinosa*	Velvety spiral pod wattle	T - CR	Velutinous, sprawling shrub, 0.3-0.7(-1.5) m high. Fl. yellow.	Sandy clay or laterite.	May to Jul	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Acacia leptoneura*	Slender nerved acacia	T - CR	Shrub. 0.6 high and 2.2m wide.	Broad valley, high elevation. Grey/white sandy loam over laterite. Associated species Hakea scoparia, Santalum acuminatum. Eucalyptus mallee over Allocasuarina and Melaleuca shrubland.	Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Acacia lirellata* subsp. *compressa*		P2	Bushy procumbent, spreading shrub, ca 0.5 m high, to 1.2 m wide. Fl. yellow.	Yellow sand, clayey loam. Sandplains.	Jun to Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Acacia phaeocalyx*		P3	Intricately branched, sprawling or compact, pungent shrub, 0.3-0.6(-0.8) m high. Fl. yellow.	Yellow or white sand, often over laterite. Flats, hillsides.	Apr to Jun	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Chorizema humile*	Prostrate flame pea	T - EN	Sprawling, prostrate or decumbent shrub. Fl. yellow & red/brown.	Sandy clay or loam. Plains.	Jul to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Daviesia euphorbioides*	Wongan cactus	T - EN	Shrub, 0.4-0.8 m high. Fl. yellow & red.	Clayey sand, sandy gravel. Flats, sandplains.	Jul to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Daviesia nudiflora* subsp. amplectens		P1	Bushy shrub, 0.3-1.5 m high. Fl. orange/yellow & red.	Clayey sand, laterite. Flats.	Jul to Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.

Table 18 continued.

Family	Species	Vernacular	Status (WA)	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome
Fabaceae	*Daviesia nudiflora* subsp. *drummondii*		P3	Bushy shrub, 0.3-1.5 m high. Fl. orange/yellow & red.	White or grey sand. Undulating low rises.	Jul to Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Daviesia smithiorum*		P2	Many-stemmed shrub, to 0.5 m high.	Associated with Low shrubland - Sheoak, Grevillea, Pea. Plains, wet and white sand. Grey sand over laterite.	Jun to Jul	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Eutaxia rubricarina*		P3	Straggling shrub, to 0.5 m high. Fl. orange & yellow & brown.	Gravelly sand, grey to pinkish-white sandy clay, red loam. Flats, slopes, valley floors, road verges.	Aug or Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Gastrolobium hamulosum*	Hook-point poison	T - CR	Low shrub, 0.2-0.45 m high. Fl. yellow & orange & red & purple.	Sandy, often gravelly soils or clay. Flats, slopes, ridges.	Aug to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Jacksonia debilis*		P1	Prostrate shrub. Fl. yellow & red.	White or grey clayey sand.	Sep to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Fabaceae	*Urodon capitatus*		P3	Low spreading or upright shrub, (0.12-)0.3-1.2 m high, to 1 m wide. Fl. yellow-orange-red.	Sandy gravelly soils. Plains.	Sep to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Frankeniaceae	*Frankenia glomerata*		P4	Prostrate shrub. Fl. pink-white.	White sand.	Nov	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Goodeniaceae	*Dampiera glabrescens*		P1	Erect perennial, herb, 0.2-0.5(-0.9) m high. Fl. purple-blue.	White or grey/yellow sand. Gravel pits, roadsides.	Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Haemodoraceae	*Conostylis caricina* subsp. *elachys*		P1	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.1 m high. Fl. cream-yellow.	Gravel, clayey loam, sand.	Jul to Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Lamiaceae	*Hemiandra rutilans*	Sargents snakebush, Colourful snakebush	T - CR	Prostrate to ascending shrub, 0.08-0.3 m high. Fl. red-purple-pink.	Yellow/grey sand.	Oct to Nov	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Malvaceae	*Guichenotia impudica*		P3	Shrub, 0.25-1 m high. Fl. pink-purple.	Laterite.	Aug to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Malvaceae	*Guichenotia seorsiflora*		T-CR	Multi-stemmed shrub, to 0.6 m high. Fl. pink/pink-cream.	Sandy clay with lateritic gravel. Breakaways.	Jul to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Myrtaceae	*Calothamnus brevifolius*		P4	Erect, spreading shrub, 0.3-0.6(-0.8) m high. Fl. red.	White/grey or yellow sand.	Jan to Feb or Apr	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Myrtaceae	*Calytrix parvivallis*		P2	Shrub, 0.25-0.5 m high. Fl. purple.	Sand, loam.	Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Myrtaceae	*Eucalyptus erythronema* subsp. *inornata*	Yellow-flowered mallee	P3	Mallee to 7 m tall; lignotuber present (resprouter).	In sites of good drainage, from lateritic and sandy gravel rises to slight slopes of pale red to grey loams.		Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.

Table 18 continued.

Family	Species	Vernacular	Status (WA)	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome
Myrtaceae	*Verticordia venusta*		P3	Erect, spreading shrub, 0.2-2 m high. Fl. pink-purple/red-brown.	Yellow sand, sandy gravel. Sandplains.	Sep to Dec or Jan	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Poaceae	*Austrostipa frankliniae*		P2	Perennial tussock grass, 0.25-0.4m tall. Bulbous base, basal tuft of leaves, unbranched.	Avon Wheatbelt, Coolgardie and Yalgoo bioregions.	Sep to Nov	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Banksia horrida*		P3	Upright, lignotuberous shrub, 0.6-1.6 m high. Fl. yellow-orange.	Sand, sometimes with gravel.	Apr to Jun or Aug	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Conospermum eatoniae*		P3	Spreading, intricately branched shrub, 0.3-1 m high. Fl. blue.	Deep white sand, sandy clay loam.	Aug to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Grevillea dryandroides* subsp. *hirsuta*	Hairy phalanx grevillea	T - VU	Prostrate, vigorously suckering shrub, 0.05-0.3 m high. Fl. red/pink-red.	White or yellow sand, laterite.	May or Sep to Nov	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Grevillea pythara*	Pythara grevillea	T - EN	Suckering shrub, 0.06-0.3 m high. Fl. orange & red & blue.	Sand or sandy loam with gravel.	May to Oct (possibly all year)	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Grevillea rosieri*		P2	Shrub. Fl. red.	Sandy soils.	Jul or Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Grevillea roycei*		P3	Erect to spreading shrub, 1.2-2.1 m high. Fl. white.	White or yellow sand.	Aug to Oct	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Persoonia pungens*		P3	Erect to decumbent or almost prostrate, lignotuberous shrub, 0.2-0.8 m high. Fl. yellow.	White or yellow sand, often over laterite.	Sep to Dec	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Proteaceae	*Synaphea constricta*		P3	Compact, tufted shrub, 0.2-0.5 m high. Fl. yellow.	Sand or sandy clay-loam over laterite.	Jun to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Rhamnaceae	*Cryptandra dielsii*		P3	Intricately branched, spreading shrub, 0.2-0.6 m high. Fl. white.	Sand, often over laterite. Sandplains.	Jul to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Rutaceae	*Phebalium drummondii*		P3	Upright shrub, 0.6-1.5 m high. Fl. yellow.	Gravelly sandy or clayey soils. Flats, roadsides.	Jul to Sep	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Stylidiaceae	*Stylidium scabridum*	Moth triggerplant	P4	Rosetted perennial, herb, 0.05-0.24 m high, Leaves tufted, linear, 2.5-9.5 cm long, 0.7-2 mm wide, apex acute to mucronate, margin involute, scabrous. Membraneous scale leaves present at base of mature leaves. Scape glandular throughout, pilose at base. Inflorescence racemose. Fl. pink.	Sand. Open woodland or heath.	Sep to Nov	Possible	Not detected – Unlikely due to growth habit would have resulted in the plant being visible at time of survey.
Asteraceae	*Millotia tenuifolia var. laevis*		P2	Ascending to erect annual, herb, 0.02-0.1 m high. Fl. Yellow.	Granite or laterite soils.	Sep to Oct	Unlikely	Not detected – Unlikely due to habitat.
Chenopodiaceae	*Roycea pycnophylloides*	Saltmat	T - EN	Perennial herb, forming densely branched silvery mats to 1 m wide.	Sandy soils, clay. Saline Flats.	Sept	Unlikely	Not detected – Unlikely due to habitat.
Cyperaceae	*Schoenus capillifolius*		P3	Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green.	Brown mud. Claypans.	Oct to Nov	Unlikely	Not detected – Unlikely due to habitat.

Table 18 continued.

Family	Species	Vernacular	Status (WA)	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome
Dilleniaceae	*Hibbertia leptopus*		P2	Perennial sub-shrub. Yellow flowers. 0.3 to 0.5m high x 0.5m wide.	Open Woodland adjacent to Marri. Yellow sand. Mid-slopes.	Aug to Sept	Unlikely	Not detected, considered unlikely due to location.
Ericaceae	*Andersonia gracilis*	Slender andersonia	T - EN	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple.	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Sep to Nov	Unlikely	Not detected – Unlikely due to habitat.
Fabaceae	*Acacia cochlocarpa* subsp. *cochlocarpa*	Spiral-fruited wattle	T - EN	Glabrous, sprawling shrub, 0.3-0.7(-1.5) m high. Fl. yellow.	Clayey, sandy, often gravelly soils.	Jan to Jul	Unlikely	Not detected, considered unlikely due to location.
Fabaceae	*Acacia deflexa*		P3	Prostrate to straggling or erect shrub, 0.15-2 m high. Fl. yellow.	Yellow & gravelly lateritic sand, gravelly sandy loam. Plains.	Aug to Sep	Unlikely	Not detected, considered unlikely due to location.
Fabaceae	*Acacia trinalis*		P1	Dense, rounded, bushy shrub or tree, 1.5-4 m high. Fl. yellow.	Brown sand, clay loam. Salt lakes & flats, swampy areas.	Sep	Unlikely	Not detected – Unlikely due to habitat.
Fabaceae	*Acacia vassalii*	Vassal's wattle	T - EN	Semi-prostrate, spreading, rounded shrub, 0.15-0.3 m high. Fl. yellow.	Grey/brown or yellow sand, sandy loam.	Jun to Jul	Unlikely	Not detected, considered unlikely due to location.
Fabaceae	*Acacia volubilis*	Tangled wattle, tangle wattle	T - CR	Dense, compact, domed, wiry, entangled shrub, 0.3-0.4 m high, to 1 m wide. Fl. yellow.	Gravelly sand, sandy clay.	Jun	Unlikely	Not detected, considered unlikely due to location.
Fabaceae	*Gastrolobium appressum*	Scale-leaf poison	T - VU	Erect shrub, to 0.3 m high. Fl. yellow & orange & red & purple.	White/yellow sand with quartz gravel. Sandplains, low rises.	Aug to Dec	Unlikely	Not detected, considered unlikely due to location.
Frankeniaceae	*Frankenia conferta*	Silky frankenia	T - EN	Small shrub. Fl. pale pink densely clustered at the top of the branches.	Preferred habitat high water mark of lake shorelines to the tops of low mounds within saline pans.	Oct to Nov	Unlikely	Not detected – Unlikely due to habitat.
Goodeniaceae	*Goodenia verreauxii*	Spindly verreauxia	P4	Succulent herb. Basal leaves grey-green. Fl. yellow.	Jarrah Forest and Shrubland, width scattered Nuytsia floribunda, Marri, Blackbutt and Banksia grandis. Dry yellow, white/grey sandy clay over laterite.	Oct	Unlikely	Not detected, considered unlikely due to location.
Goodeniaceae	*Scaevola tortuosa*		P1	Ascending perennial, herb, 0.1-0.2 m high. Fl. blue-purple/pink.	Sandy clay. Margins of salt lakes.	Oct	Unlikely	Not detected – Unlikely due to habitat.
Gyrostemonaceae	*Gyrostemon reticulatus*	Net-veined gyrostemon	T - CR	Shrub, ca 1 m high.	Dense shrubland, brown/yellow loamy sand on slopes.	Sep	Unlikely	Not detected, considered unlikely due to location.
Haemodoraceae	*Conostylis wonganensis*	Wongan conostylis	T - EN	Rhizomatous, tufted perennial, grass-like or herb, 0.08-0.17 m high. Fl. cream-yellow.	Yellow sand, sandy clay.	Jul to Sep	Unlikely	Not detected, considered unlikely due to location.
Haloragaceae	*Haloragis platycarpa*	Broad-fruited haloragis	T - CR	Perennial, herb, ca 0.3 m high.	Brown loamy soils, open woodland.	Oct	Unlikely	Not detected, considered unlikely due to location.
Lamiaceae	*Dasymalla axillaris*	Native foxglove	T - CR	Diffuse shrub, 0.15-0.3 m high. Fl. red.	Sandy soils.	Jul to Dec	Unlikely	Not detected, considered unlikely due to location.
Lamiaceae	*Dicrastylis reticulata*		P3	Woolly shrub, (0.15-)0.6-1.2(-1.5) m high. Fl. white.	Sandy soils, often over granite. Amongst granite rock, hills, flats.	Sep to Dec	Unlikely	Not detected – Unlikely due to habitat.
Lamiaceae	*Microcorys eremophiloides*	Wongan microcorys	T - Vu	Erect shrub, to 2 m high. Fl. pink-red.	Shallow soils over massive laterite, granite.	Jul or Sep to Nov	Unlikely	Not detected – Unlikely due to habitat.
Malvaceae	*Guichenotia glandulosa*		P2	Lax, multi-stemmed shrub, to 0.4 m high.	Littered soil. Creek lines.		Unlikely	Not detected, considered unlikely due to location.
Malvaceae	*Lysiosepalum abollatum*	Woolly lysiosepalum	T - CR	Dense, erect shrub, to 1.5 m high. Fl. pink-blue-purple.	Red clay.	Aug to Sep	Unlikely	Not detected – Unlikely due to habitat.
Malvaceae	*Lysiosepalum aromaticum*		P2	Thick, bushy shrub, to 0.75 m high, with a peppery scent. Fl. pink-purple.	Brown loam over granite. Slopes, moist area at foot of outcrops.	Nov	Unlikely	Not detected – Unlikely due to habitat.
Malvaceae	*Thomasia tenuivestita*		P3	Shrub, 0.6-2.5m high. Fl. purple-pink.	Granite, loam.	Jul to Oct	Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Eucalyptus caesia* subsp. *magna*		P4	(Mallee), 3-10 m high, bark 'minni-ritchi', fruits campanulate, buds to 40 mm long. Fl. pink-red.	Loam. Granite outcrops.	May to Sep	Unlikely	Not detected – Unlikely due to habitat.

Table 18 continued.

Family	Species	Vernacular	Status (WA)	Description- Species	Description - Habitat	Peak Flowering period	Pre-Survey Likelihood of Occurrence Analysis	Post Survey Likelihood of Occurrence and Flora Survey Outcome
Myrtaceae	*Eucalyptus recta*	Silver mallet	T - EN	Tree, to 15 m high, bark smooth.	Sandy laterite.	Jan to Feb or May	Unlikely	Not detected, considered unlikely due to location.
Myrtaceae	*Eucalyptus sargentii* subsp. *onesis*	Mortlock river mallee	P3	Mallee of dense and spreading habit, four to six metres tall.	Pure stands in depressions or broad drainage lines that vary from slightly to highly saline.		Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Melaleuca sciotostyla*	Wongan melaleuca	T - EN	Spreading shrub, 0.6-1.5 m high.	Orange clayey sand with lateritic pebbles. Scree slopes.	Aug	Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Scholtzia halophila* subsp. *mortlockensis*		P3	Shrub 0.5–3(–4) m high, 1.7–4(–5) m wide.	Associated with salt lakes and on saline margins of watercourses.	Sep to Nov	Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Verticordia hughanii*	Hughan's featherflower	T - EN	Low shrub, to 0.3 m high. Fl. red.	Yellow sand. Near salt lakes.	Dec	Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Verticordia mitchelliana* subsp. *mitchelliana*	Rapier featherflower	P3	Spreading shrub. 0.3m high. Fl. red.	Tall open woodland, associated with shrubland. Plain with brown sand over laterite. Salt Lake.	Oct, Dec	Unlikely	Not detected – Unlikely due to habitat.
Myrtaceae	*Verticordia staminosa* subsp. *staminosa*	Wongan featherflower	T - CR	Spreading shrub, 0.15-0.6 m high. Fl. green-yellow/yellow-brown.	Soil pockets. Granite outcrops.	Jul to Oct	Unlikely	Not detected – Unlikely due to habitat.
Orchidaceae	*Caladenia drakeoides*	Hinged dragon orchid	T - EN	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. green	Grey clayey sand, red sandy loam, in damp situations. Margins of salt lakes.	Sep to Oct	Unlikely	Not detected – Unlikely due to habitat.
Proteaceae	*Grevillea christineae*	Christine's grevillea	T - EN	Erect, wiry shrub, 0.5-0.6 m high. Fl. white-cream.	Clay loam, sandy clay, often moist.	Aug to Sep	Unlikely	Not detected, considered unlikely due to location.
Proteaceae	*Grevillea endlicheriana* subsp. *Wongan Hills (G.J. Keighery 15351)*		P2	Clumped or multi-stemmed shrub. 2-3m high x 1m white. White flowers.	Shallow brown loam or sandy clay over granite. Dense Shrubland on granite outcrop.	Sept to Oct	Unlikely	Not detected – Unlikely due to habitat.
Proteaceae	*Persoonia chapmaniana*		P3	Erect, spreading shrub, 1-2 m high. Fl. yellow.	White sandy clay, yellow sand. Vicinity of salt lakes.	Sep to Nov	Unlikely	Not detected – Unlikely due to habitat.
Rhamnaceae	*Cryptandra beverleyensis*		P3	Shrub, 0.4-1.3 m high, branchlets not spinescent.	Clay soils with sand, laterite gravel. Undulating landscape, plains.		Unlikely	Not detected, considered unlikely due to location.
Rutaceae	*Boronia ericifolia*		P2	Erect shrub, 0.3-1.2 m high. Fl. white/cream-yellow.	Sandy loam, clay, laterite. Low-lying spots.	Apr or Jun or Aug to Sep	Unlikely	Not detected – Unlikely due to habitat.
Scrophulariaceae	*Eremophila resinosa*	Resinous eremophila	T - EN	Spreading shrub, 0.4-0.8 m high, to 1 m wide. Fl. blue-purple-white.	Clay loam, gravelly sandy clay. Road verges.	Apr or Oct to Nov	Unlikely	Not detected, considered unlikely due to location.
Scrophulariaceae	*Eremophila viscida*	Varnish bush	T - EN	Shrub, 1.2-4 m high. Fl. green-white-yellow.	Granitic soils, sandy loam. Stony gullies, sandplains.	Sep to Nov	Unlikely	Not detected, considered unlikely due to location.

Table 19: Potential Threatened and Priority ecological communities located within the study area and likelihood of occurrence analysis (post survey).
Species are sorted by likelihood of presence. Numerous resources specific to Threatened and Priority flora listed below were used in the likelihood assessment

Community Name	Status		Description	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence and Survey Outcomes
	EPBC Act 1999	BC Act 2016			
York Gum Woodlands of the wheatbelt	CR	P3	Part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of York Gum.	Likely	Present
Eucalyptus Woodlands of the Western Australian Wheatbelt	Cr En	P3	The ecological community defined and assessed as TEC/PEC 'Eucalyptus Woodland of the Western Australian Wheatbelt' is comprised of eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse Eucalypt tree canopy are not part of the ecological community (DoEE 2015).	Likely	Present
Salmon Gum Woodlands of the wheatbelt	CR	P3	Part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of Salmon Gum.	Likely	Not found
Red Morrel Woodlands of the Wheatbelt	CR	P1	Tall open woodlands of Eucalyptus longicornis (red morrell) found in the Wheatbelt on lateritic, ironstone or granitic soil types. Sometimes found with Eucalyptus salmonophloia (Salmon Gum), or E. loxophleba (York Gum) woodlands and has very little understorey. It is also found directly above lake systems in the central and eastern Wheatbelt. The landscape unit in which it is found is valley floors, usually adjacent to saline areas.	Likely	Not found
Gimlet Woodlands of the wheatbelt		P3	Part of the Eucalypt Woodlands of the Western Australian Wheatbelt dominated by a canopy layer of Gimlet.	Likely	Not found
Canegrass Perched clay wetlands of the Wheatbelt dominated by *Eragrostis australasica* and *Melaleuca strobophylla* across the lake floor		P1	Canegrass Perched clay wetlands of the Wheatbelt dominated by *Eragrostis australasica* and *Melaleuca strobophylla* across the lake floor.	Unlikely	Not found
Perched wetlands of the Wheatbelt region with extensive stands of living Swamp Sheoak (Casuarina obesa) and Paperbark (*Melaleuca strobophylla*) across the lake floor.	EN	CR	Perched wetlands of the Wheatbelt region with extensive stands of living Swamp Sheoak (*Casuarina obesa*) and Paperbark (*Melaleuca strobophylla*) across the lake floor.	Unlikely	No found
Natural organic saline seeps of the Avon Botanical District		P1	The known occurrence of this community is characterised by vegetation in a series of bands from the upland to the saline seep. 1) Dunes and sandplain, 2) Saline seep and 3) Adjacent flats and flow lines.	Unlikely	Not found

Table 20: Potential conservation significant fauna located within 30 km of the survey area and likelihood of occurrence analysis.
Species ordered by pre-survey likelihood of occurrence, and then alphabetically by Class, Family and Scientific Name

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Aves	Acanthizidae	Aphelocephala leucopsis	Southern whiteface	- / VU	Favours wide range of open woodlands and shrublands with understorey of grasses, shrubs or both. Foraging on ground in areas of low tree density and herbaceous understorey litter cover.	Possible	Possible	Yes	High	No	Birds are readily detected due to their unique foraging behaviour.
Aves	Apodidae	Apus pacificus	Fork-tailed swift	MI / MI	Dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland, or saltmarsh. Almost exclusively aerial, flying from less than 1 m to at least 300 m above ground over inland plains but sometimes above foothills or in coastal areas.	Possible	Possible	Yes	High	No	The fork-tailed swift is present in Australia between September and April. Given tits tendency to flock in large numbers, feed aerially and feeding in characteristic circular flight patterns, it is readily detected when present.
Aves	Cacatuidae	Calyptorhynchus latirostris	Carnaby's cockatoo	EN / EN	Eucalypt woodlands, especially those that contain salmon gum and wandoo, and in shrubland or kwongan heathland dominated by hakea, dryandra, banksia, and grevillea species. Also forage in forests containing marri, jarrah, or karri.	Possible	Unlikely	Yes	High	No	Low quality foraging, roosting, and breeding habitat associated with Eucalypt woodland pockets. No evidence of historical or recent use. Five hollow bearing trees, 2 of which contain suitable hollows for cockatoos, as well as 8 potential habitat trees recorded within the survey area. High occupancy rate of hollows by feral bees, the limited availability of food, and the lack of water source undermine the potential suitability of the site for this species.
Aves	Falconidae	Falco hypoleucos	Grey falcon	VU / VU	Usually in lightly timbered country, especially stony plains, and lightly timbered acacia shrublands.	Possible	Possible	Yes	High	No	Low quality foraging habitat present. No evidence of nests and no calling individuals detected. If the area is used it would be as transient foraging habitat.
Aves	Megapodiidae	Leipoa ocellata	Malleefowl	VU / VU	Arid and semi-arid areas dominated by mallee eucalypts on sandy soils. They are known to also occur in mulga (*Acacia aneura*), broombush (*Melaleuca uncinata*), scrub pine (*Callitris verrucosa*), Eucalyptus woodlands and coastal heathlands. Malleefowl require abundant leaf litter and a sandy substrate for the successful construction of nest mounds.	Possible	Unlikely	No	NA	No	
Aves	Psittacidae	Pezoporus occidentalis	Night parrot	CR / EN	Usually inhabit arid or semi-arid grasslands that are dominated by spinifex, though they have also been recorded in shrublands dominated by samphire, bluebush and saltbush.	Possible	Highly Unlikely	No	NA	No	
Aves	Strigidae	Ninox connivens subsp. connivens	Barking owl	P3 / -	Open woodlands and the edges of forests, often adjacent to farmland. They are less likely to use the interior of forested habitat. Usually found in habitats that are dominated by Eucalyptus species, particularly red gum. They prefer woodlands and forests with a high density of large trees and particularly sites with hollows that are used by the owls as well as their prey. Roost sites are often located near waterways or wetlands.	Possible	Unlikely	No	NA	No	
Aves	Tytonidae	Tyto novaehollandiae subsp. novaehollandiae	Masked owl (southwest)	P3 / -	Wide variety of lowland forests and woodlands that provide mature trees with hollows suitable for nesting and roosting, timbered waterways, and open country on the fringe of these areas for foraging. Nests in large hollows in old eucalypt trees.	Possible	Unlikely	No	NA	No	Hollows present not large enough for Masked owl.

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Invertebrate	Idiopidae	Aganippe castellum		P4 / -	A. castellum prefer habitats in flood-prone depressions and flats that support myrtaceous shrub communities. The burrows of this species are specially designed with an aboveground entrance to withstand occasional sheet flooding (Main, 1987a).	Possible	Unlikely	No	NA	No	
Invertebrate	Idiopidae	Idiosoma mcclementsorum	Julimar shield-backed trapdoor spider	P2/-	Clay soils associated with eucalypt woodland and acacia shrubland, with light leaf litter and in positions with moisture retention properties such as gullies and drainage lines.	Possible	Unlikely	Yes	High	No	Clay soils were dry and compact throughout most of the survey area. Where present burrows are readily detected. Outside of known range for species.
Invertebrate	Idiopidae	Idiosoma mcnamarai	Central-eastern Wheatbelt shield-backed trapdoor spider	P1 / -	Clay soils associated with eucalypt woodland and acacia shrubland, with light leaf litter and in positions with moisture retention properties such as gullies and drainage lines.	Possible	Unlikely	Yes	High	No	Clay soils were dry and compact throughout most of the survey area. Where present the burrows of this genus are readily detected. Outside of known range for species.
Invertebrate	Idiopidae	Idiosoma nigrum	Shield-backed trapdoor spider, black rugose trapdoor spider	EN / VU	Wheatbelt: Clay soils associated with eucalypt woodland and acacia shrubland, in positions with increased moisture retention properties like gullies and drainage lines on southern facing slopes. Arid Midwest: Rocky habitats associated with acacia shrubland. Leaf litter and twigs are extremely important to the species in both areas for burrows, but the species avoids areas of dense leaf litter.	Possible	Unlikely	Yes	High	No	Clay soils were dry and compact throughout most of the survey area. Where present the burrows of this genus are readily detected.
Invertebrate	Idiopidae	Idiosoma schoknechtorum	Mortlock River shield-backed trapdoor spider	P3	Inhabits clay soils of eucalypt woodlands in semiarid environments. Uses to twigs and leaf litter to build a burrow with a "moustache like" arrangement.	Possible	Unlikely	Yes	High	No	Clay soils were dry and compact throughout most of the survey area. Where present the burrows of this genus are readily detected. Edge of range for this species
Invertebrate	Nemesiidae	Kwonkan eboracum	Yorkrakine trapdoor spider	CR/-	Heath shrubland on yellow sand, adjacent to open salmon gum (*Eucalyptus salmonophloia*) and gimlet (*E.*salubris) woodland.	Possible	Unlikely	No	Moderate	No	Burrows not detected. Most of litter onsite was light, making burrows more detectable.
Invertebrate	Nemesiidae	Teyl sp. (BY Main 1953/2683, 1984/13)	Minnivale trapdoor spider	CR / -	Perched swamp areas on high terrain, in particular the narrow band between Minnivale and Mellanbye that supports this type of habitat.	Possible	Unlikely	No	NA	No	
Mammalia	Dasyuridae	Dasyurus geoffroii	Chuditch, western quoll	VU / VU	Woodland or forest containing den resources such as logs (1m length, diameter > 30 cm and a hollow diameter 7–20 cm Dunlop and Morris 2012), stumps, or rock outcrops.	Possible	Unlikely	No	Moderate	No	No den resources within the survey area. High level of fox activity.
Mammalia	Dasyuridae	Phascogale calura	Red-tailed phascogale, kenngoor	CD / VU	Inhabits wandoo (*Eucalyptus wandoo*) and sheoak (*Allocasuarina huegeliana*) woodland associations, with populations being most dense in the latter vegetation type. They show a preference for long unburnt habitat with a continuous canopy, as well as tree hollows.	Possible	Unlikely	Yes	Low	No	2 hollow bearing trees with hollows suitable for use by this species. No evidence (scratching) that they were being used by mammals, and presence of high fox activity and low canopy connectivity undermines the suitability of habitat for the species

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Mammalia	Dasyuridae	Phascogale tapoatafa subsp. wambenger	South-western brush-tailed phascogale, wambenger	CD / -	Sclerophyll forests and open woodlands that contain hollow-bearing trees.	Possible	Unlikely	Yes	Low	No	2 hollow bearing trees with hollows suitable for use by this species. No evidence (scratching) that they were being used by mammals, and presence of high fox activity and low canopy connectivity undermines the suitability of habitat for the species.
Mammalia	Macropodidae	Notamacropus irma	Western brush wallaby	P4 / -	Preferred habitat includes open forest or woodland, particularly open, seasonally-wet flats with low grasses and open scrubby thickets.	Possible	Unlikely	No	NA	No	
Mammalia	Muridae	Pseudomys occidentalis	Western mouse	P4 / -	Historical distribution. Preference for long unburnt habitat (between 30 and 50 yrs) on sandy clay loam or sandy loam. Vegetation in suitable habitats is variable and includes sparse low shrubland, tall dense shrubland, sparse to dense shrub mallee and mid-dense woodland. All sites where the western mouse has been collected have had patches of extremely dense vegetation.	Possible	Unlikely	No	NA	No	
Mammalia	Peramelidae	Isoodon fusciventer	Quenda, southwestern brown bandicoot	P4 / -	Scrubby, often swampy, vegetation with dense cover up to 1 m high, often feeding in adjacent forest and woodland that is burnt on a regular basis. Forest, woodlands, heath, and coastal scrub, usually on sandy combination soils.	Possible	Unlikely	No	NA	No	
Reptilia	Scinidae	Egernia stokesii badia	Western spiny-tailed skink	VU / EN	York gum (*Eucalyptus loxophleba*) woodland, with some records in gimlet (*E. salubris*) and salmon gum (*E. salmonophloia*) woodland, including small remnants. Sites with the greatest number of individuals contain numerous fallen logs and low-intensity grazing by domestic stock. Preferred refuges consist of piles of several, overlapping, hollow logs providing a combination of basking and shelter sites. Also use artificial refuge such as piles of wood, scrap metal etc.	Possible	Unlikely	No	Moderate	No	Some artificial rock piles within the survey area, but these provided minimal refuge and had a high level of fox activity around them.
Aves	Cacatuidae	Calyptorhynchus banksii subsp. naso	Forest red-tailed black cockatoo	VU / VU	Foraging habitat includes vegetation containing proteaceous heath/woodland, eucalypt woodlands or forest (particularly marri and jarrah forest) and *Pinus* spp. Breeding habitat includes large, mature trees containing suitable sized hollows, proximate to high quality feeding habitat.	Unlikely	Unlikely	Yes	High	No	Low quality foraging, roosting and breeding habitat associated with Eucalypt woodland pockets. No evidence of historical or recent use.
Aves	Cacatuidae	Calyptorhynchus baudinii	Baudin's cockatoo	EN / EN	Hollows of large, mature trees. Foraging habitat includes vegetation containing proteaceous heath/woodland, eucalypt woodlands or forest (particularly marri and jarrah forest) and *Pinus* spp.	Unlikely	Unlikely	Yes	High	No	Low quality foraging, roosting, and breeding habitat associated with Eucalypt woodland pockets. No evidence of historical or recent use.
Aves	Falconidae	Falco peregrinus	Peregrine falcon	OS / -	It requires abundant prey and secure nest sites and prefers coastal and inland cliffs or open woodlands near water.	Unlikely	Highly Unlikely	No	NA	No	

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Aves	Psophodidae	Psophodes nigrogularis	Western whip bird	EN / EN	Dense heath-like shrubby thickets on coastal dunes, and mallee woodland or shrubland with an open upperstorey above a dense shrubby understorey. Preferred habitat is usually 2–3 metres tall and dominated by shrubs such as *Agonis marginata*, hakeas (e.g. *Hakea elliptica* and *H. trifurcata*), showy dryandra (*Banksia formosa*), *Eutaxia obovata, Acacia mityfolia* and heart-leaf poison-bush (*Gastrolobium bilobum*), usually with a dense shrubby understorey, and sometimes intermixed with stunted eucalypts such as marri (*Eucalyptus calophylla*) and jarrah (*E. marginata*).	Unlikely	Highly Unlikely	No	NA	No	
Fish	Galaxiidae	Galaxiella munda	Mud minnow	VU / -	Relatively undisturbed, permanent stream habitats (rather than the ephemeral wetland habitats where black-stripe minnow are typically found). Prefers small, gently flowing creeks and streams. Found in low pH environments (as low as pH 3), but low salt tolerance (susceptible to salinisation).	Unlikely	Highly Unlikely	No	NA	No	
Invertebrate	Glacidorbidae	Glacidorbis occidentalis	Jarrah forest freshwater snail	P3/-	Small intermittent streams, in gravel riffle sections.	Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Muridae	Hydromys chrysogaster	Water-rat, rakali	P4 / -	Permanent fresh or brackish water, subalpine streams and other inland waterways to lakes, swamps, and farm dams.	Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Myrmecobiidae	Myrmecobius fasciatus	Numbat, walpurti	EN / EN	Current known distribution is a small area of WA's Jarrah forest and Wheatbelt, notably at Dryandra Woodland and the Upper Warren area. Habitat is generally woodland dominated by Eucalyptus species, with abundant hollow logs and branches for shelter and termites for food.	Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Thylacomydidae	Macrotis lagotis	Bilby, dalgyte, ninu	VU / VU	Known distribution in WA includes the Gibson Desert, Little Sandy Desert, Great Sandy Desert and parts of the Pilbara and Southern Kimberley. Habitat includes open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	Unlikely	Highly Unlikely	No	NA	No	
Aves	Anatidae	Oxyura australis	Blue-billed duck	P4 / -	Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Charadriidae	Thinornis rubricollis	Hooded plover	P4 / -	Ocean sandy beaches and coastal lakes, also occur around salt and freshwater lakes that range from close to the coast to inland areas.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Psittacidae	Cacatua pastinator subsp. pastinator	Muir's corella	CD / -	Large live or dead eucalypts, particularly marri (*Corymbia calophylla*) and jarrah (*Eucalyptus marginata*), flooded gum (*Eucalyptus rudis*), yate (*Eucalyptus cornuta*) and paperbark (*Melaleuca preissiana*) in forested areas or as lone trees in paddocks and along roadsides in the region from Boyup Brook, McAlinden and Qualeup, south to Lake Muir and the lower Perup River, and east to Frankland and Rocky Gully. Nests in the hollows of mature live eucalypts (often lone trees in paddocks or along roadsides).	Highly Unlikely	Highly Unlikely	No	NA	No	

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Aves	Psittacidae	Pezoporus flaviventris	Western ground parrot	CR / CR	Preferred habitat includes low coastal and near coastal heathlands, unburnt for at least five years.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Rostratulidae	Rostratula australis	Australian painted snipe	EN / EN	Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes tea-tree (Melaleuca).	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Scolopacidae	Actitis hypoleucos	Common sandpiper	MI / MI	Wide range of 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. Has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Scolopacidae	Calidris acuminata	Sharp-tailed sandpiper	MI / MI	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans, and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beach cast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Scolopacidae	Calidris ferruginea	Curlew sandpiper	CR / CR & MI	Intertidal mudflats 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, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Scolopacidae	Calidris ruficollis	Red-necked stint	MI / MI	Coastal areas, including sheltered inlets, bays, lagoons, and estuaries with intertidal mudflats; ephemeral or permanent shallow wetlands near the coast or inland, and sometimes flooded paddocks or damp grasslands (Higgins & Davies 1996).	Highly Unlikely	Highly Unlikely	No	NA	No	

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Aves	Scolopacidae	Tringa glareola	Wood sandpiper	MI / MI	Inland shallow freshwater wetlands, often with other waders. They prefer ponds and pools with emergent reeds and grass, surrounded by tall plants or dead trees and fallen timber.	Highly Unlikely	Highly Unlikely	No	NA	No	
Aves	Scolopacidae	Tringa nebularia	Common greenshank	MI / MI	Wide variety of inland wetlands and sheltered coastal habitats of varying salinity, including embayments, harbours, river estuaries, deltas, and lagoons, and less often in tidal pools, rock-flats and rock platforms. Both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes, and inundated floodplains, claypans and salt flats. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees.	Highly Unlikely	Highly Unlikely	No	NA	No	
Invertebrate	Ardeidae	Ixobrychus flavicollis subsp. australis	Black bittern (southwest subpop.)	P2 / -	Wetlands, estuarine and littoral habitats. Dense water-edge vegetation, freshwater springs and billabongs, tidal reaches of creeks and rivers.	Highly Unlikely	Highly Unlikely	No	NA	No	
Invertebrate	Bivalvia	Westralunio carteri	Carter's freshwater mussel	VU / VU	Patchily distributed in sandy/muddy sediments of freshwater lakes, rivers and streams with greatest densities associated with woody debris and overhanging riparian vegetation near stream banks and edges of lakes/dams.	Highly Unlikely	Highly Unlikely	No	NA	No	
Invertebrate	Parartemiidae	Parartemia contracta	Brine shrimp (Wheatbelt)	P1 / -		Highly Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Macropodidae	Lagostrophus fasciatus fasciatus	Banded hare-wallaby, merrnine, marnine, munning	VU / VU	Occurs in all types of habitat on the islands including dunes, grassland and heathland. However, higher densities occur in areas of thicker vegetation (Short et al. 1997). Individuals shelter under dense thickets of dune wattle (*Acacia ligulata*), wirewood (*A. coriacea*) and Bullock bush (*Alectryon oleifolius*) on sandplains and *Diplolaena dampieri* and Bullock bush on dunes (Woinarski et al. 2014). Beneath these shrubs it forms runways and shelters (Prince & Richards 2008). Several individuals may be found sheltering in one patch of shrub (Richards 2012a), but adults of each sex appear to live in well-defined individual home ranges or territories (Woinarski et al. 2014).	Highly Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Muridae	Notomys longicaudatus	Long-tailed hopping-mouse, koolawa	EX / EX	Presumed extinct.	Highly Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Peramelidae	Chaeropus ecaudatus		EX / EX	Species extinct.	Highly Unlikely	Highly Unlikely	No	NA	No	
Mammalia	Potoroidae	Bettongia lesueur graii		EX / EX	Species extinct.	Highly Unlikely	Highly Unlikely	No	NA	No	

Table 20 continued.

Class	Family	Scientific Name	Vernacular	Status (WA) / EPBC Act	Habitat Description	Likelihood of Occurrence (pre-survey)	Likelihood of Occurrence (post-survey)	Habitat Present (Y/N)	Likelihood of Detection if Present	Species Present (Y/N)	Comment
Mammalia	Potoroidae	Bettongia penicillata subsp. ogilbyi	Woylie, brush tailed bettong	CR / EN	Tall eucalypt forests and woodlands, dense myrtaceous shrublands, and kwongan (proteaceous) or mallee heath.	Highly Unlikely	Highly Unlikely	No	NA	No	

Appendix C

Conservation Status Definitions and Condition Scale

Table 21: Conservation code definitions for flora and fauna listed as Threatened or specially protected.
Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, Threatened, extinct or in need of special protection, and have been gazetted as such.

Threat Category	Definition
Threatened - Critically endangered species (CR)	Facing an extremely high risk of extinction in the wild in the immediate future
Threatened - Endangered species (EN)	Facing a very high risk of extinction in the wild in the near future
Threatened - Vulnerable species (VU)	Facing a high risk of extinction in the wild in the medium-term future
Threatened - Extinct (EX)	There is no reasonable doubt that the last member of the species has died
Threatened – Extinct in the wild (EW)	Species is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form
Specially protected species - Migratory species (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
Specially protected species – Conservation Dependent (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as Threatened,
Specially protected species – Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation

Table 22: Conservation code definitions for flora and fauna listed as Priority.
Possibly Threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3.

Threat Category	Definition
Priority 1: Poorly-known species	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation.
Priority 2: Poorly-known species	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation.
Priority 3: Poorly-known species	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.
Priority 4: Rare, Near Threatened and other species in need of monitoring	(a) Rare. Species 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. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of Threatened species during the past five years for reasons other than taxonomy.

Table 23: Conservation code definitions for ecological communities listed as Threatened (TEC).

Threat Category	Definition
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Table 24: Conservation code definitions for ecological communities listed as Priority (PEC).

Possible Threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3.

Threat Category	Definition
Priority One (P1)	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100ha), and appear to be under immediate threat.
Priority Two (P2)	Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation.
Priority Three (P3)	(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 with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii)communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.
Priority Four (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.
Priority Five (P5)	Conservation Dependent 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.

Table 25: Condition Rating Scale (adapted from Keighery 1994) outlined in EPA (2016).

Vegetation Condition Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	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 and shrubs.

Appendix D

Species Lists and Relevé Data

Table 26: Flora species lists and relevés recorded within survey area. Species ordered alphabetically by family then species name.

Family	Species	Vernacular	Cons code	Invasive	R1	R2	R3	R4
Aizoaceae	*Carpobrotus modestus*	Inland Pigface				X		
Aizoaceae	*Mesembryanthemum crystallinum*	Iceplant		X		X		
Aizoaceae	*Mesembryanthemum nodiflorum*	Slender Iceplant		X		X		
Amaranthaceae	*Ptilotus polystachyus*	Prince of Wales Feather			X	X		
Amaranthaceae	*Ptilotus spathulatus*					X		
Apocynaceae	*Alyxia buxifolia*	Dysentry Bush				X		
Araliaceae	*Trachymene cyanopetala*						X	
Asparagaceae	*Thysanotus patersonii*					X		
Asteraceae	*Arctotheca calendula*	Cape Weed		X	X	X		
Asteraceae	*Blennospora drummondii*						X	
Asteraceae	*Erigeron bonariensis*	Fleabane		X	X			
Asteraceae	*Hypochaeris glabra*	Smooth Cats-ear		X	X			
Asteraceae	*Monoculus monstrosus*	Stinking Roger		X	X	X		
Asteraceae	*Panaetia lessonii*					X		
Asteraceae	*Sonchus asper*	Rough Sowthistle		X	X			
Asteraceae	*Ursinia anthemoides*	Ursinia		X		X		
Asteraceae	*Waitzia acuminata*	Orange Immortelle				X		
Boraginaceae	*Echium plantagineum*	Paterson's Curse		X	X			
Boryaceae	*Borya sphaerocephala*	Pincushions				X		

Table 27 continued.

Family	Species	Vernacular	Cons code	Invasive	R1	R2	R3	R4
Brassicaceae	*Brassica tournefortii*	Wild Turnip		X	X	X		
Casuarinaceae	*Allocasuarina acutivalvis*					X		
Casuarinaceae	*Allocasuarina campestris*					X		
Chenopodiaceae	*Atriplex nummularia*	Old Man Saltbush					X	
Chenopodiaceae	*Enchylaena lanata*				X	X		X
Chenopodiaceae	*Enchylaena tomentosa*	Barrier Saltbush			X			
Chenopodiaceae	*Maireana brevifolia*	Small Leaved Bluebush			X			
Chenopodiaceae	*Maireana carnosa*	Cottony Bluebush				X		
Chenopodiaceae	*Rhagodia drummondii*					X		X
Chenopodiaceae	*Rhagodia preissii*				X			
Chenopodiaceae	*Rytidosperma caespitosum*	Wallaby grass				X		
Chenopodiaceae	*Salsola australis*						X	
Crassulaceae	*Crassula colorata*	Dense Stonecrop				X		
Cyperaceae	*Lepidosperma tenue*						X	
Cyperaceae	*Lepidosperma sanguinolentum*					X	X	
Cyperaceae	*Lepidosperma costale s. lat.*						X	
Cyperaceae	*Lepidosperma aff. obtusum*					X		
Cyperaceae	*Schoenus nanus*	Tiny Bog Rush				X		
Droseraceae	*Drosera macrantha*	Bridal Rainbow				X		

Table 27 continued.

Family	Species	Vernacular	Cons code	Invasive	R1	R2	R3	R4
Droseraceae	*Drosera macrophylla*	Showy Sundew				X		
Ecdeiocoleaceae	*Ecdeiocolea monostachya*					X		
Fabaceae	*Acacia acuminata*	Jam Wattle					X	
Fabaceae	*Acacia assimilis*				X			
Fabaceae	*Acacia brumalis*						X	
Fabaceae	*Acacia dielsii*				X	X		
Fabaceae	*Acacia hemiteles*						X	
Fabaceae	*Acacia multispicata*				X	X		
Fabaceae	*Acacia ulicina*						X	
Fabaceae	*Bossiaea atrata*		P3				X	
Fabaceae	*Lupinus angustifolius*	Narrowleaf Lupin		X	X			
Geraniaceae	*Erodium botrys*	Long Storkbill		X	X			
Goodeniaceae	*Dampiera lavandulacea*					X		
Goodeniaceae	*Goodenia cycnopotamica*					X		
Haloragaceae	*Glischrocaryon angustifolium*					X		
Hemerocallidaceae	*Dianella revoluta*	Blueberry Lily				X		X
Iridaceae	*Moraea flaccida*	One-leaf Cape Tulip		X		X		
Iridaceae	*Moraea setifolia*	Thread Iris		X	X	X		
Iridaceae	*Romulea rosea*	Guildford Grass		X		X		

Table 27 continued.

Family	Species	Vernacular	Cons code	Invasive	R1	R2	R3	R4
Lauraceae	*Cassytha pomiformis*	Dodder Laurel				X		
Myrtaceae	*Ericomyrtus serpyllifolia*					X		
Myrtaceae	*Eucalyptus celastroides subsp. virella*	Wheatbelt Mallee					X	
Myrtaceae	*Eucalyptus loxophleba subsp. loxophleba*	York Gum						X
Myrtaceae	*Eucalyptus sp.*				X			
Myrtaceae	*Eucalyptus subangusta subsp. subangusta*	Grey Mallee					X	
Myrtaceae	*Eucalyptus wandoo subsp. pulverea*	White Gum				X		
Myrtaceae	*Melaleuca concreta*						X	
Orchidaceae	*Diuris suffusa*	Mottled Donkey Orchid					X	
Poaceae	*Aira cupaniana*	Silvery Hairgrass				X		
Poaceae	*Amphipogon caricinus*	Long Greybeard Grass				X		X
Poaceae	*Aristida contorta*	Bunched Kerosene Grass			X	X		
Poaceae	*Austrostipa elegantissima*	Feather Speargrass				X		X
Poaceae	*Avena barbata*	Wild Oats		X	X	X		
Poaceae	*Briza maxima*	Blowfly Grass		X		X		
Poaceae	*Bromus diandrus*	Great Brome		X	X			
Poaceae	*Chloris truncata*	Windmill Grass			X			
Poaceae	*Ehrharta longiflora*	Annual Veldt Grass		X		X		X
Poaceae	*Eragrostis curvula*	African Lovegrass		X	X			

Table 27 continued.

Family	Species	Vernacular	Cons code	Invasive	R1	R2	R3	R4
Poaceae	*Hordeum leporinum*	Barley Grass		X	X			
Poaceae	*Lolium rigidum*	Wimmera Ryegrass		X	X			
Poaceae	*Neurachne alopecuroidea*	Foxtail Mulga Grass				X		
Proteaceae	*Grevillea hookeriana*	Red Toothbrushes				X		
Proteaceae	*Grevillea teretifolia*	Round Leaf Grevillea					X	
Proteaceae	*Hakea meisneriana*					X		
Rhamnaceae	*Cryptandra nutans*						X	
Rubiaceae	*Opercularia vaginata*	Dog Weed				X		
Santalaceae	*Leptomeria preissiana*					X		
Santalaceae	*Santalum acuminatum*	Quandong				X		
Sapindaceae	*Dodonaea bursariifolia*						X	

Relevé	R1	Veg Code	1: Unclassifiable vegetation unit	Survey date	11/09/2023
Relevé comments:		Vegetation unit unclassifiable due to degraded condition.			
Recorder/s:		Ellen Hickman, Charlize van der Mescht, Marisa Wearing			
Location:		CBH Dowerin Receival Site			
GPS (latitude, longitude):		-31.217777, 117.002575			
Condition:		Degraded			
Aspect:		NW	Slope:	Gentle	
Geology:		-	Rock:	0	
Soil Colour:		Light Brown	Soil type:	Clay Loam	
Hydrology:		Good drain	Landform:	Slope Middle	

Layer	Height (m)	Cover Code	Dominant Species	Other species
T1	>30			
T2	10-30			
T3	<10			
M1	>8			
M2	<8			
S1	>2	S 10-30%	*Acacia assimilis*	
S2	1-2	M 30-70%	*Acacia dieslsii*, *Acacia multispicata*	
S3	0.5-1	V 2-10%		*Maireana brevifolia*
S4	<0.5			
V	NA			
H	NA	S 10-30%	*Acrtotheca calendula*	*Echium plantagineum, Brassica tournefortii*
G	NA	M 30-70%	*Eragrostis curvula, Bromus diandrus, Avena barbata*	

Relevé	R2	Veg Code	2: Allocasuarina/Acacia Shrubland [AASh]	Survey date	11/09/2023
Relevé comments:					
Recorder/s:		Ellen Hickman, Charlize van der Mescht, Marisa Wearing			
Location:		CBH Dowerin Receival Site			
GPS (latitude, longitude):		-31.214014, 117.002018			
Condition:		Very Good			
Aspect:		-	Slope:	Flat	
Geology:		-	Rock:	0	
Soil Colour:		Light Brown	Soil type:	Clay Loam	
Hydrology:		Good drain	Landform:	Plain	

Layer	Height (m)	Cover Code	Dominant Species	Other species
T1	>30			
T2	10-30			
T3	<10			
M1	>8			
M2	<8			
S1	>2	S 10-30%	*Allocasuarina acutivalvis*	
S2	1-2	S 10-30%	*Grevillea hookeriana, Allocasuarina campestris*	*Acacia multispicata*
S3	0.5-1			
S4	<0.5			
V	NA	V 2-10%	*Ecdeiocolea monostachya*	
H	NA	D > 70%	*Dampiera lavandulacea*	*Dianella revoluta, Enchylaena lanata*
G	NA	V 2-10%	*Bromus diandrus, Avena barbata, Austrostipa elegantissima*	

Relevé	R3	Veg Code	3: Mallee Shrubland [MSL]	Survey date	11/09/2023
Relevé comments:					
Recorder/s:		Ellen Hickman, Charlize van der Mescht, Marisa Wearing			
Location:		CBH Dowerin Receival Site			
GPS (latitude, longitude):		-31.215138, 117.000899			
Condition:		Very Good			
Aspect:		-	**Slope:**	Flat	
Geology:		-	**Rock:**	0	
Soil Colour:		Light Brown	**Soil type:**	Clay Loam	
Hydrology:		Good drain	**Landform:**	Plain	

Layer	Height (m)	Cover Code	Dominant Species	Other species
T1	**>30**			
T2	**10-30**			
T3	**<10**			
M1	**>8**			
M2	**<8**	S 10-30%	*Eucalyptus subangusta subsp. subangusta*	
S1	**>2**	M 30-70%	*Acacia acuminata*	
S2	**1-2**	M 30-70%	*Allocasuarina campestris*	
S3	**0.5-1**			
S4	**<0.5**			
V	**NA**	M 30-70%	*Ecdeiocolea monostachya*	
H	**NA**	V 2-10%	*Panaetia lessonii, Waitzia acuminata, Diuris suffusa*	
G	**NA**	V 2-10%	*Austrostipa elegantissima*	

Relevé	R4	Veg Code	4: *Eucalyptus loxophleba subsp. loxophleba* Woodland [EucloxW]	Survey date	11/09/2023
Relevé comments:					
Recorder/s:		Ellen Hickman, Charlize van der Mescht, Marisa Wearing			
Location:		CBH Dowerin Receival Site			
GPS (latitude, longitude):		-31.21506, 117.000534			
Condition:		Good			
Aspect:		-	**Slope:**	Flat	
Geology:		-	**Rock:**	0	
Soil Colour:		Dark Brown	**Soil type:**	Clay Loam	
Hydrology:		Good drain	**Landform:**	Plain	

Layer	Height (m)	Cover Code	Dominant Species	Other species
T1	**>30**			
T2	**10-30**			
T3	**<10**	D > 70%	*Eucalyptus loxophleba subsp. loxophleba*	
M1	**>8**			
M2	**<8**			
S1	**>2**			
S2	**1-2**			
S3	**0.5-1**	V 2-10%	*Dodonaea bursariifolia, Rhagodia drummondii*	
S4	**<0.5**	V 2-10%	*Enchylaena lanata*	
V	**NA**			
H	**NA**	E <5%	*Dianella revoluta*	
G	**NA**	D > 70%	*Ehrharta longiflora, Amphipogon caricinus, Austrostipa elegantissima*	

Table 27: Fauna species recorded within survey area. Ordered alphabetically by class, family, then species name.

Class	Family	Species	Vernacular	Comments
Arachnida	Araneidae	*Argiope protensa*		
Arachnida	Araneidae	*Phonognatha melania*		
Arachnida	Araneidae	*Socca pustulosa*	Knobbled Orbweaver	
Arachnida	Cheiracanthiidae	*Cheiracanthium*		
Arachnida	Corinnidae	*Nucastia sp.*		
Arachnida	Halonoproctidae	*Conothele sp.*	Trapdoor Spider (SRE)	Short Range Endemic
Arachnida	Neopilionidae	*Megalopsalis tanisphyros*	Harvestman (SRE)	Short Range Endemic
Arachnida	Salticidae	*Apricia jovialis*	Jumping Spider	
Aves	Acanthizidae	*Gerygone fusca*	Fuscous Warbler	
Aves	Cacatuidae	*Cacatua sanguinea*	Little Corella	
Aves	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Aves	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	
Aves	Columbiformes	*Spilopelia senegalensis*	Laughing Turtle Dove	Introduced
Aves	Corvidae	*Corvus coronoides*	Australian Raven	
Aves	Falconiformes	*Falco cenchroides*	Nankeen Kestrel	
Aves	Meliphagidae	*Manorina flavigula*	Yellow-throated Miner	
Aves	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	
Aves	Passeriformes	*Anthus novaeseelandiae*	Australian Pipit	
Aves	Passeriformes	*Artamus cinereus*	Black-faced Woodswallow	
Aves	Passeriformes	*Gavicalis virescens*	Singing Honeyeater	
Aves	Passeriformes	*Hirundo neoxena*	Welcome Swallow	
Aves	Passeriformes	*Lichmera indistincta*	Brown Honeyeater	
Aves	Passeriformes	*Malurus pulcherrimus*	Blue-breasted Fairy-wren	
Aves	Passeriformes	*Pachycephala rufiventris*	Rufous Whistler	
Aves	Passeriformes	*Petrochelidon nigricans*	Tree Martin	
Aves	Passeriformes	*Purnella albifrons*	White-fronted Honeyeater	
Aves	Passeriformes	*Rhipidura albiscapa*	Grey Fantail	
Aves	Passeriformes	*Rhipidura leucophrys*	Willie Wagtail	
Aves	Passeriformes	*Smicrornis brevirostris*	Brown Weebill	
Aves	Passeriformes	*Strepera versicolor*	Grey Currawong	
Aves	Passeriformes	*Zosterops lateralis*	Silvereye	
Aves	Psittaciformes	*Barnardius zonarius*	Australian Ringneck	

Table 28 continued.

Class	Family	*Species*	Vernacular	Comments
Aves	Psittaciformes	*Eolophus roseicapilla*	Galah	
Insecta	Apidae	*Apis mellifera*	European Honeybee	Introduced. Prevalent in hollows.
Insecta	Formicidae	*Calomyrmex*		
Insecta	Formicidae	*Iridomyrmex purpureus*	Southern Meat Ant	Abundant
Insecta	Formicidae	*Opisthopsis rufithorax*	Black-headed Strobe Ant	
Insecta	Formicidae	*Podomyrma adelaidae*	Spotted Muscleman Tree Ant	On smooth barked Eucalypts
Insecta	Formicidae	*Rhytidoponera metallica*	Green-head Ant	
Insecta	Myrmeleontidae		Antlion	
Insecta	Phasmida	*Sipyloidea whitei*	White's Winged Stick-insect	
Insecta	Reduviidae	*Coranus mundus*	Black Assassin Bug	
Insecta	Reduviidae	*Peirates*	Corsair Bug	
Insecta	Tenebrionidae	*Chalcopteroides sp.*	Chalcopterus Beetles	On smooth barked Eucalypts
Mammalia	Bovidae	*Ovis aries*	Sheep	Introduced
Mammalia	Canidae	*Vulpes vulpes*	Fox	Introduced. Abundant throughout
Mammalia	Leporidae	*Oryctolagus cuniculus*	Rabbit	Introduced
Mammalia	Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	
Mammalia	Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	
Reptilia	Elapidae	*Pseudonaja mengdeni*	Gwardar	
Reptilia	Elapidae	*Suta gouldii*	Gould's Hooded Snake	
Reptilia	Scincidae	*Tiliqua rugosa*	Bobtail Skink	
Reptilia	Squamata	*Ctenotus sp.*		Observed in full flight

Appendix E

EPBC Act PMST reports