Benger Solar Farm

Black Cockatoo Assessment

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Black Cockatoo Assessment

Client: SE Campbell Development Pty Ltd (South Energy)

Co No.: 627427169

Prepared by

AECOM Australia Pty Ltd
3 Forrest Place, Perth WA 6000, GPO Box B59, Perth WA 6849, Australia
T +61 8 6208 0000 F +61 8 6208 0999 www.aecom.com
ABN 20 093 846 925

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1.0 Introduction

1.1 Background

SE Campbell Developments (trading as South Energy) is considering potential sites for solar farm development in the southwest of Western Australia. To inform the second stage of the planning and approvals process, AECOM has been engaged by South Energy to undertake a black cockatoo assessment of the proposed site located at Benger (Project Area).

1.2 Location

The proposed solar farm site comprises a 187 ha parcel of farmland in Benger located approximately 20 km northeast of Bunbury, in the Shire of Harvey in Western Australia (Figure 1). There is currently no registered street address for the site, which represents Lot 0 on Diagram 685 (Land ID 039815).

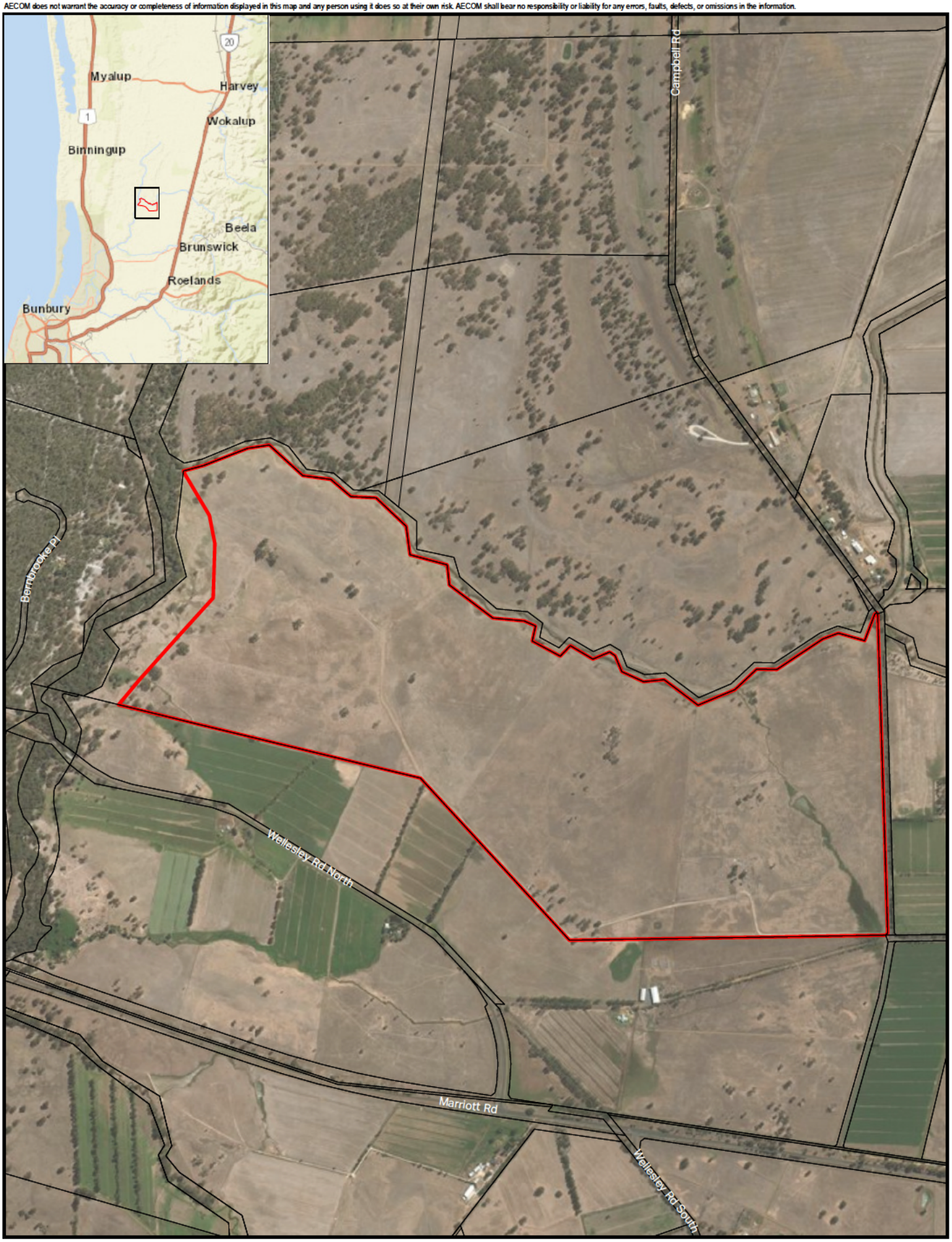
The site is bound by the Wellesley River to the west, and an unnamed tributary to the north. The eastern boundary abuts Campbell Road, and the southern boundary is broadly aligned with Wellesley Road North and Partridge Road, which are located approximately 200 m south.

1.3 Objectives

The objective of this survey is to assess the significance of the Project Area to black cockatoo species. The specific objectives of the survey were to assess the extent and quality of black cockatoo foraging, roosting and breeding habitat throughout the Project Area.

This technical document describes the existing environment, methodology, desktop and field results and preliminary discussion. This information can be used to determine whether the project will have a significant impact on endangered Black cockatoo Populations.

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PROJECT ID	60590393
CREATED BY	KW
APPROVED BY	L.Fisher
LAST MODIFIED	28 MAY 2019

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DATUM GDA 1994, PROJECTION MGA ZONE 50

0 125 250 375 500
metres

1:15,000 when printed at A4

LEGEND

- Black Cockatoo Survey Area
- Cadastre

Data sources: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
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Location of the Project and the Survey Area Extent

SOUTH ENERGY

BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure
1

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A4 size

2.0 Existing Environment

2.1 Climate

The Benger Project Area is located south of Perth which experiences a Mediterranean type climate. Mediterranean climate is characterised by warm to hot dry summers and mild to cool wet winters. The Mediterranean climate in Australia is a result of the Indian Ocean High, a high pressure cell that shifts towards the poles in summer and the equator in winter, playing a major role in the formation of the deserts of Western Australia, and the Mediterranean climate of southwest and south-central Australia. Precipitation occurs during winter months, with the possibility of some summer storms.

Rainfall data was obtained from the Brunswick Junction weather station (Station ID 9513), located 3.8 km from Benger. Mean annual rainfall at Brunswick Junction is 996 mm (BoM, 2018). Monthly Rainfall ranges from 12.3 mm in January, to 196.3 m in June (Figure 2). No historical temperature data are available for Brunswick Junction weather station, the next closest weather station is Wokalup (5.5km from the Project). Historical data from Wokalup show that mean monthly minimum temperatures range from 16.7 ºC to 31.0 ºC and mean monthly maximum temperatures range from 18.5 ºC to 34.7 ºC (Figure 2).

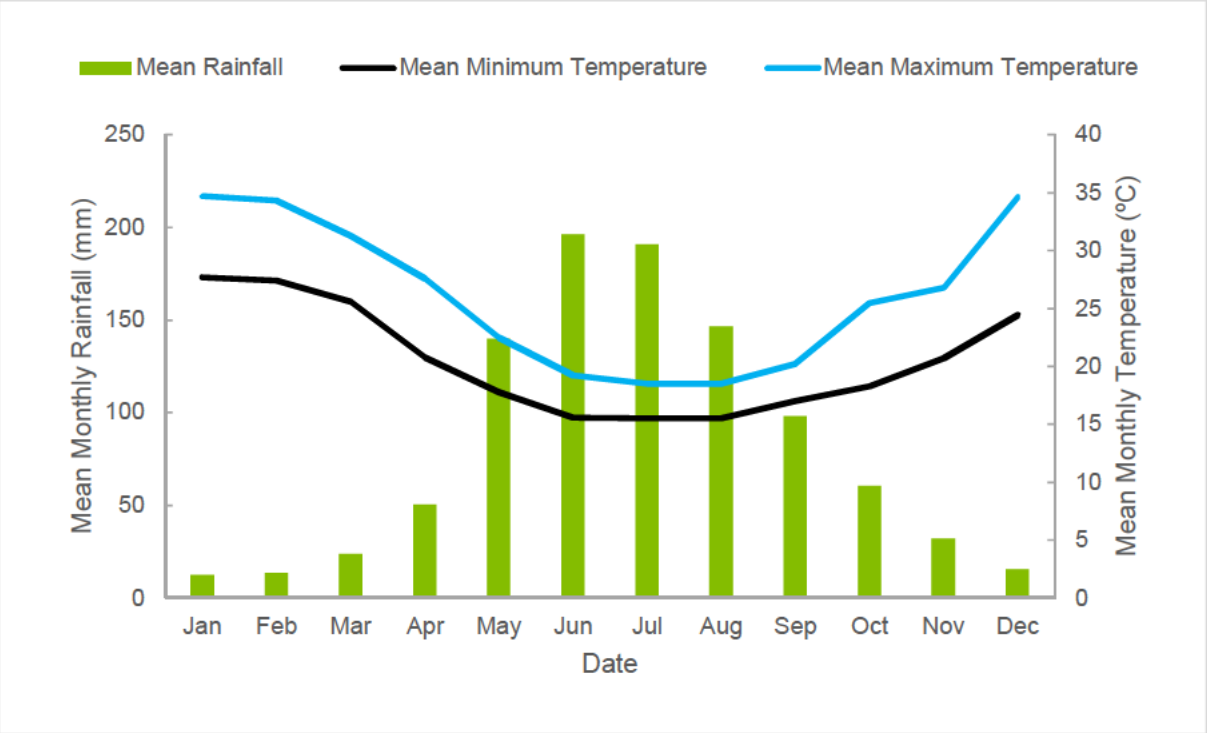


Figure 2 Climate data for the Brunswick Junction weather station (BoM, 2018)

2.2 IBRA Region

The Project Area lies in the Swan Coastal Plain 2 (SWA2) subregion of the Swan Coastal Plain IBRA region. This subregion comprises colluvial and aeolian sands, alluvial rivers flats and coastal limestone (Mitchell *et al.*, 2002). Vegetation in the SWA2 subregion has been described as heath and/or Tuart woodlands on Limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes and Marri on colluvial and alluvials (Mitchell *et al.,* 2002).

2.3 Soils and Geology

The Project lies in the alluvial plain at foothills of the Darling Scarp. Soil mapping indicates that soils present are predominantly alluvium (Table 1). Six soil systems have been mapped in the Project Area by Purdie et al. (2004). The majority of the Project Area lies within the Pinjarra P2 Phase soil system, which is characterised by duplex soils comprising shallow pale sand and loams over clay.

Table 1 Soil Systems within the Project Area (Purdie et al., 2004)

Soil System	Description
Pinjarra P2 Phase	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.
Pinjarra P10 Phase	Gently undulating to flat terraces adjacent to major rivers, but below the general level of the plain, with deep well drained uniform brownish sands or loams subject to periodic flooding.
Pinjarra P8 Phase	Broad poorly drained flats and poorly defined stream channels with moderately deep to deep sands over mottled clays; acidic or less commonly alkaline grey and yellow duplex soils to uniform bleached or pale brown sands over clay.
Pinjarra P7a Phase	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and grey duplex soils becoming alkaline with depth.
Pinjarra P1a Phase	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or coeffective duplex) soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and generally not susceptible to salinity.
Pinjarra P3 Phase	Flat to very gently undulating plain with deep, imperfect to poorly drained acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.

2.4 Vegetation

Beard (2013) mapped three pre-European vegetation associations across the Project Area (Table 2). The majority of the Project Area is characterised by pre-European vegetation association 968.

Aerial photography from the Project Area show the majority of the site has been cleared for agriculture prior to 1996.

Table 2 Pre-European Vegetation Associations Mapped in the Project Area

Vegetation Association	Description
968	Jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) and wandoo (*E. wandoo*) woodland.
1000	Woodland, Low woodland, Low forest or Woodland.
1182	Jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) and wandoo (*E. wandoo*) woodland.

3.0 Legislative Framework

3.1 Overview

Table 3 summarises the key legislation governing the protection and management of Western Australia's conservation significant fauna species.

Table 3 Relevant Legislation, Regulations and Guidance

Legislation, Regulations and Guidance	Purpose
Commonwealth of Australia	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Provides for the protection of the environment and the conservation of biodiversity.
EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (2012).	These guidelines are intended to assist proponents in determining whether an action needs to be referred to the Australian Government. Definitions of habitat are provided as are criteria used to judge significant impact for these black Cockatoo species.
Revised Draft Referral Guideline for Three Threatened Black Cockatoo Species (2017).	This guideline outlines important information and requirements for proponents, particularly on habitat quality, survey expectations, standards for mitigating impacts and significant impacts.
Western Australia	
Wildlife Conservation Act 1950 (WC Act)	Provides for the conservation and protection of Western Australia's wildlife.
Environmental Protection Act 1986 (EP Act)	Preventing, controlling and abating environmental harm and conserving, preserving, protecting, enhancing and managing the environment.
Biosecurity and Agriculture Management Act 2007 (BAM Act)	Provides for the management, control and prevention of certain plants and animals, and for the protection of agriculture and related resources generally.
EPA Technical Guidance – Terrestrial Fauna Surveys, 2016	Provides guidance on the standard of survey required to assist in collecting the appropriate data for decision-making associated with the protection of Western Australia's terrestrial fauna.
EPA Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna, 2016	Provides advice on fauna sampling techniques and methodologies for different regions of the State and the analysis, interpretation and reporting requirements for EIA.

3.2 Commonwealth – EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the main piece of Federal legislation protecting biodiversity in Australia. All matters of national environmental significance (MNES) are listed under the EPBC Act. These include:

- listed threatened species and ecological communities
- migratory species protected under international agreements
- Ramsar wetlands of international importance
- the Commonwealth marine environment
- world Heritage properties
- national Heritage places
- Great Barrier Reef Marine Park
- a water resource, in relation to coal seam gas development and large coal mining development
- nuclear actions.

If an action is likely to have a significant impact on a MNES this action must be referred to the Minister for the Environment for a decision on whether assessment and approval is required under the EPBC Act.

Species at risk of extinction are recognised at a Commonwealth level and are categorised in one of six categories as outlined in Table 4.

Table 4 Categories of Species Listed under Schedule 179 of the EPBC Act

Conservation	Code Category
Ex	Extinct Taxa
ExW	Extinct in the Wild
CE	Critically Endangered
E	Endangered
V	Vulnerable
CD	Conservation Dependent

3.3 Western Australia

3.3.1 Wildlife Conservation Act 1950

Fauna that are considered Threatened and need to be specially protected because they are under identifiable threat of extinction are listed under the *Wildlife Conservation Act 1950* (WC Act). These categories are defined in Table 5.

Species that have not yet been adequately surveyed to warrant being listed under the WC Act are added to a Priority List by the State Minister for Environment. Categories and definitions of Priority flora and fauna species are provided in Table 6 and expanded in Appendix A.

Table 5 Conservation Codes for Fauna Listed under the *Wildlife Conservation Act 1950*

Code	Category
CR	Critically endangered species
EN	Endangered species
VU	Vulnerable species
EX	Presumed extinct species
IA	Migratory birds protected under an international agreement
CD	Special conservation
OS	Special protection for reasons other than those already mentioned (fauna only)

Table 6 Conservation Codes for Fauna Endorsed by the Minister for Environment

Conservation Code	Category
Priority One	Poorly Known Species
Priority Two	Poorly Known Species
Priority Three	Poorly Known Species
Priority Four	Rare, Near Threatened and other species in need of monitoring
Priority Five	Conservation Dependent species

3.3.2 Biosecurity and Agriculture Management Act 2007

Biosecurity is the management of the risk of animal and plant pests and diseases entering, emerging, establishing or spreading in WA to protect the economy, environment and community. Biosecurity is managed under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) which came into effect 1 May 2013. Exotic animals and plants can become an invasive species if they can establish in new areas where local conditions are favourable for their growth.

4.0 Methodology

4.1 Targeted Black Cockatoo Survey

A targeted Black Cockatoo survey was conducted to identify potential breeding, roosting and foraging habitat for the three threatened Black Cockatoo species that are likely to occur in the survey area. These are Carnaby's Cockatoo *Calyptorhynchus latirostris* (Endangered under the EPBC Act and under the WC Act), the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* (Vulnerable under the EPBC Act and under the WC Act) and Baudin's Cockatoo *Calyptorhynchus baudinii* (Endangered under the EPBC Act and under the WC Act). The survey was conducted on 8 May 2019 in accordance with DSEWPaC (2012) by Ecologists Floora de Wit and Laura Fisher.

4.1.1 Breeding Habitat

The black cockatoo breeding habitat assessment focussed on quantifying breeding and potential breeding trees within the survey area. Table 7 defines breeding habitat and identifies those trees that Black Cockatoos will utilise as breeding trees, according to DSEWPaC (2012).

The following information was collected for all potential breeding trees with a Diameter at Breast Height (DBH) >500 mm (*Eucalyptus wandoo* >300 mm). Details collected for each tree included:

- location
- tree species
- DBH
- number of potentially suitable hollows
- hollow details – including dimensions, height from ground, direction, type of hollow, evidence of use, etc.

Table 7 potential breeding Habitat for Black Cockatoo Species

Habitat	Carnaby's Cockatoo	Forest Red-Tailed Black Cockatoo	Baudin's Cockatoo
Specific breeding habitat	Generally in woodland or forest, but also breeds in former woodland or forest now present as isolated trees. Nest in hollows in live or dead trees of salmon gum *E. salmonophloia*, wandoo, tuart, jarrah *E. marginata*, flooded gum *E. rudis*, york gum *E. loxophleba subsp. loxophleba*, powderbark *E. accedens*, karri and marri.	Generally in woodland or forest, but may also breed in former woodland or forest now present as isolated trees. Nest in hollows in live or dead trees of marri, karri, wandoo, bullich *E. megacarpa*, blackbutt *E. patens*, tuart and jarrah.	Generally in woodland or forest, but may also breed in former woodland or forest now present as isolated trees. Nest in hollows in live or dead trees of karri *Eucalyptus diversicolor*, marri *Corymbia calophylla*, wandoo *E.wandoo* and tuart *E. gomphocephala*.
Definition of breeding habitat	'Breeding habitat' is defined in these referral guidelines as trees of species known to support breeding within the range of the species which either have a suitable nest hollow OR are of a suitable DBH to develop a nest hollow. For most tree species, suitable DBH is 500 mm. Note that *E. wandoo* is DBH >300 mm.		

Source: DSEWPaC (2012).

4.1.2 Roosting Habitat

Table 8 defines the suitable trees that the three Western Australian Black Cockatoo species may utilise as roosting trees. Both white-tailed Black Cockatoo species roost in or near riparian environments or near other permanent water sources. The Forest Red-Tailed Black Cockatoo prefers the edges of forests for roosting (DSEWPaC, 2012). Potential roosting trees were searched for and assessed during the field survey.

Evidence of roosting usually involves large amounts of bird scat beneath a large, mature tree, with a significant amount of broken branches, twigs etc. on the ground. Roosting sites were searched for throughout the survey area.

Table 8 Suitable Roosting Trees for the Three Western Australian Threatened Black Cockatoo Species

Carnaby's Cockatoo	Forest Red-Tailed Black Cockatoo	Baudin's Cockatoo
Generally in or near riparian environments or natural and artificial permanent water sources. Flat-topped yate *E. occidentalis*, salmon gum, wandoo, marri, karri, blackbutt, tuart, introduced eucalypts (for example blue gum) and introduced pines.	Tall jarrah, marri, blackbutt, tuart and introduced eucalypt trees within or on the edges of forests.	Generally in or near riparian environments or other permanent water sources. Jarrah, marri, flooded gum, blackbutt *E. patens*, tuart, and introduced eucalypts including blue gum *E. globulus*, and lemon scented gum *Corymbia citriodora*.

Source: DSEWPaC (2012).

4.1.3 Foraging Habitat

The quality of foraging habitat not only reflects the availability of food sources, but also the proximity to reliable water sources, connectivity to other suitable habitat, presence of breeding and potential breeding trees, and proximity to confirmed roost and breeding sites (amongst others). These parameters were utilised by the DotEE (2017) to produce a draft quality of foraging habitat scoring system, which has been slightly amended by AECOM (Table 11). This scoring system was utilised to assess potential foraging habitat for Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo throughout the survey area.

The scoring tool is used by initially defining the quality of the overall habitat present (i.e. Very High Quality, High Quality, Quality and Low Quality) and then adding or subtracting points from this depending on the ecological values of the habitat (i.e. proximity to water, proximity to a known roost site, evidence of foraging material etc.). This determines an overall quantitative rating. Table 9 defines the levels of foraging habitat quality used during the assessment.

Table 10 reflects the Foraging and common food items for the black cockatoo species.

Table 9 Black Cockatoo Foraging Assessment Scoring

Score	Foraging Quality
1 – 3	Low Quality
4 – 6	Quality
7 – 8	High Quality
>8	Very High Quality

Table 10 Foraging and Common Food Items for the Black Cockatoo Species

Species	Carnaby's Cockatoo	Forest Red-tailed Black Cockatoo	Baudin's Cockatoo
Foraging	Native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp. Forages in pine plantations (*Pinus* spp.), eucalypt woodland and forest that contains foraging species. Also individual trees and small stands of these species.	Jarrah and marri woodlands and forest, and edges of karri forests including wandoo and blackbutt, within the range of the subspecies.	Eucalypt woodlands and forest, and proteaceous woodland and heath. During the breeding season feed primarily on native vegetation, particularly marri. Outside the breeding season, may feed in fruit orchards (mostly apple and pear, but also persimmon) and tips of *Pinus* spp.
Foraging: common food items	Seeds, flowers and nectar of native proteaceous plant species (for example, *Banksia* spp., *Hakea* spp., *Dryandra* spp, and *Grevillea* spp), eucalypts and Callistemon. Also seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds and pecan nuts; insects and insect larvae; occasionally flesh and juice of apples and persimmons.	Mostly seeds of marri and jarrah, also *Eucalyptus caesia*, *illyarrie E. erythrocorys* and some introduced eucalypts such as river red gum *E. camaldulensis* and flooded gum *E. grandis*, *Allocasuarina* cones, fruits of snottygobble *Persoonia longifolia* and mountain marri *Corymbia haematoxylon*. On the Swan Coastal Plain, often feed on introduced cape lilac *Melia azedarach*.	Mostly marri (seeds, flowers, nectar and grubs) and proteaceous trees and shrubs. Also other native seeds and introduced fruits; insects and insect larvae; pith of kangaroo paw *Anigozanthos flavidus*; juice of ripe persimmons; tips of *Pinus* spp. And seeds of apples and pears.

Source: DSEWPaC (2012).

Table 11 Quality of Foraging Habitat Assessment Tool

Initial Score	Carnaby's Cockatoo	Forest Red-tailed Black Cockatoo	Baudin's Cockatoo
10	Quality foraging habitat that is being managed for black cockatoos, including successful rehabilitation, and/or has some level of protection from clearing	Quality foraging habitat that is being managed for black cockatoos, including successful rehabilitation, and/or has some level of protection from clearing	Quality foraging habitat that is being managed for black cockatoos, including successful rehabilitation, and/or has some level of protection from clearing
7	Native shrubland, kwongan heathland and woodland dominated by proteaceous plant species (e.g. *Banksia* sp., *Hakea* sp. and *Grevillea* sp.) as well as eucalypt (not mallee) woodland and forest that is dominated by foraging species. Does not include orchards, canola, or areas under a RFA	Jarrah and Marri woodlands and forest, and edges of Karri forests, including Wandoo and Blackbutt, within the range of the subspecies. Does not include areas under a RFA	Eucalypt woodlands and forest, and proteaceous woodland and heath, particularly marri. Does not include orchards or areas under RFA
5	Pine plantation, mallee eucalypts, introduced eucalypts and /or native vegetation with foraging species that are not dominant	Introduced eucalypts, introduced Cape lilac (*Melia acedarach*) and /or native vegetation with foraging species that are not dominant	Pine plantation or introduced eucalypts
1	Individual foraging plants or small stand of foraging plants (≤2 ha)	Individual foraging plants or small stand of foraging plants (≤2 ha)	Individual foraging plants or small stand of foraging plants (≤2 ha)
Additions: Context adjustor – attributes improving habitat quality			
+3	Is within the Swan Coastal Plain	Jarrah and/or Marri shows good recruitment (i.e. evidence of young trees)	Is within the known foraging area
+3	Contains trees known to be used for breeding and / or with suitable nest hollows	Contains trees known to be used for breeding and / or with suitable nest hollows	Contains trees known to be used for breeding
+2	Primarily comprises Marri	Primarily contains Marri and / or Jarrah	Primarily contains marri
+2	Contains trees with potential to be used for breeding (DBH ≥500 mm or ≥300 mm for Salmon Gum and Wandoo)		
+1	Known to be a large or key roosting site		
Subtractions: Context adjustor – attributes reducing habitat quality			
-2	Does not contain evidence of foraging by species		
-2	No other foraging habitat within 6 km		
-1	Is >12km from known roosting site		
-1	Is >12 km from known breeding location		
-1	Is >2 km from watering point		
-1	Disease present (e.g. *Phytophthora cinnamomi* or Marri canker)		

Source: DotEE (2017) – amended by AECOM

4.2 Survey Limitations

Table 12 Survey Limitations

Limitation	Black Cockatoo Survey
Competency/experience of consultant conducting survey	**Nil** Floora is an ecologist with over 12 years' environmental industry experience and Laura is an ecologist with three years environmental industry experience. Both have conducted environmental surveys in a range of bioregions within Western Australia.
Scope (i.e. what life forms were sampled)	**Minor** All areas of potential foraging habitat were inspected and every potential breeding tree within the survey area was assessed for suitability. Due to size of some trees, vision of the entire tree was not always possible when looking for hollows, and in this case the precautionary principle was utilised.
Proportion of fauna identified, recorded and/or collected (based on sampling, timing and intensity)	**Minor** A flock of Carnaby's Cockatoo was identified in the survey area during the first ecological survey conducted for the Project. No direct or indirect evidence of the Forest Red-tailed Black Cockatoo or Baudin's Cockatoo were recorded during the survey.
Sources of information	**Minor** DBCA database, Naturemap, EPBC Act PMST and DSEWPaC (2012) and DotEE (2017) were utilised to inform the Black Cockatoo survey.
Completion (is further work needed)	**Nil** The objectives of the targeted Black Cockatoo survey were met and no further work is required.
Timing, weather, season, cycle	**Nil** All Black Cockatoo species have been recorded on the Swan Coastal Plain during the survey period.
Disturbances (e.g. fire flood, accidental human intervention) which affected results of the survey	**Nil** The Targeted Black Cockatoo survey was not disrupted or impacted.
Intensity (was the intensity adequate)	**Nil** The survey area was assessed over a one day period which enabled sufficient time to assess each vegetation patch and potential breeding habitat tree.
Resources (degree of expertise available in animal identification)	**Nil** The resources (time, equipment and expertise) were sufficient for a Black Cockatoo survey. Floora is an ecologist with over 12 years' environmental industry experience and Laura is an ecologist with three years environmental industry experience.
Remoteness and/or access problems	**Nil** The majority of the survey area was traversed on-ground and was accessible.
Availability of contextual information on the region	**Nil** Sufficient contextual information is available on the Swan Coastal Plain.

5.0 Results and Discussion

The survey area is within the modelled distribution of Carnaby's Cockatoo *Calyptorhynchus latirostris*, the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* and Baudin's Cockatoo *Calyptorhynchus baudinii*, according to the Protected Matters Search Tool (PMST) and DSEWPaC (2012).

5.1 Breeding and Potential Breeding Trees

The survey area contains a total of 109 trees defined as potential Black Cockatoo breeding habitat trees according to the DSEWPaC (2012) guidelines (hollow-forming eucalypts with DBH ≥500 mm, ≥300 mm for Salmon Gum *Eucalyptus salmonophloia* and Wandoo *Eucalyptus wandoo*). Seven of these 109 trees contained hollows that were potentially suitable for use by breeding Black Cockatoos. Refer to Table 13 for the details of the seven trees, and Figure 3 and Appendix A for details of all 109 trees.

Table 13 Potential Black Cockatoo Breeding Trees within the survey area

ID	Longitude	Latitude	Species	Height (m)	DBH (cm)	Number of potentially suitable hollows
50	115.7984	-33.2035	Stag	18	85.3	2
67	115.804	-33.2103	*Eucalyptus grandis* (Flooded Gum)	18	103.4	1
74	115.8047	-33.2053	Stag	6	105.6	2
76	115.8028	-33.2098	*Corymbia calophylla* (Marri)	14	91	1
90	115.8029	-33.2093	*Corymbia calophylla* (Marri)	14	69	1
106	115.8088	-33.2089	*Corymbia calophylla* (Marri)	15	88	1
108	115.804	-33.2066	*Corymbia calophylla* (Marri)	12	79	1

5.2 Roosting Trees

No roosting trees were identified within the survey area.

5.3 Foraging Habitat

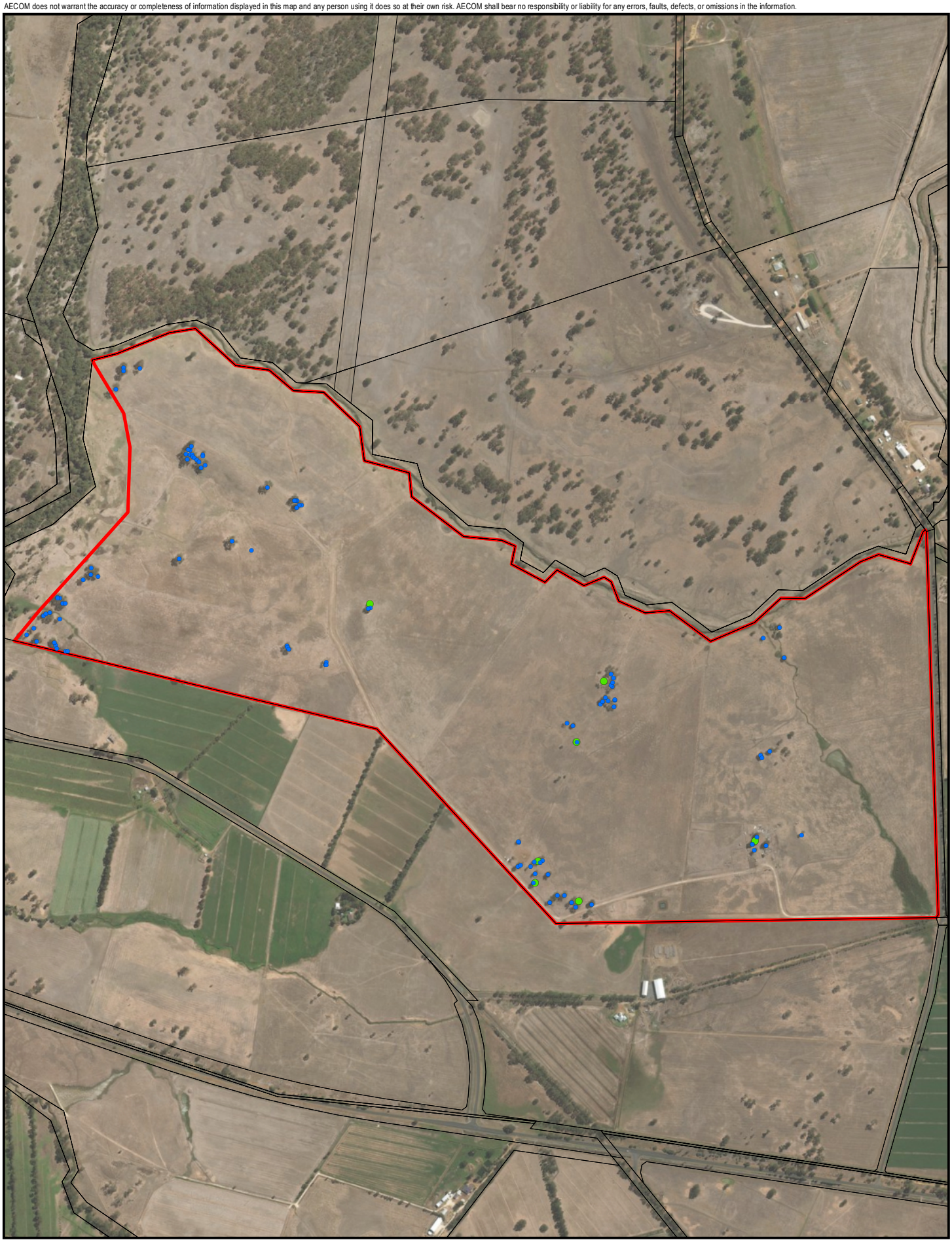
The survey area contains a total of 0.56 ha of High Quality, 1.47 ha of Quality and 0.04 ha of Low Quality Carnaby's Cockatoo *Calyptorhynchus latirostris* foraging habitat (Figure 4). This comprised; paddocks with scattered remnant native trees over weeds. Signs of disease may be present in the area, with a number of dead and/or dying eucalypts. No Carnaby's Cockatoo *Calyptorhynchus latirostris* foraging evidence was recorded in the survey area.

The survey area contains a total of 0.56 ha of Quality and 1.47 ha of Low Quality Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* foraging habitat (Figure 5). This comprised; paddocks with scattered remnant native trees over weeds. Signs of disease may be present in the area, with a number of dead and/or dying eucalypts. No Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* foraging evidence was recorded in survey area.

The survey area contains a total of 0.56 ha of Quality and 1.47 ha of Low Quality Baudin's Cockatoo *Calyptorhynchus baudinii* foraging habitat. This comprised; comprising paddocks with scattered remnant native trees over weeds (Figure 6). Signs of disease may be present in the area, with a number of dead and/or dying eucalypts. No Baudin's Cockatoo *Calyptorhynchus baudinii* foraging evidence was recorded in survey area.

The foraging habitat assessment is presented in Appendix B. This defines 11 areas that were subject to assessment, as identified in Figures 4-6. The assessment was predominantly defined by the presence of hollow-bearing trees.

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LAST MODIFIED 28 MAY 2019

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DATUM GDA 1994, PROJECTION MGA ZONE 50

0 100 200 300 400
metres

1:12,500 when printed at A4

LEGEND

- Black Cockatoo Survey Area
- Cadastre
- Black Cockatoo Breeding Trees
- Potential Black Cockatoo Breeding Trees

Data sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGR D, IGN, and the GIS User Community

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Black Cockatoo Breeding Trees

SOUTH ENERGY

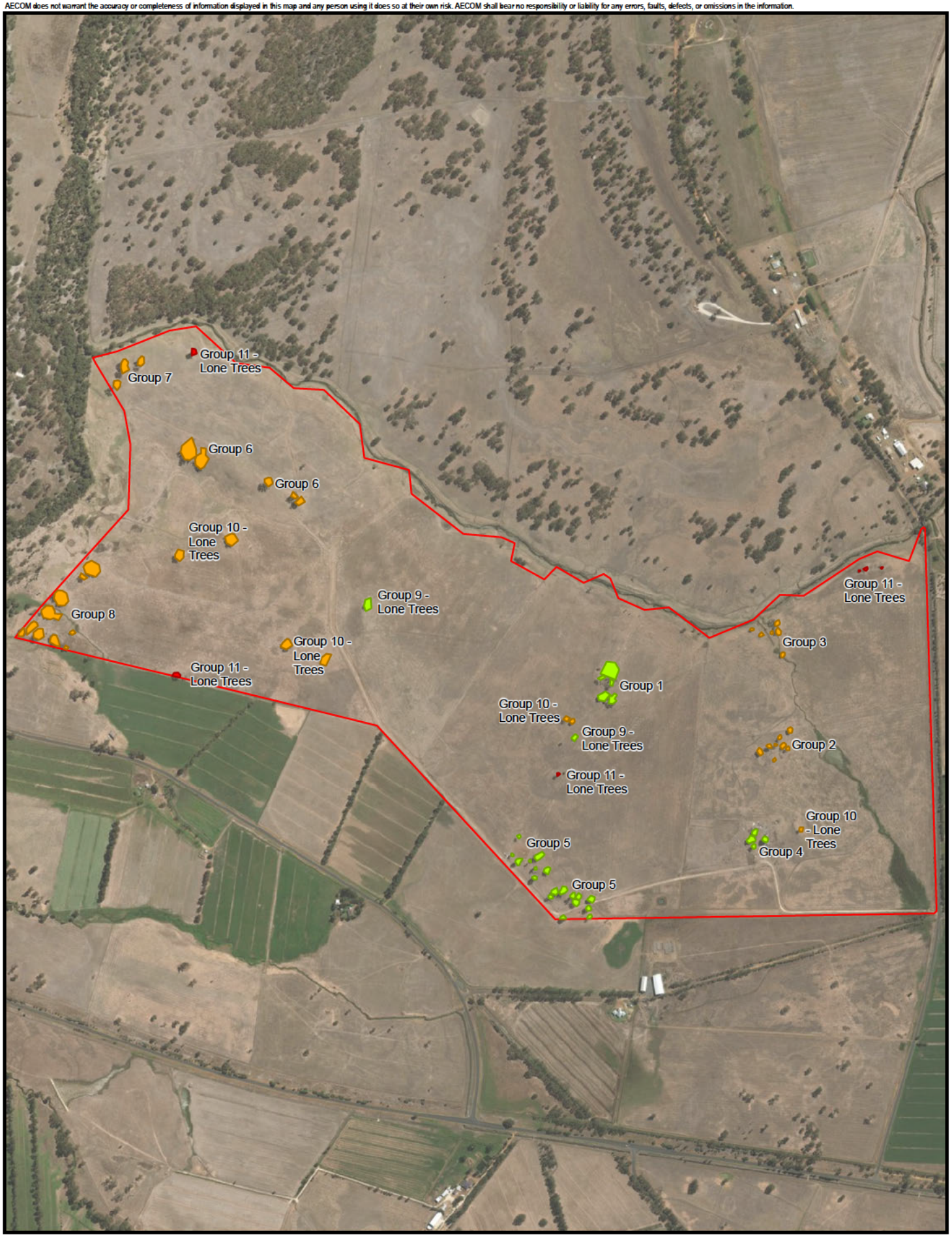
BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure
3

Map Document: G:\GIS_Projects\60590393_BengerSolarFarm_MELB\02_MXDs\20190528_BCReportFigures\G60590393_Fig3_BCBreedingTrees.mxd (wyattk2)

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0 100 200 300 400
metres

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LEGEND

- Black Cockatoo Survey Area
- High Quality
- Quality
- Low Quality

Data sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Carnaby's Black Cockatoo Foraging Habitat

SOUTH ENERGY

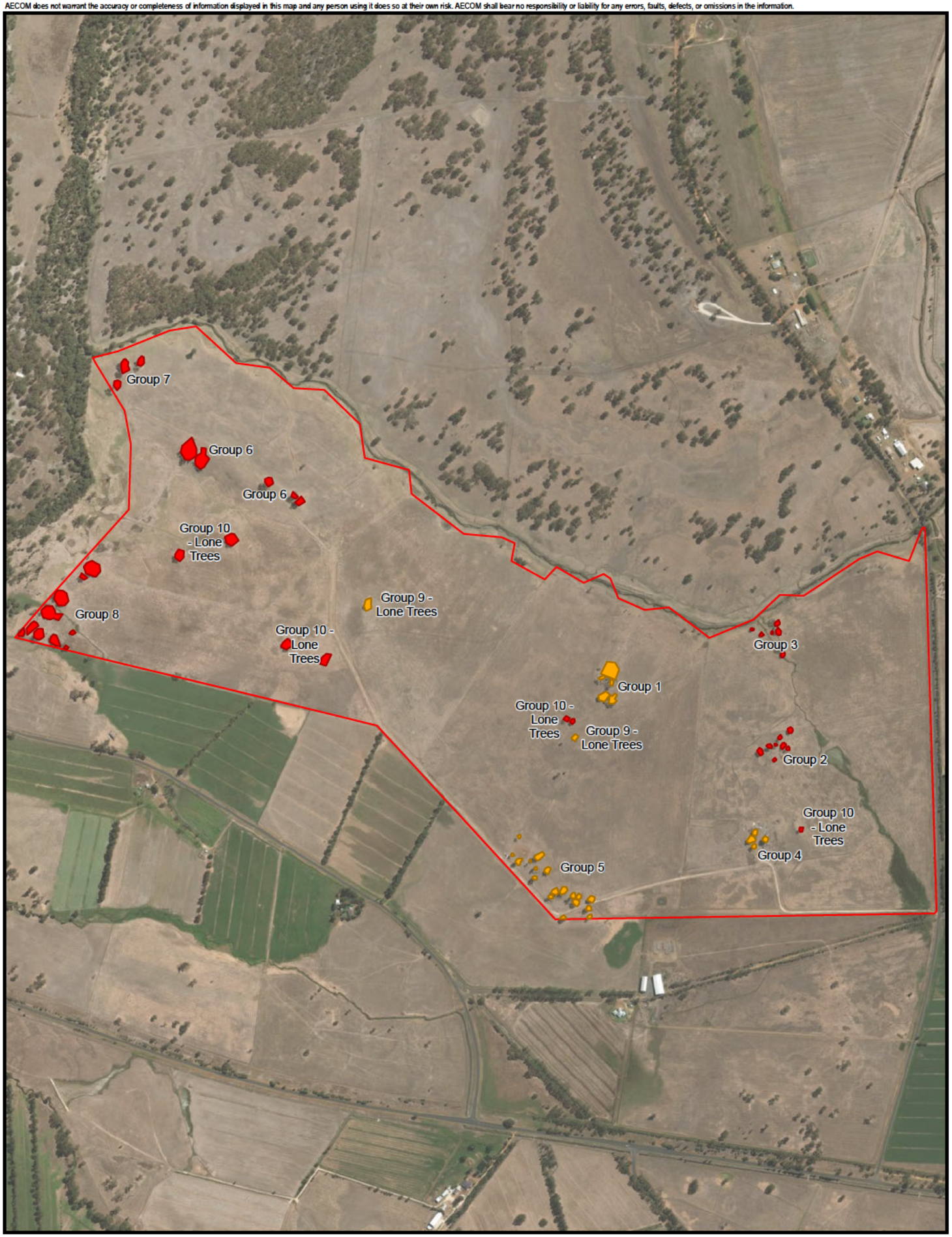
BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure 4

Map Document: G:\GIS_Projects\60590393_BengerSolarFarm_MELB\02_MXDs\20190528_BCReportFigures\G60590393_Fig4_CarnabysBCForagingHabitat.mxd (tynan.schweitzer)

A4 size

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DATUM GDA 1994, PROJECTION MGA ZONE 50

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metres

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LEGEND

- Black Cockatoo Survey Area
- Quality
- Low Quality

Data sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Forest Red-tailed Black Cockatoo Foraging Habitat

SOUTH ENERGY

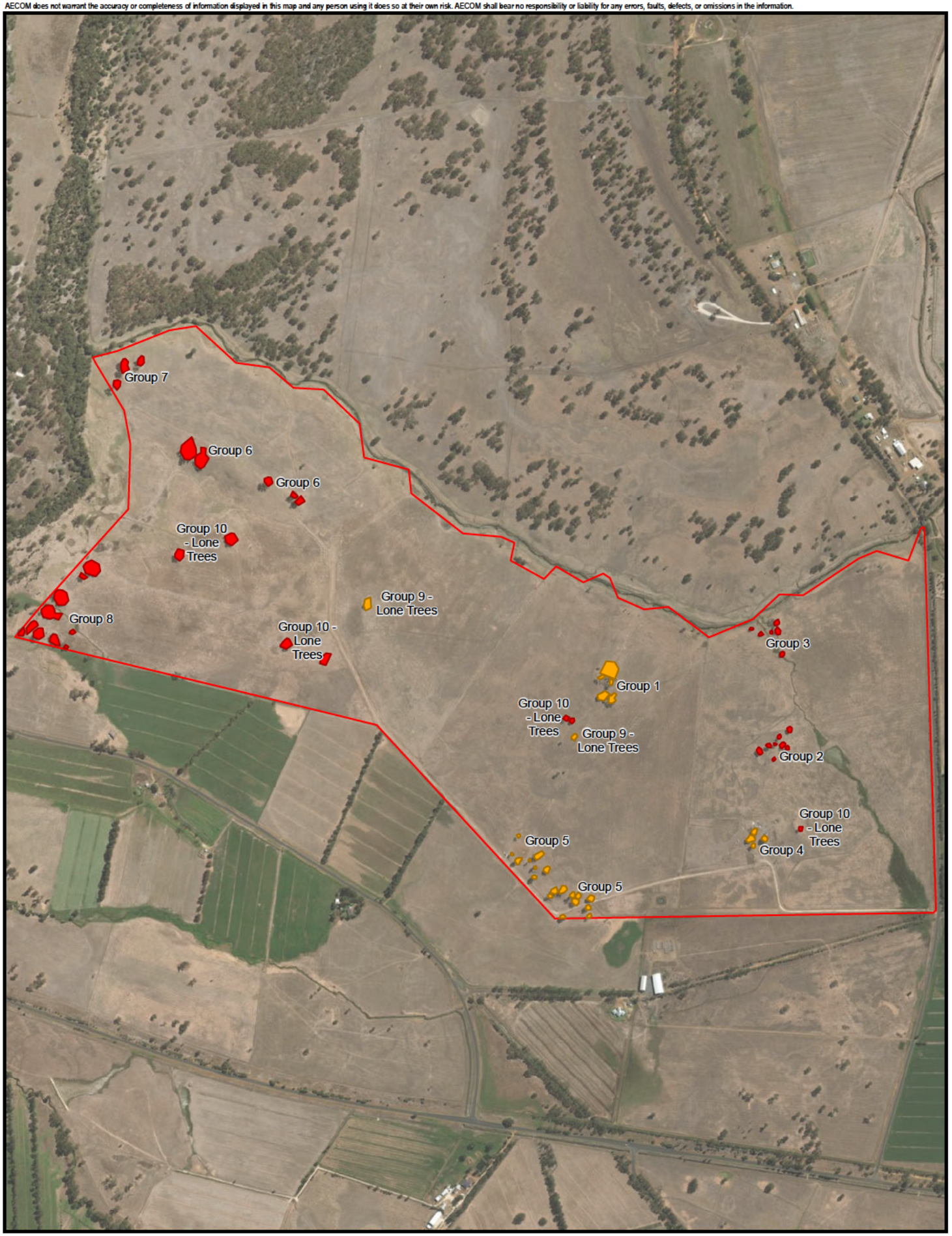
BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure 5

Map Document: G:\GIS_Projects\60590393_BengerSolarFarm_MELB\02_MXDs\20190528_BCReportFigures\G60590393_Fig5_ForestRTBCForagingHabitat.mxd (tynan.schweitzer)

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DATUM GDA 1994, PROJECTION MGA ZONE 50

0 100 200 300 400
metres

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LEGEND
- Black Cockatoo Survey Area
- Quality
- Low Quality

Data sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2018).

Baudin's Cockatoo Foraging Habitat

SOUTH ENERGY

BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure 6

Map Document: G:\GIS_Projects\60590393_BengerSolarFarm_MELB\02_MXDs\20190528_BCReportFigures\G60590393_Fig6_BaudinsBCForagingHabitat.mxd (tynan.schweitzer)

A4 size

6.0 Conclusion

6.1 Summary

While the survey area is comprised of scattered trees over cleared paddocks the trees have both breeding and foraging habitat value for Threatened black cockatoo species. In summary, the significant values of the survey area include:

- the presence of 109 trees defined as potential Black Cockatoo breeding habitat trees. Seven of these 109 trees contained hollows that were potentially suitable for use by breeding Black Cockatoos
- 0.56 ha of High Quality, 1.47 ha of Quality and 0.04 ha of Low Quality Carnaby's Cockatoo *Calyptorhynchus latirostris* foraging habitat
- 0.56 ha of Quality and 1.47 ha of Low Quality Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* foraging habitat
- 0.56 ha of Quality and 1.47 ha of Low Quality Baudin's Cockatoo *Calyptorhynchus baudinii* foraging habitat.

6.2 Recommendations

The clearing of breeding trees with hollows and clearing of more than 1 ha of foraging vegetation would require referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). If South Energy can retain these trees and high quality habitat then it could be argued that the impact on the species would not be significant and therefore would not require referral.

The clearing recommended in Figure 7 amounts to 0.971 hectares of black cockatoo habitat under the EPBC Act which would also be classed as native vegetation under the EP Act. This clearing would not be seen as 'significant' under the EPBC Act so therefore does not need to be referred.

Clearing of native vegetation in Western Australia requires a Native Vegetation Clearing Permit under Part V of the EP Act unless the clearing is undertaken as part of a permissible exemption.

The relevant exemptions for the clearing at this site are:

- Regulation 5, Item 1: Clearing to construct a building. Clearing must be done by or with the prior authority of the owner of the property on which the clearing is to take place. Clearing of native vegetation for the lawful construction of a building or other structure is exempt as long as other relevant approvals have been obtained, including any planning approvals and building licence. Clearing must only be to the extent necessary for the building or other structure. For example, this exemption does not allow you to clear a large area to simply install a 2m x 3m garden shed. This exemption does not allow clearing of riparian vegetation. Under this item you should note that clearing for a building, combined with other exempt clearing activities on the property, must not exceed five hectares in a financial year.
- Regulation 5, Item 12 Clearing for vehicular tracks. Clearing to construct a vehicular track on a property, being clearing which does not, together with all other limited clearing carried out on the property in the financial year in which the clearing takes place, exceed five hectares, if –

(a) the clearing for the track is no wider than necessary

(b) there is at least 100 metres between that track and any other cleared land that can be used for the purpose for which the particular track is intended

(c) the vegetation is not in a road reserve

(d) the vegetation is not riparian vegetation (unless there is no reasonable alternative route and the track is necessary for the commercial activities carried out on the property).

Under this item you should note that clearing for a building, combined with other exempt clearing activities on the property, must not exceed five hectares in a financial year.

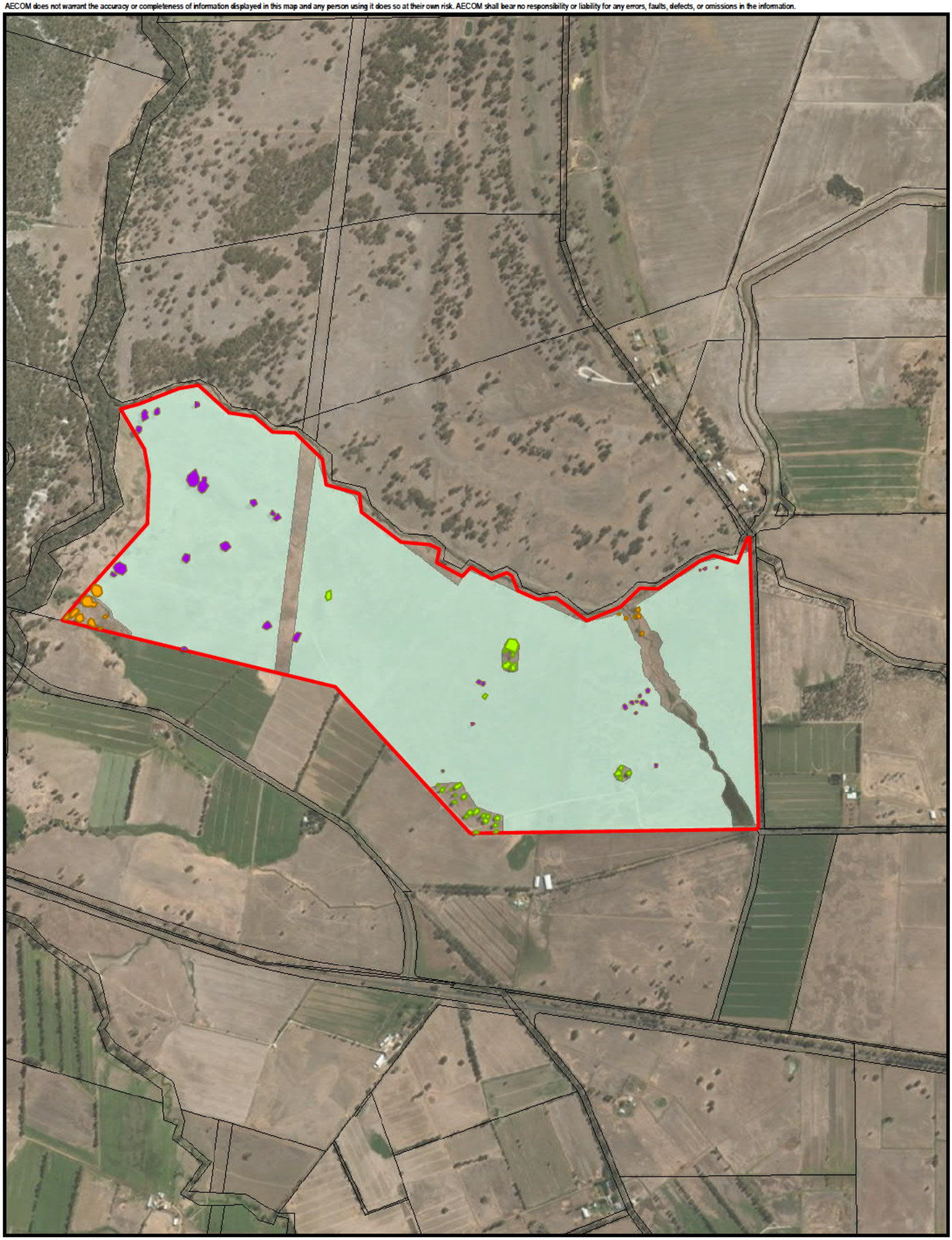
- Regulation 5, Item 19 Clearing of isolated trees. Clearing of a tree on a property that is in an otherwise cleared area on the property and is more than 50 metres from any other native vegetation, being vegetation which does not, together with all other limited clearing carried out on the property in the financial year in which the clearing takes place, exceed five hectares.

This means that if you clear for any of the following purposes, the clearing must not add up to more than five hectares in a financial year.

- Clearing to construct a building (Item 1)
- Clearing to collect firewood (Item 5)
- Clearing to obtain fencing or farming materials (Item 6)
- Clearing for woodwork (Item 7)
- Clearing for fence lines (Item 10)
- Clearing for vehicular tracks (Item 12)
- Clearing for walking tracks (Item 13)
- Clearing isolated trees (Item 19)

This exemption does not apply in an environmentally sensitive area.

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DATUM GDA 1994, PROJECTION MGA ZONE 50

0 130 260 390 520
metres

1:16,554 when printed at A4

LEGEND

- Accepted Vegetation Removal Areas
- Black Cockatoo Survey Area
- Potential Untilisation Areas
- Cadastre

Carnaby Habitats

- High Quality
- Quality
- Low Quality

Data sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2018).

Black Cockatoo Breeding Trees, Recommended Accepted Clearing Areas

SOUTH ENERGY

BENGER SOLAR FARM - BLACK COCKATOO ASSESSMENT

Figure 7

Map Document: \\auper1gis01\geo\GIS_Projects\60590393_BengerSolarFarm_MELB\02_MXDs\20190528_BCReportFigures\G60590393_Fig7_HabitatClearingAreas.mxd (rob.mcgregor)

A4 size

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Appendix A

Breeding and Potential Black Cockatoo Breeding Trees

Appendix A Breeding and Potential Black Cockatoo Breeding Trees

ID	Longitude	Latitude	Species	Tree Height (m)	DBH (cm)	Number of Potentially Suitable Hollows
1	115.7923	-33.198	*Eucalyptus grandis* (Flooded Gum)	20	165	0
2	115.7916	-33.1985	*Corymbia calophylla* (Marri)	25	98	0
3	115.7957	-33.2008	*Corymbia calophylla* (Marri)	35	140	0
4	115.7966	-33.2012	*Corymbia calophylla* (Marri)	35	142.6	0
5	115.7965	-33.2012	*Corymbia calophylla* (Marri)	20	60	0
6	115.7965	-33.2012	*Corymbia calophylla* (Marri)	18	85.6	0
7	115.7918	-33.198	Stag	10	129	0
8	115.7947	-33.202	*Corymbia calophylla* (Marri)	18	59	0
9	115.7918	-33.1981	*Corymbia calophylla* (Marri)	25	100	0
10	115.7935	-33.2001	*Corymbia calophylla* (Marri)	35	167	0
11	115.7965	-33.2011	*Corymbia calophylla* (Marri)	33	119	0
12	115.7935	-33.2	*Corymbia calophylla* (Marri)	30	86.5	0
13	115.7964	-33.2011	*Corymbia calophylla* (Marri)	35	106	0
14	115.7936	-33.1999	*Corymbia calophylla* (Marri)	14	59.8	0
15	115.7964	-33.2011	*Corymbia calophylla* (Marri)	20	52	0
16	115.7935	-33.1999	*Corymbia calophylla* (Marri)	30	72	0
17	115.7952	-33.2022	*Corymbia calophylla* (Marri)	30	50	0
18	115.7936	-33.1998	Stag	20	62	0
19	115.7933	-33.2024	*Corymbia calophylla* (Marri)	30	89	0
20	115.7939	-33.2	*Corymbia calophylla* (Marri)	30	99.3	0
21	115.7936	-33.2	Stag	15	105	0
22	115.7939	-33.2	*Corymbia calophylla* (Marri)	30	65	0
23	115.794	-33.2002	*Corymbia calophylla* (Marri)	18	61.7	0
24	115.7902	-33.2044	*Corymbia calophylla* (Marri)	20	70.6	0
25	115.7936	-33.2	*Corymbia calophylla* (Marri)	30	149	0

ID	Longitude	Latitude	Species	Tree Height (m)	DBH (cm)	Number of Potentially Suitable Hollows
26	115.7899	-33.2043	*Eucalyptus grandis* (Flooded Gum)	10	103.4	0
27	115.7937	-33.2	*Eucalyptus grandis* (Flooded Gum)	30	149	0
28	115.7894	-33.2042	*Corymbia calophylla* (Marri)	18	68.4	0
29	115.7937	-33.2001	*Corymbia calophylla* (Marri)	17	51	0
30	115.7938	-33.2001	*Corymbia calophylla* (Marri)	17	61	0
31	115.7891	-33.2041	*Eucalyptus grandis* (Flooded Gum)	24	108	0
32	115.7938	-33.2002	*Corymbia calophylla* (Marri)	16	58	0
33	115.7939	-33.2003	*Corymbia calophylla* (Marri)	15	56	0
34	115.7893	-33.2039	*Eucalyptus grandis* (Flooded Gum)	8	79	0
35	115.7897	-33.2036	*Corymbia calophylla* (Marri)	17	94.5	0
36	115.7902	-33.2044	Stag	15	64	0
37	115.79	-33.2037	*Corymbia calophylla* (Marri)	16	68.4	0
38	115.7907	-33.2028	*Corymbia calophylla* (Marri)	14	79.8	0
39	115.7899	-33.2044	*Corymbia calophylla* (Marri)	16	58	0
40	115.7909	-33.2027	*Corymbia calophylla* (Marri)	18	78	0
41	115.7909	-33.2025	*Eucalyptus grandis* (Flooded Gum)	20	84	0
42	115.7898	-33.2042	*Corymbia calophylla* (Marri)	11	81	0
43	115.791	-33.2027	*Corymbia calophylla* (Marri)	15	67	0
44	115.7896	-33.2036	*Corymbia calophylla* (Marri)	10	56	0
45	115.7972	-33.2048	*Corymbia calophylla* (Marri)	16	59.2	0
46	115.7896	-33.2036	*Corymbia calophylla* (Marri)	15	111	0
47	115.7972	-33.2048	Stag	20	112	0
48	115.7972	-33.2048	*Corymbia calophylla* (Marri)	15	66.5	0
49	115.79	-33.2032	*Corymbia calophylla* (Marri)	15	58	0
50	115.7984	-33.2035	Stag	18	85.3	2
51	115.7984	-33.2035	*Corymbia calophylla* (Marri)	12	66.5	0

ID	Longitude	Latitude	Species	Tree Height (m)	DBH (cm)	Number of Potentially Suitable Hollows
52	115.79	-33.2032	*Corymbia calophylla* (Marri)	15	60	0
53	115.8023	-33.2095	Stag	22	111.4	0
54	115.7901	-33.2033	*Corymbia calophylla* (Marri)	14	55	0
55	115.8027	-33.2095	*Corymbia calophylla* (Marri)	18	84	0
56	115.8028	-33.2096	*Corymbia calophylla* (Marri)	16	56.6	0
57	115.7866	-33.1972	*Corymbia calophylla* (Marri)	16	75	0
58	115.8032	-33.2103	*Corymbia calophylla* (Marri)	18	60.7	0
59	115.8034	-33.2101	*Eucalyptus grandis* (Flooded Gum)	14	61	0
60	115.7902	-33.2033	*Corymbia calophylla* (Marri)	16	70	0
61	115.8036	-33.2101	*Corymbia calophylla* (Marri)	16	70	0
62	115.7962	-33.2044	*Corymbia calophylla* (Marri)	14	60	0
63	115.7962	-33.2044	*Corymbia calophylla* (Marri)	14	54	0
64	115.8038	-33.2103	*Corymbia calophylla* (Marri)	25	117.7	0
65	115.8039	-33.2104	*Corymbia calophylla* (Marri)	20	82	0
66	115.7962	-33.2045	*Corymbia calophylla* (Marri)	15	108	0
67	115.804	-33.2103	*Eucalyptus grandis* (Flooded Gum)	18	103.4	1
68	115.7984	-33.2036	*Corymbia calophylla* (Marri)	14	94	0
69	115.8043	-33.2103	*Eucalyptus grandis* (Flooded Gum)	150	98	0
70	115.8037	-33.2062	*Corymbia calophylla* (Marri)	16	56.6	0
71	115.8024	-33.2094	*Corymbia calophylla* (Marri)	15	90	0
72	115.8039	-33.2063	*Corymbia calophylla* (Marri)	14	73.5	0
73	115.8028	-33.2098	*Corymbia calophylla* (Marri)	14	50	0
74	115.8047	-33.2053	Stag	6	105.6	2
75	115.8049	-33.2051	*Corymbia calophylla* (Marri)	17	77.6	0
76	115.8028	-33.2098	*Corymbia calophylla* (Marri)	14	91	1

ID	Longitude	Latitude	Species	Tree Height (m)	DBH (cm)	Number of Potentially Suitable Hollows
77	115.805	-33.2054	*Corymbia calophylla* (Marri)	25	79	0
78	115.8049	-33.2054	*Corymbia calophylla* (Marri)	24	65.5	0
79	115.8032	-33.2097	*Corymbia calophylla* (Marri)	16	84	0
80	115.805	-33.2053	*Corymbia calophylla* (Marri)	20	56	0
81	115.805	-33.2052	*Corymbia calophylla* (Marri)	22	60.4	0
82	115.8095	-33.2041	*Eucalyptus grandis* (Flooded Gum)	10	66.5	0
83	115.803	-33.2093	*Corymbia calophylla* (Marri)	15	74	0
84	115.8096	-33.2048	*Eucalyptus grandis* (Flooded Gum)	10	97	0
85	115.8092	-33.2069	*Corymbia calophylla* (Marri)	16	66.2	0
86	115.81	-33.2088	*Corymbia calophylla* (Marri)	18	55.7	0
87	115.8088	-33.2088	*Corymbia calophylla* (Marri)	14	64	0
88	115.8029	-33.2094	*Corymbia calophylla* (Marri)	15	99	0
89	115.8088	-33.2092	*Corymbia calophylla* (Marri)	14	61	0
90	115.8029	-33.2093	*Corymbia calophylla* (Marri)	14	69	1
91	115.8091	-33.209	*Corymbia calophylla* (Marri)	16	52	0
92	115.8028	-33.2094	*Corymbia calophylla* (Marri)	18	114	0
93	115.8024	-33.2089	*Corymbia calophylla* (Marri)	15	88	0
94	115.8024	-33.2089	*Corymbia calophylla* (Marri)	15	60	0
95	115.804	-33.2066	Stag	8	87	0
96	115.8046	-33.2058	*Corymbia calophylla* (Marri)	14	53	0
97	115.8047	-33.2057	Stag	10	60	0
98	115.8048	-33.2056	*Corymbia calophylla* (Marri)	15	66	0
99	115.8048	-33.2057	*Corymbia calophylla* (Marri)	15	69	0
100	115.805	-33.2057	*Corymbia calophylla* (Marri)	13	56	0
101	115.805	-33.2057	*Eucalyptus grandis* (Flooded Gum)	8	80	0

ID	Longitude	Latitude	Species	Tree Height (m)	DBH (cm)	Number of Potentially Suitable Hollows
102	115.805	-33.2058	*Corymbia calophylla* (Marri)	14	52	0
103	115.8091	-33.2043	*Corymbia calophylla* (Marri)	13	54	0
104	115.809	-33.207	*Corymbia calophylla* (Marri)	15	61	0
105	115.809	-33.207	*Corymbia calophylla* (Marri)	14	54	0
106	115.8088	-33.2089	*Corymbia calophylla* (Marri)	15	88	1
107	115.8087	-33.209	*Corymbia calophylla* (Marri)	12	68	0
108	115.804	-33.2066	*Corymbia calophylla* (Marri)	12	79	1
109	115.8087	-33.209	*Corymbia calophylla* (Marri)	20	88	0

Appendix B

Black Cockatoo Foraging Assessments

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Appendix B1: Carnaby's Cockatoo Foraging Habitat Assessment

ID	Initial score	Is within the Swan Coastal Plain? (+3)	Contains trees known to be used for breeding and / or with suitable nest hollows (+3)	Primarily comprises Marri (+2)	Contains trees with potential to be used for breeding (DBH ≥500 mm or ≥300 mm for Salmon Gum and Wandoo (+2)	Known to be large or key roosting site (+2)	Does not contain evidence of foraging by species (-2)	No other foraging habitat within 6 km (-2)	Is > 12 km from known breeding location (-1)	Is >12km from known roosting site (-1)	Is >2km from watering point (-1)	Disease Present (-1)	Final Score
1	1	3	3	2	2	0	-2	0	0	0	0	-1	8
2	1	3	0	2	2	0	-2	0	0	0	0	-1	5
3	1	3	0	2	2	0	-2	0	0	0	0	-1	5
4	1	3	0	2	2	0	-2	0	0	0	0	-1	5
5	1	3	3	2	2	0	-2	0	0	0	0	-1	8
6	1	3	0	2	2	0	-2	0	0	0	0	-1	5
7	1	3	0	2	2	0	-2	0	0	0	0	-1	5
8	1	3	0	2	2	0	-2	0	0	0	0	-1	5
9	1	3	3	2	2	0	-2	0	0	0	0	-1	8
10	1	3	0	2	2	0	-2	0	0	0	0	-1	5
11	1	3	0	0	0	0	-2	0	0	0	0	-1	3

Appendix B2: Forest Red-tailed Black Cockatoo Foraging Habitat Assessment

ID	Initial score	Jarrah and/or Marri shows good recruitment (+3)	Contains trees known to be used for breeding and / or with suitable nest hollows (+3)	Primarily Contains Marri / jarrah (+2)	Contains trees with potential to be used for breeding (+2)	Known to be large or key roosting site (+2)	No other foraging habitat within 6km (-2)	Is <12km from a known breeding location (-1)	Does not contain evidence of foraging by species (-2)	Is >12km from a known breeding location (-1)	Is >2km from a watering point (-1)	Disease Present (-1)	Final Score
1	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
2	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
3	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
4	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
5	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
6	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
7	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
8	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
9	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
10	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
11	1	0	0	0	0	0	0	0	-2	0	0	0	**-1**

Appendix B3: Baudin's Cockatoo Foraging Habitat Assessment

ID	Initial score	Is within the known foraging area (+3)	Contains trees known to be used for breeding and / or with suitable nest hollows (+3)	Primarily Contains Marri (+2)	Contains trees with potential to be used for breeding (+2)	Known to be large or key roosting site (+2)	No other foraging habitat within 6km (-2)	Is <12km from a known breeding location (-1)	Does not contain evidence of foraging by species (-2)	Is >12km from a known breeding location (-1)	Is >2km from a watering point (-1)	Disease Present (-1)	Final Score
1	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
2	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
3	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
4	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
5	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
6	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
7	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
8	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
9	1	0	3	2	2	0	0	0	-2	0	0	0	**6**
10	1	0	0	2	2	0	0	0	-2	0	0	0	**3**
11	1	0	0	0	0	0	0	0	-2	0	0	0	**-1**