Water Corporation

Greenbushes to Kirup Link

Additional Flora and Fauna Survey and Targeted Black Cockatoo Assessment

December 2018

Executive summary

Water Corporation propose to construct new infrastructure to improve the supply of water to the towns of Balingup, Mullalyup and Kirup, and as a component of the broader Warren Blackwood Water Supply Scheme. This new infrastructure will potentially involve the clearing of vegetation and fauna habitat, disturbance of dieback, and management of contaminated material within the location of the proposed works to facilitate construction and installation of this infrastructure.

Water Corporation has recently identified a section of the pipeline which had not been identified during the initial design phase of the project. This section of the alignment has not previously been surveyed and is likely to require clearing of vegetation and fauna habitat.

GHD Pty Ltd (GHD) was commissioned by Water Corporation to undertake a flora, vegetation and fauna survey, including a targeted black cockatoo assessment of the additional section of the alignment. The purpose of the survey is to delineate key flora, vegetation and fauna values of the site. The outcome of the survey and information supplied in this biological survey report will be used to inform the environmental assessment and approvals process.

This report is subject to, and must be read in conjunction with, the limitations, assumptions and qualifications contained within the report.

Key findings

Flora and vegetation

- Four vegetation types were mapped and described for the survey area, excluding cleared or highly degraded areas containing isolated trees and shrubs. The four vegetation types are variations in Eucalyptus dominated woodlands over a highly modified understorey dominated by weeds with the occasional scattered native species.
- The Eucalyptus woodlands ranged from jarrah-marri dominated woodlands, jarrah-marri-blackbutt woodlands, marri-blackbutt-flooded gum woodlands and small pockets of flooded gum woodlands within the drainage areas.
- Although the remnant vegetation within the survey area is highly altered by disturbances the dominant tree species remaining are consistent with the broader vegetation complexes mapped across the survey area by Smith (1974) and Mattiske and Havel (1998).
- The vegetation within the survey area was rated from Degraded to Completely Degraded. The survey area is highly modified largely as a result of clearing and the spread of invasive weed species.
- No Commonwealth or State listed Threatened Ecological Communities or Priority Ecological Communities were identified within the survey area.
- A total of 61 flora taxa (including subspecies and varieties) representing 23 families and 51 genera was recorded from the survey area.
- A total of 37 introduced flora taxa (60% of the total flora present) were recorded in the survey area. Of these, two species, Bridal Creeper (**Asparagus asparagoides*) and Blackberry *(*Rubus ulmifolius*) are listed as a Declared Pest Plants under the *Biosecurity and Management Act 2007* (BAM Act) and as Weeds of National Significance (WONS).
- No flora of conservation significance was recorded within the project area, and none are considered likely to occur.

Fauna

- The survey area comprised of three broad habitat types including Mixed Eucalypt Woodlands, Flooded Gum Minor Drainage Lines and Cleared/Highly Modified areas. The majority of the survey area consists of a mixed woodland of *Corymbia calophylla* (marri), *Eucalyptus marginata* (jarrah), *E. patens* (Blackbutt) and *E. rudis* (flooded gum) with the occasional scattered introduced *Pinus* (pine) species over introduced herbs and grasses.
- The vegetation remaining within the survey area forms a narrow corridor of remnant vegetation (trees) adjacent to existing roads and tracks, in an area which has been largely cleared for agriculture, pine plantations and Balingup town site.
- A total of 28 fauna species (4 introduced) were recorded within the survey area, including 19 birds, four mammals one reptile and four amphibian species.
- Two conservation significant fauna species were identified during the field survey. They were:
  - Forest red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), listed Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Wildlife Conservation Act 1950* (WC Act) – observed foraging within the survey area and adjacent properties
  - Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), listed as Endangered under the EPBC Act and WC Act – evidence of feeding observed on marri nuts
- In addition to the species identified during the field survey, the likelihood of occurrence assessment identified the likely presence of one additional conservation significant species, the Baudin's Black Cockatoo (*Calyptorhynchus baudinii*).
- The majority of the vegetation within the survey area is considered suitable foraging habitat for Black Cockatoos, including the mixed Eucalypt woodlands of jarrah, marri, blackbutt and flooded gum as well as the scattered Pine trees. There is approximately 4.3 ha of suitable foraging habitat in the survey area.
- The habitat assessment identified 286 potential breeding trees of suitable diameter at breast height (DBH) (jarrah, marri, blackbutt and flooded gum > 500 mm) from within the survey area. Of the 286 trees, 19 contained hollows of which six were identified with potentially suitable hollows for Black Cockatoo nesting.
- No evidence of roosting by Black Cockatoos was observed within the survey area. The survey area provides limited potential roosting habitat due to the narrow, linear nature of the remaining vegetation within the survey area.

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1. Introduction

1.1 Background

Water Corporation propose to construct new infrastructure to improve the supply of water to the towns of Balingup, Mullalyup and Kirup, and as a component of the broader Warren Blackwood Water Supply Scheme.

This new infrastructure will potentially involve the clearing of vegetation and fauna habitat, disturbance of dieback, and management of contaminated material within the location of the proposed works to facilitate construction and installation of this infrastructure.

Water Corporation has recently identified the need for an additional section of pipeline, not previously considered in the environmental assessments. This section of the alignment is likely to require clearing of vegetation and fauna habitat.

1.2 Purpose of the report

GHD Pty Ltd (GHD) was commissioned by Water Corporation to undertake a flora, vegetation and fauna survey, including a targeted black cockatoo assessment of the additional section of the alignment. The purpose of the survey is to delineate key flora, vegetation and fauna values of the site. The outcome of the survey and information supplied in this biological survey report will be used to inform the environmental assessment and approvals process.

1.3 Project location

1.3.1 Survey area

The survey area is located within the Shires of Donnybrook – Balingup and Bridgetown – Greenbushes. The survey area includes two areas, with the main alignment located at Forrest Street in Balingup town extending approximately 3.5 km south to the Summit Tank site along Old Padbury Road. The alignment ranges from 14 m to 45 m wide, with an average width of 20 m. The other small survey area is located in Mullalyup, and included a 153 m long by 8 m wide section of the alignment. The survey area is 8.82 ha in total. The survey area and local context is shown in Figure 1, Appendix A.

1.3.2 Study area

The study area used for biological based desktop database searches included a 5 km buffer around the survey area extent in order to provide information on the context for the project within the wider area.

1.4 Scope of works

The flora, vegetation and fauna assessment included both desktop and field assessment. The following actions were completed to fulfil the scope:

- A review of relevant databases including the EPBC Act Protected Matters Search Tool (PMST) and the Department of Biodiversity Conservation and Attractions (DBCA) NatureMap and FloraBase
- Development of base maps (aerial photography with cadastre and land system mapping) for the field survey

- The vegetation complex mapping of the area was referenced to determine the pre-European extent remaining to assess the significance of the proposed native vegetation clearing
- A single season biological survey (by an environmental specialist) was conducted in Spring to verify / ground truth the desktop assessment findings through a targeted and detailed flora and vegetation survey and a Level 1 fauna survey (reconnaissance survey), including a targeted black cockatoo assessment
- Conservation significant flora species were actively searched for based on habitat requirements, and the population extents or locations of any potential Threatened flora, Priority flora and any other flora of local or taxonomic significance were mapped where identified
- Ecological community mapping was undertaken according to National Vegetation Information System (NVIS) structural and floristics (Executive Steering Committee for Australian Vegetation Information (ESCAVI) 2003)
- Vegetation types, condition, conservation significant species were mapped where present
- The vegetation types were described and classified to determine their conservation significance based on an analysis of the floristic data collected
- The significance of any Threatened Ecological Communities (TEC), Priority Ecological Communities (PEC) and any other areas of ecological importance was identified, mapped and discussed based on the results of the field survey
- An inventory of plant taxa (including weed species) was compiled
- An inventory of vertebrate fauna species was compiled through opportunistic recording of species, tracks, scats, bones, diggings and feeding areas
- Potentially occurring significant fauna species (giving specific consideration to Black Cockatoos, Western Ringtail Possum, Chuditch and the Southern Brush-tailed Phascogale) and their habitat were identified, where possible mapped and discussed
- Relevant photograph and figures were included in the reporting, with spatial shapefiles supplied separately

A concise technical report was produced (this document).

1.5 Relevant legislation, conservation codes and background information

In Western Australia (WA) some communities, flora and fauna are protected under both Federal and State Government legislation. In addition, regulatory bodies also provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this Project is provided in Appendix B.

1.6 Report limitations and assumptions

This report has been prepared by GHD for Water Corporation and may only be used and relied on by Water Corporation for the purpose agreed between GHD and the Water Corporation as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Water Corporation arising in connection with this report. The services undertaken by GHD in connection with preparing this

report were limited to those specifically detailed in the Contract and are subject to the scope limitations set out in the Contract.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report (including species listings). GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Water Corporation and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This report has assessed the flora and fauna within the survey area (Figure 1, Appendix A). Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

Prior to the commencement of the field survey, a desktop assessment was undertaken to identity relevant environmental information pertaining to the survey area. This included a review of the information presented in GHD (2017) and an updated search of the following:

- DotEE PMST to identify species and communities listed under the EPBC Act potentially occurring within the survey area (DotEE 2018a) (Appendix C)
- The DBCA TEC and PEC database to determine the potential for TECs or PECs to be present within the survey area (DBCA 2018a)
- The DBCA NatureMap database for flora and fauna species previously recorded within the survey area (DBCA 2007–2018) (Appendix C)
- The DBCA Threatened (Declared Rare) and Priority Flora (TPFL) database and the WA Herbarium (WAHerb) database for Threatened flora species listed under the WC Act and listed as Priority by DBCA, previously recorded within the survey area (DBCA 2018b)
- Existing datasets including previous broad vegetation mapping of the survey area (Smith 1974), historical aerial photography, and hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats

2.2 Field survey

2.2.1 Vegetation and flora

GHD ecologist Erin Lynch (flora license no. SL012374) completed a single season, detailed vegetation and flora assessment of the survey area on the 30 and 31 October 2018; accompanied by Water Corporation Senior Advisor – Environment, Gemma Tribbick. The field survey was undertaken to identify and describe the dominant vegetation types, assess vegetation condition, and identify and record vascular flora taxa present at the time of survey. Targeted searches for conservation significant or other significant ecological communities and flora taxa were also undertaken during the field survey.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a).

Data collection

Field survey methods involved traversing the survey area by foot. No quadrats were undertaken within the survey area due to the highly disturbed condition of the vegetation and dominance of introduced species as well as the linear nature of the vegetation. Relevé and/or photo reference sites were conducted along the alignment to describe the vegetation and physical features of the site. Field data at each site was recorded on a pro-forma data sheet and included the parameters detailed in Table 1.

Table 1 Data collected during the field survey

Aspect	Measurement
Collection attributes	Personnel/recorder; date, photograph of the site.
Physical features	Aspect, soil attributes, ground surface cover, leaf and wood litter.
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool to accuracy approximately ± 5 m.

Aspect	Measurement
Vegetation condition	Vegetation condition was assessed using the condition rating scale adapted by EPA (2016a) for the South West Botanical Province.
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover using NVIS.

A flora inventory was compiled from taxa listed in the relevés/photo reference sit and from opportunistic floristic records throughout the survey area.

Vegetation types

Vegetation types were identified and boundaries delineated using a combination of aerial photography, topographical features and field data/observations.

Vegetation types were described based on structure, dominant taxa and cover characteristics as defined by field observations. Vegetation types descriptions are consistent with NVIS Level V (Association), and are grouped within NVIS Level III (Broad Floristic Formation). At Level V up to three taxa per stratum are used to describe the association (ESCAVI 2003).

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (devised by Keighery (1994) and adapted by EPA (2016a)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is outlined in Appendix B.

Flora identification and nomenclature

Species well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. Plant species were identified with the use of local and regional flora keys and by comparison with the named species held at the WA Herbarium.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–2018) and the EPBC Act Threatened species database provided by DotEE (2018b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase* (WA Herbarium 1998–2018).

2.2.2 Fauna

GHD ecologist Erin Lynch undertook a Level 1 fauna survey (reconnaissance survey) of the survey area in conjunction with the vegetation and flora assessment. The survey area was traversed on foot over the course of the survey to identify and describe the dominant fauna habitat types present and their condition, assess habitat connectivity, and identify and record fauna species within the survey area. An assessment of the likelihood of conservation significant fauna and their habitats occurring within the survey area was also undertaken.

The survey methodology employed by GHD was undertaken with reference to the EPA *Technical Guidance – Sampling methods for terrestrial vertebrate fauna* (EPA 2016b) and *Technical Guidance – Terrestrial Fauna Surveys* (EPA 2016c).

Habitat assessment

The survey area was assessed for habitat type, structural complexity, connectivity, disturbance, type and extent of resource availability and value for fauna. Specifically, the assessment included:

- Habitat structure (e.g. vegetation type, presence/absence of overstorey, midstorey, understorey, and ground cover)
- Presence/absence of refuge including: fallen timber (coarse woody debris), hollow-bearing trees and stags and rocks/breakaways, and the type and extent of each refuge
- Location of the habitat within the survey area in comparison to the habitat within the surrounding landscape
- Habitat connectivity and identification of wildlife corridors within and immediately adjacent to the survey area
- Identification and evaluation of key habitat features and types identified during the desktop assessment relevant to fauna of conservation significance
- Evaluation of the likelihood of occurrence of conservation significant fauna within the habitat (based on presence of suitable habitat)

Opportunistic observations

Opportunistic fauna searches were conducted throughout the survey area and focussed on the following:

- Searching the survey area for tracks, scats, pellets, bones, diggings, feathers, nests and feeding areas indicating the current or recent presence of native and feral fauna
- Searching through microhabitats within the survey area
- Opportunistic observations of species in the survey area, including visual and aural sightings
- Observed fauna were recorded and where conservation significant fauna were identified, photographs, GPS points and habitat data were recorded

Targeted habitat assessment for Black Cockatoo species

A habitat assessment for Black Cockatoo species was conducted with reference to the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso*, (Department of Sustainability, Environment, Water, Populations, and Communities (DSEWPaC 2012). The assessment included the identification, description and recording of:

- Potential and actual breeding habitat (relevant tree species with a DBH of >500 mm for Jarrah, Marri and Flooded Gum or DBH of >300 mm for Wandoo or Salmon Gum)
- Existing tree hollows and any evidence of use by Black Cockatoos (a suitable nesting hollow currently able to support breeding was defined as a tree hollow with an entrance diameter greater than 100-150 mm which would allow entry of a Black Cockatoo)
- The diameter at breast height (DBH) of trees with existing hollows
- Potential night roosting and foraging habitat

Fauna species identification

Identification of fauna species was made in the field using available field guides and electronic guides (e.g. Morcombe 2014). Where identification was not possible, photographs of specimens were collected to be later identified.

Fauna nomenclature

Nomenclature used in this report follows that used by the WA Museum and the DBCA NatureMap database (DBCA 2007–2018) with the exception of birds, where Christidis & Boles (2008) was used.

2.3 Limitations

2.3.1 Desktop limitations

Desktop investigations use a variety of online resources such as the WA Museum and DBCA NatureMap database and the EPBC Act PMST. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

2.3.2 Field survey limitations

The EPA technical guidance recommend flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2. Based on this assessment, the present survey effort has not been subject to any constraints which affect the thoroughness of the assessment and the conclusions which have been formed.

Table 2 Field survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information	Nil	Adequate information is available for the survey area, this includes broad scale (1:250,000) mapping by Smith (1974) and digitised by Shepherd et al. (2002). Regional biogeography (Hearn et al. 2002). Database searches provide adequate information about Threatened and Priority flora and fauna, TECs and PECs.
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Minor	The detailed vegetation and flora survey was undertaken in spring 2018 which is the recommended timing for flora surveys in the region. This timing is considered appropriate due to the high proportion of species able to be identified at the time of the survey and highly disturbed nature of the survey area. The flora recorded from the field survey is detailed in section 5.1.4 and a full flora species list is provided in Appendix E. The reconnaissance fauna survey was also undertaken in spring 2018. The fauna assessment sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings, etc. Many cryptic species would not have been identified during a reconnaissance survey and seasonal variation within species often requires targeted surveys at a particular time of the year. Of the fauna species recorded during the survey, all were identified to species level. The fauna assessment was aimed at identifying habitat types and terrestrial vertebrate fauna utilising the survey area. No sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than vertebrate species.
Flora determination	Minor	Flora determination was undertaken by the GHD ecologist in the field and at the WA Herbarium. Eight taxa were only able to be identified to genus level, the remaining 53 taxa were identified to species level. Some species, particularly grasses, sedges and herbs, may have been overlooked due to lack of material. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time report development, but it should be noted this may change in response to ongoing research and review of International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	Access to the survey area was made by foot, with access along the survey area by road. The survey area was traversed extensively on foot.

Aspect	Constraint	Comment
Mapping reliability	Minor	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Smith 1974) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung tablet and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ±5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain minor inaccuracies.
Timing/weather/ season/cycle	Minor	The field surveys were conducted during spring (30 and 31 October 2018). In the three months prior to the survey (August-October), Donnybrook weather station (No. 009534, BoM 2018) recorded a total of 278 mm of rainfall. This total is approximately 13% lower than the long term average of 314 mm for the same period (BoM 2018). The weather conditions recorded during the field survey were (BoM 2018): • Daily maximum temperature of 23 °C • Daily minimum temperature of 10 °C • Daily rainfall 0 mm. The weather conditions recorded during the survey are considered unlikely to have impacted upon the vegetation and flora survey. The timing of the survey (spring) is considered appropriate.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	The survey area has been subjected to historical disturbance events (e.g. clearing); however, these disturbances did not impact the survey.
Intensity (in retrospect, was the intensity adequate)	Nil	The vascular flora of the survey area was sampled with reference to EPA (2016a) guidance. The terrestrial fauna survey was completed with reference to EPA (2016b) guidance. The survey area was sufficiently covered by the GHD ecologist during the survey.
Resources	Nil	Adequate resources were employed during the field survey. Two person days was spent undertaking the survey using an experienced ecologist.
Access restrictions	Nil	No access problems were encountered during the survey.
Experience levels	Nil	The ecologist who executed the survey is a practitioner suitably qualified and experienced in their respective field. GHD ecologist Erin Lynch has over 10 years' experience undertaking flora and fauna surveys within WA.

3. Desktop assessment

3.1 Regional biogeography

The survey area is situated in the South West Botanical Province of Western Australia (Beard 1990) within the Jarrah Forest bioregion and Southern Jarrah Forest sub-region described by the Interim Biogeographic Region of Western Australia (IBRA) (DotEE 2018c).

Within the Southern Jarrah Forest sub-region, south of Collie the plateau broadens and slopes gently to the south coast. Drainage is still dissected in the west but broadening and levelling of the surface in the east causes poor drainage and large and small wetlands. The ironstone becomes less evident being buried beneath sands. Rainfall is from 1200 mm in the south-west to 500 m in the east. Vegetation comprises Jarrah – Marri forest in the west grading to Marri and Wandoo woodlands in the east (Hearn et al. 2002).

3.2 Geology, landform and soils

The Department of Agriculture and Food Western Australia (DAFWA) (2007) soil mapping indicates there are four soil types within the survey area as described in Table 3.

Table 3 Description of soil units mapped within the survey area (DAFWA 2007)

Soil Unit	Soil description	Geology	Landform
Kirup gently slopes Phase (255LvKR2)	Duplex sandy gravels, loamy gravels, pale deep sands and yellow deep sands	Lateritic colluvium over conglomerate over granitic rocks	Gentle slopes
Balingup moderate slopes Phase (255LvBL4)	Friable red-brown loamy earths, brown loamy earths, brown deep loamy duplexes and loamy gravels	Colluvium over gneiss and granite	Moderate valley slopes
Balingup footslopes Phase (255LvBLf)	Friable red-brown loamy earths, brown loamy earths, brown deep loamy duplexes and loamy gravels	Colluvium over gneiss and granite	Footslopes
Balingup low slopes Phase (255LvBL3)	Friable red-brown loamy earths, brown loamy earths, brown deep loamy duplexes and loamy gravels	Colluvium over gneiss and granite	Gentle to moderate valley slopes

3.3 Watercourses and wetlands

The EPBC Act PMST did not identify any International significant wetlands within 5 km of the survey area (DotEE 2018a).

There are no permanent watercourses or wetlands within the survey area.

3.4 Land use

3.4.1 Conservation areas and reserves

The southern section of the survey area is located within DBCA managed lands (Figure 1, Appendix A):

- CALM Exec Body Freehold (name: 1489/474) (P102432 909) for the purpose of Conservator of Forests (Freehold)
- CALM Exec Body Freehold (name: 1489/474) (P102431 908) for the purpose of Conservator of Forests (Freehold)
- CALM Exec Body Freehold (name: 1371/170) (P301590 200) for the purpose of Conservator of Forests (Freehold)

3.4.2 Environmentally sensitive areas

There are no Environmentally Sensitive Areas (ESAs) located within or immediately adjacent to the survey area.

3.5 Vegetation and flora

3.5.1 Broad vegetation mapping and extents

Broad scale pre-European vegetation mapping of the area was completed by Smith (1974) at an association level. The mapping indicates one vegetation association is present within the project footprint:

- Medium forest; jarrah-marri (vegetation association 3)

The Smith (1974) pre-European mapping has been adapted and digitised by Shepherd *et al.* (2002). The extent of the vegetation associations has been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA (latest update December 2017 – Government of WA (GoWA) 2018). As shown in Table 4, the current extent of vegetation association 3 is greater than 50% of its pre-European extent at all levels (State, IBRA bioregion, IBRA subregion and LGA).

As part of the Regional Forest Agreement, Mattiske and Havel (1998) mapped vegetation complexes of the forest regions of south west WA at a scale of 1:50,000. Mattiske and Havel (1998) mapping indicates three vegetation complexes are present within the survey area:

- Kirup (KR) Open forest to woodland of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla-Banksia attenuata-Xylomelum occidentale* on sandy slopes in the humid zone
- Balingup (BL) Open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on slopes and woodland of *Eucalyptus rudis* on the valley floor in the humid zone
- Balingup (BLf) Woodland of *Eucalyptus rudis* on valley floors and woodland of *Eucalyptus patens – Corymbia calophylla* on footslopes with some *Eucalyptus marginata* subsp. *marginata* on lower slopes in the humid zone

The Local Biodiversity Program (2013) and Molloy *et al.*, (2007) have assessed vegetation complexes described and mapped by Mattiske and Havel (1998) against presumed pre-European extents within the Southern Jarrah Forest IBRA subregion. In Table 5 the vegetation extents of the KR complex is shown to be more than 50% of its pre-European extent for the Southern Jarrah Forest region. The BL complex has just under 30% and the BLf complex just less than 10% of its pre-European extents remaining within the Southern Jarrah Forest region.

Recently, Webb *et al*. (2016) reviewed the vegetation complex mapping datasets of the Swan Coastal Plain (Heddle *et al.* 1980) and the South West Forest Region (Mattiske and Havel 1998). The reviewed mapping (referred to as GoWA 2018) does not extend to IBRA sub-region boundaries, but can be used for vegetation complex extents within the Local Government Area (Table 6 and 7).

Based on this updated data, vegetation complex BL has 30% of its pre-European extent remaining in the Shire of Donnybrook-Balingup and approximately 22% remaining in the Shire of Bridgetown-Greenbushes. Vegetation complex BLf has less than 8% of its pre-European extent remaining in the Shire of Donnybrook-Balingup and 12% remaining in the Shire of Bridgetown-Greenbushes. Vegetation complex KR has over 50% of its pre-European extent remaining in the Shire of Donnybrook-Balingup and approximately 15% remaining in the Shire of Bridgetown-Greenbushes.

Table 4 Extents of vegetation associations mapped within the survey area (Smith 1974, GoWA 2018)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent in all DBCA managed lands
Jarrah Forest IBRA bioregion		4,506,660.26	2,406,938.58	53.41	69.52
Southern Jarrah Forest IBRA sub-region		2,607,879.53	1,298,973.53	49.81	69.6
3	State: WA	2,661,404.62	1,806,035.91	67.86	81.36
	IBRA bioregion: Jarrah Forest	2,390,591.54	1,606,736.77	67.21	80.85
	IBRA sub-region: Southern Jarrah Forest	1,482,491.85	883,557.83	59.60	78.25
	LGA: Donnybrook-Balingup	93,347.17	61,228.07	65.59	89.96
	LGA: Bridgetown-Greenbushes	121,152.70	68,440.37	56.49	86.65

Table 5 Extent of vegetation complexes in the Southern Jarrah Forest subregion within the survey area (Mattiske and Havel 1998, Local Biodiversity Program 2013)

Vegetation Complex	Pre-European extent (ha)	2013 extent (ha)	% of pre-European extent	% of pre-European extent with formal protection
BL	59446.57	17474.17	29.391	1.49
BLf	2972.50	273.48	9.20	-
KR	3459.19	2037.12	58.89	3.86

Table 6 Extent of vegetation complexes in the Shire of Donnybrook-Balingup within the project area (GoWA 2018)

Vegetation complex	Pre-European total (ha)	Remaining extent total (ha)	Remaining extent (%)	Proportion of the Vegetation Complex within the LGA (%)
BL	42835	13095	30.57	72.06
BLf	2125.51	168.18	7.91	71.51
KR	3423.99	2031.73	59.34	98.98

Table 7 Extent of vegetation complexes in the Shire of Bridgetown-Greenbushes within the project area (GoWA 2018)

Vegetation complex	Pre-European total (ha)	Remaining extent total (ha)	Remaining extent (%)	Proportion of the Vegetation Complex within the LGA (%)
BL	12913	2830	21.92	21.72
BLf	798.99	98.99	12.39	26.88
KR	35.19	5.39	15.31	1.02

3.5.2 Conservation significant ecological communities

The EPBC Act PMST did not identify any federally listed TECs potentially occurring within the study area (DotEE 2017a) (Appendix C). DBCA TEC and PEC data obtained by the Water Corporation did not reveal any TECs or PECs occurring near the survey area. The closest known record of a TEC/PEC is situated over 25 km north-east of the survey area.

3.5.3 Flora diversity

The NatureMap database identified 112 flora taxa, representing 57 families and 86 genera previously recorded within the study area (Appendix C). This total comprised 81 native taxa and 31 naturalised (introduced) taxa. Dominant families recorded include Fabaceae (13 taxa), Myrtaceae (8 taxa) and Poaceae (6 taxa).

3.5.4 Conservation significant flora

The EPBC Act PMST, NatureMap database and DBCA TPFL and WAHERB databases identified the presence/potential presence of six conservation significant flora taxa within the study area (Appendix C). The desktop searches recorded:

- Four taxa listed under the EPBC Act and/or WC Act
- One Priority 3 taxon
- One Priority 4 taxon

3.6 Fauna

3.6.1 Fauna diversity

The NatureMap database identified 115 vertebrate fauna species previously recorded within the study area (Appendix C). This total comprised 103 birds, 3 reptiles, 8 mammals and one amphibian species. Of these, 111 are native species and four are naturalised (introduced) species.

3.6.2 Conservation significant fauna

The EPBC Act PMST and NatureMap database identified the presence/potential presence of 23 conservation significance fauna within the study area. This total does not include those species exclusively marine as no marine habitat is present within the survey area or indirectly impacted by the project. The desktop searches recorded:

- Ten species listed as Threatened under the EPBC Act and/or as Schedule 1-4 (Threatened) under the WC Act
- Two species listed as Schedule 7 (Other specially protected fauna) under the WC Act
- Seven species listed as migratory (Terrestrial and Wetland) under the EPBC Act and/or as Schedule 5 (Migratory birds protected under an international agreement) under the WC Act
- Four species listed as Priority by DBCA

4. Results

4.1 Flora and vegetation

4.1.1 Vegetation types

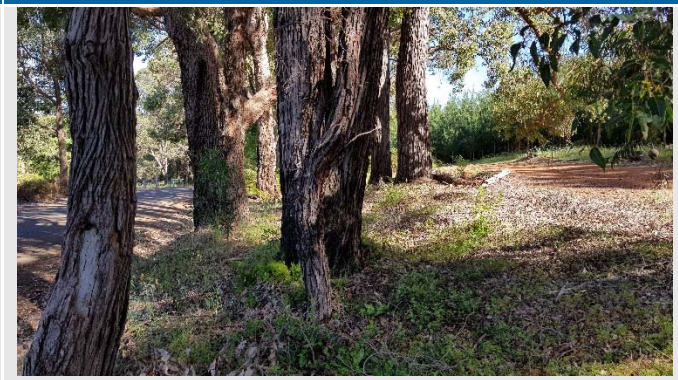
Four vegetation types were mapped and described for the survey area, excluding cleared or highly degraded areas containing isolated trees and shrubs. The four vegetation types were variations in Eucalyptus dominated woodlands over a highly modified understorey dominated by weeds with the occasional scattered native species.

The Eucalyptus woodlands ranged from jarrah-marri dominated woodlands, jarrah-marri-blackbutt woodlands, marri-blackbutt-flooded gum woodlands and small pockets of flooded gum woodlands within the drainage areas.

Although the remnant vegetation within the survey area is highly altered by disturbances the dominant tree species remaining are consistent with the broad vegetation complexes mapped across the survey area by Smith (1974) and Mattiske and Havel (1998).

A description and representative photo of the vegetation identified within the survey area is presented in Table 8 and mapped in Figure 2, Appendix A.

Table 8 Vegetation types identified within the survey area

Vegetation type	Vegetation description	Extent (ha)	Site photograph
V1. *Eucalyptus marginata (jarrah) – Corymbia calophylla (marri) woodland*	*Eucalyptus marginata and Corymbia calophylla* woodland over **Rubus ulmifolius* and *Pteridium esculentum* herbland over **Avena barbata, *Briza maxima* and **Bromus diandrus* open grassland on loamy gravels.	1.58 h	
V2. *C. calophylla – E. patens (Blackbutt) – E. rudis (flooded gum) woodland*	*Corymbia calophylla, Eucalyptus patens* and *E. rudis* woodland over *Xanthorrhoea preissii* scattered shrubs over **Rubus ulmifolius, *Asparagus asparagaceae*,**Watsonia meriana* subsp. *bulbillifera* and *Pteridium esculentum* closed herbland on loamy gravels.	0.65 ha	

Vegetation type	Vegetation description	Extent (ha)	Site photograph
V3. *E. rudis* open woodland	*Eucalyptus rudis* open woodland over **Watsonia meriana* subsp. *bulbillifera*, *Typha* sp. and *Juncus pallidus* herbland and sedgeland over **Cynodon dactylon* grassland on low-lying drainage areas.	0.37 ha	
V4. *C. calophylla – E. patens* woodland	*Corymbia calophylla* and *Eucalyptus patens* woodland over **Rubus ulmifolius, *Asparagus asparagaceae* and *Pteridium esculentum* closed herbland over **Avena barbata*, **Cynodon dactylon* and **Briza maxima* open grassland on loamy gravels.	1.34	
Cleared/Isolated native and/or introduced/planted trees and shrubs	Previously cleared areas (tracks, roads and farmland) where the understorey has been completely cleared of native vegetation. Consists of scattered individual or clumps of trees (mix of native, introduced and planted species) and/or tall shrubs over introduced grasses and herbs. The natural structure of the vegetation is no longer intact.	4.88	

4.1.2 Vegetation condition

The vegetation within the survey area was rated from Degraded to Completely Degraded. The survey area is highly modified largely as a result of clearing and the spread of invasive weed species. The vegetation structure of the areas mapped as Degraded have been significantly altered and lack a native mid and lower understorey and reduced species diversity. The understorey was largely dominated by invasive weeds (i.e. Blackberry) as well as common herbaceous and grassy weed species with the occasional native species.

Areas mapped as Completely Degraded were either completely cleared (roads, tracks, etc.) or parkland cleared with the occasional (scattered) native and/or planted trees and shrubs over weeds.

There is 3.38 ha (38%) of vegetation mapped as Degraded whilst the remaining 5.44 ha (62%) is considered Completely Degraded. Mapping of vegetation condition within the survey area is provided in Figure 3, Appendix A.

4.1.3 Conservation significant ecological communities

No TECs or PECs were identified within the survey area.

4.1.4 Flora diversity

A total of 61 flora taxa (including subspecies and varieties) representing 23 families and 51 genera was recorded from the survey area. This total comprised 24 native taxa and 37 introduced taxa. The dominant families included Fabaceae (10 taxa), Asteraceae (9 taxa) and Poaceae (8 taxa).

The survey area contains low species diversity and is completely dominated by introduced/weed species due to multiple disturbances to the area.

The full list of flora identified within the survey area is provided in Appendix E.

4.1.5 Introduced flora

A total of 37 introduced flora taxa (60% of the total flora present) were recorded in the survey area. Of these, two species, Bridal Creeper (**Asparagus asparagoides*) and Blackberry *(*Rubus ulmifolius*) are listed as a Declared Pest Plants under the BAM Act and as WONS. Blackberry and Bridal Creeper were consistently present along the alignment.

4.1.6 Conservation significant flora

No EPBC Act or WC Act listed flora were recorded within the survey area. In addition no DBCA Priority-listed flora or flora of conservation significance, as defined in EPA 2016c, were recorded within the survey area.

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix D). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of species.

The likelihood of occurrence assessment post-field survey concluded that no conservation significant flora are likely to occur within the survey area due to the lack of suitable habitat and highly modified nature of the survey area.

4.2 Fauna

4.2.1 Fauna habitats

The survey area comprised of three broad habitat types including Mixed Eucalypt Woodlands, Flooded Gum Minor Drainage Lines and Cleared/Highly Modified areas. The majority of the survey area consists of a mixed woodland of *Corymbia calophylla* (marri), *Eucalyptus marginata* (jarrah), *E. patens* (blackbutt) and *E. rudis* (flooded gum) with the occasional scattered introduced *Pinus* (pine) species over introduced herbs and grasses. The structure of the remnant vegetation remaining has been significantly altered with only few scattered natives remaining in the understorey.

Jarrah-marri woodland is well represented in the local area, as well as in the broader region (including throughout the surrounding State Forest). The *Eucalyptus rudis* woodland occurs along watercourses, drainage lines and lower lying areas in the region and therefore is less common at both a local and regional scale.

Parts of the survey area had previously been cleared for tracks and roads which provide very few resources for fauna. Other highly modified areas which had previously been cleared of native vegetation (farmland or within the town site) contained scattered native and planted (introduced species) trees and shrubs. These areas provide some habitat value to fauna species such as foraging and refuge for birds.

4.2.2 Habitat connectivity and linkages

The vegetation remaining within the northern extent of the survey area forms a narrow corridor of remnant vegetation (trees) adjacent to existing roads and tracks, in an area which has been largely cleared for agriculture, pine plantations and Balingup town site. To the south, the survey area connects to large tracts of remnant vegetation (including State Forest).

4.2.3 Fauna diversity

A total of 28 fauna species were recorded within the survey area, including 19 birds, four mammals one reptile and four amphibian species. Of these, four are introduced species.

The list of fauna species identified during the field survey is provided in Appendix E.

4.2.4 Conservation significant fauna

Two conservation significant fauna species were identified during the field survey. They were:

- Forest red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), listed Vulnerable under the EPBC Act and WC Act – observed foraging within the survey area and adjacent properties
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), listed as Endangered under the EPBC Act and WC Act – evidence of feeding observed on marri nuts

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant fauna identified in the desktop assessment (Appendix D). This assessment was based on species biology, habitat requirements, the quality and availability of suitable habitat.

In addition to the species identified during the field survey, the assessment identified the likely presence of one additional conservation significant species, the Baudin's Black Cockatoo (*Calyptorhynchus baudinii*). The survey area provides suitable foraging habitat and potential breeding and roosting habitat for the Baudin's Black Cockatoo.

The likelihood of occurrence assessment identified that other fauna species of conservation significance could occasionally occur within the habitats of the survey area (e.g. species deemed unlikely). However, it is considered unlikely the survey area provides important habitat (e.g. breeding habitat or key foraging habitat) for any of these species and that these other species may occasional use the habitats of the survey area for temporary refuge and dispersal between other areas of habitat (i.e. Chuditch, Quenda, Peregrine Falcon).

4.3 Targeted Black Cockatoo assessment

4.3.1 Foraging habitat

The majority of the vegetation within the survey area is considered suitable foraging habitat for Black Cockatoos, including the mixed Eucalypt woodlands of jarrah, marri, blackbutt and flooded gum as well as the scattered Pine trees. There is approximately 4.3 ha of suitable foraging habitat in the survey area. Plentiful old and fresh foraging evidence was observed throughout the survey area (Forest Red-tailed Black Cockatoo and Carnaby's Cockatoos chew marks on marri nuts) (Plate 1). Forest Red-tailed Black Cockatoos were also observed feeding on marri trees during the survey.

Plate 1 Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo feedsign

Black cockatoo foraging habitat within the survey area has been mapped on Figure 4, Appendix A.

4.3.2 Potential breeding habitat

The habitat assessment identified 286 potential breeding trees of suitable DBH (jarrah, marri, blackbutt and flooded gum > 500 mm) from within the survey area (Appendix E). Trees of this size are considered to have nesting potential now, or will develop hollows within 100 years. Of the 286 trees, 19 contained hollows of which six were identified with potentially suitable hollows for Black Cockatoo nesting (with a hollow diameter greater than 100-150 mm, to allow entry of Black Cockatoo). The size of a hollow is an estimate as the assessment was undertaken from ground level, there is the potential for the actual hollow size to be greater than 100 mm. No evidence of recent use of suitable hollows by Back Cockatoos (e.g. chews) was recorded.

List of potential breeding trees recorded within the survey area is provided in Appendix E and mapped in Figure 4, Appendix A.

4.3.3 Roosting habitat

No evidence of roosting by Black Cockatoos was observed within the survey area. The survey area provides limited potential roosting habitat due to the narrow, linear nature of the remaining vegetation within the survey area.

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Appendices

Appendix A – Figures

Legend

Threatened Fauna

- Priority Fauna
- Schedule 2 - Fauna that is rare or is likely to become extinct as endangered fauna
- Schedule 3 - Fauna that is rare or is likely to become extinct as vulnerable fauna

Declared Rare & Priority Species

- (T) Threatened Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- Watercourse
- Major roads
- Minor roads
- Survey area

DBCA Legislated Lands

- Conservator Of Forests
- Executive Director Department Of CALM
- State Forest
- Timber

South Western Hwy

Paper Size ISO A3

0 250 500 750 1,000

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Water Corporation
Greenbushes to Kirup Link EIA & Approvals

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Locality & Environmental Constraints

FIGURE 1

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: bjones2

Paper Size ISO A3

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Map Projection: Transverse Mercator
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Vegetation mapping

Project No. **61-35763**
Revision No. **0**
Date **17/12/2018**

FIGURE 2

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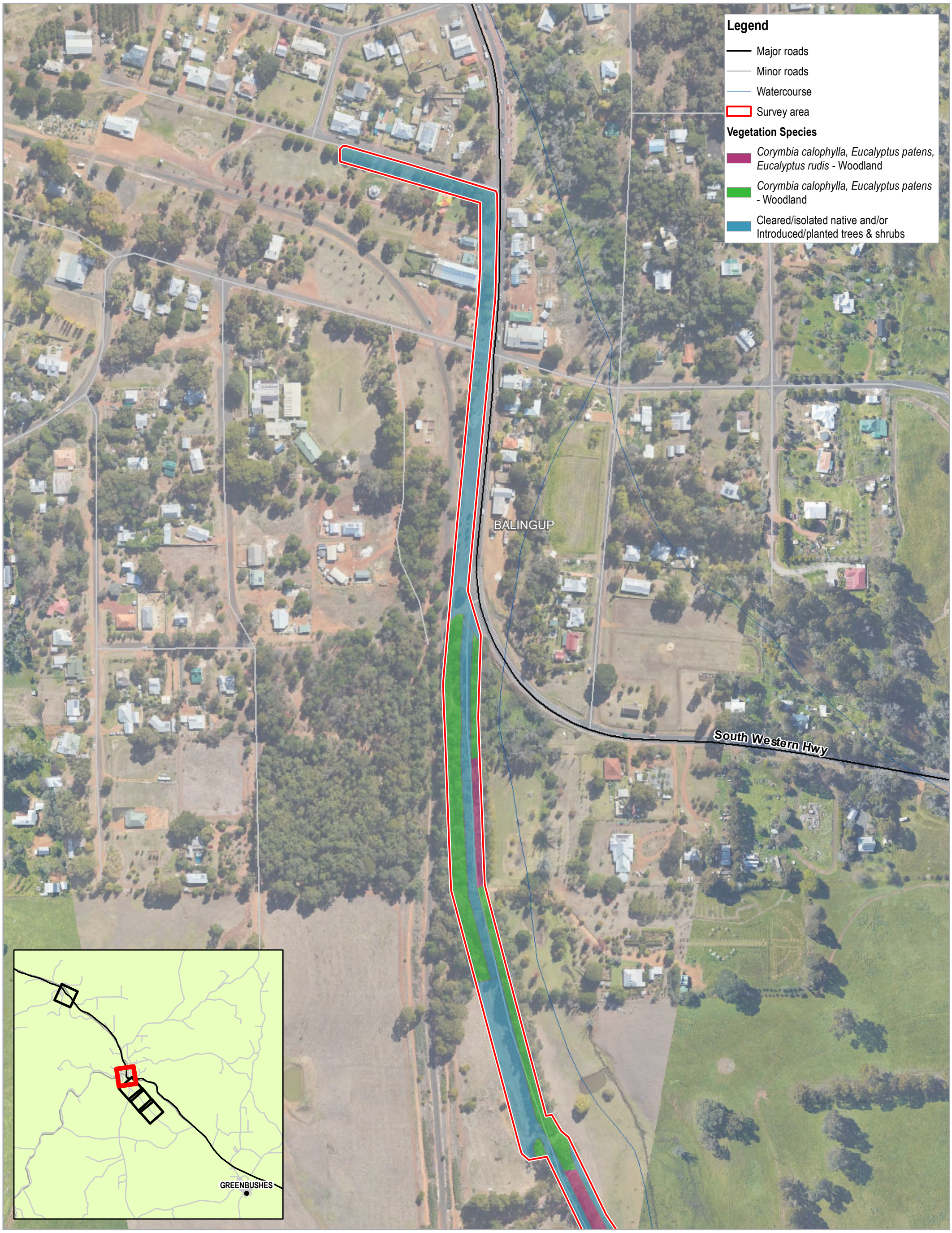
Data source: GHD: Survey area boundary - 20181009, vegetation mapping - 20181205; Landgate: Suburbs - 20180319, Imagery - 20181204; MRWA: Road - 20171211; Geoscience Australia: GeoData Topo 250k Series 3. . Created by: bjones2



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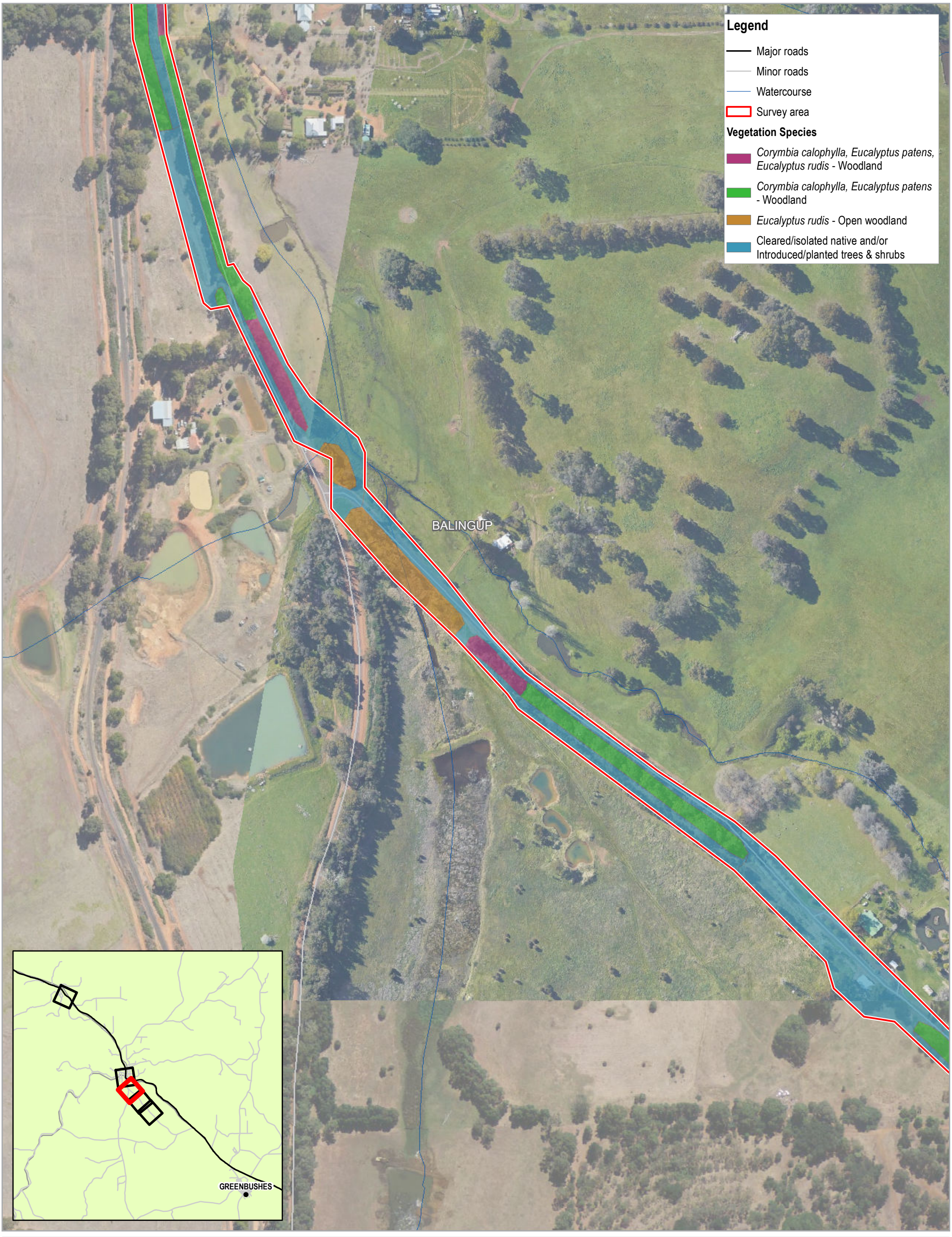

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Legend

- Major roads
- Minor roads
- Watercourse
- Survey area

Vegetation Species

- *Corymbia calophylla, Eucalyptus patens, Eucalyptus rudis* - Woodland
- *Corymbia calophylla, Eucalyptus patens* - Woodland
- *Eucalyptus marginata, Corymbia calaphylla* - Woodland
- Cleared/isolated native and/or Introduced/planted trees & shrubs

BALINGUP

GREENBUSHES

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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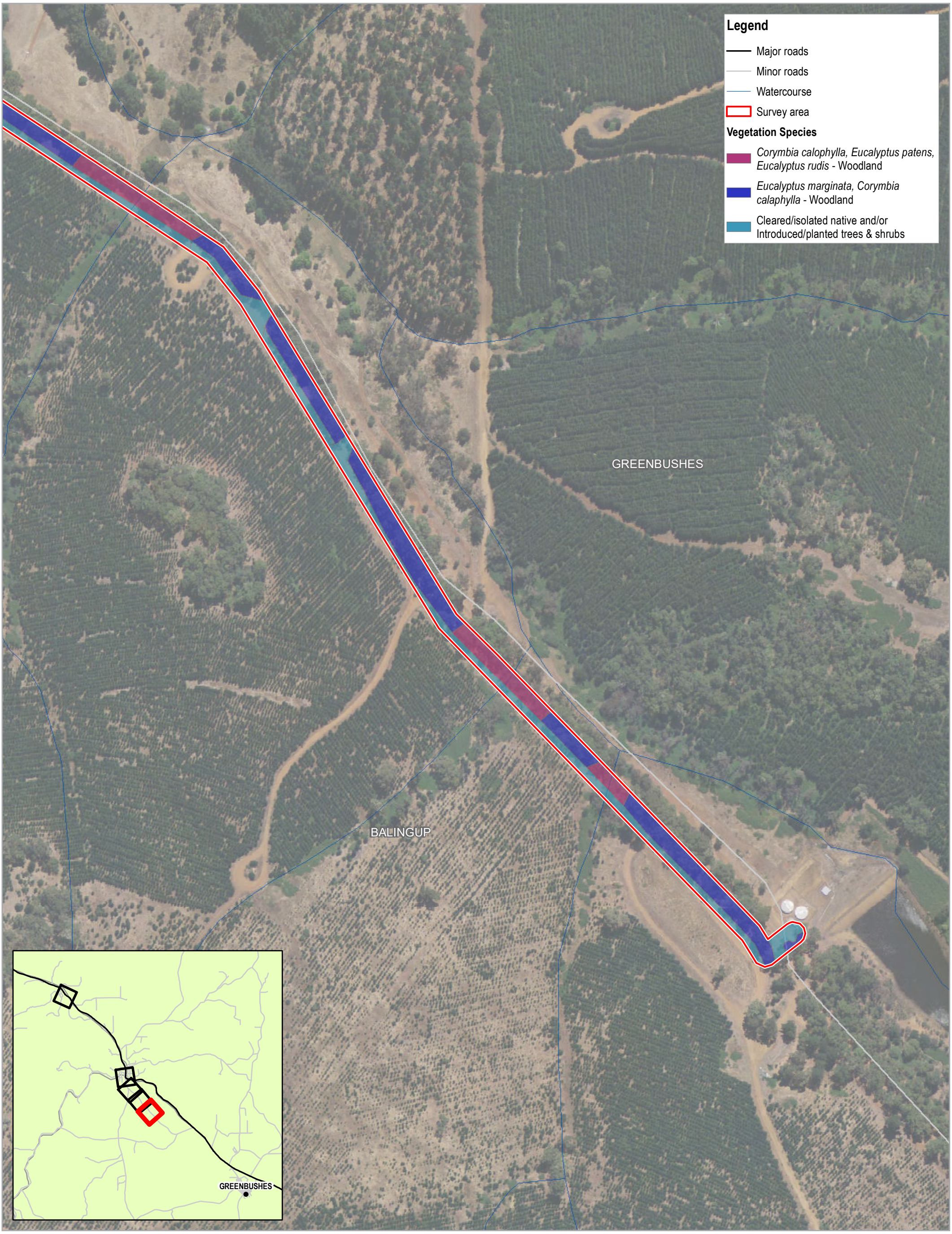

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FIGURE 2

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FIGURE 3

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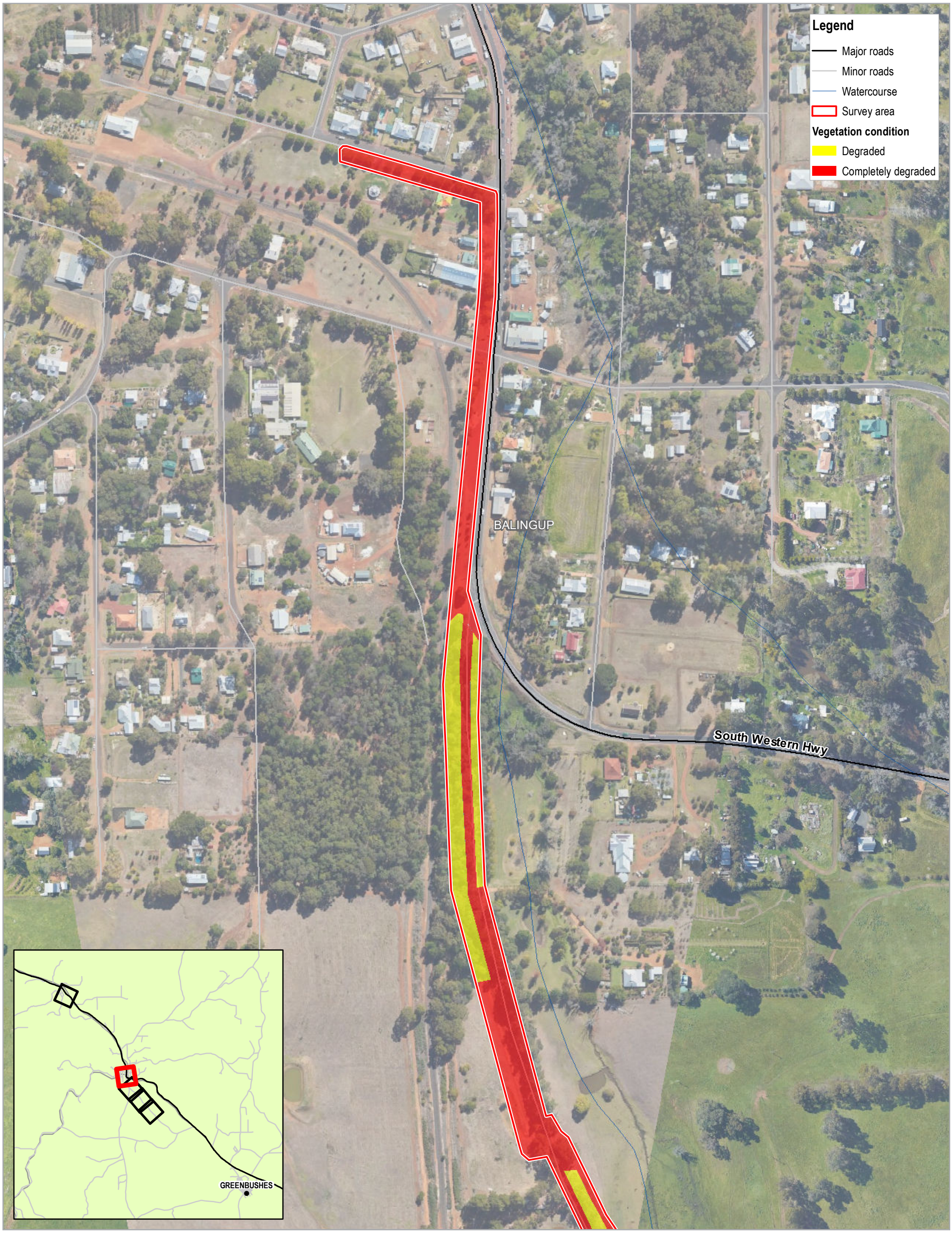

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Vegetation condition

FIGURE 3

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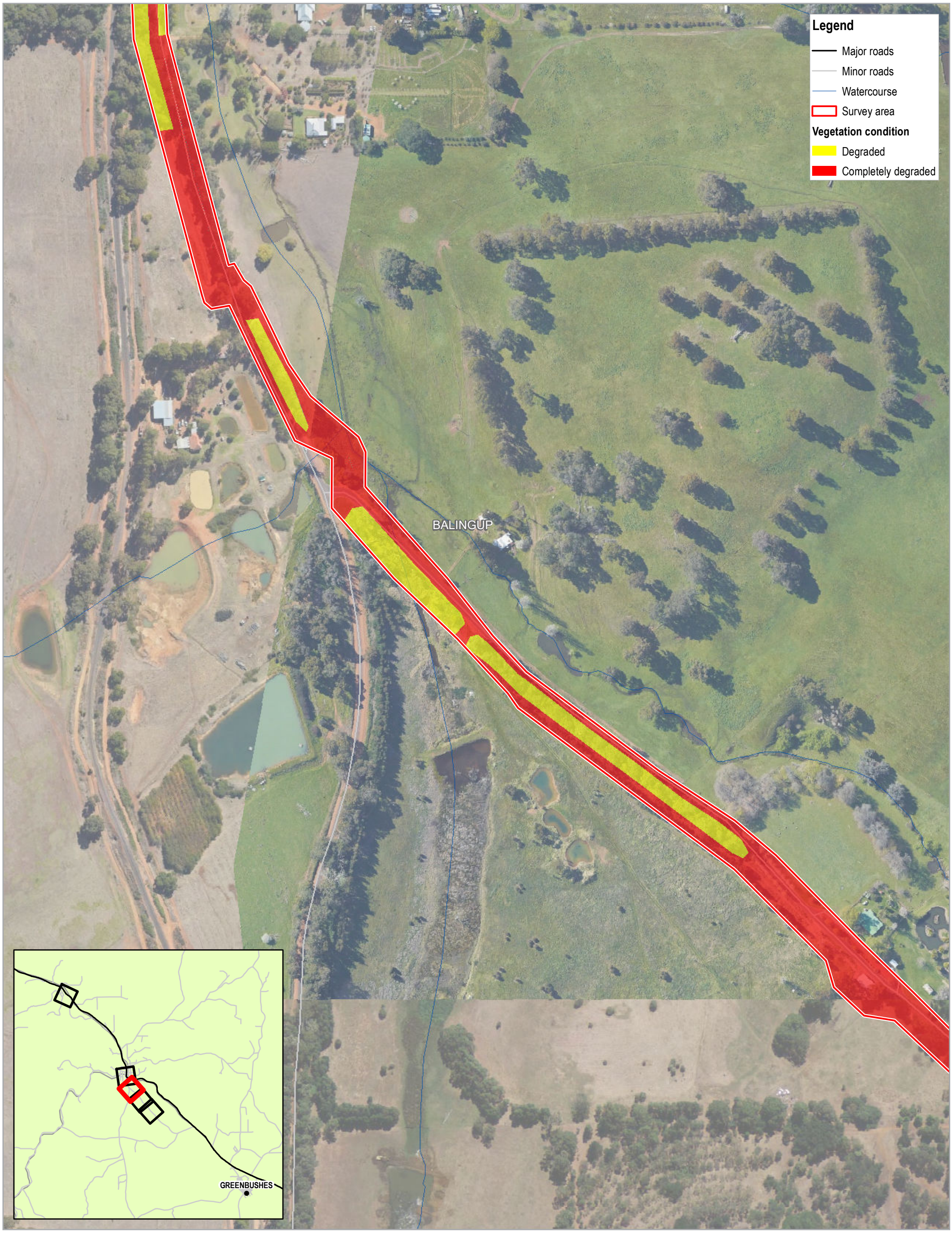

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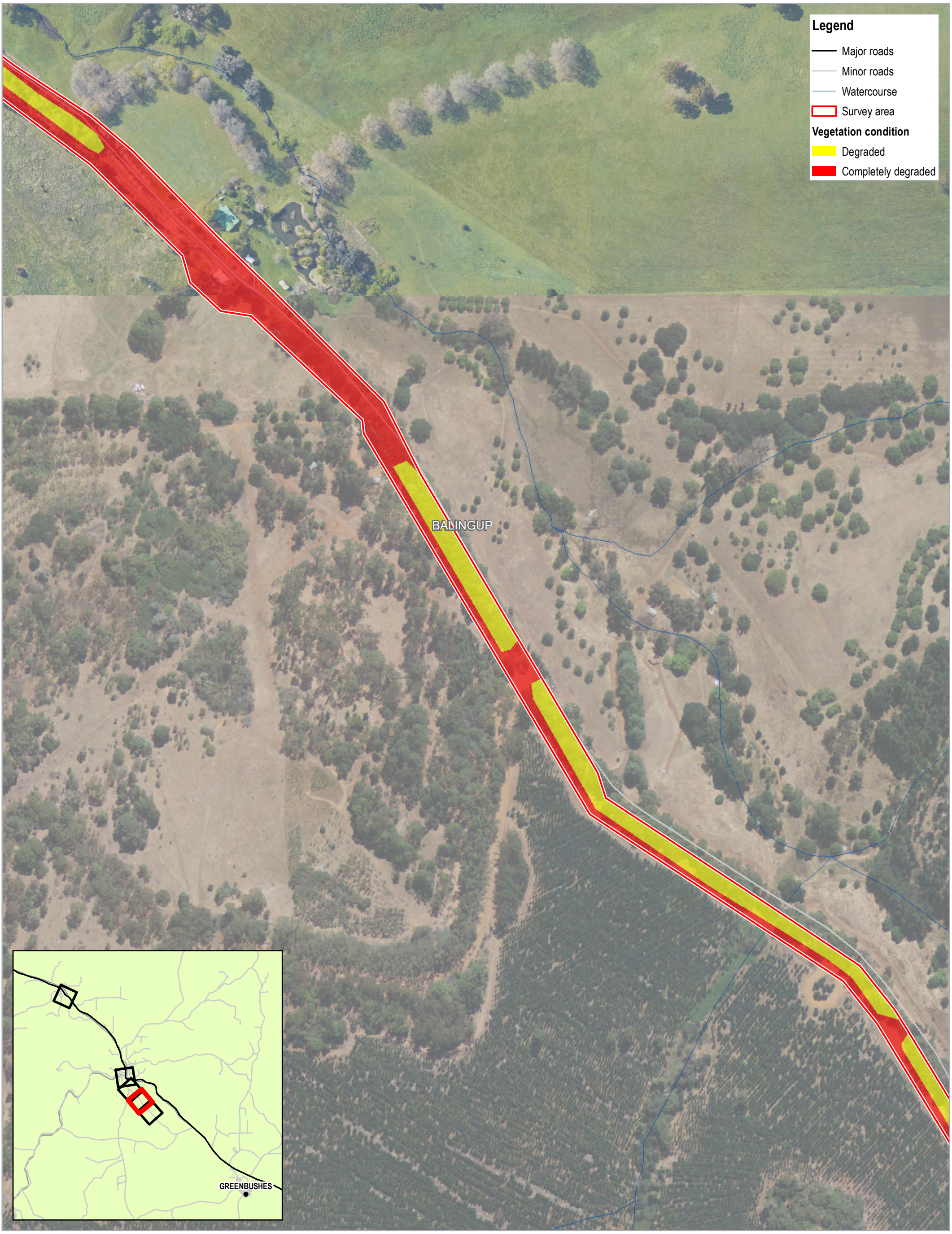

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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

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FIGURE 3

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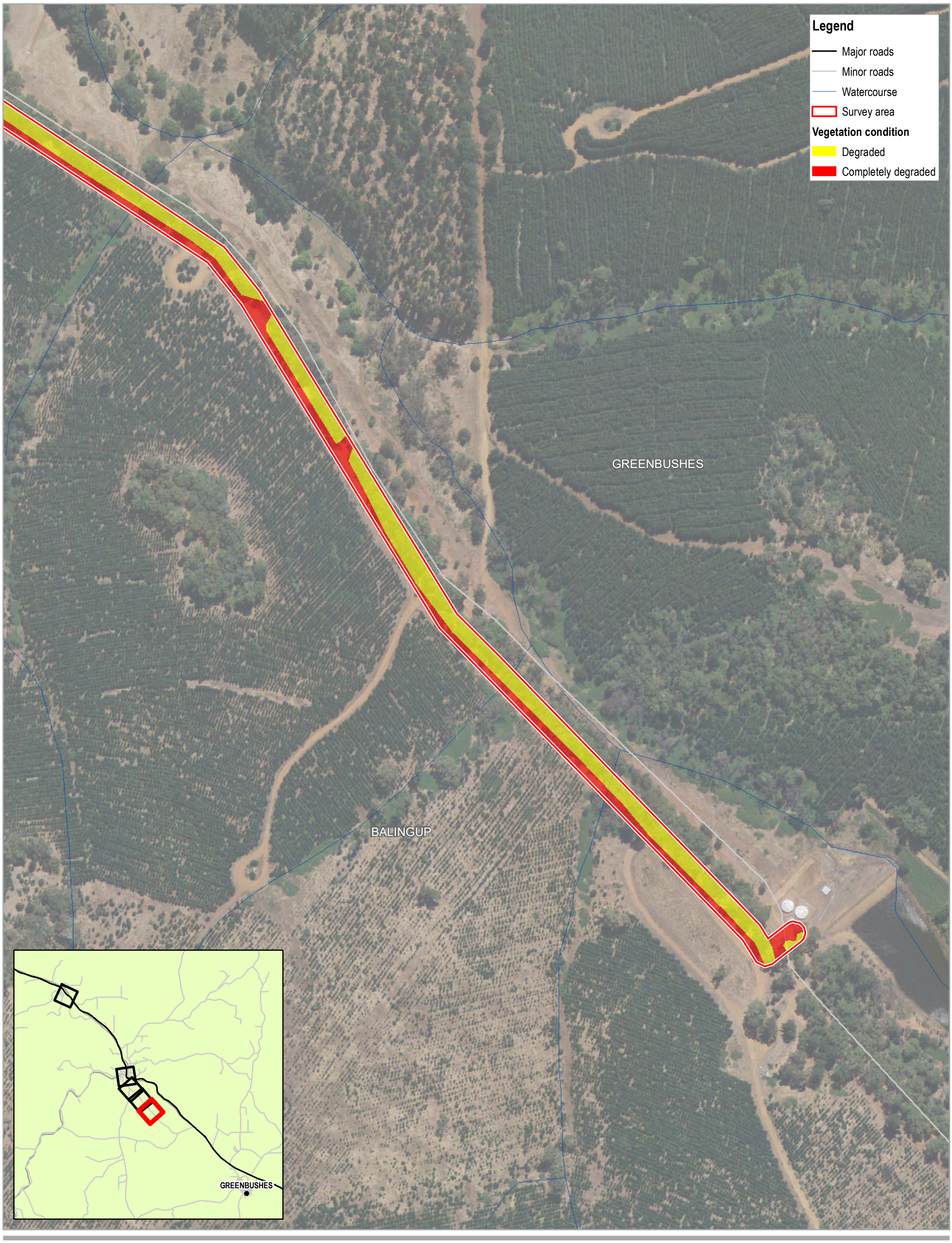

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Water Corporation
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Vegetation condition

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Date **17/12/2018**

FIGURE 3

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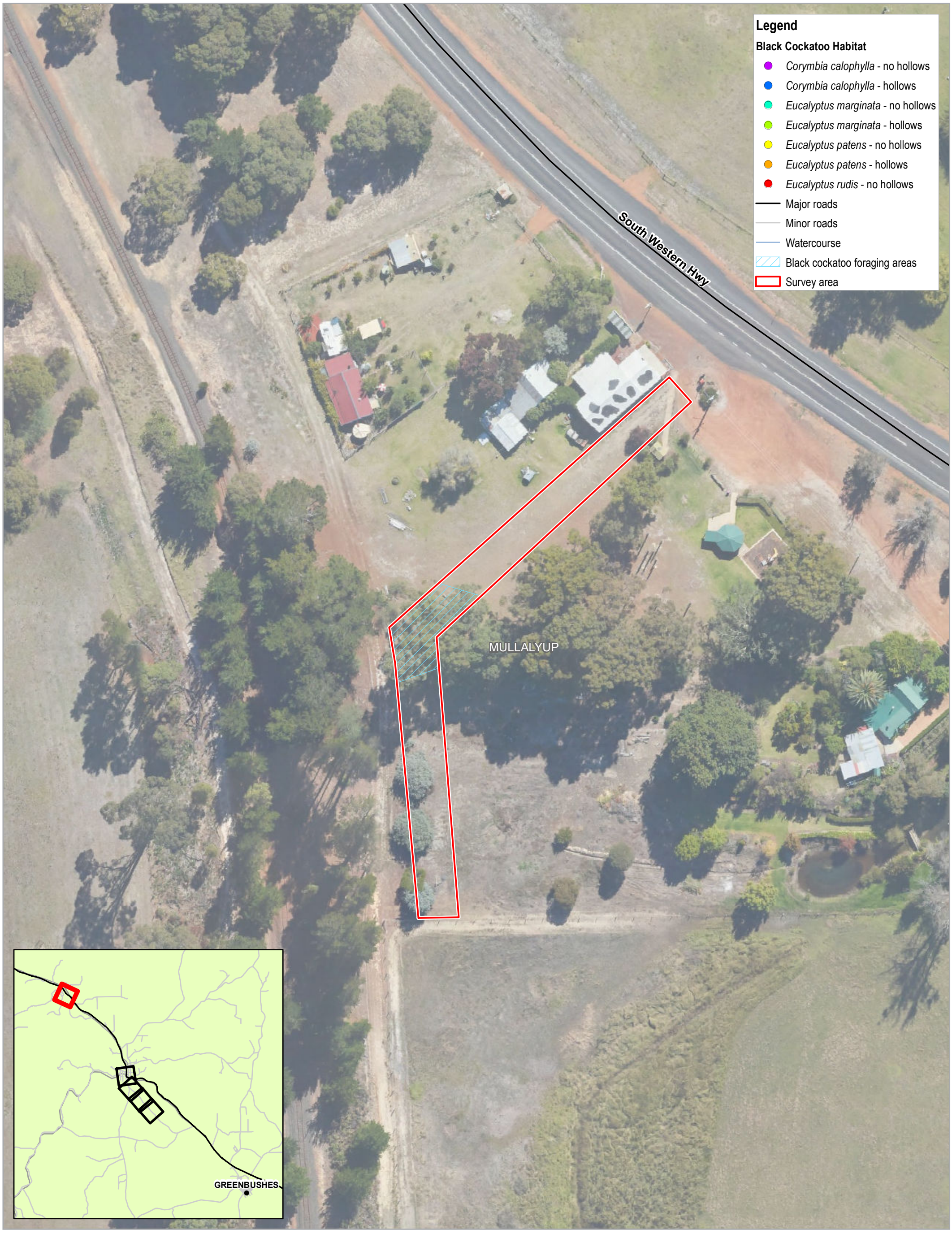
Print date: 17 Dec 2018 - 17:25

Data source: GHD: Survey area boundary - 20181009, vegetation mapping - 20181205; Landgate: Suburbs - 20180319, Imagery - 20181204; MRWA: Road - 20171211; Geoscience Australia: GeoData Topo 250k Series 3. . Created by: bjones2



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Map Projection: Transverse Mercator
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Greenbushes to Kirup Link EIA & Approvals

Black cockatoo habitats

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FIGURE 4

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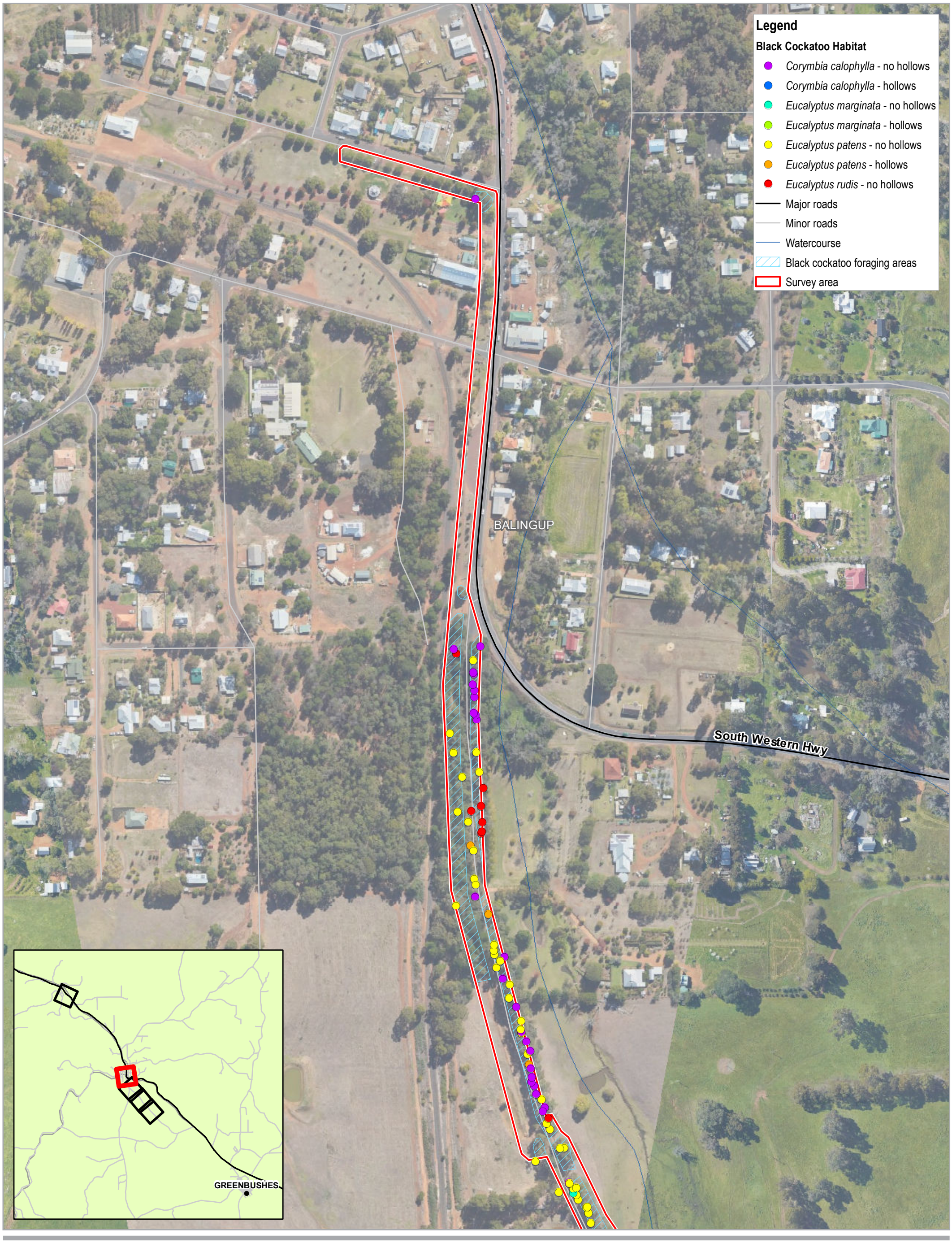
Print date: 17 Dec 2018 - 17:26

Data source: GHD: Survey area boundary - 20181009, Black Cockatoo Habitat - 20181129, Black Cockatoo Foraging area - 20181205; Landgate: Suburbs - 20180319, Imagery - 20181204; MRWA: Road - 20171211; Geoscience Australia: GeoData Topo 250k Series 3. . Created by: bjones2



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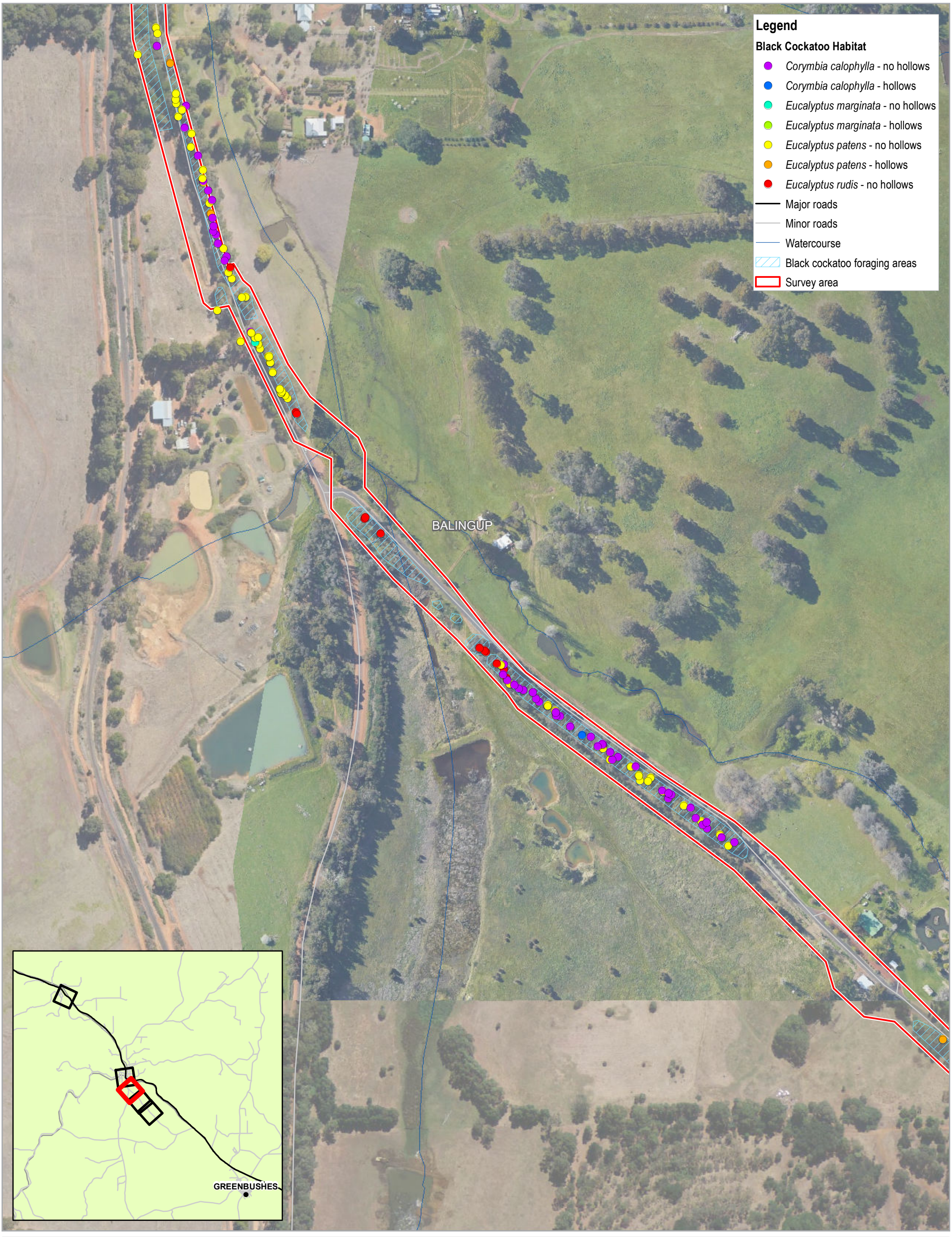

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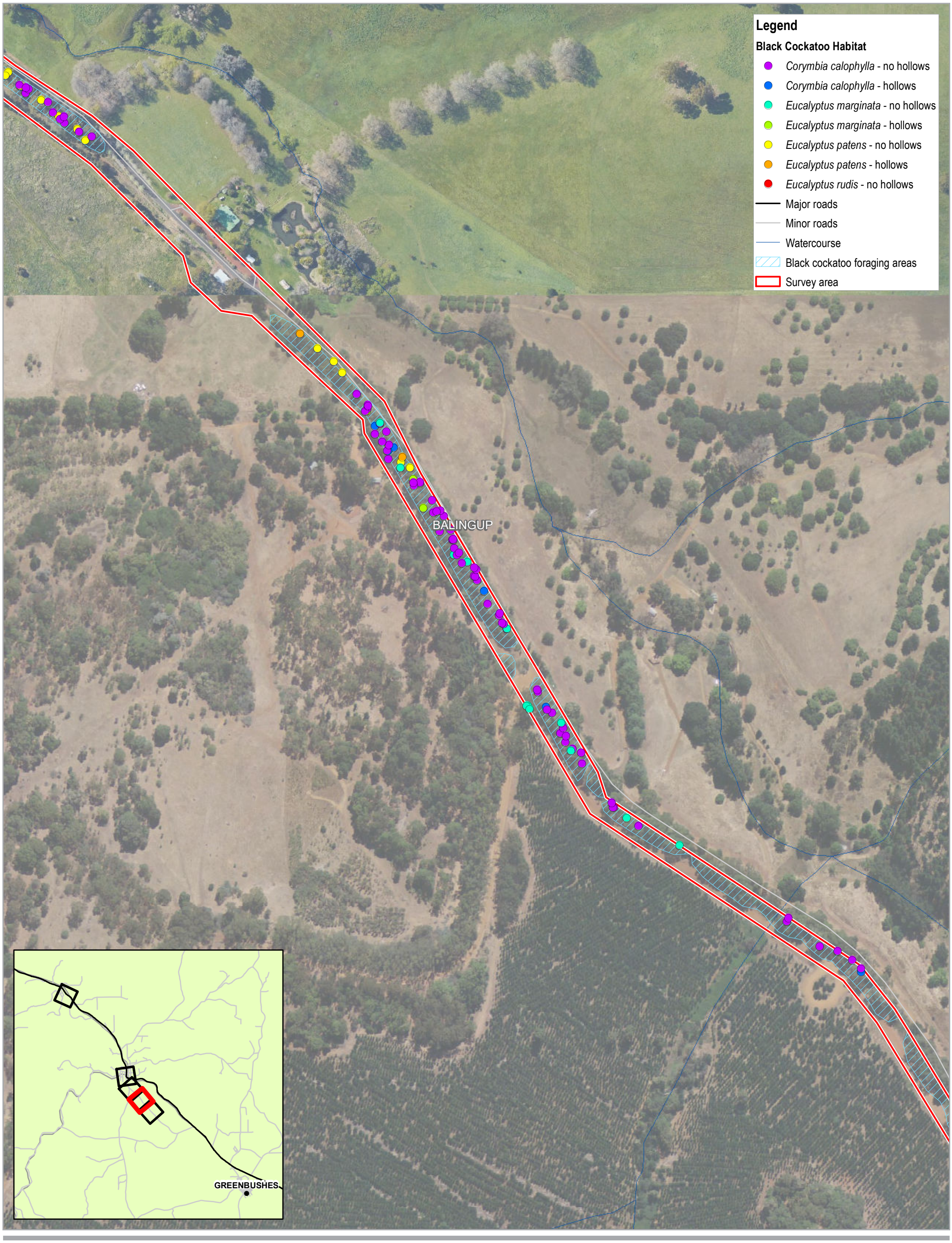

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FIGURE 4

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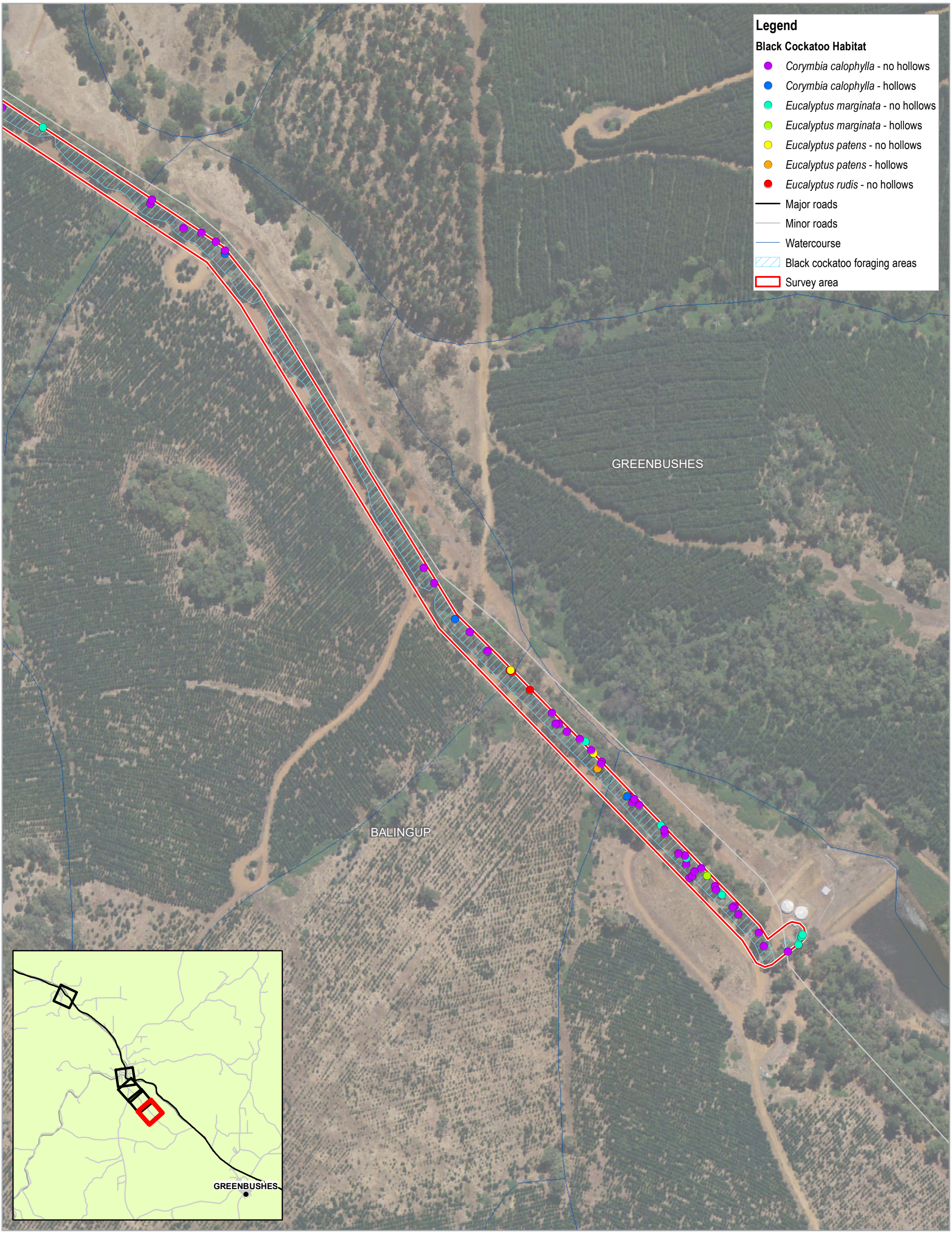
Data source: GHD: Survey area boundary - 20181009, Black Cockatoo Habitat - 20181129, Black Cockatoo Foraging area - 20181205; Landgate: Suburbs - 20180319, Imagery - 20181204; MRWA: Road - 20171211; Geoscience Australia: GeoData Topo 250k Series 3. . Created by: bjones2



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Appendix B – Relevant legislation, conservation codes and background information

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

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

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

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

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State *Biodiversity and Conservation Act 2016*

The Biodiversity Conservation Bill 2015 was introduced to State Parliament in November 2015, and passed in September 2016. The Bill became the *Biodiversity Conservation Act 2016* (BC Act) upon receiving Assent on 21 September 2016. The BC Act will eventually fully replace both the *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act).

Several parts of the BC Act were proclaimed by the State Governor in the Government Gazette and came into effect on 3 December 2016. However, provisions that replace those existing under the WC Act and Sandalwood Act (including threatened species listings and controls over the taking and keeping of native species) and their associated Regulations cannot be brought into effect until the necessary Biodiversity Conservation Regulations have been made.

State *Wildlife Conservation Act 1950*

The WC Act provides for the conservation and protection of wildlife. It is administered by the Department of Biodiversity, Conservation and Attractions (DBCA) and applies to both flora and fauna. Any person wanting to capture, collect, disturb or study fauna requires a permit to do so. A permit is required under the WC Act if removal of threatened species is required.

State *Biosecurity and Agriculture Management Act 2007*

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976.* The main purposes of the BAM Act and its regulations are to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- Manage the impact and spread of those pests already present in the state
- Safely manage the use of agricultural and veterinary chemicals
- Increased control over the sale of agricultural products that contain violative chemical residues

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Background information

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005.

Aspects of ESAs

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the EPBC Act.
An area that is included on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a Threatened Ecological Community.
A Bush Forever Site listed in "Bush Forever" Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.
The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Reserves and conservation areas

Department of Biodiversity, Conservation and Attractions managed lands and waters

DBCA manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DBCA managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DBCA managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DBCA managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil.

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity … because of their ecological, botanical, zoological, limnological or hydrological importance” (DEE 2018b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DEE 2018b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DEE 2018a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia’s Biological Diversity (ANZECC 2000).

The extent of remnant native vegetation in WA has been assessed by Shepherd et al. (2002) and the GoWA (2018), based on broadscale vegetation association mapping by Beard (various publications). The GoWA produces Statewide Vegetation Statistics Reports that are used for a number of purposes including conservation planning, land use planning and when assessing development applications. The reports are updated at least every two years.

Vegetation condition

The vegetation condition can be assessed in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016a). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale for the South West and Interzone Botanical Provinces

Condition	South West and Interzone Botanical Provinces description
Pristine	Pristine or nearly so, no obvious signs of 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 vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as ‘parkland cleared’ with the flora comprising weed or crop species with isolated native trees or shrubs.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act. The DBCA also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act.

Conservation codes and definitions for TECs listed under the EPBC Act or endorsed by the WA Minister for the Environment

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories	
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.

Categories	Definition
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.

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	Poorly known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3	Poorly known ecological communities. (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or 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, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Category	Description
Priority 4	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. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority 5	Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in ‘pristine’ condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)
- Being poorly reserved

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Flora and fauna

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the WC Act can warrant referral to the DEE and/or the EPA.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for Conservation of Nature (IUCN).

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

The State conservation level of Threatened flora and fauna has been published as Specially Protected under the WC Act, and listed under Schedules 1 to 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2015 for Threatened Fauna and under Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice 2015 for Threatened (Declared Rare) Flora. The schedules align with the categories of the EPBC Act Threatened Fauna and Threatened Flora Lists. Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such.

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. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

For the purposes of this assessment, all species listed under the EPBC Act, WC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act listed flora and fauna species

Conservation category	Definition
Extinct	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A) A species known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or B) A species that has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A species facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000).
Endangered	A) A species not critically endangered; and B) A species facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

Conservation category	Definition
Vulnerable	A) A species not critically endangered or endangered; and B) A species facing a high risk of extinction in the wild in the medium-term, as determined in accordance with the prescribed criteria.
Conservation Dependent	A) The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or B) The following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that Section 180 provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Conservation codes and descriptions for WC Act listed flora and fauna species

Conservation category	Schedule and definition
Threatened species (T)	Published as Specially Protected under the WC Act, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora. **Threatened fauna** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the WC Act. **Threatened flora** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the WC Act.
Critically Endangered (CR)	Schedule 1: Threatened species considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Schedule 2: Threatened species considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Schedule 3: Threatened species considered to be facing a high risk of extinction in the wild.
Presumed Extinct (EX)	Schedule 4: Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
International Agreement (IA)	Schedule 5: Migratory birds protected under an international agreement
Conservation Dependent (CD)	Schedule 6: Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other Specially Protected (OS)	Schedule 7: Fauna otherwise in need of special protection to ensure their conservation.

Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	Poorly-known taxa 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. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	Poorly-known taxa 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. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	Poorly-known taxa 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. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	Rare, Near Threatened and other taxa in need of monitoring A. Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)

- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty-two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

References

ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

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EPA 2016a, *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Perth, WA.

EPA 2016b, *Environmental Factor Guideline - Flora and Vegetation*, EPA, Perth, WA.

GoWA 2018, *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report)*, Current as of February 2018, Perth Western Australia, Department of Environment and Conservation, from https://www2.landgate.wa.gov.au/web/guest/downloader.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture.

Appendix C – Database search results

EPBC Act Protected Matters Search Tool (5 km buffer)

Naturemap flora and fauna searches (5 km buffer)

Australian Government
Department of the Environment and Energy

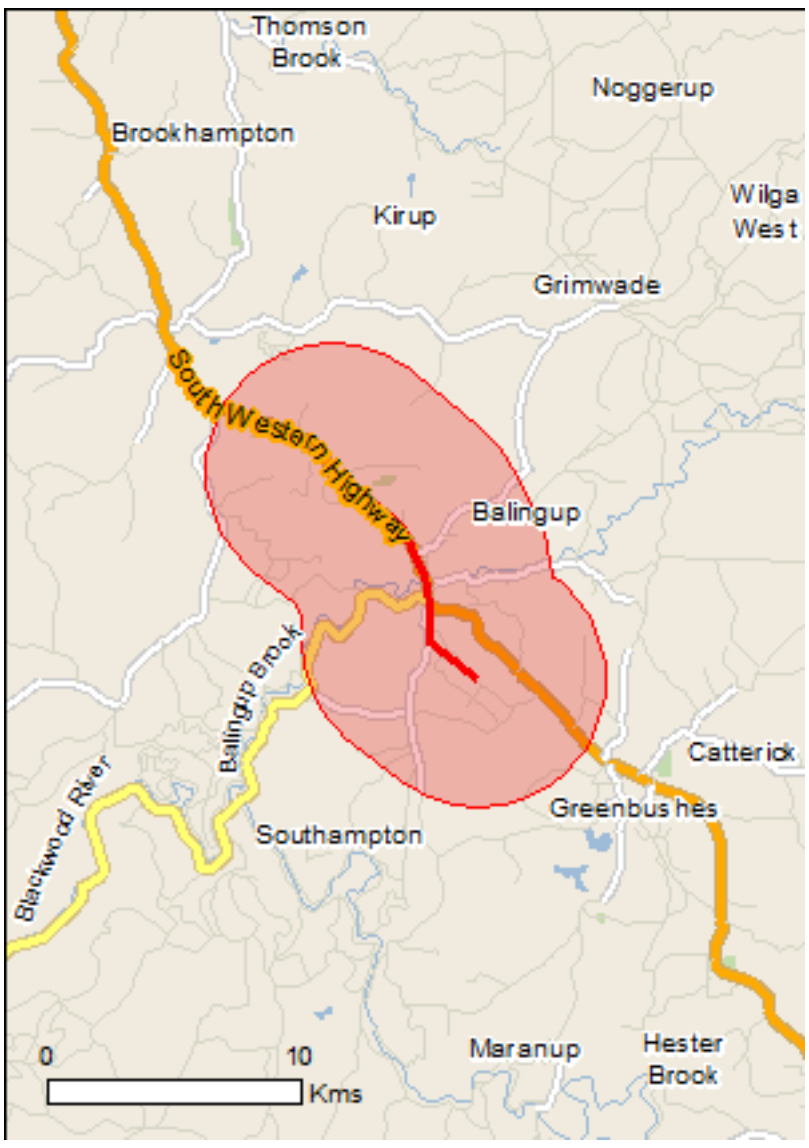
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

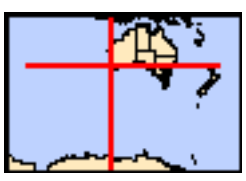
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 28/11/18 17:47:59



Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	14
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	12
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	19
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii		
Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus latirostris		
Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Myrmecobius fasciatus		
Numbat [294]	Endangered	Species or species habitat known to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
Other		
Westralunio carteri		
Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Caladenia harringtoniae		
Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat likely to occur within area
Caladenia hoffmanii		
Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Goodenia arthrotricha		
[12448]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Unnamed WA20751	WA

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		

Name	Status	Type of Presence
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.750146 115.951838,-33.76621 115.97536,-33.780996 115.983789,-33.78904 115.985972,-33.800193 115.985972,-33.811344 116.003451,-33.811344 116.003451

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Flora 5km

Created By Guest user on 24/10/2018

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	All Plants
Method	'By Line'
Vertices	33° 47' 05" S,115° 58' 58" E 33° 47' 07" S,115° 59' 04" E 33° 47' 23" S,115° 59' 02" E 33° 47' 38" S,115° 59' 07" E 33° 47' 49" S,115° 59' 20" E 33° 47' 57" S,115° 59' 31" E 33° 48' 09" S,115° 59' 40" E 33° 48' 15" S,115° 59' 49" E 33° 48' 24" S,115° 59' 55" E 33° 48' 35" S,116° 00' 08" E
Group By	Family

Family	Species	Records
Alliaceae	1	1
Apiaceae	5	5
Araceae	1	1
Asparagaceae	4	4
Asteraceae	4	10
Boraginaceae	1	1
Boryaceae	1	1
Brassicaceae	1	1
Bryaceae	1	1
Caprifoliaceae	1	1
Centrolepidaceae	1	1
Cephaloziellaceae	1	2
Convolvulaceae	1	1
Cupressaceae	1	1
Cyperaceae	3	3
Dasypogonaceae	1	1
Dicranaceae	1	5
Droseraceae	1	1
Elaeocarpaceae	2	4
Ericaceae	4	5
Euphorbiaceae	1	1
Fabaceae	13	15
Geraniaceae	1	1
Goodeniaceae	1	1
Haemodoraceae	2	3
Iridaceae	4	10
Juncaceae	2	2
Juncaginaceae	1	1
Lamiaceae	1	1
Lentibulariaceae	1	1
Lindsaeaceae	1	1
Loganiaceae	1	1
Myrtaceae	8	11
Orchidaceae	2	3
Oxalidaceae	1	1
Phyllanthaceae	1	1
Pittosporaceae	1	1
Plantaginaceae	1	2
Poaceae	6	7
Podocarpaceae	1	1
Pottiaceae	1	2
Primulaceae	1	1
Proteaceae	2	2
Racopilaceae	1	1
Ranunculaceae	2	2
Restionaceae	4	5
Rosaceae	3	5
Rubiaceae	1	1
Rutaceae	1	1
Santalaceae	1	1
Sapindaceae	1	1
Scrophulariaceae	1	1
Sematophyllaceae	1	4
Solanaceae	1	1
Stylidiaceae	2	2
Thymelaeaceae	2	2
Zamiaceae	1	1
TOTAL	**112**	**148**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Alliaceae					
1.	1378	*Allium triquetrum (Three-cornered Garlic)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Apiaceae					
2.	6253	*Platysace filiformis*			
3.	6283	*Xanthosia atkinsoniana*			
4.	6284	*Xanthosia candida*			
5.	6285	*Xanthosia ciliata*			
6.	6289	*Xanthosia huegelii*			
Araceae					
7.	1049	*Zantedeschia aethiopica (Arum Lily)*	Y		
Asparagaceae					
8.	8779	*Asparagus asparagoides (Bridal Creeper)*	Y		
9.	1309	*Laxmannia squarrosa*			
10.	1229	*Lomandra integra*			
11.	1239	*Lomandra preissii*			
Asteraceae					
12.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
13.	20074	*Conyza sumatrensis*	Y		
14.	8227	*Silybum marianum (Variegated Thistle)*	Y		
15.	29048	*Tolpis virgata*	Y		
Boraginaceae					
16.	6674	*Borago officinalis (Borage)*	Y		
Boryaceae					
17.	1273	*Borya sphaerocephala (Pincushions)*			
Brassicaceae					
18.	3061	*Raphanus raphanistrum (Wild Radish)*	Y		
Bryaceae					
19.	32427	*Rosulabryum capillare*			
Caprifoliaceae					
20.	7365	*Lonicera japonica (Japanese Honeysuckle)*	Y		
Centrolepidaceae					
21.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
Cephaloziellaceae					
22.		*Cephaloziella exiliflora*			
Convolvulaceae					
23.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
Cupressaceae					
24.	93	*Callitris drummondii (Drummond's Cypress Pine)*			
Cyperaceae					
25.	902	*Gahnia decomposita*			
26.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
27.	985	*Schoenus discifer*			
Dasypogonaceae					
28.	1219	*Dasypogon hookeri (Pineapple Bush)*			
Dicranaceae					
29.	32338	*Campylopus introflexus*	Y		
Droseraceae					
30.	3118	*Drosera pallida (Pale Rainbow)*			
Elaeocarpaceae					
31.	4526	*Tetratheca affinis*			
32.	4538	*Tetratheca parvifolia*		P3	
Ericaceae					
33.	6367	*Leucopogon capitellatus*			
34.	6396	*Leucopogon glabellus*			
35.	40941	*Leucopogon obovatus subsp. revolutus*			
36.	6454	*Leucopogon verticillatus (Tassel Flower)*			
Euphorbiaceae					
37.	4666	*Monotaxis occidentalis*			
Fabaceae					
38.	3331	*Acacia extensa (Wiry Wattle)*			
39.	17958	*Acacia mearnsii*	Y		
40.	30032	*Acacia saligna subsp. saligna*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
41.	3713	*Bossiaea linophylla*			
42.	3799	*Daviesia cordata (Bookleaf)*			
43.	15505	*Daviesia incrassata subsp. incrassata*			
44.	3954	*Gompholobium polymorphum*			
45.	3955	*Gompholobium preissii*			
46.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
47.	4044	*Kennedia prostrata (Scarlet Runner)*			
48.	4065	*Lupinus angustifolius (Narrowleaf Lupin)*	Y		
49.	3618	*Paraserianthes lophantha (Albizia)*			
50.	4313	*Trifolium subterraneum (Subterranean Clover)*	Y		
Geraniaceae					
51.	4341	*Geranium solanderi (Native Geranium)*			
Goodeniaceae					
52.	7602	*Scaevola calliptera*			
Haemodoraceae					
53.	1453	*Conostylis serrulata*			
54.	1478	*Phlebocarya ciliata*			
Iridaceae					
55.	1534	*Ixia polystachya (Variable Ixia)*	Y		
56.	11550	*Patersonia umbrosa var. xanthina (Yellow Flags)*			
57.	1561	*Tritonia crocata*	Y		
58.	38401	*Tritonia gladiolaris (Lined Tritonia)*	Y		
Juncaceae					
59.	8328	*Juncus amabilis*			
60.	1184	*Juncus holoschoenus (Jointleaf Rush)*			
Juncaginaceae					
61.	40660	*Cycnogeton huegelii*			
Lamiaceae					
62.	38323	*Lavandula stoechas subsp. stoechas*	Y		
Lentibulariaceae					
63.	7157	*Utricularia violacea (Violet Bladderwort)*			
Lindsaeaceae					
64.	59	*Lindsaea linearis (Screw Fern)*			
Loganiaceae					
65.	46316	*Orianthera serpyllifolia subsp. angustifolia*			
Myrtaceae					
66.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
67.	5628	*Eucalyptus drummondii (Drummond's Gum)*			
68.	18085	*Eucalyptus utilis*			
69.	12906	*Eucalyptus wandoo subsp. wandoo*			
70.	13273	*Melaleuca incana subsp. incana*			
71.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
72.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
73.	13280	*Melaleuca viminea subsp. viminea*			
Orchidaceae					
74.	1590	*Caladenia ferruginea (Rusty Spider Orchid)*			
75.	1603	*Caladenia longiclavata (Clubbed Spider Orchid)*			
Oxalidaceae					
76.	4351	*Oxalis flava (Pinkbulb Soursob)*	Y		
Phyllanthaceae					
77.	4690	*Poranthera huegelii*			
Pittosporaceae					
78.	28290	*Cheiranthera parviflora*			
Plantaginaceae					
79.	7068	*Kickxia spuria (Roundleaf Toadflax)*	Y		
Poaceae					
80.	250	*Bromus hordeaceus (Soft Brome)*	Y		
81.	444	*Holcus lanatus (Yorkshire Fog)*	Y		
82.	528	*Paspalum distichum (Water Couch)*	Y		
83.	557	*Piptatherum miliaceum (Rice Millet)*	Y		
84.	40430	*Rytidosperma pilosum*			
85.		*Vulpia sp.*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Podocarpaceae					
86.	86	*Podocarpus drouynianus (Wild Plum, Kula)*			
Pottiaceae					
87.	32445	*Tortula muralis*			
Primulaceae					
88.	6483	*Samolus junceus*			
Proteaceae					
89.	13085	*Grevillea centristigma*			
90.	2082	*Grevillea ripicola (Collie Grevillea)*		P4	
Racopilaceae					
91.	32480	*Racopilum cuspidigerum var. convolutaceum*			
Ranunculaceae					
92.	2929	*Clematis pubescens (Common Clematis)*			
93.	10911	*Ranunculus amphitrichus*			
Restionaceae					
94.	17691	*Desmocladus fasciculatus*			
95.	1070	*Hypolaena exsulca*			
96.	1071	*Hypolaena fastigiata*			
97.	1092	*Loxocarya cinerea*			
Rosaceae					
98.	10764	*Rosa chinensis x multiflora*	Y		
99.	3187	*Rosa rubiginosa (Sweet Briar)*	Y		
100.	23990	*Rubus ulmifolius var. ulmifolius*	Y		
Rubiaceae					
101.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
Rutaceae					
102.	18529	*Philotheca spicata (Pepper and Salt)*			
Santalaceae					
103.	2342	*Leptomeria cunninghamii*			
Sapindaceae					
104.	40761	*Acer negundo*	Y		
Scrophulariaceae					
105.	7107	*Verbascum virgatum (Twiggy Mullein)*	Y		
Sematophyllaceae					
106.	32433	*Sematophyllum homomallum*			
Solanaceae					
107.	6964	*Datura stramonium (Common Thornapple)*	Y		
Stylidiaceae					
108.	7684	*Stylidium amoenum (Lovely Triggerplant)*			
109.	7708	*Stylidium crassifolium (Thick-leaved Triggerplant)*			
Thymelaeaceae					
110.	5231	*Pimelea angustifolia (Narrow-leaved Pimelea)*			
111.	11182	*Pimelea lehmanniana subsp. nervosa*			
Zamiaceae					
112.	85	*Macrozamia riedlei (Zamia, Djiridji)*			

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Fauna 5km

Created By Guest user on 24/10/2018

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	33° 47' 05" S,115° 58' 58" E 33° 47' 07" S,115° 59' 04" E 33° 47' 23" S,115° 59' 02" E 33° 47' 38" S,115° 59' 07" E 33° 47' 49" S,115° 59' 20" E 33° 47' 57" S,115° 59' 31" E 33° 48' 09" S,115° 59' 40" E 33° 48' 15" S,115° 59' 49" E 33° 48' 24" S,115° 59' 55" E 33° 48' 35" S,116° 00' 08" E
Group By	Species Group

Species Group	Species	Records
Amphibian	1	1
Bird	103	1484
Fish	1	4
Invertebrate	10	10
Mammal	8	20
Reptile	3	8
TOTAL	**126**	**1527**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25404	*Geocrinia leai (Ticking Frog)*			
Bird					
2.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
3.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
4.	24262	*Acanthiza inornata (Western Thornbill)*			
5.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
6.	25536	*Accipiter fasciatus (Brown Goshawk)*			
7.	24301	*Aegotheles cristatus subsp. cristatus (Australian Owlet-nightjar)*			
8.	24312	*Anas gracilis (Grey Teal)*			
9.	24315	*Anas rhynchotis (Australasian Shoveler)*			
10.	24316	*Anas superciliosa (Pacific Black Duck)*			
11.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
12.	24561	*Anthochaera carunculata (Red Wattlebird)*			
13.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
14.	24285	*Aquila audax (Wedge-tailed Eagle)*			
15.	41324	*Ardea modesta (great egret, white egret)*			
16.	24341	*Ardea pacifica (White-necked Heron)*			
17.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
18.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
19.	24318	*Aythya australis (Hardhead)*			
20.		*Barnardius zonarius*			
21.	24319	*Biziura lobata (Musk Duck)*			
22.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
23.	24427	*Cacomantis flabelliformis subsp. flabelliformis (Fan-tailed Cuckoo)*			
24.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
25.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
26.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
27.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
28.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
29.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
30.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
31.	24288	*Circus approximans (Swamp Harrier)*			
32.	24289	*Circus assimilis (Spotted Harrier)*			
33.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
34.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
35.	25592	*Corvus coronoides (Australian Raven)*			
36.	25595	*Cracticus tibicen (Australian Magpie)*			
37.	24322	*Cygnus atratus (Black Swan)*			
38.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
39.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
40.	24470	*Dromaius novaehollandiae (Emu)*			
41.		*Egretta novaehollandiae*			
42.		*Elanus axillaris*			
43.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
44.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
45.	25621	*Falco berigora (Brown Falcon)*			
46.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
47.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
48.	25623	*Falco longipennis (Australian Hobby)*			
49.	24474	*Falco longipennis subsp. longipennis (Australian Hobby)*			
50.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
51.	25727	*Fulica atra (Eurasian Coot)*			
52.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
53.	25530	*Gerygone fusca (Western Gerygone)*			
54.	24443	*Grallina cyanoleuca (Magpie-lark)*			
55.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
56.	24295	*Haliastur sphenurus (Whistling Kite)*			
57.	24491	*Hirundo neoxena (Welcome Swallow)*			
58.	25661	*Lichmera indistincta (Brown Honeyeater)*			
59.		*Lophoictinia isura*			
60.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
61.	25654	*Malurus splendens (Splendid Fairy-wren)*			
62.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
63.	24598	*Merops ornatus (Rainbow Bee-eater)*			
64.		*Microcarbo melanoleucos*			
65.	25610	*Myiagra inquieta (Restless Flycatcher)*			
66.	24738	*Neophema elegans (Elegant Parrot)*			
67.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
68.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
69.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
70.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
71.	25682	*Pardalotus striatus (Striated Pardalote)*			
72.	48061	*Petrochelidon nigricans (Tree Martin)*			
73.	48066	*Petroica boodang (Scarlet Robin)*			
74.	24659	*Petroica goodenovii (Red-capped Robin)*			
75.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
76.	24409	*Phaps chalcoptera (Common Bronzewing)*			
77.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
78.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
79.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
80.	25720	*Platycercus icterotis (Western Rosella)*			
81.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
82.	24747	*Platycercus spurius (Red-capped Parrot)*			
83.	25703	*Podargus strigoides (Tawny Frogmouth)*			
84.	25704	*Podiceps cristatus (Great Crested Grebe)*			
85.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
86.	30854	*Polytelis anthopeplus subsp. westralis (Regent Parrot)*			
87.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
88.	24771	*Porzana tabuensis (Spotless Crake)*			
89.		*Purpureicephalus spurius*			
90.	48096	*Rhipidura albiscapa (Grey Fantail)*			
91.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
92.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
93.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
94.	24329	*Stictonetta naevosa (Freckled Duck)*			
95.	25597	*Strepera versicolor (Grey Currawong)*			
96.	25752	*Sturnus vulgaris (Common Starling)*	Y		
97.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
98.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
99.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
100.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
101.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
102.	25764	*Tyto novaehollandiae (Masked Owl)*			
103.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
104.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Fish					
105.		*Edelia vittata*			
Invertebrate					
106.		*Aganippe rhaphiduca*			
107.		*Araneus cyphoxis*			
108.		*Araneus senicaudatus*			
109.		*Argiope protensa*			
110.		*Austracantha minax*			
111.		*Cyclosa trilobata*			
112.		*Heurodes turritus*			
113.		*Latrodectus hasseltii*			
114.		*Missulena granulosa*			
115.		*Tasmanicosa leuckartii*			
Mammal					
116.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
117.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
118.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
119.	24223	*Mus musculus (House Mouse)*	Y		
120.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
121.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
122.	24245	*Rattus rattus (Black Rat)*	Y		
123.	24111	*Sminthopsis gilberti (Gilbert's Dunnart)*			
Reptile					
124.	25117	*Hemiergis peronii subsp. peronii*			
125.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
126.	25225	*Varanus rosenbergi (Heath Monitor)*			

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Appendix D – Likelihood of occurrence assessments

Flora likelihood of occurrence assessment

Fauna likelihood of occurrence assessment

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within study area from field survey results.
Likely	Species previously recorded within 2 km and large areas of suitable habitat occur in the study area.
Possible	Species previously recorded within 2 km and areas of suitable habitat occur/may occur in the study area.
Unlikely	Species previously recorded within 2 km, but suitable habitat does not occur in the study area.
Highly unlikely	Species not previously recorded within 2 km, suitable habitat does not occur in the study area and/or the study area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Source information - desktop searches

PMST – DotEE Protected Matters Search Tool (PMST) to identify flora listed under the EPBC Act potentially occurring within the study area

NM – DBCA NatureMap (accessed October 2018)

Flora likelihood of occurrence assessment for conservation significant flora

Family	Taxon	Status		Description (WA Herbarium 1998–2018, DotEE 2018a)	Likelihood of Occurrence	Source
		WC Act	EPBC Act			
Goodeniaceae	*Goodenia arthrotricha*	T	En	Erect perennial, herb, to 0.4 m high. Flowers blue, October to November. Occurs on gravel, granite rocks and slopes.	**Highly Unlikely** – The survey area is outside of the known distribution of this species. There is no suitable habitat within the survey area.	PMST
Orchidaceae	*Caladenia harringtoniae*	T	Vu	Tuberous, perennial, herb, 0.2-0.4 m high. Flowers. pink, October to November. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops	**Unlikely** – there is no suitable habitat present in the survey area. The closest known record is approximately 10 km south of the survey area.	PMST
Orchidaceae	*Caladenia hoffmanii*	T	En	Tuberous, perennial, herb, 0.13-0.3 m high. Flowers green & yellow & red, August to October. Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies	**Highly Unlikely** – there is no suitable habitat present in the survey area. The survey area is outside of its currently known distribution.	PMST
Orchidaceae	*Diuris micrantha*	T	Vu	Tuberous, perennial, herb, 0.3-0.6 m high. Flowers yellow & brown, Sep to Oct. Brown	**Highly Unlikely** – there is no suitable habitat present in the survey	PMST

Family	Taxon	Status		Description (WA Herbarium 1998–2018, DotEE 2018a)	Likelihood of Occurrence	Source
		WC Act	EPBC Act			
				loamy clay. Winter-wet swamps, in shallow water	area. The survey area is outside of its currently known distribution.	
Elaeocarpaceae	*Tetratheca parvifolia*	P3		Small shrub, 0.2-0.3 m high. Flowers pink, October. Gravelly soil.	**Unlikely** – given the survey intensity and highly disturbed nature of the survey area this species is considered unlikely to occur.	NM
Proteaceae	*Grevillea ripicola*	P4		Spreading, much-branched, non-lignotuberous shrub, 0.6-2(-3) m high, to 4 m wide. Flowers red/red-orange, January or March to April or November to December. Sandy clay, clay or gravelly loam. Swampy flats, granite outcrops, along watercourses.	**Unlikely** – there is no suitable habitat present in the survey area and the closest known record is approximately 4.5 km away.	NM

Parameters of fauna likelihood of occurrence assessment

Assessment outcome	Description
Likely	Species are **likely** to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area. OR Species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
Unlikely	Species assessed as **unlikely** include those species previously recorded within 5 km of the survey area however: • There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area. • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area. OR Those species that have a known distribution overlapping with the survey area however: • There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
Highly unlikely	Species that are considered **highly unlikely** to occur in the survey area include: • Those species that have no suitable habitat within the survey area. • Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.

Source information - desktop searches

PMST – DotEE PMST to identify fauna listed under the EPBC Act potentially occurring within the survey area

DBCA – DBCA 2018. WA Government, Department of Parks and Wildlife Threatened and Priority fauna rankings (current as of 11 September 2018) – WC Act

NM – DBCA NatureMap (accessed October 2018)

Fauna likelihood of occurrence assessment

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
Birds						
Calidris ferruginea (Curlew Sandpiper)	CR, IA	CR, IA		X	Curlew Sandpipers mainly occur in areas with soft mud conditions, including 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. They are found inland 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. In WA, they are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed between Carnarvon and Dampier Archipelago (DEE 2017). They are common on the Swan Coastal Plain, particularly near large drying lakes like Thompson and Forrestdale, and Peel Inlet. They are less common along the southern coast to Esperance (Nevill 2013).	**Highly unlikely** The survey area does not contain suitable habitat for this species.
Numenius madagascariensis (Eastern Curlew)	CR, IA	CR, IA		X	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal saltworks and sewage farms. In the south west, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet (Marchant & Higgins 1993). They are uncommon further south of Geraldton, but can be spotted in Alfred Cove, Peel Inlet and the Albany region (Nevill 2013).	**Highly unlikely** The survey area does not contain suitable habitat for this species.

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
Calyptorhynchus latirostris (Carnaby's Black Cockatoo)	En	En	X	X	This species mainly occurs in uncleared or remnant native eucalypt woodlands and in shrubland or kwongan heathland dominated by *Hakea*, *Banksia* and *Grevillea* species. The species also occurs in forests containing Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) or Karri (*E. diversicolor*). Breeding usually occurs in the western Wheatbelt region of WA, with flocks moving to the higher rainfall coastal area to forage after the breeding season. Feeds on the seeds of a variety of native plants, including *Allocasuarina*, *Banksia*, *Eucalyptus*, *Grevillea* and *Hakea*, and some introduced plants (DSEWPaC 2012).	**Known** Evidence of feeding on marri nuts was observed within the survey area. This species has been recorded in the area previously. The habitat within the survey area is suitable for foraging and contains potential breeding and roosting trees.
Calyptorhynchus banksii subsp. *naso* (Forest Red-tailed Black Cockatoo)	Vu	Vu	X	X	Forest Red-tailed Black Cockatoo typically occurs in dense Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*) forests, however the species also occurs in a range of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt, Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (DSEWPaC, 2012). Habitats also tend to have an understorey of *Banksia spp., Persoonia spp., Allocasuarina* spp. The Forest red-tailed Black Cockatoo generally nests in hollows in live or dead trees of Marri, Karri, Wandoo, Bullich, Blackbutt, Tuart and Jarrah (DSEWPaC 2012).	**Known** One flock was observed loafing in the survey area and adjacent property and there was fresh and old evidence of feeding on Marri nuts. The habitat within the survey area is suitable for foraging and contains potential breeding and roosting trees.

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
Calyptorhynchus baudinii (Baudin's Cockatoo)	En	En	X	X	Baudin's Black Cockatoo occurs in high-rainfall areas, usually at sites that are heavily forested and dominated by Marri (*Corymbia calophylla*) and Eucalyptus species, especially Karri (*E. diversicolor*) and Jarrah (*E. marginata*). The species also occurs in woodlands of Wandoo (*E. wandoo*), Blackbutt (*E. patens*), Flooded Gum (*E. rudis*), and Yate (*E. cornuta*). Baudin's Black Cockatoo breeds in the Jarrah, Marri and Karri forests of the deep south-west in areas averaging more than 750 mm of rainfall annually. The range of the species extends from Albany to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Boyup Brook. Preferred roosts are in areas with a dense canopy close to permanent water sources that provide the birds with protection from weather conditions (DSEWPaC, 2012).	**Likely** Although not recorded during the recent survey, this species has been recorded previously in the surrounding area. The habitat within the survey area is suitable for foraging and contains potential breeding and roosting trees.
Falco peregrinus (Peregrine Falcon)		S	X		The Peregrine Falcon is seen occasionally anywhere in the south-west of WA. It is found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. The species nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe, 2004).	**Unlikely – irregular visitor** The woodland within the survey area is suitable for foraging for the Peregrine Falcon however the survey area is not considered significant habitat for this species.
Oxyura australis (Blue-billed Duck)		P4	X		The blue-billed Duck is a small Australian almost entirely aquatic duck, with both the male and female growing to a length of 40 cm. The male has a slate-blue bill which changes to bright-blue during the breeding season. The Blue-billed Duck is endemic to Australia's temperate regions, ranging from the south west of WA, extending to southern Queensland, through New South Wales and Victoria, to Tasmania. The species is readily seen on freshwater lakes and billabongs where deep fresh water is present (Morcombe 2004).	**Unlikely** There is no suitable habitat within the survey area for the Blue-billed Duck, although there are nearby areas where the species may occur.
Tyto novaehollandiae subsp. *novaehollandiae* (Masked Owl southern subsp.)		P3	X		The Masked Owl is found across a range of habitats from wet sclerophyll forest, dry sclerophyll forest, non-eucalypt dominated forest, scrub and cleared land with remnant old growth trees. There are however several aspects of habitat preference which appear to be	**Unlikely** Given the narrow, linear nature of the vegetation remaining within the survey area and degraded condition

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
					common: the Masked Owl requires large hollows in old growth eucalypts for nesting; it often favours areas with dense understorey or ecotones comprising dense and sparse ground cover, they are often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney, 2002).	of the understorey it is considered unlikely the survey area provides core habitat for this species.
Migratory Birds						
Motacilla cinerea (Grey Wagtail)	IA	IA		X	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DotEE 2018). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).	**Unlikely** There are no known records of this species within the survey area or surrounding region. The vegetation within the survey area is not considered core habitat for this species.
Actitis hypoleucos (Common Sandpiper)	IA	IA		X	The Common Sandpiper is found along all coastlines of Australia and uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around often narrow and steep muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, mangroves, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. It is often found near mangroves, and sometimes in areas of mud littered with rocks or snags (DotEE 2018). They are somewhat uncommon in the south west, but can be found on Rottnest and Penguin Islands, and along the south coast all the way to the Esperance region, including the inland lakes like Lake Warden (Nevill 2013).	**Highly unlikely** The survey area does not contain suitable habitat for this species.
Calidris acuminata (Sharp-tailed Sandpiper)	IA	IA		X	In Australasia, the Sharp-tailed Sandpiper 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 saltlakes	**Highly unlikely** The survey area does not contain suitable habitat for this species.

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
					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. Sometimes they occur on rocky shores (DotEE 2018). They are found throughout many wetlands on the Swan Coastal Plain, in Perth lakes with wet grassed margins and receding waters, Vasse and Harvey Estuaries, and the Busselton wetlands, but are less common on the south coast until the Esperance region (Nevill 2013).	
Calidris melanotos (Pectoral Sandpiper)	IA	IA		X	In Australia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum (DotEE 2018). The bird can be seen on the Swan Coastal Plain but is rare to scarce on Lake Thompson, and as well on any freshwater wetland in the southwest with shallow, well-grassed margins. They are seen at Lake Warden, Esperance, and at Lake McLarty (Nevill 2013).	**Highly unlikely** The survey area does not contain suitable habitat for this species.
Pandion haliaetus (Osprey)	IA	IA		X	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range but may also occur on low sandy, muddy or rocky shores and over coral cays (DotEE 2018). The osprey is found along all of the south west coast line except east of Cape le Grand where it becomes scarce (Nevill 2013).	**Highly unlikely** The survey area does not contain suitable habitat for this species.

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
Mammals						
Dasyurus geoffroii (Western Quoll, Chuditch)	Vu	Vu	X	X	The Chuditch inhabits eucalypt forest (especially Jarrah, *Eucalyptus marginata*), dry woodland and mallee shrublands. In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. Most diurnal resting sites in sclerophyll forest consist of hollow logs or earth burrows (Van Dyke & Strahan, 2008). The species can travel large distances, has a large home range and is sparsely populated through a large portion of its range.	**Unlikely** There is limited suitable woodland habitat for this species in the survey area. The survey area may be used opportunistically for foraging and as a linkage between surrounding areas of native vegetation however due to the linear and degraded nature of the vegetation within the survey area it is not considered core habitat for the Chuditch.
Phascogale tapoatafa subsp. *tapoatafa* (Southern Brush-tailed Phascogale)		S	X		Found in dry, open sclerophyll forests and woodlands with a generally sparse ground-storey, which contain suitable nesting resources such as tree hollows, rotted stumps and tree cavities. Records are less common in high rainfall areas in both the north and south of WA (DEC 2012). This species is one of the most arboreal dasyurids and seldom feed on the ground. Foraging success is greatest on mature trees, large logs and dead standing trees with rough bark. An individual can use more than 40 nests in a single year, including hollow trees, rotted stumps, house ceilings and bird nests (Van Dyck and Strahan 2008).	**Unlikely** There is limited suitable woodland habitat for this species in the survey area. Given the size and degraded nature of the survey area, this species is unlikely to provide core habitat for this species.
Pseudocheirus occidentalis (Western Ringtail Possum)	CE	CE		X	Ideal habitat for the Western Ringtail Possum comprises long unburnt mature remnants of peppermint (*Agonis flexuosa*) woodlands with high canopy continuity; others comprise of jarrah (Eucalyptus marginata)/marri (*Corymbia calophylla*) forests and woodlands with adequate hollows, coastal heath, myrtaceous heaths and shrublands, Bullich (*E. megacarpa*) dominated riparian zones and karri forests. Populations are associated with swamps, water courses or floodplains, and at topographic low points which provide cooler, often more fertile conditions. Their current distribution is patchy and largely restricted to the moister south-western corner of WA, especially in the Australind/Eaton area to Waychinicup National Park. The Upper Warren area east of Manjimup is the only place the possum survives in the	**Unlikely** There is some suitable woodland habitat (e.g. hollow-bearing trees) for this species in the survey area and the nearest records are located within 5 km. The survey area was thoroughly searched for dreys (nests) and scats however no evidence of Western Ringtail Possum was observed during the survey. Previous records of Western

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
					absence of coastal peppermint. Persistence in translocation sites has only been at Karakamia Sanctuary, Perup Sanctuary and Yalgorup National Park (DBCA 2014; TSSC 2013; Van Dyck and Strahan 2008).	Ringtail Possums are sparsely scattered in the local region.
Setonix brachyurus (Quokka)	Vu	Vu		X	The Quokka prefer dense forests and thickets, streamside vegetation, heaths and shrublands of *Agonis linearifolia*-dominated swamps in the Jarrah (*Eucalyptus marginata*) forest. The northern extent of the current distribution on the mainland is in the Jarrah forest immediately south-east of the Perth metropolitan area, to southward through the southern Jarrah, Marri and Karri forests to the south coast, but largely confined throughout to areas receiving an annual rainfall of 1,000 millimetres or more (Van Dyck and Strahan, 2008).	**Unlikely** There is no suitable habitat within the survey area for the Quokka, due to the absence of areas with dense understorey vegetation.
Myrmecobius fasciatus (Numbat)	Vu	En	X	X	Current Numbat populations occupy several different habitat types: upland Jarrah forest, open eucalypt woodland, banksia woodland and tall closed shrubland. The only remaining original subpopulations are at Dryandra Woodland and the Upper Warren area (including Tone Perup Nature Reserve, Greater Kingston National Park and adjoining State Forest). In WA there are nine translocation sites, including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (see DBCA 2015 for complete list and details). At Dryandra, numbats inhabit brown mallet (*Eucalyptus astringens*) plantations. Habitats usually have an abundance of termites in the soil, and hollow logs, tree hollows, burrows and branches for shelter (DotEE 2017; Van Dyck and Strahan 2008).	**Unlikely** There are no remaining populations of the Numbat in the Donnybrook to Bridgetown region.
Hydromys chrysogaster (Water Rat)		P4	X		The Water Rat lives in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. Woody debris, rock ledges and wetland islands are likely to be important areas for feeding and refuge (DEC 2012). It is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck and Strahan 2008).	**Unlikely** There is no suitable habitat within the survey area.

Species Name	Status		Desktop Search		Description and habitat requirements	Likelihood
	EPBC Act Status	WA Status	NM	PMST		
Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)		P4	X		The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan, 2008).	**Unlikely** There is some suitable woodland habitat within the survey area. The survey area may be utilised opportunistically for foraging and as a linkage to surrounding areas of native vegetation. The survey area is not considered core habitat due to the size and degraded nature of the survey area.
Other						
Westralunio carteri (Carter's Freshwater Mussel)	Vu			X	Carter's Freshwater Mussel is usually found in freshwater river pools. They are most common in areas with muddy, silty and sandy bottoms and flowing permanent water. Environmental tolerances of W. carteri are not precisely known but they can be found where water temperatures range from 4° C to over 30° C.	**Highly unlikely** There is no suitable habitat for this species within the survey area.

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Appendix E – Field results

Flora species list

Fauna species list

Flora species recorded within the survey area

Family	Taxon	Status
Alliaceae	**Allium triquetrum*	
Asparagaceae	**Asparagus asparagoides*	DP, WONS
Asteraceae	**Arctotheca calendula*	
Asteraceae	**Cirsium vulgare*	
Asteraceae	**Conyza bonariensis*	
Asteraceae	**Crepis capillaris*	
Asteraceae	**Dittrichia graveolens*	
Asteraceae	**Hypochaeris glabra*	
Asteraceae	*Senecio sp.*	
Asteraceae	**Sonchus asper*	
Asteraceae	**Sonchus oleraceus*	
Boraginaceae	*Burchardia congesta*	
Brassicaceae	**Raphanus raphanistrum*	
Caryophyllaceae	**Petrorhagia dubia*	
Cyperaceae	*Ficinia marginata*	
Cyperaceae	*Lepidosperma sp.*	
Cyperaceae	*Tetraria octandra*	
Dennstaedtiaceae	*Pteridium esculentum*	
Fabaceae	**Acacia longifolia*	
Fabaceae	**Acacia melanoxylon*	
Fabaceae	**Acacia podalyriifolia*	
Fabaceae	*Acacia pulchella*	
Fabaceae	*Acacia saligna*	
Fabaceae	**Acacia sp.*	
Fabaceae	*Bossiaea ornata*	
Fabaceae	*Gompholobium polymorphum*	
Fabaceae	**Lathyrus tingitanus*	
Fabaceae	**Quercus sp.*	
Hemerocallidaceae	*Agrostocrinum hirsutum*	
Hemerocallidaceae	*Stypandra glauca*	
Iridaceae	**Chasmanthe floribunda*	
Iridaceae	**Gladiolus angustus*	
Iridaceae	**Gladiolus caryophyllaceus*	
Iridaceae	*Patersonia occidentalis*	
Iridaceae	**Romulea rosea*	
Iridaceae	**Watsonia meriana subsp. bulbillifera*	
Juncaceae	*Juncus pallidus*	
Myrtaceae	*Callistemon* sp.*?pallidus*	Planted
Myrtaceae	*Corymbia calophylla*	
Myrtaceae	*Eucalyptus marginata*	
Myrtaceae	*Eucalyptus patens*	
Myrtaceae	*Eucalyptus rudis*	
Myrtaceae	*Eucalyptus* sp.	Planted
Oxalidaceae	**Oxalis pes-caprae*	

Family	Taxon	Status
Papaveraceae	**Fumaria capreolata*	
Pinaceae	**Pinus pinaster*	
Plantaginaceae	**Plantago lanceolata*	
Poaceae	**Avena barbata*	
Poaceae	**Briza maxima*	
Poaceae	**Bromus diandrus*	
Poaceae	**Cenchrus clandestinus*	
Poaceae	**Cynodon dactylon*	
Poaceae	**Eragrostis curvula*	
Poaceae	**Holcus lanatus*	
Poaceae	**Phalaris* sp.	
Ranunculaceae	*Clematis pubescens*	
Rosaceae	**Rosa canina*	
Rosaceae	**Rubus ulmifolius*	DP, WONS
Solanaceae	*Solanum symonii*	
Typhaceae	*Typha* sp.	
Xanthorrhoeaceae	*Xanthorrhoea preissii*	

Fauna observed within the survey area

Family	Taxon	Common Name	Status
Birds			
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	Introduced
Cacatuidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black-Cockatoo	Vulnerable
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo	Endangered
Cacatuidae	*Eolophus roseicapillus*	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Columbidae	*Phaps chalcoptera*	Common Bronzewing	
Corvidae	*Corvus coronoides*	Australian Raven	
Cracticidae	*Cracticus tibicen*	Australian Magpie	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	
Hirundinidae	*Petrochelidon nigricans*	Tree Martin	
Maluridae	*Malurus splendens*	Splendid Fairy-wren	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	
Meropidae	*Merops ornatus*	Rainbow Bee-eater	
Motacillidae	*Motacilla cinerea*	Grey Wagtail	
Psittacidae	*Barnardius zonarius*	Twenty-eight Parrot	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	
Zosteropidae	*Zosterops lateralis*	Silvereye	
Mammals			
Canidae	*Canis lupus*	Dog	Introduced
Felidae	*Felis catus*	Cat	Introduced
Leporidae	*Oryctolagus cuniculus*	Rabbit	Introduced
Macropidae	*Macropus fuliginosus*	Western Grey Kangaroo	
Reptiles			
Scincidae	*Tiliqua rugosa rugosa*	Bobtail	
Amphibians			
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	
Limnodynastidae	*Limnodynastes dorsalis*	Western Banjo Frog	
Myobatrachidae	*Crinia georgiana*	Quacking Frog	
Myobatrachidae	*Crinia glauerti*	Clicking Froglet	

Potential Black Cockatoo Breeding Tree Records

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	750	0			yes	no	no	407650.7562	6258496.458
Eucalyptus marginata	820	0			no	no	no	407662.9609	6258509.386
Eucalyptus marginata	910	0			no	no	no	407660.1691	6258502.463
Eucalyptus marginata	800	0			no	no	no	407663.8147	6258511.386
Corymbia calophylla	1200	0			no	no	no	407629.4906	6258501.048
Corymbia calophylla	800	0			no	no	no	407625.2094	6258512.662
Corymbia calophylla	800	0			no	no	no	407607.0144	6258529.294
Corymbia calophylla	1140	0			no	no	no	407603.8051	6258536.336
Corymbia calophylla	750	0			yes	no	no	407602.1574	6258535.529
Eucalyptus marginata	680	0			no	no	no	407592.4176	6258546.531
Corymbia calophylla	630	0			no	no	no	407586.3035	6258554.16
Corymbia calophylla	830	0			no	no	no	407587.1946	6258550.892
Eucalyptus marginata	1180	1	large	Yes	no	no	no	407579.5077	6258563.52
Corymbia calophylla	570	0			yes	no	no	407574.2757	6258569.923
Corymbia calophylla	1000	0			yes	no	no	407568.2226	6258567.134
Corymbia calophylla	540	0			no	no	no	407563.7099	6258561.406
Corymbia calophylla	550	0			no	no	no	407566.1476	6258563.313
Corymbia calophylla	650	0			no	no	no	407560.9174	6258573.501
Eucalyptus marginata	850	0			yes	no	no	407561.0726	6258578.967
Corymbia calophylla	1160	0			yes	no	no	407559.8204	6258581.295
Corymbia calophylla	750	0			yes	no	no	407554.0555	6258582.997
Corymbia calophylla	720	0			no	no	no	407542.0536	6258600.527
Corymbia calophylla	700	0			yes	no	no	407541.6105	6258604.215
Eucalyptus marginata	780	0			no	no	no	407538.7303	6258607.852
Corymbia calophylla	900	0			yes	no	no	407519.2371	6258625.966
Corymbia calophylla	700	0			yes	no	no	407514.9714	6258631.343

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	520	0	0		no	no	no	407513.2913	6258628
Corymbia calophylla	1200	1	small	no	yes	no	no	407508.657	6258633.69
Corymbia calophylla	550	0			no	no	no	407509.1853	6258634.582
Eucalyptus patens	900	0			no	no	no	407508.0678	6258634.311
Eucalyptus patens	990	1	large	unsure, upward facing hollow	no	no	no	407482.471	6258658.15
Corymbia calophylla	500	0			yes	no	no	407486.1026	6258664.214
Corymbia calophylla	750	0			yes	no	no	407485.5161	6258662.484
Eucalyptus patens	900	0			no	no	no	407479.0746	6258671.731
Corymbia calophylla	650	0			no	no	no	407476.85	6258674.574
Eucalyptus marginata	600	0			no	no	no	407471.905	6258682.224
Corymbia calophylla	520	0			no	no	no	407466.8549	6258684.348
Corymbia calophylla	700	0			no	no	no	407455.2459	6258690.946
Corymbia calophylla	700	0			yes	no	no	407445.5306	6258697.792
Corymbia calophylla	1200	0			no	no	no	407448.1487	6258697.799
Corymbia calophylla	900	0			no	no	no	407442.1534	6258707.347
Eucalyptus rudis	1200	0			no	no	no	407422.5383	6258727.601
Eucalyptus rudis	700	0			no	no	no	407406.9442	6258743.638
Eucalyptus rudis	600	0			no	no	no	407404.7753	6258745.275
Eucalyptus patens	1300	0			no	no	no	407405.5567	6258745.196
Corymbia calophylla	900	0			old	no	no	407369.4202	6258779.04
Corymbia calophylla	1000	0			no	no	no	407385.1744	6258762.341
Corymbia calophylla	1200	2	large and med	no	yes	no	no	407356.4007	6258790.577
Corymbia calophylla	1200	0			no	no	no	405960.5868	6261176.179
Corymbia calophylla	700	0			old	no	no	407338.0364	6258822.463
Corymbia calophylla	600	0			yes	no	no	407328.6546	6258835.923
Corymbia calophylla	900	1	small	no	yes	no	no	407152.8351	6259113.695

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	800	0			yes	no	no	407152.7256	6259116.701
Corymbia calophylla	900	0			yes	no	no	407144.727	6259124.482
Corymbia calophylla	510	0			yes	no	no	407131.9823	6259132.283
Corymbia calophylla	1800	0			no	no	no	407116.1454	6259136.303
Corymbia calophylla	750	0			no	no	no	407086.8411	6259158.307
Corymbia calophylla	600	0			old	no	no	407088.3453	6259161.659
Eucalyptus marginata	750	0			no	no	no	406991.9191	6259225.807
Corymbia calophylla	800	0			no	no	no	406955.6558	6259243.219
Eucalyptus marginata	700	0			no	no	no	406945.1866	6259250.098
Corymbia calophylla	600	0			no	no	no	406933.7643	6259259.553
Corymbia calophylla	700	0			no	no	no	406932.8929	6259259.524
Corymbia calophylla	850	0			no	no	no	406931.7219	6259263.905
Corymbia calophylla	800	0			no	no	no	406905.5194	6259298.283
Corymbia calophylla	750	0			no	no	no	406897.2062	6259311.224
Corymbia calophylla	580	0			old	no	no	406904.9093	6259307.993
Eucalyptus marginata	1200	0			no	no	no	406895.6938	6259309.844
Corymbia calophylla	750	0			no	no	no	406890.9345	6259317.36
Corymbia calophylla	650	0			old	no	no	406891.265	6259322.858
Corymbia calophylla	800	0			no	no	no	406886.3782	6259325.107
Corymbia calophylla	910	0			no	no	no	406888.9749	6259330.006
Eucalyptus marginata	700	0			no	no	no	406887.2775	6259334.455
Corymbia calophylla	900	0			old	no	no	406879.0833	6259343.259
Corymbia calophylla	900	0			old	no	no	406874.4601	6259346.168
Corymbia calophylla	950	2	small and medium	bee hives	old	no	no	406873.7848	6259348.48
Eucalyptus marginata	900	0			no	no	no	406857.6154	6259349.529
Eucalyptus marginata	600	0			no	no	no	406856.5419	6259349.493

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Eucalyptus marginata	500	0			no	no	no	406859.1561	6259346.757
Corymbia calophylla	520	0			yes	no	no	406866.5276	6259361.829
Corymbia calophylla	580	0			yes	no	no	406865.7564	6259363.698
Corymbia calophylla	600	0			yes	no	no	406838.7372	6259418.094
Eucalyptus marginata	800	0			yes	no	no	406838.9512	6259417.673
Corymbia calophylla	750	0			yes	no	no	406836.1702	6259421.998
Corymbia calophylla	1100	0			yes	no	no	406834.7247	6259422.921
Corymbia calophylla	600	0			yes	no	no	406832.1634	6259429.549
Corymbia calophylla	500	0			yes	no	no	406832.804	6259431.411
Corymbia calophylla	1200	0			yes	no	no	406821.7395	6259439.474
Corymbia calophylla	1300	2	large	yes	yes	no	no	406818.8781	6259451.064
Corymbia calophylla	1000	0			no	no	no	406812.6485	6259460.61
Corymbia calophylla	1300	0			old	no	no	406809.7639	6259464.326
Corymbia calophylla	1500	0			old	no	no	406810.911	6259464.095
Corymbia calophylla	700	0			old	no	no	406812.0656	6259470.211
Corymbia calophylla	800	0			yes	no	no	406810.1756	6259472.089
Eucalyptus marginata	1000	0			no	no	no	406804.09	6259477.001
Corymbia calophylla	900	0			no	no	no	406799.2494	6259475.778
Eucalyptus marginata	1700	0			no	no	no	406792.1005	6259483.389
Corymbia calophylla	900	0			old	no	no	406794.948	6259483.157
Corymbia calophylla	950	0			old	no	no	406796.6855	6259485.035
Corymbia calophylla	600	0			no	no	no	406792.3613	6259488.911
Corymbia calophylla	700	0			yes	no	no	406791.9021	6259496.47
Corymbia calophylla	800	0			no	no	no	406790.7559	6259496.713
Corymbia calophylla	600	0			yes	no	no	406791.3162	6259497.014
Corymbia calophylla	950	0			yes	no	no	406789.2287	6259505.041
Corymbia calophylla	600	0			yes	no	no	406779.4143	6259503.899

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Eucalyptus marginata	800	0			no	no	no	406778.414	6259509.785
Corymbia calophylla	800	0			yes	no	no	406783.3944	6259517.39
Corymbia calophylla	800	0			yes	no	no	406780.1395	6259522.199
Corymbia calophylla	800	0			yes	no	no	406776.832	6259521.823
Corymbia calophylla	600	0			no	no	no	406773.9507	6259520.466
Eucalyptus marginata	1600	1	medium maybe	potential hollow, hard to see?	no	no	no	406765.066	6259524.441
Corymbia calophylla	1000	0			yes	no	no	406772.8246	6259531.487
Corymbia calophylla	1000	0			yes	no	no	406762.0807	6259546.973
Corymbia calophylla	1000	0			yes	no	no	406761.8896	6259547.466
Corymbia calophylla	750	0			yes	no	no	406756.6723	6259544.479
Corymbia calophylla	500	0			yes	no	no	406756.3555	6259547.058
Eucalyptus marginata	1600	1	small	no	no	no	no	406756.0132	6259550.181
Eucalyptus patens	1000	0			no	no	no	406753.3102	6259560.248
Eucalyptus patens	1000	0			no	no	no	406745.2913	6259565.304
Eucalyptus marginata	700	0			no	no	no	406744.759	6259560.257
Eucalyptus patens	1400	2	large	yes	yes	no	no	406746.4578	6259569.721
Corymbia calophylla	700	0			no	no	no	406734.0454	6259568.073
Corymbia calophylla	1600	2	small		no	no	no	406738.9006	6259578.371
Corymbia calophylla	650	0			no	no	no	406733.033	6259575.506
Corymbia calophylla	750	1	small		no	no	no	406733.8015	6259575.17
Corymbia calophylla	600	0			no	no	no	406734.5929	6259580.395
Corymbia calophylla	1300	0			no	no	no	406728.5528	6259583.326
Corymbia calophylla	900	0			no	no	no	406722.1717	6259590.036
Corymbia calophylla	550	0			old	no	no	406732.266	6259592.23
Corymbia calophylla	1700	1	large	no	no	no	no	406722.0581	6259597.235
Corymbia calophylla	520	0			no	no	no	406726.6905	6259599.566

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Eucalyptus marginata	1100	0			no	no	no	406726.7387	6259600.149
Eucalyptus marginata	1400	1	large	no	no	no	no	406714.9335	6259610.55
Corymbia calophylla	1000	0			yes	no	no	406713.6609	6259610.194
Corymbia calophylla	550	0			yes	no	no	406715.7567	6259615.984
Corymbia calophylla	600	0			yes	no	no	406715.9841	6259615.14
Corymbia calophylla	550	0			no	no	no	406715.3178	6259612.435
Corymbia calophylla	520	0			yes	no	no	406706.0658	6259625.243
Eucalyptus patens	700	0			no	no	no	406693.1823	6259644.434
Eucalyptus patens	500	0			no	no	no	406685.6562	6259654.459
Eucalyptus patens	1400	0			no	no	no	406671.4318	6259665.928
Eucalyptus patens	2100	2	large	potential	no	unsure, very high up.		406655.809	6259679.027
Corymbia calophylla	1600	0			yes	no	no	406471.3418	6259853.601
Eucalyptus patens	600	0			no	no	no	406465.8388	6259850.348
Corymbia calophylla	780	0			yes	no	no	406460.0478	6259857.749
Eucalyptus patens	700	0			no	no	no	406458.5895	6259860.122
Corymbia calophylla	1000	0			yes	no	no	406447.169	6259865.697
Corymbia calophylla	650	0			yes	no	no	406443.3735	6259868.966
Eucalyptus patens	640	0			no	no	no	406441.9871	6259871.867
Corymbia calophylla	850	0			yes	no	no	406446.8291	6259871.242
Corymbia calophylla	600	0			old	no	no	406437.1298	6259874.843
Corymbia calophylla	1200	0			old	no	no	406432.5961	6259883.844
Eucalyptus patens	1200	0			no	no	no	406426.5099	6259885.779
Corymbia calophylla	540	0			no	no	no	406412.8201	6259892.074
Corymbia calophylla	530	0			yes	no	no	406415.5204	6259895.542
Corymbia calophylla	550	0			yes	no	no	406412.9921	6259896.868
Eucalyptus patens	790	0			no	no	no	406408.472	6259898.195
Corymbia calophylla	590	0			no	no	no	406407.4484	6259899.158

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Eucalyptus patens	530	0			no	no	no	406397.3158	6259910.47
Eucalyptus patens	1070				no	no	no	406395.0233	6259907.683
Eucalyptus patens	510	0			no	no	no	406387.7751	6259907.963
Eucalyptus patens	590	0			no	no	no	406386.8484	6259912.458
Corymbia calophylla	980	0			yes	no	no	406384.0155	6259920.458
Eucalyptus patens	580	0			no	no	no	406379.6269	6259920.175
Corymbia calophylla	840	0			yes	no	no	406368.3657	6259928.99
Corymbia calophylla	790	0			yes	no	no	406363.2799	6259926.631
Eucalyptus patens	1100	0			no	no	no	406361.2584	6259926.484
Corymbia calophylla	790	0			yes	no	no	406361.4875	6259933.01
Eucalyptus patens	720	0			no	no	no	406355.112	6259936.594
Corymbia calophylla	560	0			yes	no	no	406355.0663	6259939.837
Corymbia calophylla	520	0			yes	no	no	406354.503	6259940.295
Corymbia calophylla	600	0			yes	no	no	406350.4185	6259938.28
Corymbia calophylla	680	0			yes	no	no	406344.4858	6259946.745
Corymbia calophylla	1560	2	large	yes	yes	chew marks around hollow		406336.6342	6259948.223
Corymbia calophylla	570	0			yes	no	no	406326.1175	6259955.689
Corymbia calophylla	540	0			yes	no	no	406317.2824	6259964.925
Corymbia calophylla	790	0			yes	no	no	406313.6676	6259965.505
Corymbia calophylla	670	0			yes	no	no	406313.3297	6259968.327
Eucalyptus patens	740	0			no	no	no	406312.5885	6259969.638
Eucalyptus patens	520	0			no	no	no	406306.3028	6259974.437
Eucalyptus patens	550	0			no	no	no	406306.2828	6259973.967
Corymbia calophylla	610	0			yes	no	no	406298.6655	6259977.82
Corymbia calophylla	1020	0			yes	no	no	406295.8453	6259980.598
Corymbia calophylla	610	0			yes	no	no	406293.0579	6259986.157

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	720	0			yes	no	no	406284.4357	6259988.144
Corymbia calophylla	800	0			yes	no	no	406280.5715	6259989.474
Corymbia calophylla	790	0			yes	no	no	406276.5895	6259992.708
Eucalyptus patens	510	0			no	no	no	406272.4251	6259993.64
Corymbia calophylla	630	0			yes	no	no	406270.4552	6259996.858
Eucalyptus rudis	870	0			no	no	no	406269.6596	6259998.682
Corymbia calophylla	550	0			yes	no	Possible in area	406266.7287	6260001.896
Eucalyptus rudis	520	0			no	no	no	406267.5067	6260006.41
Corymbia calophylla	620	0			no	no	no	406267.4299	6260010.771
Eucalyptus patens	530	0			no	no	no	406264.8663	6260010.197
Eucalyptus rudis	1100	0			no	no	no	406261.2289	6260011.183
Eucalyptus rudis	550	0			no	no	no	406251.527	6260021.778
Eucalyptus rudis	550	0			no	no	no	406250.3564	6260022.694
Eucalyptus rudis	1000	0			no	no	no	406245.8207	6260025.119
Eucalyptus rudis	900	0			no	no	no	406158.4909	6260126.48
Eucalyptus rudis	1000	0			no	no	no	406144.3612	6260139.646
Eucalyptus rudis	900	0			no	no	no	406144.9503	6260141.087
Eucalyptus rudis	900	0			no	no	no	406083.1759	6260233.602
Eucalyptus rudis	1000	0			no	no	no	406084.1314	6260232.477
Eucalyptus patens	1050	0			no	no	no	406076.1407	6260246.167
Eucalyptus patens	550	0			no	no	no	406074.0113	6260248.985
Eucalyptus patens	850	0			no	no	no	406070.2914	6260250.658
Eucalyptus patens	600	0			no	no	no	406070.1141	6260251.259
Eucalyptus patens	650	0			no	no	no	406071.0368	6260252.263
Eucalyptus patens	750	0			no	no	no	406069.0623	6260254.625
Eucalyptus patens	1150	0			no	no	no	406062.7705	6260269.134

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Eucalyptus patens	700	0			no	no	no	406060.3637	6260278.32
Eucalyptus patens	650	0			no	no	no	406060.7419	6260277.905
Eucalyptus patens	650	0			no	no	no	406058.8568	6260282.952
Eucalyptus patens	550	0			no	no	no	406059.7427	6260283.557
Eucalyptus patens	660	0			no	no	no	406051.6399	6260289.992
Eucalyptus patens	1000	0			no	no	no	406050.2599	6260294.267
Eucalyptus marginata	1100	0			no	no	no	406047.3442	6260295.757
Eucalyptus patens	1100	0			no	no	no	406047.3315	6260299.71
Eucalyptus patens	550	0			no	no	no	406050.0831	6260300.307
Corymbia calophylla	850	0			no	no	no	406043.3761	6260304.765
Eucalyptus patens	850	0			no	no	no	406043.952	6260304.27
Eucalyptus patens	1400	0			no	no	no	406039.1754	6260335.696
Eucalyptus patens	750	0			no	no	no	406035.6375	6260335.459
Eucalyptus patens	800	0			no	no	no	406026.6402	6260352.163
Eucalyptus patens	610	0			no	no	no	406023.7024	6260357.448
Eucalyptus rudis	950	0			no	no	no	406025.3431	6260362.112
Corymbia calophylla	700	0			yes	no	no	406020.2469	6260368.154
Corymbia calophylla	700	0			no	no	no	406022.1011	6260371.66
Eucalyptus patens	600	0			no	no	no	406019.3114	6260378.84
Corymbia calophylla	600	0			no	no	no	406014.3632	6260383.332
Corymbia calophylla	700	0			no	no	no	406012.7412	6260390.859
Corymbia calophylla	700	0			no	no	no	406010.1034	6260394.209
Corymbia calophylla	510	0			no	no	no	406010.4985	6260398.736
Corymbia calophylla	650	0			no	no	no	406009.6808	6260405.93
Eucalyptus patens	600	1	small	no	no	no	no	406008.1425	6260409.661
Eucalyptus patens	800	0			no	no	no	406006.7547	6260418.641
Corymbia calophylla	500	0			no	no	no	406009.2978	6260421.461

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	600	0			no	no	no	406005.6399	6260429.993
Eucalyptus patens	800	0			no	no	no	406001.6915	6260436.988
Corymbia calophylla	600	0			no	no	no	406001.3229	6260438.197
Eucalyptus patens	850	0			no	no	no	406000.7595	6260440.589
Eucalyptus patens	1400	0			no	no	no	406001.1296	6260448.127
Corymbia calophylla	750	0			no	no	no	405996.859	6260460.727
Eucalyptus patens	1100	0			no	no	no	405990.4118	6260468.562
Eucalyptus patens	950	0			no	no	no	405991.0853	6260480.383
Corymbia calophylla	600	0			no	no	no	405984.8133	6260485.466
Eucalyptus patens	1000	0			no	no	no	405979.3675	6260495.35
Corymbia calophylla	800	0			no	no	no	405986.2542	6260504.91
Eucalyptus patens	1000	0			no	no	no	405982.6212	6260501.52
Eucalyptus patens	750	0			no	no	no	405977.406	6260507.102
Eucalyptus patens	900	0			no	no	no	405977.0703	6260510.786
Eucalyptus patens	1200	0			no	no	no	405977.2354	6260515.787
Eucalyptus patens	1200	1	small	no	no	no	no	405972.3139	6260542.606
Eucalyptus rudis	700	0			no	no	no	405965.9245	6260614.679
Eucalyptus rudis	550	0			no	no	no	405966.372	6260615.975
Eucalyptus rudis	1000	0			no	no	no	405966.7919	6260624.309
Eucalyptus rudis	850	0			no	no	no	405965.5707	6260638.375
Eucalyptus rudis	900	0			no	no	no	405967.6063	6260654.6
Eucalyptus patens	500	0			no	no	no	405964.0845	6260668.725
Eucalyptus patens	750	0			no	no	no	405961.4852	6260686.192
Corymbia calophylla	800	0			yes	no	no	405961.7178	6260714.988
Corymbia calophylla	500	0			yes	no	no	405960.7829	6260719.189
Corymbia calophylla	500	0			yes	no	no	405959.2354	6260721.047
Corymbia calophylla	700	0			yes	no	no	405959.7505	6260735.008

Tree Species	DBH	Hollows	Hollow Size	Hollow Suitable	Feeding Evidence	Breeding Evidence	Roosting Evidence	Easting	Northing
Corymbia calophylla	600	0			yes	no	no	405959.8138	6260740.94
Corymbia calophylla	600	0			yes	no	no	405958.2208	6260746.158
Corymbia calophylla	500	0			no	no	no	405959.0675	6260755.628
Corymbia calophylla	950	0			no	no	no	405958.755	6260756.774
Eucalyptus patens	500	0			no	no	no	405958.6896	6260767.628
Corymbia calophylla	550	0			no	no	no	405964.9143	6260779.994
Corymbia calophylla	900	0			yes	no	no	405941.4527	6260777.453
Eucalyptus rudis	1100	0			no	no	no	405943.7412	6260773.394
Eucalyptus patens	500	0			no	no	no	405938.0537	6260702.765
Eucalyptus patens	550	0			no	no	no	405941.3649	6260685.595
Eucalyptus patens	900	0			no	no	no	405948.8014	6260664.162
Eucalyptus patens	500	0			no	no	no	405945.0285	6260633.478
Eucalyptus rudis	1000	0			no	no	no	405957.0229	6260633.996
Eucalyptus patens	500	0			no	no	no	405954.0455	6260624.36
Eucalyptus patens	1100	1	small	no	no	no	no	405956.3657	6260603.625
Eucalyptus patens	1100	0			no	no	no	405958.8673	6260598.91
Eucalyptus patens	850	0			no	no	no	405959.5829	6260574.077
Eucalyptus patens	900	0			no	no	no	405960.9113	6260568.93
Corymbia calophylla	600	0			yes	no	no	405960.37	6260557.944
Eucalyptus patens	500	0			no	no	no	405943.4982	6260550.193
Eucalyptus patens	550	0			no	no	no	406013.7177	6260323.882
Eucalyptus patens	650	0			no	no	no	406034.4796	6260296.525

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
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