ENVIRONMENTAL ASSESSMENT AND INDICATIVE REHABILITATION PLAN

SUPPORTING DOCUMENT FOR EXTRACTIVE INDUSTRY LICENCE APPLICATION

150 RUNNYMEDE ROAD BINNINGUP

PREPARED FOR:

MCDOUGALL QUARRIES PTY LTD

JUNE 2022

PREPARED BY:

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150 RUNNYMEDE ROAD, BINNINGUP
ENVIRONMENTAL ASSESSMENT AND REHABILITATION PLAN

Distribution List:

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Draft Report	Kirsi Kauhanen Dane Vincent	Sue Brand	24 June 2022
Final Report	Kirsi Kauhanen Dane Vincent	Sue Brand	29 June 2022

EXECUTIVE SUMMARY

McDougall Quarries Pty Ltd is proposing to extract sand on 150 Runnymede Road in Binningup, located approximately 23 km north of Bunbury, in the Shire of Harvey. The purpose of this document is to provide supporting environmental information for the Development Approval (DA) application and the associated Extractive Industry Licence (EIL) application that will be submitted to the local government authority, Shire of Harvey. This document describes the environmental values of the site, potential environmental impacts and their management, and includes an indicative rehabilitation plan. This document should be read in conjunction with the DA application.

The proposed extraction area has been delineated so that it focuses on the previously cleared and degraded areas in the southwest corner of the property. The proposed extraction area covers 16.01 ha, of which 52% has been cleared in the past. The main environmental impacts of the project are associated with the proposed vegetation clearing, involving the following:

- Removal of 7.64 ha of mostly degraded native vegetation and associated fauna habitat.
- Removal of four individuals of *Acacia* sp. Binningup (Priority 1 species), while retaining 35 individuals (90%) of the species recorded on the property.
- Removal of 7.64 ha of low to moderate quality black cockatoo foraging habitat, including 75 diameter at breast height (DBH) trees, one of which has two hollows potentially suitable for black cockatoo nesting (no signs of use). No known roosting sites are proposed to be removed.

The proposed vegetation clearing will not impact on state or federally listed Threatened or Priority Ecological Communities (TEC or PEC) or Threatened flora species. The proposed extraction area has been designed to exclude areas within 20 m of know or likely TEC/PEC.

The impacts of vegetation clearing will be mitigated through onsite revegetation. At this stage it is expected that the entire extraction area (16.01 ha) will be revegetated with native vegetation, however the exact scale and type of revegetation will be determined as part of the NVCP process.

The proposed sand extraction project has been designed to minimise environmental impacts and the majority of the potential impacts - such as weeds, dieback, and dust - can be effectively managed through the measures detailed in this document and associated management plans. The significance of the impacts of the proposed vegetation clearing and the management/mitigation/offset measures required will be determined by the Department of Water and Environmental Regulation (DWER) as part of the Native Vegetation Clearing Permit process. A referral to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the EPBC Act will be made and if assessment is required, it is expected this would be undertaken by DWER under the bilateral agreement between the departments. As part of these processes, various measures to reduce, mitigate, and offset impacts of the native vegetation clearing will be considered.

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Appendices

1. INTRODUCTION

McDougall Quarries Pty Ltd (McDougall Quarries) is proposing to extract sand on 150 Runnymede Road (Lot 9 on Diagram 41076) in Binningup (the property) located approximately 23 km north of Bunbury, in the Shire of Harvey (Figure 1 and Figure 2). The property totals 257.46 ha in size and is zoned 'General Farming' in the Shire of Harvey Town Planning Scheme No.1. The property is largely covered in remnant native vegetation, apart from a parkland cleared area in the southwestern corner. The sand extraction is proposed to occur in this degraded portion of the property and cover total of 16.01 ha (Figure 3).

The purpose of this document is to provide supporting environmental information for the Development Approval (DA) application and the associated Extractive Industry Licence (EIL) application that will be submitted to the Shire of Harvey. This document describes the preliminary environmental values of the site, potential environmental impacts and their management, and includes an indicative rehabilitation plan. This document should be read in conjunction with the DA application.

The project requires a Native Vegetation Clearing Permit (NVCP) from the Department of Water and Environmental Regulation (DWER) and therefore the project impacts and their management will continue to be refined as part of the NVCP process.

Scale: 1:100000
Original Size: A4
Image: Copernicus Sentinel Data 2020
Grid: GDA94
0 2.5 5 km

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 1

Location Plan

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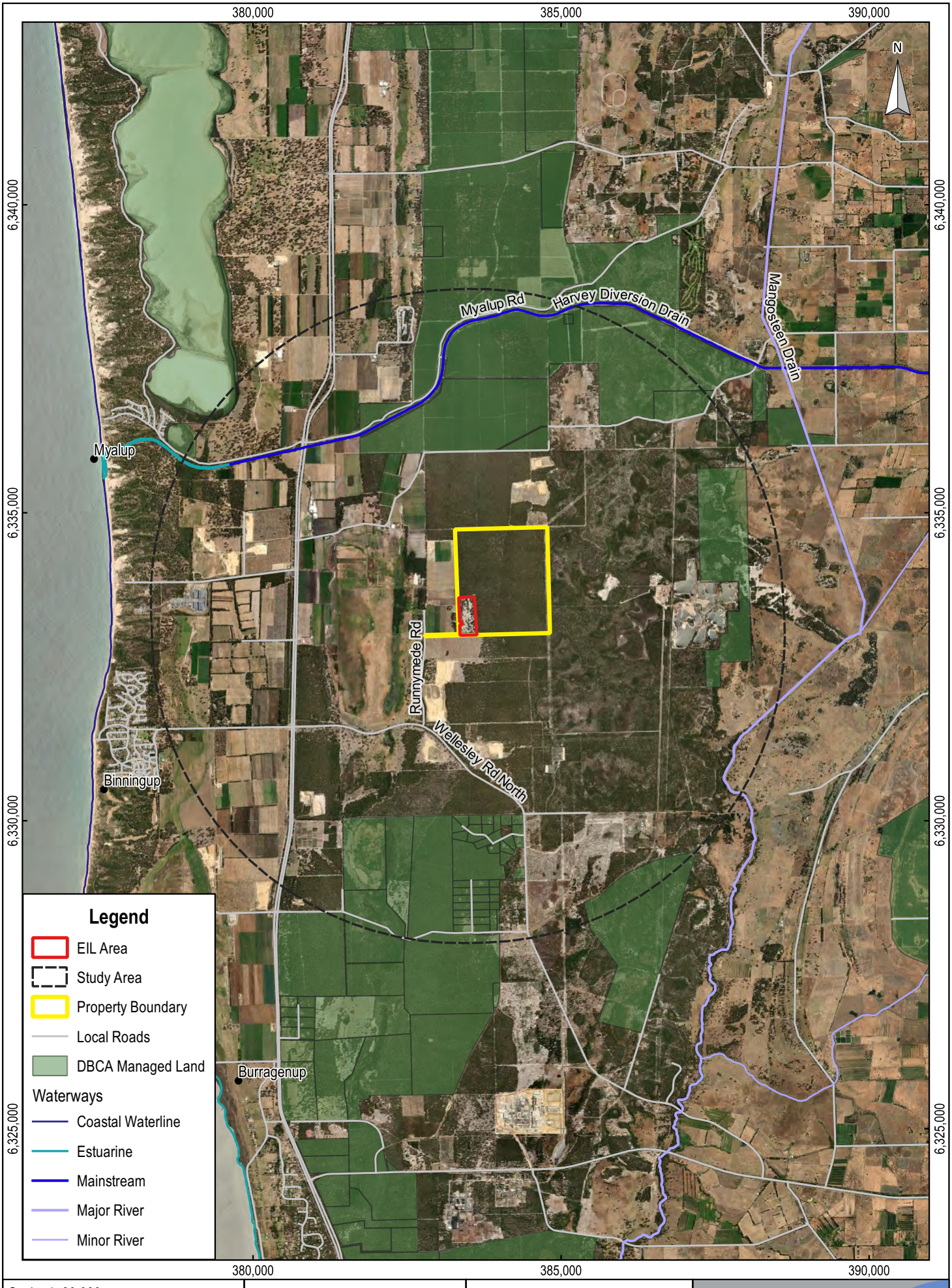

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Aerial Image Date: Nov 2021
Grid: GDA94 / MGA zone 50
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McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 2

Local Context

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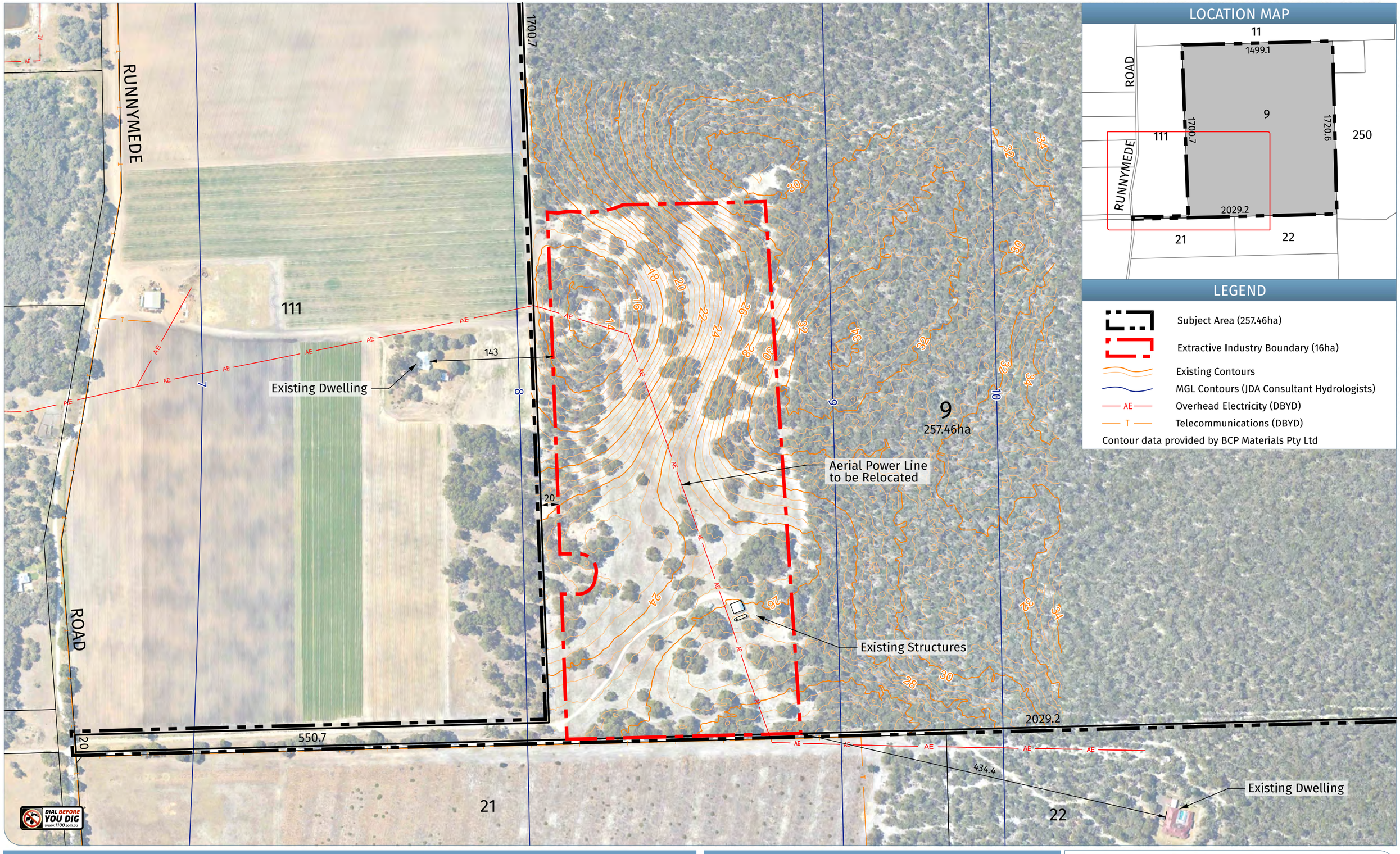

LOCATION MAP

LEGEND

- Subject Area (257.46ha)
- Extractive Industry Boundary (16ha)
- Existing Contours
- MGL Contours (JDA Consultant Hydrologists)
- AE — Overhead Electricity (DBYD)
- T — Telecommunications (DBYD)

Contour data provided by BCP Materials Pty Ltd

SITE PLAN

Lot 9 (No. 150) Runnymede Road, BINNINGUP

Plan No.	23076-01	
Date	15/06/22	
Drawn	NP	
Checked	DL	
Revision	E	
Scale	1:4000@A3	0 50m 100m

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NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

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2. KEY LEGISLATION

2.1 ENVIRONMENTAL PROTECTION ACT 1986 (WA)

The *Environmental Protection Act 1986* (EP Act) is administered by the DWER and the Department of Biodiversity, Conservation and Attractions (DBCA). The EP Act provides for conservation, preservation, protection, enhancement and management of the environment, and for matters incidental to or connected with it. The EP Act establishes head powers to provide mechanisms for the development of Environmental Protection Policies, the referral and assessment of proposals (environmental impact assessment), the control of pollution, and enforcement. The EP Act also provides for an Environmental Protection Authority that is a statutory authority and is the primary provider of independent environmental advice to Government. DWER administers the clearing provisions of the EP Act. Applications for a NVCP are assessed and decisions are made to grant or refuse the application in accordance with the EP Act.

2.2 BIODIVERSITY CONSERVATION ACT 2016 (WA)

The *Biodiversity Conservation Act 2016* replaces the *Wildlife Conservation Act 1950* and provides for the ongoing protection of Western Australian flora, fauna, and ecological communities.

2.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (CWLTH)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. The EPBC Act aims to protect Matters of National Environmental Significance. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and Environment (DAWE) lists, for example, Threatened species, Migratory species, and Threatened Ecological Communities. All development proposals are required to consider potential obligations under the EPBC Act.

3. EXISTING ENVIRONMENT

The existing environment of the extraction area is described on the basis of a desktop review, flora and vegetation survey by Ecoedge (2022), and fauna survey by MBS Environmental (2022). Where the desktop review utilised GIS data layers available through DataWA (Government of Western Australia 2022), the layers are referenced using their identifier e.g., DWER-031.

3.1 BIOREGIONAL CONTEXT

The proposal area is located within the Swan Coastal Plain Bioregion classified by the Interim Biogeographic Regionalisation for Australia and described as a low lying coastal plain mainly covered by Banksia or Tuart woodlands over sandy soils with paperbark prevalent in swampy areas (Thackway and Cresswell 1995).

The Swan Coastal Plain Bioregion is divided into two subregions; the Dandaragan Plateau (SWA01) and Perth (SWA02). The proposal area is located within the Perth subregion (SWA02). This subregion is comprised of colluvial and aeolian sands, alluvial river flats, and coastal limestone. Native vegetation varies from Heath and/or Tuart woodlands on limestone, Banksia and Jarrah woodlands on Quaternary marine dunes of various ages, and Marri on colluvial and alluvials. This subregion also includes a complex series of seasonal wetlands (Mitchell, Williams, and Desmond 2002). The primary land use associated with this subregion includes dry land agriculture, conservation, and crown reserve, as well as urban and rural residence (Mitchell, Williams, and Desmond 2002).

3.2 LANDFORMS AND SOIL SYSTEMS

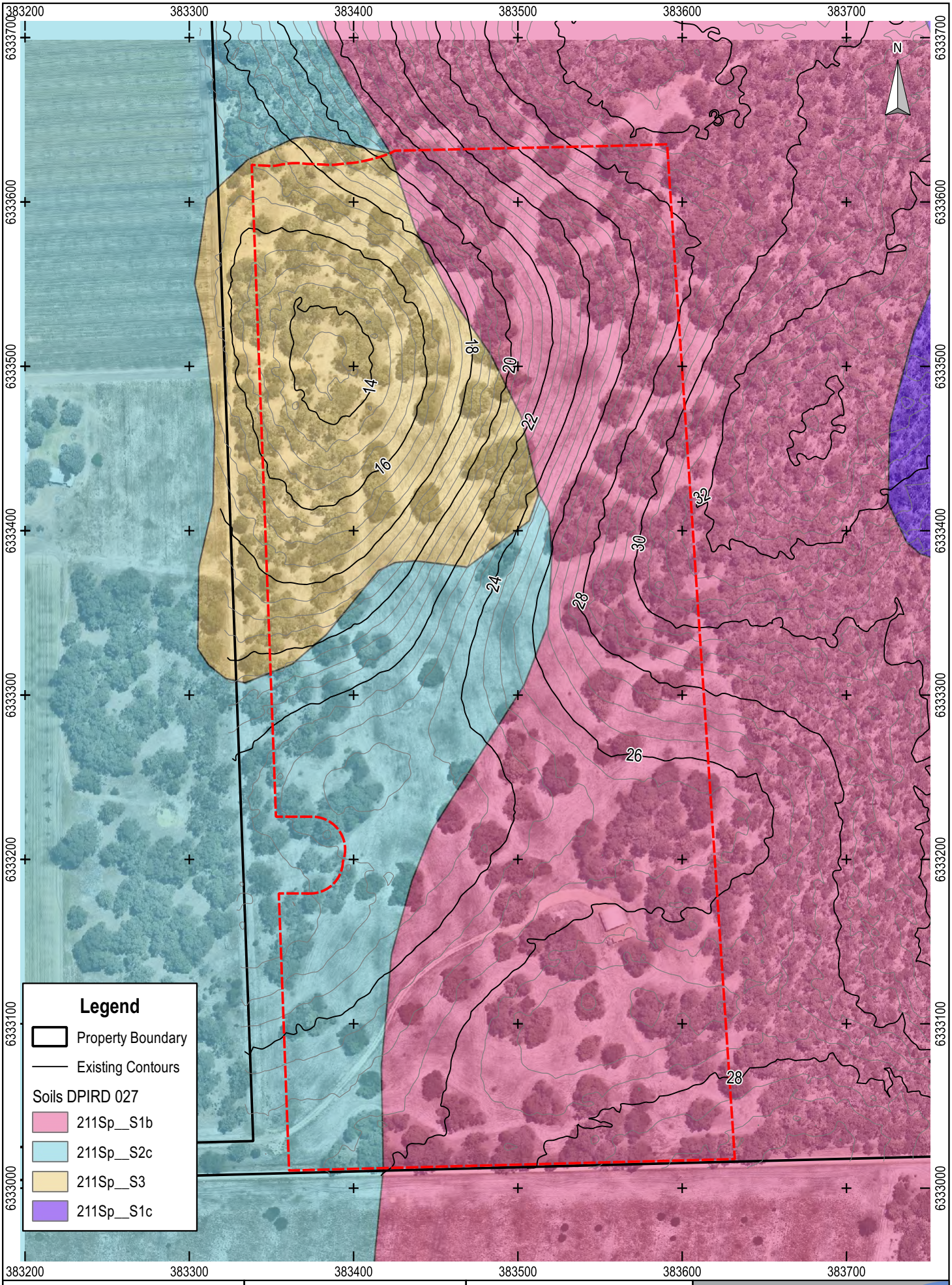
The property is wholly contained within the Spearwood System of the Swan Coastal Plain (DPIRD-064). The Spearwood System is characterised by sand dunes and plains with deposits of Aeolian sand and limestone over sedimentary rocks (DPIRD-064). As the proposal is located on a sand dune away from wetlands and waterways, the risk of acid sulfate soil (ASS) is low, and this is supported by the ASS mapping (DWER-055).

There are three soil landscape units within the proposal area (Figure 4, DPIRD-027):

- Spearwood S2c Phase (211Sp_S1c): Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c). Usually occurs on the eastern edge of the Spearwood Dunes.
- Spearwood S1b Phase (211Sp_S1b): Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
- Spearwood S3 Phase (211Sp_S3): Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.

The topography of the proposal area undulates from approximately 32 m Australian Height Datum (AHD) in the east to 14 m AHD to the northwest (DPIRD-072) (Figure 4).

Most of 150 Runnymede Road, including the proposal area, is located in an area mapped as a regionally significant basic raw material (sand) resource (DMIRS-050).



Scale: 1: 3,000
Original Size: A4
Grid: GDA94 / MGA zone 50

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McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 4

Landform and Soils

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3.3 GROUNDWATER

The proposal area lies within the South West Coastal Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) (DWER-034). The unconfined 'Perth – Superficial Swan' aquifer overlies the more confined 'Perth-Leederville' aquifer (Government of Western Australia 2022b). Recent groundwater monitoring found the maximum groundwater table is approximately eight to nine metres below the natural ground surface level (JDA Consultant Hydrologists 2022).

3.4 SURFACE WATER

The proposal area lies within the eastern edge of the Harvey Diversion Catchment of the Harvey River Basin (712 km^2) of the South West Division (DWER-027; DWER-028; DWER-029; DWER-030). No surface water areas proclaimed under the RIWI Act occur within the proposal area (DWER-037).

There are no permanent or ephemeral water bodies (wetlands, rivers, creeks, drainage lines) within the proposal area or property boundary (DWER-031; DBCA-019; DBCA-010; DBCA-045). The closest wetland is a multiple use wetland (UFI 13249) approximately 630 m to the west of the proposal area, with the closest conservation category wetland (UFI 13255) approximately 1.2 km to the northeast (DBCA-019). The closest watercourse is Harvey Diversion Drain approximately 3.2 km north of the proposal area (DWER-031).

No Public Drinking Water Source Areas (PDWSAs) are located within the proposal area or property boundary, with the closest being Brunswick River and Tributaries, 4 kms to the east (DWER-033).

3.5 ENVIRONMENTALLY SENSITIVE AREAS

There are no areas defined as Environmentally Sensitive Areas (ESA) within the proposal area (DWER-046). The closest ESA is the conservation category wetland located 1.2 km to the east.

3.6 FLORA AND VEGETATION

In broad scale vegetation mapping datasets, the proposal area is mapped as Vegetation Association 6 (Pre-European vegetation dataset DPIRD-006) and Karrakatta Complex - Central and South (South-west vegetation complexes dataset DBCA-046). Vegetation Association 6 is described as: Medium woodland; tuart and jarrah (Government of Western Australia 2018a). Karrakatta Complex - Central and South is described as: predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River (Government of Western Australia 2018b). Based on native vegetation extent dataset (DPIRD-005), there is 50.7% native vegetation remaining within 5 km buffer of the proposal area (4,162.4 ha of vegetation within a total area of 8,204.9 ha).

Ecoedge (2022) completed a reconnaissance flora and vegetation survey of the degraded southwestern portion of the property (see Appendix 1) that identified a total of 64 flora species, of which 24 species were introduced. No federally listed significant flora species were found within the survey area. One state listed significant flora species, *Acacia* sp. Binningup listed as Priority 1 by DBCA, was recorded (Figure 5). Two cryptic orchid species, *Drakaea micrantha* (Threatened) and *Caladenia speciosa* (P4) that would have likely been dormant at the time of the survey, have some residual potential to occur, however the degraded nature of the site reduces the likelihood of these species persisting in the survey area. All other significant flora species with potential to occur in the area based on desktop database searches, are considered unlikely to occur in the survey area following the field assessment. One Declared Pest, as listed under the *Biosecurity and Agriculture Management Act 2007*, **Solanum linnaeanum* (Apple of Sodom), was recorded by Ecoedge (2022) and MBS Environmental has also observed **Zantedeschia aethiopica* (Arum Lily) in the proposal area.

Ecoedge (2022) recorded 9.82 ha of native vegetation in the total survey area of 19.31 ha, with the rest being cleared. Two native vegetation units were described (Table 1) and are mapped in Figure 5. The majority of the vegetation was in Degraded condition, with 1.12 ha in Good and 0.05 ha in Very Good condition (Table 2, Figure 6).

The survey area may have originally supported Banksia Woodlands of the Swan Coastal Plain TEC/PEC. However, the disturbance history of the site has resulted in significant changes to species composition and vegetation condition. As a result, the vegetation remaining does not meet the criteria for Banksia Woodlands of the SCP TEC/PEC, apart from a small 0.05 ha area along the northern boundary of the survey area in Very Good condition. This area qualifies as the TEC/PEC based on the assumption that it is part of a larger area of Banksia Woodlands on SCP TEC/PEC outside the current survey area. The balance of vegetation on 150 Runnymede Road (outside the survey area) has not been formally surveyed but at least parts of it are expected to represent Banksia Woodlands on SCP TEC/PEC.

Table 1: Vegetation Units (Ecoedge 2022)

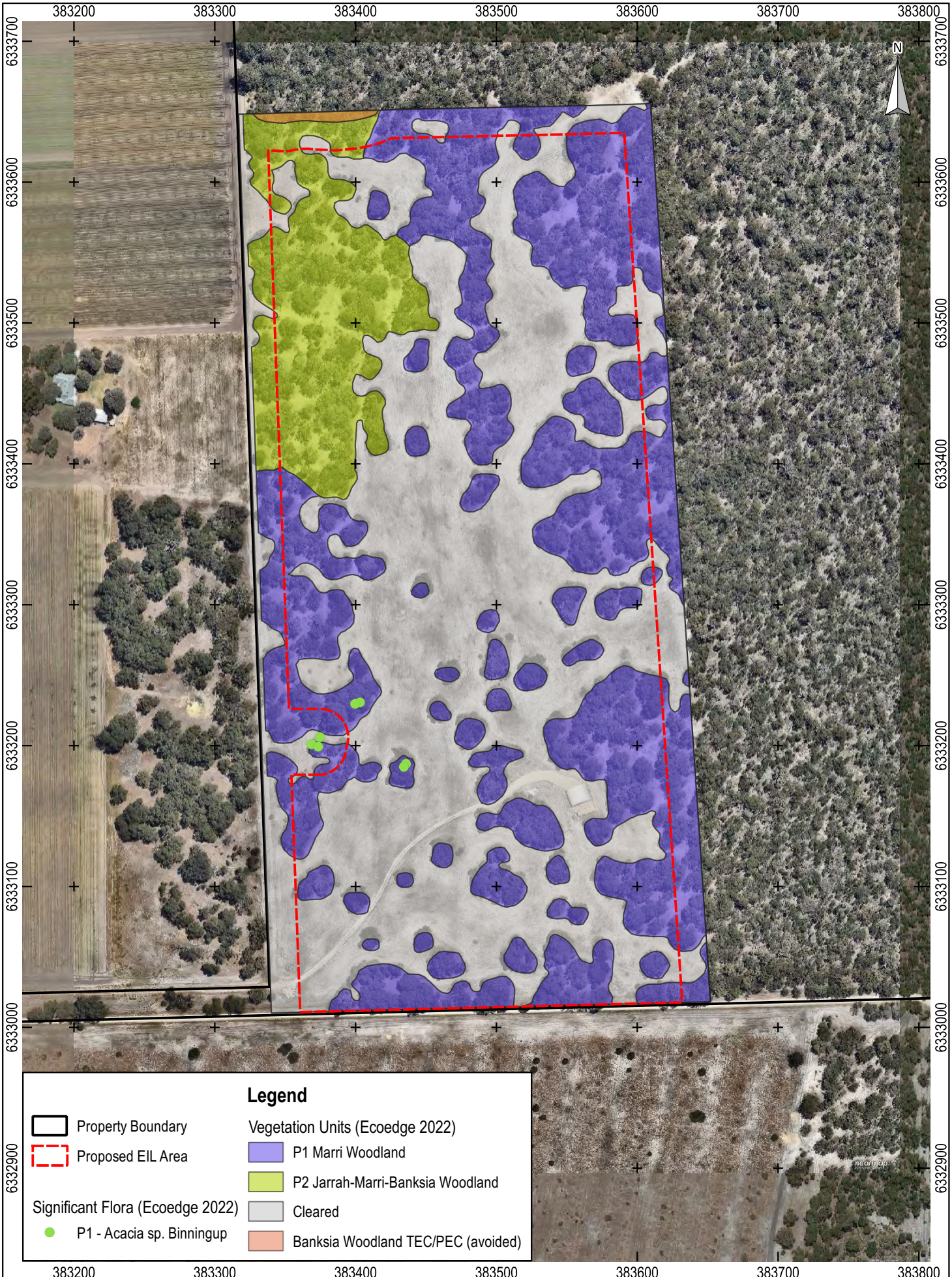
Vegetation Unit Description	Within Area Surveyed (ha)	Within Proposed Extraction Area (ha)	Example Image
Unit P1 Marri Woodland: *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.	7.61	5.95	
Unit P2 Jarrah-Marri-Banksia Woodland: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.	2.21	1.69	

Vegetation Unit Description	Within Area Surveyed (ha)	Within Proposed Extraction Area (ha)	Example Image
Cleared: Cleared sandy soil covered in pasture grasses and other introduced flora species.	9.49	8.36	
Totals	19.31	16.01*	

** It is noted that due to rounding issues, the rounded components add up to 16.00 ha although the total area is 16.01 ha.*

Table 2: Vegetation Condition (Ecoedge 2022)

Vegetation Condition	Within Surveyed Area (ha)	Within Proposed Extraction Area (ha)
Pristine	0	0
Excellent	0	0
Very Good	0.05	0
Good	1.12	1.07
Degraded	8.48	6.44
Completely Degraded	0.17	0.14
Cleared	9.49	8.36
Total	19.31	16.01



Scale: 1: 3,500
Original Size: A4
Grid: GDA94 / MGA zone 50

0 50 100 m

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 5

Vegetation Units and Significant Flora

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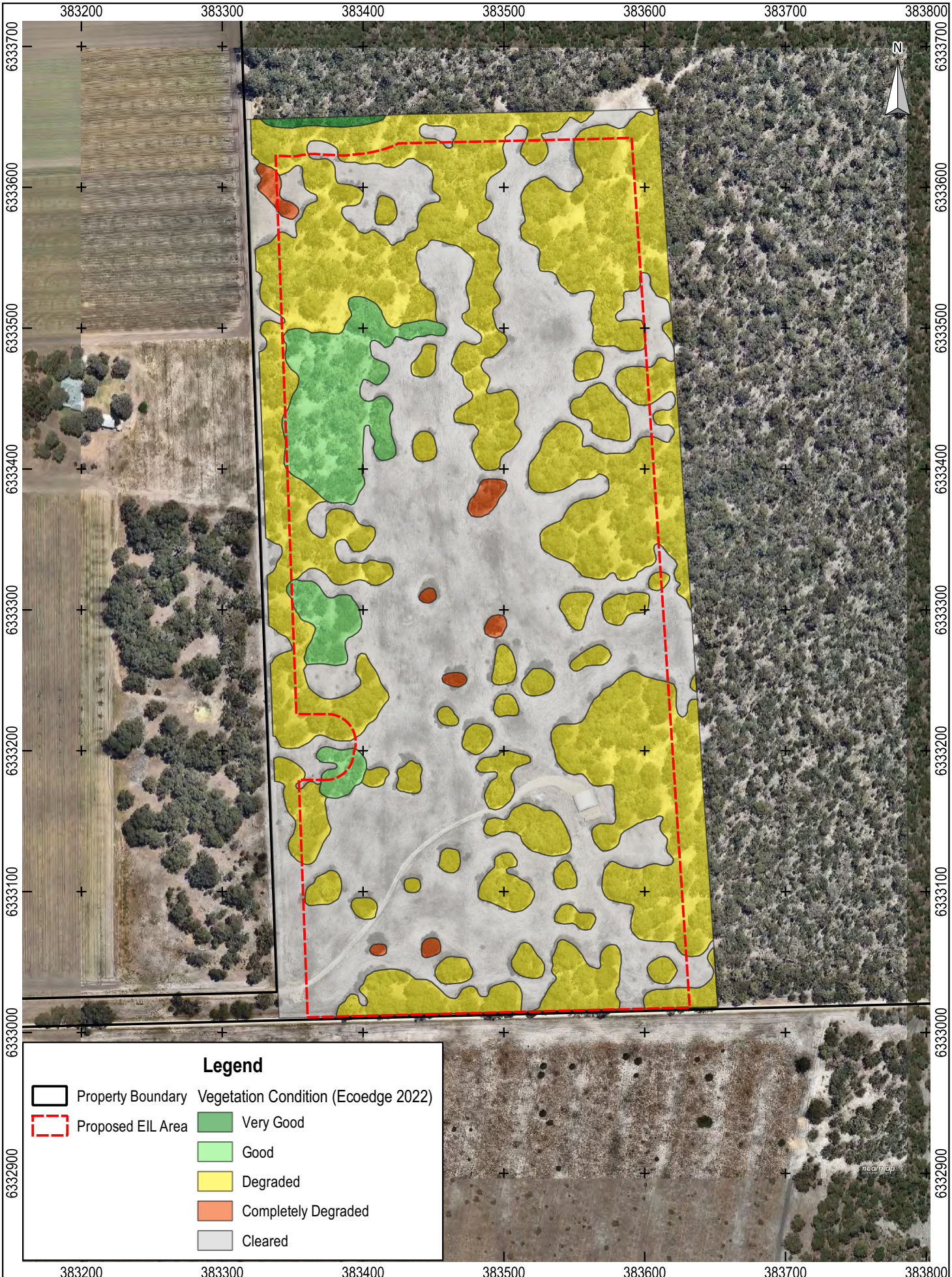

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Original Size: A4
Grid: GDA94 / MGA zone 50

0 50 100 m

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150 Runnymede Road
Binningup

Figure 6

Vegetation Condition

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3.7 Terrestrial Fauna

A desktop review and basic fauna survey of the degraded southwestern portion of Lot 150 Runnymede Road was completed by Greg Harewood and MBS Environmental, which wholly encompassed the proposal area (MBS Environmental 2022; see Appendix 2). The field assessment included a basic fauna assessment and targeted survey for Threatened Black Cockatoos and Western Ringtail Possum.

The described and mapped fauna habitat types align with the vegetation units (Table 3, Figure 7).

Table 3: Habitat Types (MBS Environmental 2022)

Habitat type	Description	Within Area Surveyed (ha)	Within Proposed Extraction Area (ha)
FH1	Marri Woodland: *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland over sand.	7.61	5.95
FH2	Jarrah-Marri-Banksia Woodland: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland over sand.	2.21	1.69
FH3	Cleared: Cleared sandy soil covered in pasture grasses and other introduced flora species.	9.49	8.36
Total		19.31	16.01*

** It is noted that due to rounding issues, the rounded components add up to 16.00 ha although the total area is 16.01 ha.*

A total of 50 significant fauna species were identified from 10 km radius, of which 38 species were excluded from consideration due to the absence of suitable habitat, such as marine and coastal habitats, watercourses, dense vegetation, salt lakes, or wetlands (MBS Environmental 2022). This left 12 fauna species of significance with potential to occur in the survey area.

Evidence of the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), listed as Vulnerable under both state and federal legislation, constituted the singular significant fauna species recorded within the survey area. The evidence was in the form of chewed marri fruits, attributed to the Forest Red-tailed Black Cockatoo. The other significant fauna species identified from the desktop review were not observed on site. Carnaby's Cockatoo and Baudin's Cockatoo (both listed as Endangered at state and federal level) are considered likely to occur in the survey area at times due to the availability of suitable habitat and several recent records in nearby areas. Chuditch (Vulnerable) is considered locally extinct and not expected to occur. Quenda (P4) is also not expected to utilise the survey area due to the limited understorey and largely cleared nature of the site but might be present in the surrounding, unsurveyed areas of better quality vegetation. The remaining seven significant fauna species identified in the desktop review but not observed on site are the Coastal Plains Skink (P3), Perth Lined Lerista (P3), Peregrine Falcon (OS), South-western Brush-tailed Phascogale (CD), Western Ringtail Possum (Critically Endangered), Western Brush Wallaby (P4), and Western False Pipistrelle (P4). These species are considered to have some

residual potential to occur but are unlikely to actively utilise or depend on the survey area for persistence in the surrounding area (MBS Environmental 2022).

A total of 92 trees within the survey area were recorded as having a diameter at breast height (DBH) of >50cm, making them potentially old enough to contain hollows large enough for black cockatoo breeding (MBS Environmental 2022). The vast majority of these trees (91) appeared to not contain hollows of any size. One tree (Dead Unknown) appeared to contain two large hollows, potentially suitable for black cockatoo nesting (based on ground level observations). No signs of use were noted. No evidence of black cockatoo roosting within trees located within the survey area was observed during the field survey.

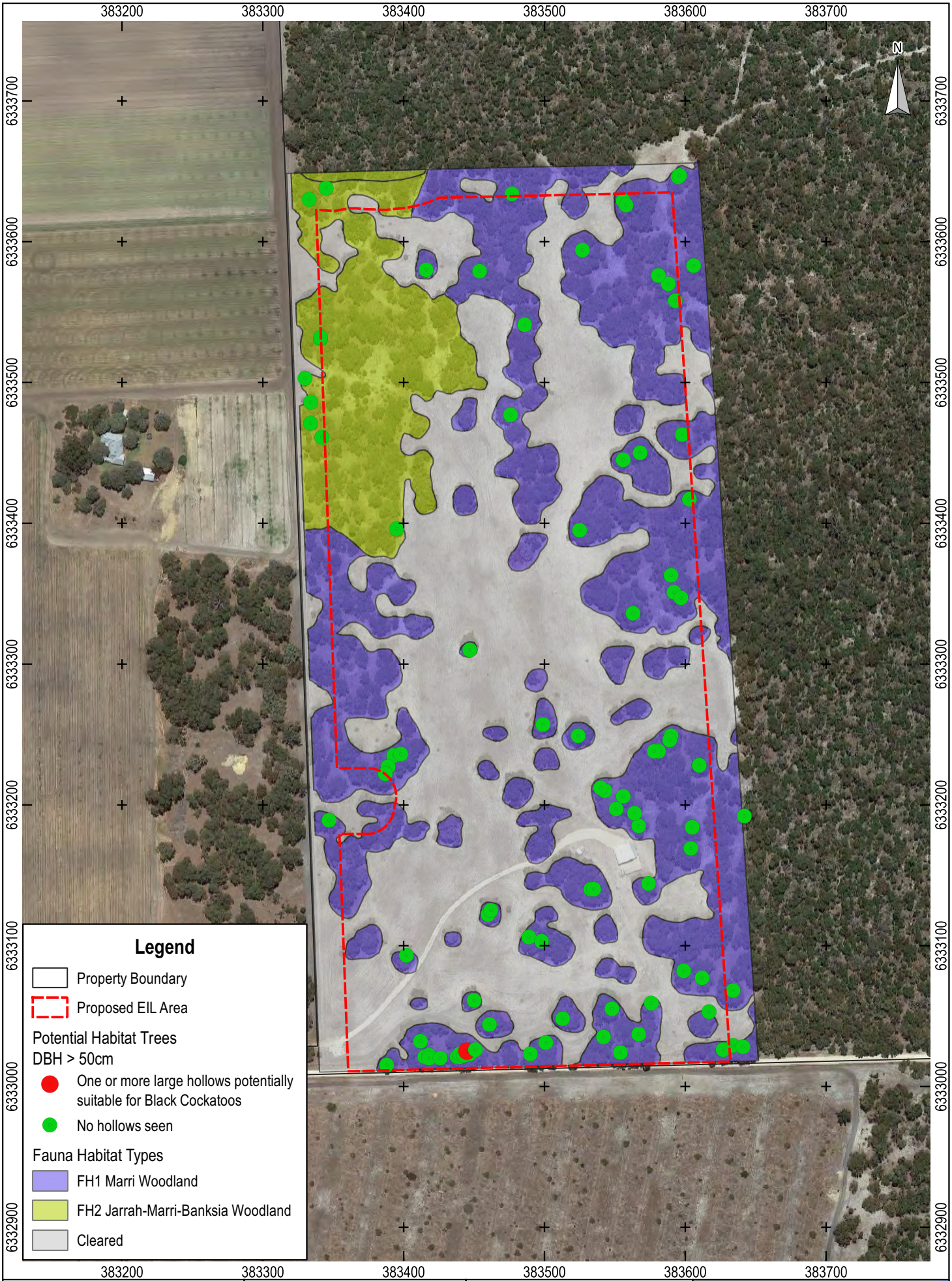
The proposal area does contain what superficially looks like suitable habitat for the Western Ringtail Possum, however no evidence of utilisation was found (i.e., no dreys, no scats and no individuals). This would suggest that they are either absent from the area surveyed or present in very low densities.

3.8 ABORIGINAL AND OTHER HERITAGE

There are no registered heritage sites listed under Global, Commonwealth, National and State databases for the proposal area, 150 Runnymede Road, or immediately adjacent properties (DAWE 2022a, 2022b, 2022c, DPLH 2022a, Heritage Council 2022). While several Shire heritage sites exist within the local area, the proposed clearing will not result in any discernable impact, with the closest site, Pead's Cottage, occurring 1 km west of the site (DPLH-008, Heritage Council 2022).

There are no Registered or Other Aboriginal Heritage Places, as listed by the Aboriginal Heritage Inquiry System within the proposal area or 150 Runnymede Road (DPLH-001). The closest Aboriginal Heritage Place is 1 km to the south and is listed as "Stored Data/Not a Site". The proposed clearing will not result in any impact to this site. There are no Indigenous Reserves or Townships within the proposal area, 150 Runnymede Road, or surrounding properties (DPLH-003).

The property falls within the Southwest Native Title Settlement Area (Tribunal file number: WC2003/006; Federal Court file numbers: WAD6006/2003) (LGATE-005). This Native Title Claim was federally determined to exist in parts of its application area on 1 December 2021, however the registration decision status was not accepted (National Native Title Tribunal 2021). The areas remaining for consideration for native title exist outside the property boundaries, approximately 340 kms to the north (NNTT 2022). This Native Title area does not preclude development from taking place on this privately owned property.



Scale: 1: 3,500
Original Size: A4
Grid: GDA94 / MGA zone 50

0 50 100 m

McDougall Quarries Pty Ltd
150 Runnymede Road
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Figure 7

Fauna Values

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4. ENVIRONMENTAL IMPACTS AND MANAGEMENT

4.1 FLORA AND FAUNA

The proposed extraction area totals 16.01 ha of which 52% is already cleared. The proposal requires clearing of approximately 7.64 ha of native vegetation. The proposed extraction area has been located in the degraded southwestern portion of the property in order to avoid impacts on the better quality native vegetation and associated fauna habitat located elsewhere on the property. The need for vegetation clearing has been further minimised by utilising existing access tracks and other cleared areas.

The environmental impacts of native vegetation clearing will be assessed by DWER as part of the NVCP process. The flora and vegetation survey (Ecoedge 2022) and the fauna survey (MBS Environmental 2022) that cover the proposed extraction area will provide information for the NVCP process. The key impacts of the proposed clearing are expected to be as follows:

- Removal of 7.64 ha of mostly degraded native vegetation on Swan Coastal Plain that has been extensively cleared, although it is noted that approximately 50% of pre-European vegetation extent remains within 5 km radius.
- Removal of four individuals of *Acacia* sp. Binningup (P1), while retaining 35 individuals (90%) of the species recorded on the property.
- Removal of 7.64 ha of low to moderate quality black cockatoo foraging habitat, including 75 DBH trees, one of which has two hollows potentially suitable for black cockatoo nesting (no signs of use). No known roosting sites are proposed to be removed. These impacts are not considered significant in the local context, as the remainder of the property retains over 230 ha of native vegetation providing better quality black cockatoo foraging, breeding and roosting habitat, and there are 17,347 ha of remnant native vegetation within 12 km of the site.

The proposed vegetation clearing will not impact on state or federally listed Threatened or Priority Ecological Communities or Threatened flora species. The 0.05 ha of vegetation in Very Good condition likely to be part of a larger area of Banksia Woodlands on Swan Coastal Plain TEC/PEC outside the survey area will not be disturbed. Also, the proposed extraction area has been reduced in size to exclude 20 m buffer from the potential TEC/PEC in the unsurveyed bushland on the property. This buffer zone will significantly reduce the potential of any indirect impacts on the TEC/PEC.

The impacts of vegetation clearing will be mitigated through onsite revegetation that is expected to return native vegetation to the entire extraction area (16.01 ha; see Section 5). The exact scale and type of revegetation will be determined as part of the NVCP process.

At this stage, the following measures are expected to be implemented during the operations to manage impacts on flora and fauna:

- Demarcating the extraction area and the proposed clearing area in the field prior to disturbance to avoid off site impacts.
- Undertaking vegetation clearing in stages corresponding to the extraction stages from east to west. Clearing of the next stage may start only once the extraction of the previous stage is nearing completion.
- Engaging a licenced and appropriately qualified fauna specialist to inspect the clearing area ahead of vegetation disturbance, and be present to during the vegetation clearing to move along or capture and relocate fauna.
- Removing and stockpiling topsoil, retaining some logs and larger branches, and mulching vegetation for later use in rehabilitation.
- Implementing weed management measures as per Section 4.2.

- Implementing dieback management measures as per Section 4.3.
- Implementing dust management measures as per Section 4.5.
- Implementing groundwater management measures as per Section 4.8.
- Implementing surface water and drainage management as per Section 4.9.
- Implementing a rehabilitation plan as per Section 5.

Considering that only patches of parkland cleared vegetation is proposed to be cleared, environmental management measures will be implemented during the project, revegetation will be undertaken after the project, and that the property retains more than 230 ha of native vegetation in better condition than the clearing area, the overall impacts of the project on flora, vegetation and fauna are not expected to be significant in the local context.

4.2 WEEDS

Due to the disturbance history of the site, the extraction area supports a range of weed species, most of which are common in the local area. Two Declared Pest species **Solanum linnaeanum* (Apple of Sodom) and **Zantedeschia aethiopica* (Arum Lily) have been observed in the extraction area.

The following measures will be undertaken to minimise the risk of introducing and spreading weeds:

- Remove soil and vegetation from earth-moving machinery prior to entering and leaving the site.
- Ensure that no known weed affected soil, mulch, fill, or other material is brought on site.
- Restrict the movement of machines and other vehicles to the limits of the extraction area.
- Undertake control of **Solanum linnaeanum* (Apple of Sodom) and **Zantedeschia aethiopica* (Arum Lily) prior to clearing of native vegetation if the season is suitable for control.
- During extraction operations, undertake weed control within the extraction area to prevent the spread of weeds.
- During rehabilitation activities, undertake weed control as necessary to minimise weed spread and to prevent weeds from compromising the end land use.

4.3 DIEBACK

No dieback survey has been undertaken on the property. No obvious signs of dieback were observed by MBS Environmental during site visits in December 2021 and January 2022. The degraded southwestern portion of the site is likely to be uninterpretable in terms of dieback due to the high level of historical disturbance and the lack of indicator species. The occurrence of dieback in the cleared areas cannot be ruled out.

The following measures will be undertaken to minimise the risk of introducing and spreading dieback:

- Educate staff and contractors on the environmental impacts of dieback and provide training in how to clean earth-moving machinery, vehicles, and equipment of soil and vegetation prior to entering and leaving the site.
- Provide signage at site entrance detailing clean on entry and exist requirements.
- Clean vehicles, machinery and equipment of soil and vegetation prior to entering and leaving the site.
- Trucks leaving the site will be required to have their load covered.
- Ensure that no known dieback affected soil, mulch, fill, or other material is brought on site.
- Restrict the movement of machines and other vehicles to the limits of the extraction area.

4.4 LANDFORM AND SOILS

Based on 'soil landscape land quality' mapping (various DPIRD data layers), the main degradation risk on these soils is wind erosion (DPIRD-016). This will be managed as follows:

- Clearing of native vegetation will be staged, to minimise the area of bare ground open to the elements at any one point in time.
- Post-extraction rehabilitation will be undertaken gradually as extraction progresses to minimise the area of bare ground open to the elements at any time. In the native vegetation rehabilitation areas, mulch will be applied for a range of purposes, including to reduce wind erosion.
- A water truck will be available for dust suppression when required to minimise wind erosion.
- Soil binding agents may be utilised if necessary to provide further reduction in wind erosion.

The proposed maximum final batter slopes of 1:6 (vertical : horizontal) are in line with naturally occurring slopes along the sand dune ridge and are also in accordance with approved final batter slopes for the other extractive sites in the local area. These slopes have been shown to be stable and are suitable for revegetation.

4.5 DUST

Extractive operations have potential to generate significant dust, however effective management measures are available to limit the generation of dust. Please refer to the separate Dust Management Plan for further information on dust risks, their management and monitoring. The objective of dust management on the site is to avoid off site impacts.

4.6 NOISE

Potential noise impacts and necessary noise management measures have been addressed separately as part of the DA/EIL application.

4.7 VISUAL IMPACTS

The local area has multiple existing sand extraction sites, some of which are visible from Runnymede Road. The proposed operations are located approximately 550 m from Runnymede Road and this buffer is partly vegetated and will screen most of the operations, however some operational areas may still be visible from Runnymede Road. Although, parts of the proposed operations are also likely to be visible from the nearest resident on the western side, a 20 m predominantly vegetated setback will be retained on the western side that will reduce the visual impacts. The operations may be partly visible from the property on the southern side; however, this property is currently being used for sand extraction as well.

4.8 GROUNDWATER

The proposed operations are not expected to have significant impacts to groundwater levels or water quality due to the following:

- Separation distance to maximum groundwater level will remain at least 0.5 m.
- The proposed vegetation clearing is limited to approximately 7.64 ha of parkland cleared, degraded vegetation that will be re-established following extraction. The remainder of the property consists of more than 230 ha of better quality native vegetation, which will be retained.
- No hydrocarbons or other chemicals will be stored on site. On-site refuelling of equipment will be from a mobile service vehicle carrying appropriate spill prevention and mitigation equipment. No major repairs or maintenance will take place on site.

Groundwater quality and levels in the local area are mostly influenced by the large scale horticultural operations to the west of the proposed extraction site.

4.9 SURFACE WATER AND DRAINAGE

There are no signs of surface water (permanent or ephemeral) within the extraction area or the immediate surrounds. Due to the free draining nature of the sandy soil and the gently sloping surface, stormwater is expected to percolate into the soil. There are no drainage lines or signs of stormwater erosion on the site currently, not even in the areas that have been completely cleared of native vegetation in the past.

Accordingly, nil to minimal stormwater runoff is expected to occur. The following drainage measures will be put in place to manage any runoff that might occur in major rainfall events:

- Clean stormwater from outside the project area will be diverted away from operational areas.
- Stormwater from the project area will initially be contained within the project area.
- Retention areas will be used to reduce turbidity.
- Overflow spillways and paths will be designed to mitigate potential erosion and downstream water quality issues.
- Ripping along contour and revegetation of the project area will minimise future stormwater runoff and erosion.

4.10 ABORIGINAL HERITAGE

There are no registered Aboriginal heritage sites on the property. Should any potential artifacts or remains be discovered during operations, any works in the vicinity will stop immediately and the matter will be referred to the Department of Planning, Lands and Heritage. If bones are discovered, then the police will also be advised. The applicant notes that it is an offence under the WA *Aboriginal Heritage Act 1972* to interfere with any Aboriginal site unless written permission is obtained from the relevant Minister.

5. REHABILITATION

5.1 INDICATIVE REHABILITATION MEASURES

Sand extraction and rehabilitation will proceed gradually in stages. Once extraction of sand has been completed in a stage, it will be rehabilitated as extraction moves forward. It is expected that the entire extraction area (16.01 ha) will be rehabilitated with native vegetation to mitigate/offset the proposed clearing of 7.64 ha of native vegetation, however this will be refined during the NVCP assessment process by DWER. The exact revegetation measures for native vegetation may also change as part of the same process. Indicative revegetation measures are provided in the following sections. Some of these works will be undertaken prior to or during the extractive operations in preparation for rehabilitation. As part of decommissioning, any temporary site infrastructure (e.g., portable toilets) and waste/debris will be removed.

5.1.1 Clearing and Handling of Native Vegetation

Key measures relating to clearing and handling of native vegetation include the following:

- Clearing of native vegetation will be undertaken in stages.
- Some of the cleared vegetation, such as canopy material and smaller branches, will be mulched for later use in rehabilitation.
- Other plant matter, such as larger branches and some tree trunks, removed from the clearing areas will be transferred to the native vegetation rehabilitation areas to create microhabitats and assist with topsoil retention.

5.1.2 Soil Management and Earthworks

Key measures relating to soil management and earthworks include the following:

- Removal of topsoil (approximately 100 mm thick) and remaining litter will proceed in stages ahead of extraction. When possible, stripped topsoil will be directly transferred into rehabilitation areas and spread across finalised land surfaces to avoid stockpiling, thus maximising seed and microbial benefits. When necessary, topsoil will be stockpiled for later use.
- Sand extraction will proceed in stages. As each stage of extraction phase is completed, the landform will be finalised in accordance with the latest approved development plan (maximum batter slopes of 1:6). The final contours shall be achieved and confirmed by way of digital survey.
- Prior to topsoil return, the pit floor will be deep ripped to remove any compaction that may have occurred during the sand extraction operations. Other areas of potential compaction will also be ripped. The removal of compaction is necessary to maximise plant root and water penetration into the soil during revegetation. Due to the sandy nature of the soils, the pit batter slopes are not expected to require deep ripping.
- The stockpiled topsoil will be re-spread across the extraction area to 50-100 mm deep. A thin layer of the stockpiled mulch will also be added to assist in erosion control and moisture retention.
- Following the return of topsoil and mulch, all areas will be shallow ripped along contour. This will create rip lines that will assist in stormwater retention and infiltration. In native rehabilitation areas, seedlings will be planted into these lines. The reason ripping is undertaken after spreading of topsoil and mulch is to avoid compacting and otherwise disturbing the rip lines while moving topsoil/mulch. Ripping will not occur in close vicinity to retained native trees to protect their root systems.

Scale: 1: 3,000
Original Size: A4
Grid: GDA94 / MGA zone 50

0 50 100 m

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 8

Indicative Rehabilitation Plan

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MBS ENVIRONMENTAL

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5.1.3 Revegetation - Native Vegetation

At this stage, the objective of native vegetation rehabilitation is to establish self-sustaining native vegetation comprising of local provenance species that, in the long term, will provide similar fauna habitat to what is currently present. Details of native vegetation rehabilitation will be further defined as part of the NVCP process.

5.1.4 Weed Control

Weed control measures include those described for the operational stage (4.2) as well as the following, which is specific to rehabilitation:

- Where necessary, weeds will be controlled prior to seeding/planting with a broad-spectrum herbicide.
- Spot spraying with broad-spectrum or a selective herbicide will also be undertaken as necessary after seed germination and plant establishment.

5.1.5 Grazing Control

Key grazing control measures include:

- A stock-proof fence, which will be installed and maintained to protect the rehabilitation.
- Additional grazing controls (e.g., tree guards or rabbit/kangaroo fencing) will be implemented as necessary to achieve rehabilitation completion criteria.

5.1.6 Dieback Management

Dieback management measures described in Section 4.3 also apply to rehabilitation.

5.2 INDICATIVE COMPLETION CRITERIA

Indicative completion criteria are presented in Table 4. These will be further developed as part of the NVCP process.

Table 4: Completion Criteria

Aspect	Completion Criteria
Landform	Final landform is in accordance with an approved post-extraction plan.
Soil Profile	Topsoil has been replaced in all rehabilitation areas.
Vegetation – Species Composition	For each target revegetation type, the revegetation supports a minimum of 25 locally occurring native species.
Vegetation – Density	On average across the revegetation area, the stem densities of native flora are: • At least 600 trees per hectare. • At least 2,000 shrubs per hectare. • At least 2,400 herbs/grasses/climbers per hectare.
Vegetation – Condition	Vegetation is self-sustaining (typically in Good or better condition).
Significant Weeds	No declared pest plants are present.
Common Weeds	Average weed cover is less than 20%.

5.3 INDICATIVE MONITORING AND MITIGATION MEASURES

Monitoring and mitigation measures have been broken down to those relating to final landform (Section 5.3.1) and more specifically to native vegetation (5.3.2), and these are covered in the following sections.

5.3.1 Final Landform

Monitoring and mitigation measures relating to final landform that will be undertaken in all rehabilitation areas are described in Table 5.

Table 5: Monitoring and Mitigation Measures for Final Landform

Item	Monitoring	Frequency	Mitigation
Landform	Licenced surveyor will confirm that the final landform is in accordance with the final contour plan.	Once per rehabilitation stage (typically an annual survey capturing new areas).	Corrective works as necessary.
Soil Profile	Photographic monitoring will be undertaken to show that topsoil has been respread.	Once per rehabilitation stage as part of vegetation monitoring.	Corrective works as necessary.
Erosion	Rehabilitation areas will be monitored for landform stability and signs of erosion.	At least annually until completion criteria met.	Corrective works as necessary.

5.3.2 Native Vegetation

Formal revegetation monitoring will occur at least once per year in spring until the completion criteria have been met and maintained for two years. This monitoring will be undertaken by a suitably qualified and experienced environmental professional. Additional informal monitoring will be undertaken by the sand extraction project operators and landowners to identify and respond to any maintenance needs as quickly as possible and maximise progress towards completion criteria. Separate seedling survival checks may also be undertaken as need be in autumn in preparation for a planting season.

Vegetation monitoring will comprise the following:

- Mixture of permanent and random quadrats (10 m by 10 m each, minimum one per hectare).
- Vegetation monitoring survey will be undertaken once per year in spring until completion criteria are met and maintained for two years.
- During each survey, the following will be recorded for each quadrat:
  - Number of native plants present (planted, seeded, or naturally recruited).
  - Species of native plants (planted, seeded, or naturally recruited).
  - Maximum height for each native species.
  - Native vegetation structure.
  - Native vegetation % foliage cover.
  - Species of weeds.
  - Estimated live % foliage cover of weeds.
  - Vegetation condition (Keighery 1994).
  - Signs of grazing, disease, pests, lack of moisture, erosion or other landform instability, or other factor potentially adversely impacting on revegetation.
  - Location coordinates and photographs.
- Boundary fence inspected to determine need for maintenance.
- Opportunistic traverses undertaken across the revegetation area when moving between monitoring locations. During these traverses, notes will be made of following:
  - Species of native plants (to obtain a record of species potentially not present in quadrats).
  - Species of weeds (particularly any significant weed species to be eradicated).
  - Signs and location of any grazing, disease, pests, lack of moisture, erosion or other landform instability, or other factor potentially adversely impacting on revegetation.
  - Location of any bare patches larger than 30 m^2.

Monitoring results will be assessed against the completion criteria and mitigation measures will be implemented if necessary. These mitigation measures will include, but are not limited to, the following:

- Supplementary planting/seeding.
- Weed and/or pest control.
- Fence maintenance.

6. CONCLUSION

The proposed sand extraction project has been designed to minimise environmental impacts as far as possible. The majority of the potential impacts, relating to e.g., weeds, dieback and dust, can be effectively managed through the measures detailed in this document and associated management plans. The significance of the impacts of the proposed vegetation clearing and the management/mitigation/offset measures required will be determined by the Department of Water and Environmental Regulation (DWER) as part of the Native Vegetation Clearing Permit process. A referral to the Commonwealth Department of Agriculture, Water and the Environment under the EPBC Act will be made and it is expected that any required assessment would be undertaken by DWER under the bilateral agreement between the departments. As part of these processes, various measures to reduce, mitigate and offset impacts of the native vegetation clearing will be considered.

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APPENDICES

Appendix 1: Flora and Vegetation Survey (Ecoedge 2022)

Reconnaissance Flora and Vegetation Survey

Part of 150 Runnymede Road

Prepared for MBS Environmental
June 2022

Ecoedge

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Version	Origin	Review	Review date	Release approval	Issue date
V1	R. Smith	B. Eckermann			
Final draft	MBS	Ecoedge	21/6/2022	Ecoedge	22/6/2022
Final	MBS	Ecoedge	27/6/2022	Ecoedge	27/6/2022

Executive Summary

A Reconnaissance flora and vegetation survey was undertaken in the southwest corner of 150 Runnymede Road on 1 February 2022. The survey was undertaken in accordance with the Environmental Protection Authority Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (2016), apart from being outside the preferred spring survey season.

The total area surveyed was approximately 19.31 hectares in size of which approximately 9.82 ha was vegetated to some degree. Sixty-four species of vascular flora were identified within the survey area, of which 24 (37.5%) were introduced taxa. No flora listed as threatened under the Commonwealth *EPBC Act (1999)* or the *Western Australian Biodiversity Conservation Act 2016* was found within the survey area. One State-listed Priority 1 flora species *Acacia* sp. Binningup was recorded within the survey area. No other State-listed Priority flora or other flora of significance were found. One Declared Pest plants (under the *Biosecurity and Agriculture Management Act 2007*), **Solanum linnaeanum* (Apple of Sodom) was found within the survey area.

Two native vegetation units were identified within the survey area:

- **Unit P1 Marri Woodland:** *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland (covering 7.56 ha).
- **Unit P2 Jarrah-Marri-Banksia Woodland**: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland (covering 2.17 ha).

The majority of this vegetation was in Degraded condition, with 1.12 ha in Good and 0.05 ha in Very Good condition. Approximately 9.49 ha of the survey area was already cleared.

The 0.05 ha area of Very Good condition vegetation along the northern boundary of the survey area met the criteria to qualify as 'Banksia Woodlands of the Swan Coastal Plain' that is a federal TEC and state PEC. This is based on an assumption that the 0.05 ha area forms part of a larger patch of the Banksia Woodlands of SCP TEC/PEC extending north, outside of the survey area. The rest of the vegetation in the survey area does not represent a TEC or PEC.

The identified vegetation units are associated with wetland or riverine species.

One vegetation complex, Karrakatta Complex-Central and South, occurs within the survey area. This complex has less than 30% of its pre-European extent remaining within the Swan Coastal Plain, however more than 30% remain within Shire of Harvey.

One vegetation association is mapped across the survey area, Association 6 'Medium woodland; tuart & jarrah'. This association has less than 30% of its pre-European extent remaining on the Swan Coastal Plain, however more than 30% remain within Shire of Harvey.

A regional ecological linkage axis line mapped by Molloy et al. (2009) runs north-south across 150 Runnymede Road, to the east of the survey area. Some parcels of vegetation within the survey area have been assigned the highest 1a or second highest 1b proximity value.

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Statement of Limitations

Reliance on data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge was engaged by McDougall Quarries Pty Ltd (McDougall Quarries) to undertake a Reconnaissance flora and vegetation survey at 150 Runnymede Road in Binningup. The survey area comprised approximately 19.31 ha of partly cleared native vegetation in the southwest corner of the property ('the survey area') (Figure 1, Figure 2).

The flora and vegetation survey was undertaken on 1 February 2022. This report compiles findings of the survey.

2 Scope and objectives

McDougall Quarries required the survey to identify key flora and vegetation values of the survey area to inform environmental impact assessment of a potential future development proposal. Survey focus was in particular on determining whether Threatened and Priority ecological communities (TECs/PECs) and/or Threatened and Priority flora were present or likely to be present within the survey area.

The scope required a desktop assessment to be conducted prior to the field survey to identify significant biological features and constraints (relating to flora and vegetation) that have been recorded in or nearby the survey area, such as significant flora, TEC and PECs, riparian vegetation, unusual soil/landscape systems (e.g. granite outcrops), conservation estates, poorly represented vegetation associations and/or vegetation complexes and Environmentally Sensitive Areas (ESA's).

The survey and report were required to be undertaken in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) and meet requirements of other relevant State and Commonwealth guidelines for threatened species and communities, such approved conservation advice for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) threatened species and communities.

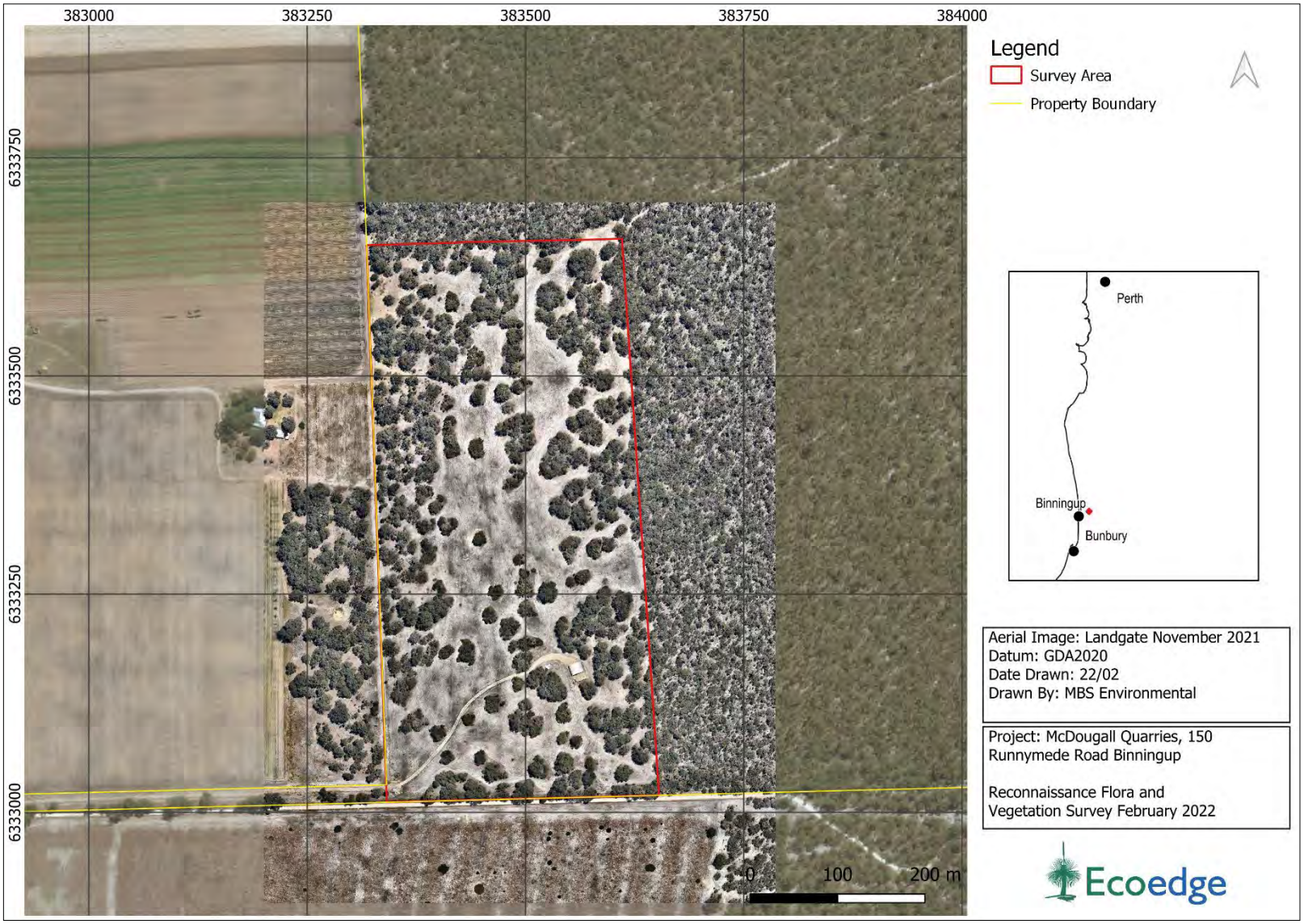

Figure 1. Aerial photograph showing the location of the survey area.

3 Methods

3.1 Desktop assessment

Prior to the field survey, a desktop assessment was undertaken to provide contextual information on the flora and vegetation within the survey area. The desktop assessment area (the 'study area') encompassed a 5-kilometre (km) buffer to the survey area (Figure 2). The desktop assessment included a review of the following information. Where this desktop review utilised GIS data layers available through DataWA (Government of Western Australia 2022), the layers are referenced using their identifier e.g., DWER-031.

- Regional landscape and soil mapping - Land resources from Harvey to Capel on the Swan Coastal Plain (Barnesby and Proulx-Nixon 2000), as digitally presented in the Soil Landscape Mapping – Best Available Data Set, DPIRD-027.
- Vegetation complex mapping of the South West Forest Region of Western Australia (Mattiske and Havel 1998) and the System 6 area (Heddle et al. 1980) as updated by Webb et al. (2016) and mapped in DBCA-046.
- Beard's Pre-European vegetation association mapping dataset (DPIRD-006) (Beard et al. 2013).
- WA Threatened and Priority Ecological Communities DBCA database extracts (DBCA 2020c) and TEC and PEC listings (DBCA 2018a, DBCA 2021d).
- Federal Protected Matters Search Tool results (DAWE 2022).
- Threatened and Priority flora Naturemap search results (DBCA 2021a).
- Extract from the Department's Threatened Flora database and the Western Australian Herbarium database (DBCA 2021b).
- Environmentally sensitive areas distribution maps and data, DWER-046 (DWER 2020).
- Geomorphic Wetlands, Swan Coastal Plain data set, DBCA-019 (DBCA 2021e)
- Directory of Important Wetlands in Australia – Western Australia data set, DBCA-045 (DBCA 2018c).
- Surface Hydrology Lines (National) (Crossman & Li 2015).
- Regional Ecological Linkages (Molloy et al. 2009).

3.1.1 Significant flora likelihood of occurrence

Prior to undertaking the survey, an assessment of the likelihood of occurrence of Threatened and Priority flora occurring within the survey area was undertaken. The rationale for determining the pre and post likelihood of occurrence is provided in **Appendix 1.**

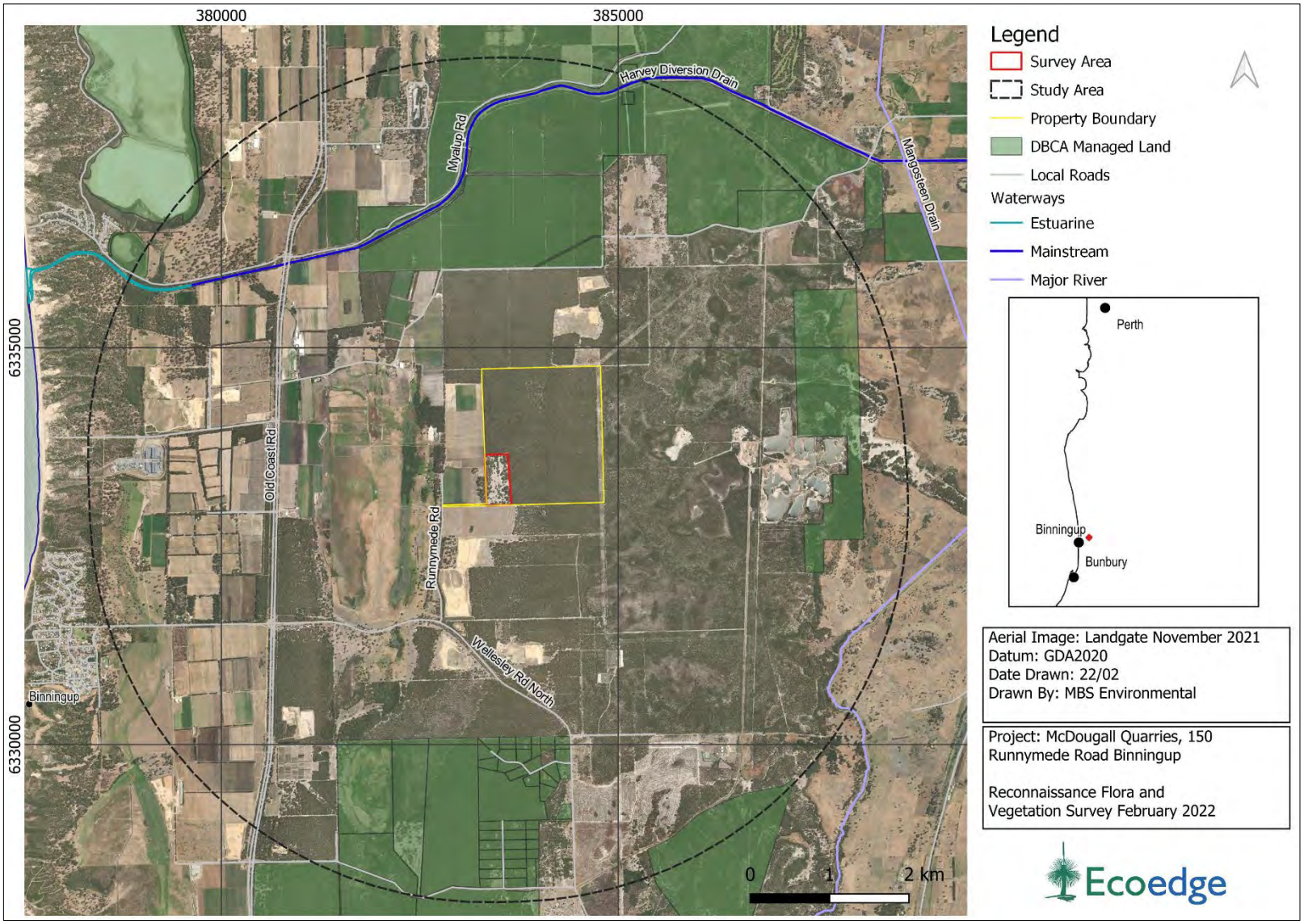

Figure 2. Aerial photograph showing the location of the survey and study area.

3.2 Field survey

The flora and vegetation survey was undertaken on 1 February 2022 by Russell Smith (flora permit FB61000473) and Ben Eckermann (flora permit FB62000262) in accordance with EPA 2016 guidelines. The survey area of 19.31 ha was traversed on foot.

Flora species not identified in the field were either photographed or collected for later identification. Taxonomy and conservation status were checked against the latest WA Herbarium census download (DBCA 2022).

Plant communities were described using data collected at relevés or vegetation condition waypoints as well as recent aerial photography. The relevé information was used to identify and describe vegetation units using the NVIS system (Level 5; NVIS 2017).

Vegetation condition was assessed using the method of the EPA (2016) (**Appendix 2**).

3.3 Survey limitations

Limitations with regards to the assessment are addressed in **Table 1.**

Table 1. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	Negligible	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements for a reconnaissance survey.
Proportion of flora identified	Minor	The survey was carried out on 1 February which is outside the optimal spring survey season for the southwest. Considering the disturbance history of the site and the degraded and parkland cleared nature of the vegetation in the survey area, this was considered a minor constraint in terms of the proportion of flora identified. 95% of native species recorded were identified to species level.
Climatic and seasonal effects	Low	Rainfall recorded at Bunbury, the nearest open weather station, for 12 months preceding the survey was 133% of the long-term mean however the survey was undertaken in February, outside the main spring survey season and the conditions were dry. Considering the disturbance history of the site and the degraded and parkland cleared nature of the vegetation in the survey area, this was considered a 'low' constraint for a reconnaissance only survey.
Availability of contextual information	Negligible	Comprehensive regional surveys of remnant vegetation, and more localised surveys, have been carried out on the southern Swan Coastal Plain.
Completeness of the survey	Negligible	All of the survey area vegetation was easily accessible.
Skill and knowledge of the botanists	Negligible	The senior botanist has 30 years' experience in flora surveys in the south-west of WA and within this IBRA region.
Disturbance (fire, grazing, clearing etc.)	Minor	All of the survey area has been disturbed in the past through grazing of livestock or clearing.

4 Results desktop assessment

4.1 Biogeographic region and location

The survey area is located within the Swan Coastal Plain Bioregion classified by the Interim Biogeographic Regionalisation for Australia (IBRA) (Commonwealth of Australia 2016). It is characterised as a low lying coastal plain, mainly covered by Banksia or Tuart woodlands over sandy soils with paperbark prevalent in swampy areas (Thackway and Cresswell 1995).

The Swan Coastal Plain Bioregion is divided into two subregions the Dandaragan Plateau (SWA01) and Perth (SWA02), of which the survey area is located within the Perth subregion. This subregion is comprised of colluvial and aeolian sands, alluvial river flats and coastal limestone. Native vegetation varies from Heath and/or Tuart woodlands on limestone, Banksia and Jarrah woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. This subregion also includes a complex series of seasonal wetlands (Mitchell, Williams, and Desmond 2002).

The survey area is located on 150 Runnymede Road in Binningup, approximately 23 km north of Bunbury and 5.5 km east-northeast of the Binningup town centre, in the Shire of Harvey. The survey area is located on the western slope of a large, north-south oriented sand dune ridge (Figure 2).

4.2 Landform and soils

The survey area occurs within the Spearwood System (211 Sp) of the Swan Coastal Plain. The Spearwood System is characterised by sand dunes and plains, with deposits of aeolian sand and limestone over sedimentary rocks (Barnesby and Proulx-Nixon 2000, DPIRD-064).

The Spearwood system has been further separated into landform-soil mapping units or “land units” based on landscape position and soil characteristics (Barnesby and Proulx-Nixon 2000, DPIRD-027). Three land units have been described for the survey area and are described in **Table 2** and **Figure 3**.

Table 2. Soil mapping units occurring within the survey area (Barnesby and Proulx-Nixon 2000, DPIRD-027)

System	Land units	Description
Spearwood System (211 Sp)	211Sp_S1c	Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c). Usually occurs on the eastern edge of the Spearwood Dunes.
	211Sp_S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
	211Sp_S3	Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.

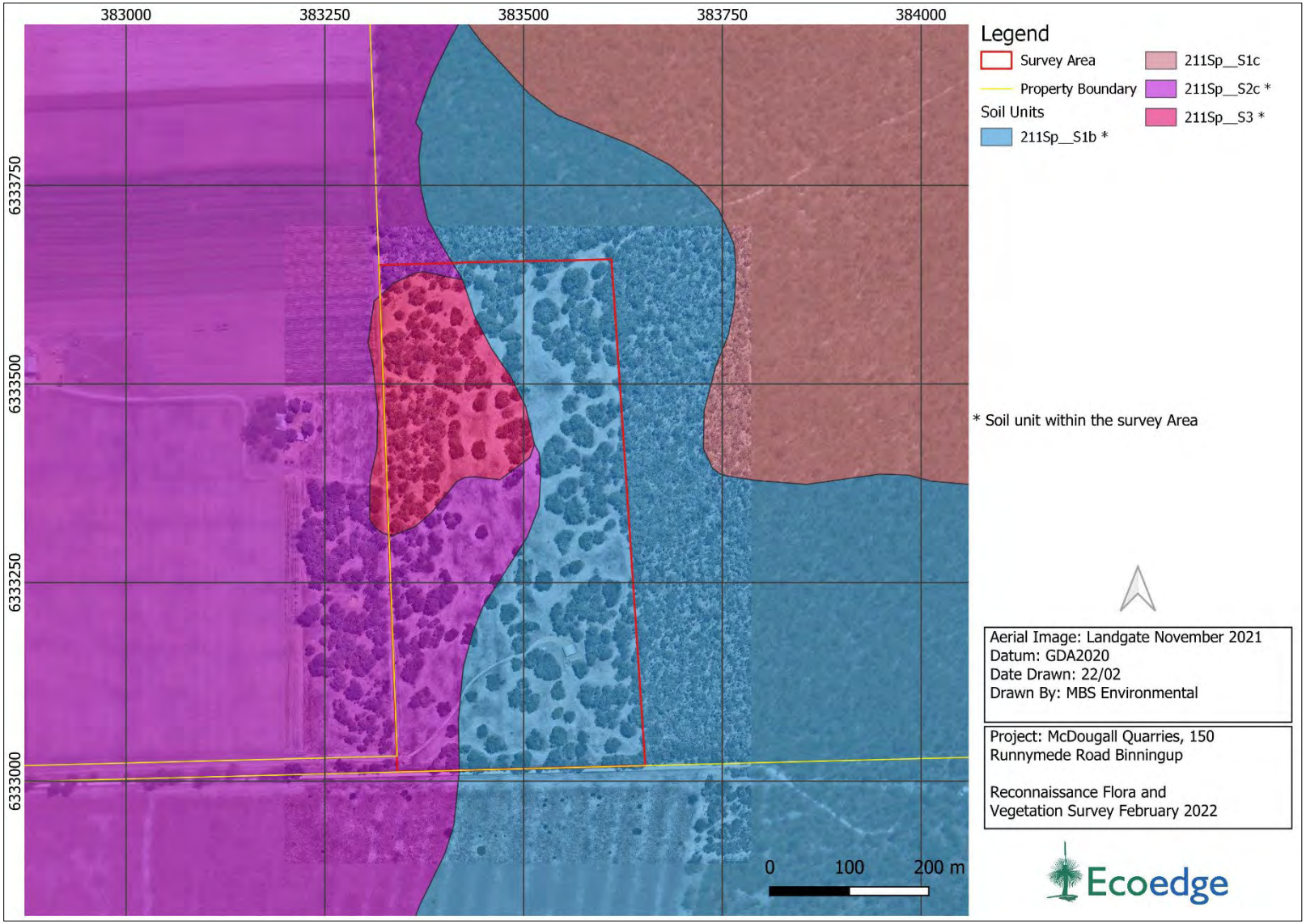

Figure 3. Land units mapped in and nearby the survey area (DPIRD-027).

4.3 Vegetation description according to pre-European mapping datasets

The 19.31 ha survey area contains approximately 9.82 ha of remnant native vegetation.

4.3.1 Vegetation Complexes

The comprehensive pre-1750 distribution of vegetation complexes[1] across the southwest of Western Australia is based on two main data sets, Heddle et al.'s 1980 1:250,000 scale vegetation complex mapping of the 'System 6' area comprising the greater Perth and Darling Range Region and Mattiske and Havel's 1998 1:50,000 scale mapping of forest vegetation covered by the Regional Forest Agreement 1999[2] (Webb et al. 2016). Both data sets were prepared in order to inform the adequacy of biodiversity conservation through state-managed reserves (EPA 1993, South West Regional Forest Agreement 1999). In 2016 these data sets were revised by DPaW (Webb et al. 2016) in order to fill data gaps and improve alignment and correlation between the data sets.

One vegetation complex occurs within the survey area, according to the 1:250,000 mapping of Swan Coastal Plain Vegetation Complexes (Heddle et al. 1980) as updated by Webb et al. (2016). This is described in **Table 3** and shown in **Figure 4.**

Table 3. Vegetation complex mapped for the survey area (Webb et al. 2016).

Vegetation Complex	Description
Karrakatta Complex-Central and South	Vegetation consisting predominantly of an open-forest of *Eucalyptus gomphocephala (*Tuart), Eucalyptus *marginata* (Jarrah) and *Corymbia calophylla* (Marri). Common species include *Banksia attenuata, B. menziesii* (north of Mandurah), *B. grandis*, *A. fraseriana* and to a lesser extent peppermint (*Agonis flexuosa*). Shrub species include *Jacksonia sternbergiana*, *J. furcellata*, *Acacia cyclops, A. saligna*, *Hibbertia spp*., *Allocasuarina humilis, Calothamnus quadrifidus* and *Grevillea preissii.* On deeper sands of the jarrah woodland, the understory species show changes and include *Hibbertia hypericoides, Conospermum stoechadis, Hovea trisperma* and *Bossiaea eriocarpa*

[1] Vegetation complex mapping is based on broadscale assessment of regional patterns of vegetation in relation to underlying landforms, soils and climatic trends.

[2] Mattiske and Havel's (1998) mapping also included an assessment of an area of the very southern portion of the Swan Coastal Plain landform (Webb etal. 2016).

4.3.2 Vegetation associations

A systematic survey of native vegetation in Western Australia was undertaken by J. S. Beard (along with others) during the 1970s, which described vegetation systems in the southwest of Western Australia at a scale of 1:250,000. Beard's vegetation maps attempted to depict the vegetation as it might have been prior to European settlement in terms of type and extent (Beeston et al. 2001). The Beard Vegetation Association dataset, also referred to as the pre-European native vegetation extent dataset, was digitised by Shepherd et al. (2002).

Beard vegetation associations have been described to a minimum standard of Level 3 "Broad Floristic Formation" for the National Vegetation Inventory System (NVIS) (state-wide to regional scale) [3].

The survey area comprised only one Beard vegetation association: Association 6 'Medium woodland; tuart & jarrah' (DPIRD-006).

[3] Beard's vegetation mapping units are referred to as 'associations' however these do not correspond to the NVIS Level 5 'Associations'. The NVIS system was developed long after Beard's work was completed, and while both classification systems use the same term, NVIS 'Associations' describe vegetation in more detail than do Beard's.

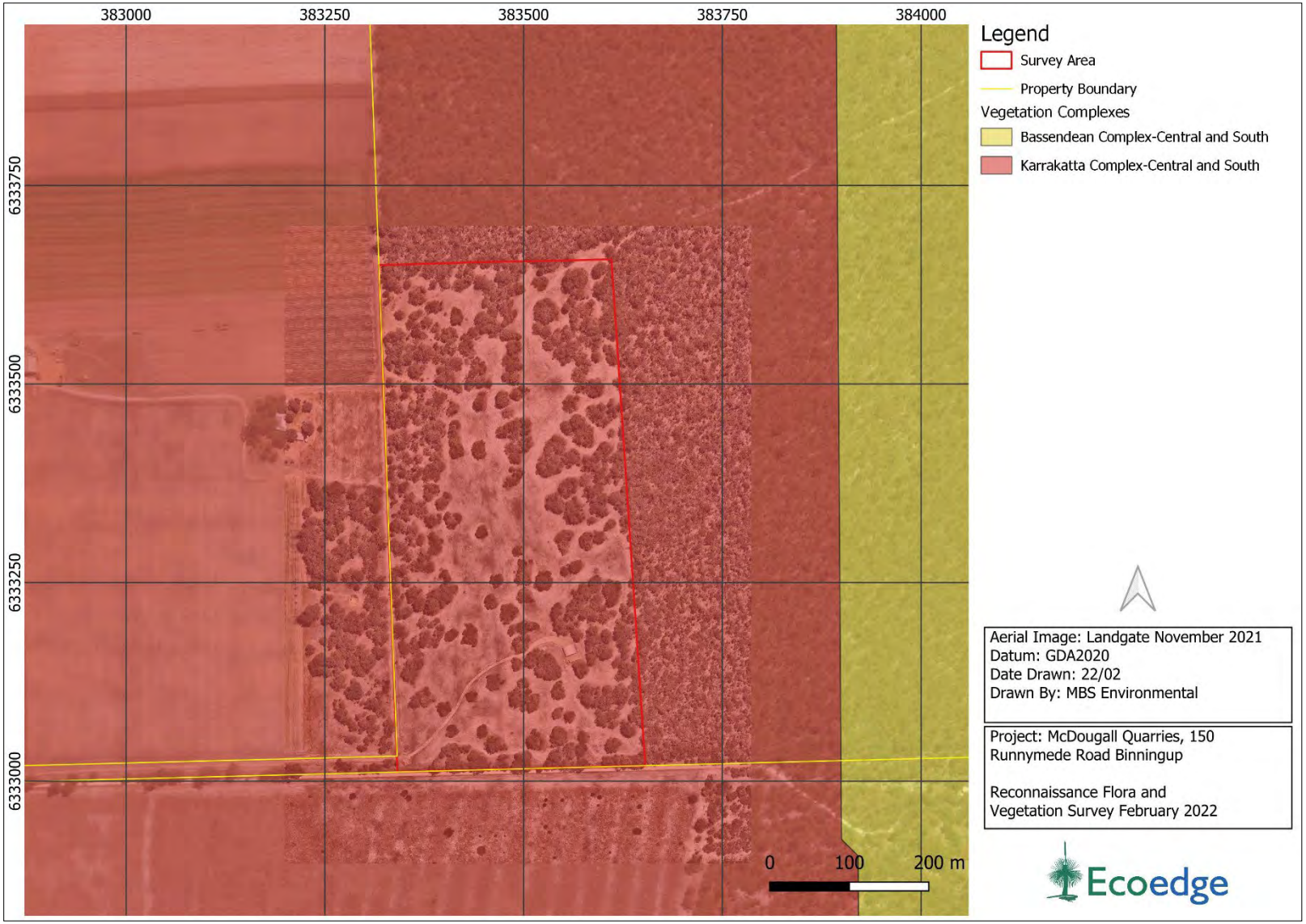

Figure 4. Vegetation complexes mapped in and nearby the survey area (Webb et al. 2016).

4.3.3 Assessment of remaining extent against pre-European extent

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community, was necessary if Australia's biological diversity was to be protected (Environment Australia 2001).

In its report on the Statewide Vegetation Statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for WA (Government of Western Australia 2019). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the "CAR Reserve Analysis".

Table 4 presents the statistics as they relate to the percentage remaining of pre-European extent vegetation and the percentage of current extent in DBCA managed land of the vegetation complex identified within the survey area. The Karrakatta Complex (Central and South), has 23.49% of its pre-European extent remaining. The complex has over 30% of its pre-European extent remaining within the bounds of the Shire of Harvey.

Table 5 presents the same statistics for the Beard vegetation association mapped across the survey area: Association 6. Association 6 retains 23.72% of its pre-European extent at state level and IBRA region and subregion levels, and 38.18% within the Shire of Harvey.

The red, orange and yellow shading in the tables indicates the status of the Commonwealth 30% retention target.

Status of the commonwealth retention target	>30%	<30%	<10%

Table 4. Vegetation complexes mapped within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019a).

Vegetation Complex	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA reserves
Karrakatta Complex-Central and South				
Swan Coastal Plain	53,080.99	12,467.20	23.49	8.07
Shire of Harvey	5,113.94	1,852.93	36.23	No data

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

Table 5. Vegetation associations within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019b).

Beard Vegetation Association	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA Managed Land*
Association 6				
State-wide	56,343.01	13,362.25	23.72	9.45
IBRA region: Swan Coastal Plain (SWA)	56,343.01	13,362.25	23.72	9.45
IBRA sub-region Perth (SWA02)	56,343.01	13,362.25	23.72	9.45
Shire of Harvey	6,232.23	2,379.30	38.18	23.59

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

4.4 Threatened and Priority ecological communities

Ecological communities are defined by Western Australia's DBCA as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC 2013).

Under Section 27 of the *Biodiversity Conservation Act 2016* (BC Act), the Western Australian Minister for Environment may list communities considered to be under significant threat as a TEC. These TECs can be listed under one of three conservation categories: critically endangered (CR), endangered (EN), vulnerable (VU). The BC Act also provides for listing ecological communities as presumed totally destroyed if no representative or previously extant occurrences have been located or its range has been so extensively modified that no occurrence of it is likely to recover species composition/structure in the immediate future.

Ecological communities (community types and sub-types) with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on a 'Priority list' and referred to as Priority Ecological Communities (PECs). PECs are listed as Priorities 1, 2 or 3 (referred to as P1, P2, P3), dependent upon survey properties and/or definition of the community. Ecological communities that are adequately known are rare but not Threatened, that meet criteria for near Threatened, or that have been recently removed from the Threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC 2013).

The current listing of Threatened and Priority ecological communities is specified in DBCA (2018a, 2021d). The conservation categories for these Threatened and Priority ecological communities are defined in **Appendix 3**.

TECs can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are three categories of TEC under the EPBC Act: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) (Department of Agriculture, Water and the Environment) (DAWE 2020b). These are defined in **Appendix 4.**

The desktop assessment, which included a Protected Matters Search (DAWE 2022) and review of DBCA TEC and PEC database extracts (DBCA 2021c), found four EPBC Act listed TECs, three BC Act listed TECs, and three State listed PECs within the 5 km study area.

Outcomes of these searches are presented in **Table 6.** The results of the DBCA records are shown in **Figure 5.**

Table 6. Threatened and Priority ecological communities occurring within study area (DAWE 2022, DBCA 2021c).

Community Name	Community Description	Status (WA)	Status (EPBC Act)
'Claypans of the Swan Coastal Plain' – a federally listed TEC consisting of four State-listed communities, two of which occur in the study area: 1. SCP08: Herb rich shrublands in clay pans 2. SCP09: Dense shrublands on clay flats		1. T (VU) 2. T (VU)	T (CR)
Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the of the Swan Coastal Plain		P3	T (CR)
'Banksia Woodlands of the Swan Coastal Plain' – a federally listed TEC consisting of numerous State-listed communities, one of which occurs in the study area 1. SCP21c Low lying *Banksia attenuata* woodlands or shrubland		P3	T (EN)
SCP24 Northern Spearwood shrublands and woodlands		P3	-
Muchea Limestone: Shrublands and woodlands on Muchea Limestone of the Swan Coastal Plain		T (EN)	T (EN)

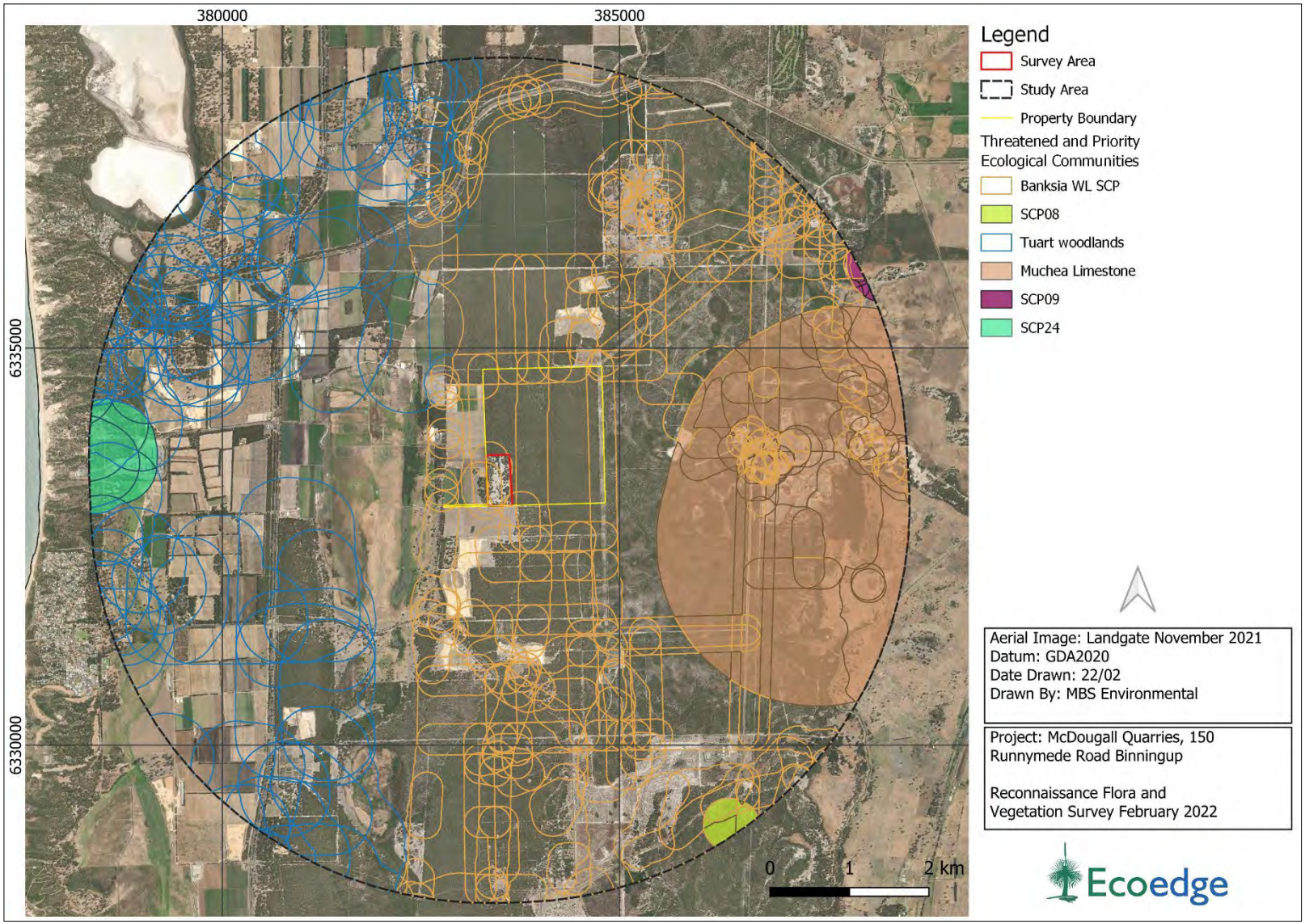

Figure 5. Threatened and Priority ecological communities within the study area. (DBCA 2021c)

4.5 Threatened and Priority flora

Species of flora and fauna are defined as having a Threatened or Priority conservation status where their extant populations are restricted geographically and/or under threat of possible extinction. The DBCA recognises these threats and consequently applies regulations towards population and species protection.

Threatened extant flora species are listed under Section 19 of the BC Act and are ranked according to their level of threat using the International Union for Conservation of Nature (IUCN) Red List categories and criteria of; Critically Endangered (CE), Endangered (EN), Vulnerable (VU). It is an offence to "take" or damage Threatened flora without Ministerial approval. Section 5 of the Act defines "to take" as "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means".

Priority flora is under consideration for future declaration as "Threatened flora", dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species are adequately known rare or Threatened species that require regular monitoring.

Threatened flora lists are formally reviewed annually, whilst the Priority flora list is subject to a less formal ongoing review. The current listing of Threatened and Priority flora was updated on 5 December 2018 (DBCA 2018b).

Categories of Threatened and Priority flora as defined by the BC Act are presented in **Appendix 5** (DBCA 2019a).

Threatened flora may also be protected under the Commonwealth EPBC Act and be listed in one of six categories; the definitions of these categories are summarised in **Appendix 6** (DAWE 2020c).

Threatened or Priority flora occurring within 5 km of the survey area were identified from DBCA Threatened and Priority flora database search (DBCA 2021b), NatureMap search (DBCA 2021a), and a Protected Matters Search Tool query (DAWE 2022). NatureMap and Protected Matters Search Tool results are provided in **Appendix 7**.

Fifteen conservation significant species with known records within 5 km of the survey area were identified. These are shown in **Figure 6**. Of these, none were considered likely to occur in the survey area based on pre-survey information due to the type and condition of habitat available, but four species were considered possible to occur. The rest of the species were considered unlikely to occur based on lack of preferred habitat**.**

A breakdown of the likelihood of occurrence of all potential species according to conservation status is provided in **Table 7** based on pre-survey information, with the complete likelihood of occurrence assessment (pre and post survey) provided in **Appendix 8**.

Table 7 Likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total number	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Likely	**0**	0	0	0	0	0
Possible	**4**	1	0	0	2	1
Unlikely	**11**	1	0	4	2	4
Total	**15**	**2**	**0**	**4**	**4**	**5**

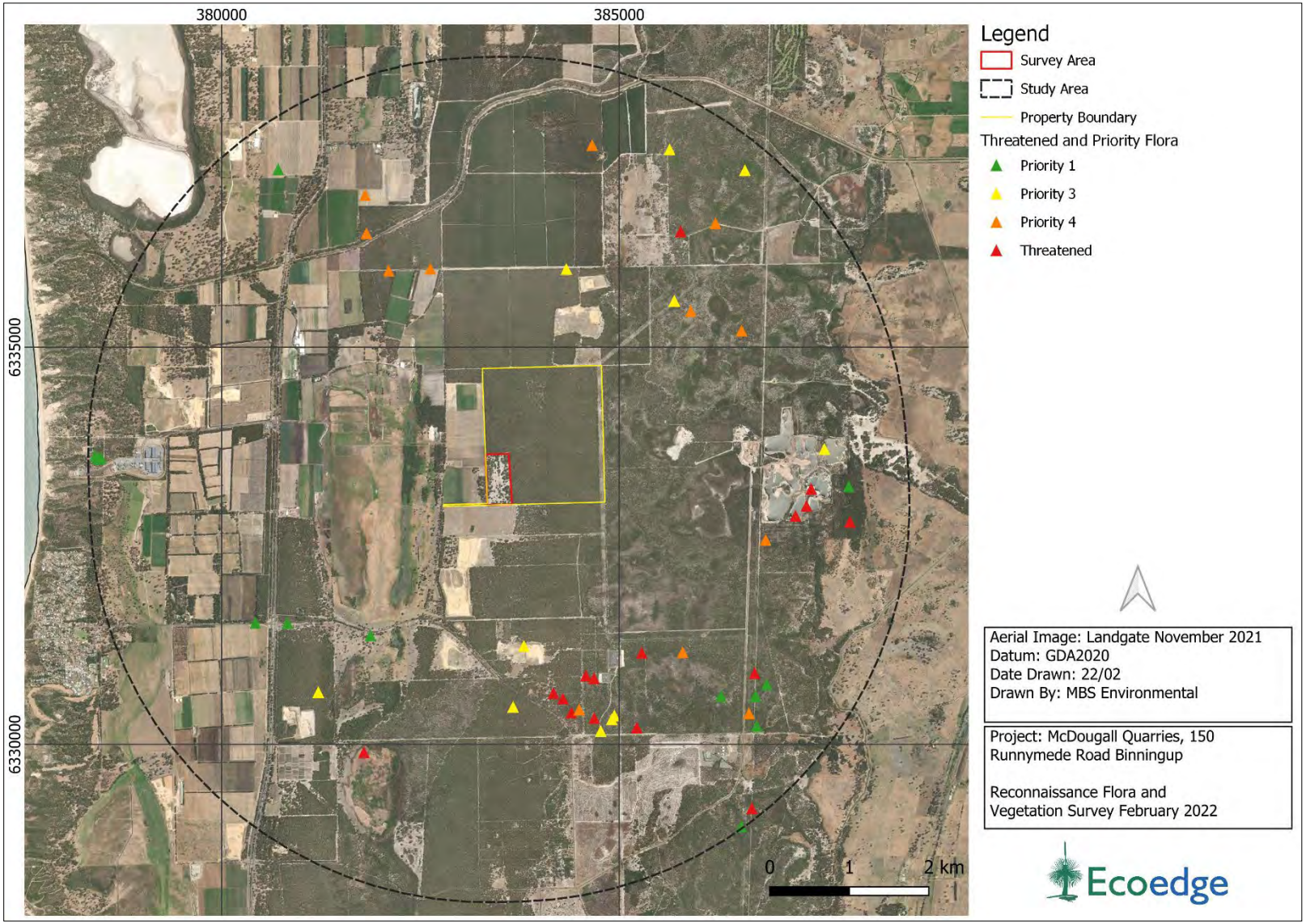

Figure 6. Threatened and Priority flora within the five km study area (DBCA 2021b)

4.6 Wetlands

Wetlands on the SCP have been classified into types using the geomorphic wetland classification system of Semeniuk & Semeniuk (1995), which is based on the characteristics of landform and water permanence, for example, lakes, palusplains and damplands. These are described in **Table 8.** The SCP wetlands have also been evaluated and assigned an appropriate management category and corresponding category objective, providing guidance on the nature of the management and protection the wetland should be afforded. These categories are described in **Table 9.**

Table 8. Wetland types (adapted from Semeniuk & Semeniuk, 1995).

Management Category	Basin	Flat	Channel	Slope	Highland
Permanently inundated	Lake		River		
Seasonally inundated	Sumpland	Floodplain	Creek		
Intermittent inundation	Playa	Barlkarra	Wadi		
Seasonally waterlogged	Dampland	Palusplain	Trough	Paluslope	Palusmont

Table 9. Definitions of and objectives for the different wetland management categories EPA 2008).

Management Category	Definition	Category Objective
Conservation	Wetlands with high conservation value for both natural or human use	To preserve wetland (natural) attributes and functions
Resource Enhancement	Wetlands with moderate natural and human use attributes that can be restored or enhanced	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use	Wetlands that score poorly on both natural and human use attributes	To use, develop and manage wetlands in the context of water, town and environmental planning

There are no wetlands within the survey area or the immediate surrounds (**Figure 7**). The closest wetland is a Multiple use dampland (UFI 13249) located approximately 650 m to the west of the survey area, with the closest conservation category wetland (UFI 13255) approximately 1.2 km to the northeast (DBCA 2021e, DBCA-019) (**Figure 7, Figure 8**).

4.7 Watercourses

There are no permanent or ephemeral rivers, creeks or drainage lines within the survey area or the property overall (Crossman & Li 2015, DWER-031; DBCA-019; DBCA-010; DBCA-045). The closest watercourse is Harvey Diversion Drain approximately 3.2 km north of the proposal area (Crossman & Li 2015, DWER-031) **Figure 7** and **Figure 8.**

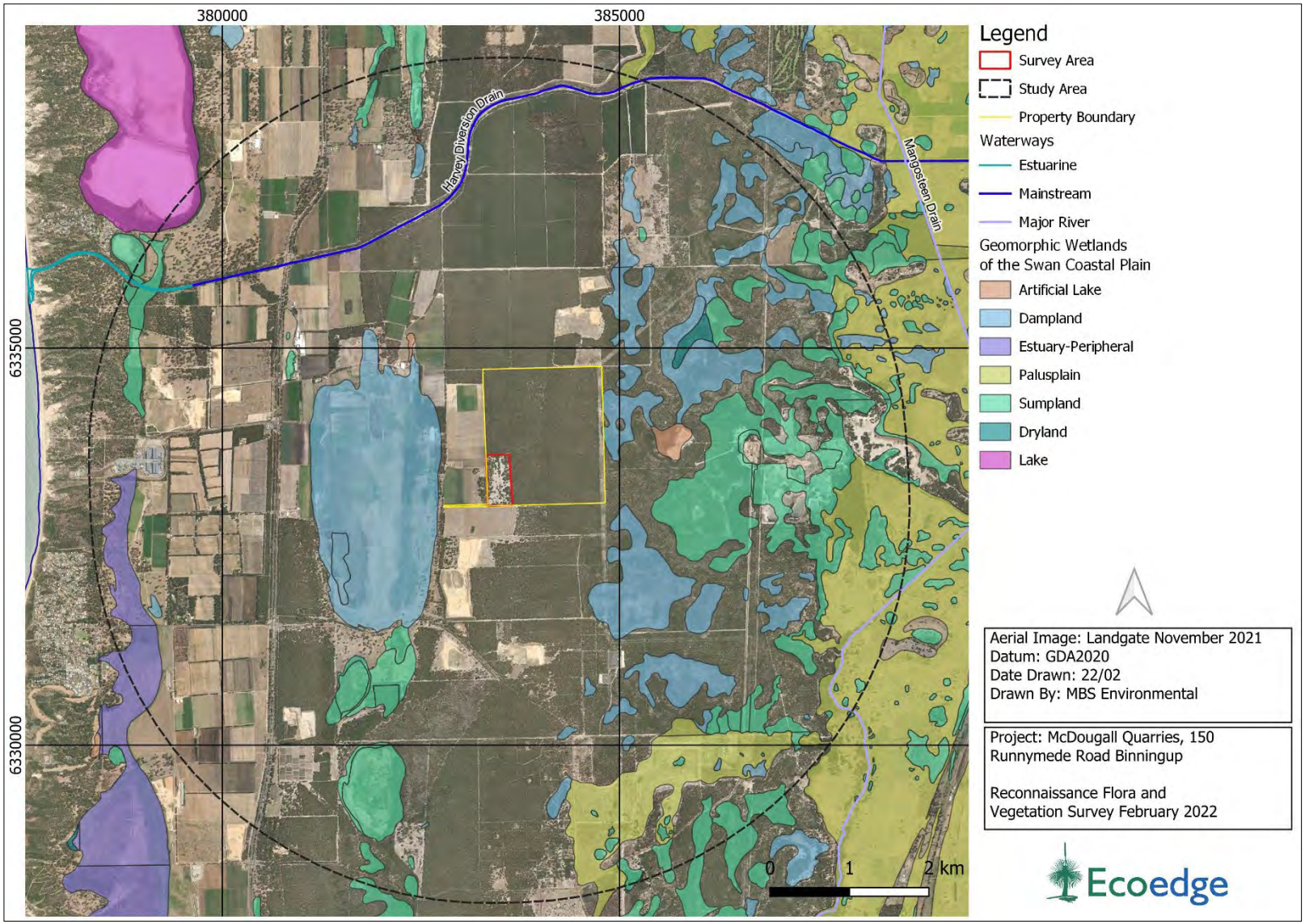

Figure 7. Geomorphic wetland type and waterways in proximity to the survey area (DBCA 2021e).

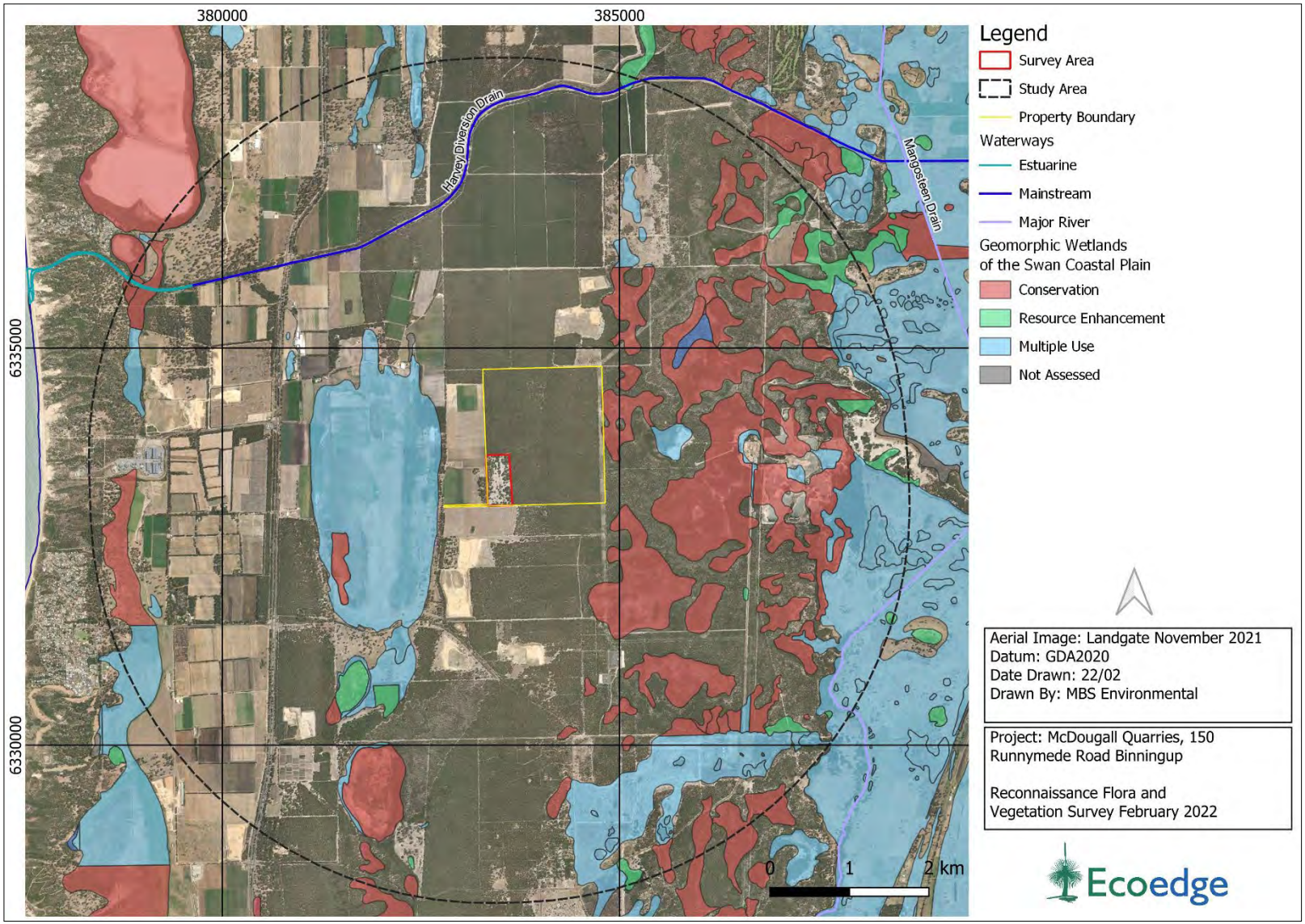

Figure 8. Status of geomorphic wetlands in proximity to the survey area (DBCA 2021e).

4.8 Regional ecological linkages

Regional ecological linkages "link protected patches of regional significance by retaining the best (condition) patches available as steppingstones for flora and fauna between regionally significant areas" (Molloy et al. 2009).

Regional ecological linkages have been mapped by Molloy et al. (2009) across the SW of Western Australia in an area spanning between just north of Mandurah to Walpole in the south-east.

Molloy et al. (2009) assessed and assigned "proximity value" (pv) ratings to all patches of remnant native vegetation as a way of indicating the value of their connectivity with regional ecological linkages. This was based on their distance from the nearest mapped regional ecological linkage axis line and connected parcels of remnant vegetation (**Table 10**).

Table 10. Linkage proximity values rating assigned to patches of remnant vegetation within a landscape (from Molloy et al. 2009).

Proximity value	Description	
1a	with an edge touching or	< 100 m from a linkage
1b	with an edge touching or	< 100 m from a natural area selected in 1a
1c	with an edge touching or	< 100 m from a natural area selected in 1b
2a	with an edge touching or	< 500 m from a linkage
2b	with an edge touching or	< 500 m from a natural area selected in 2a
2c	with an edge touching or	< 500 m from a natural area selected in 2b
3a	with an edge touching or	< 1000 m from a linkage
3b	with an edge touching or	< 1000 m from a natural area selected in 3a
3c	with an edge touching or	< 1000 m from a natural area selected in 3b

A regional ecological linkage axis line mapped by Molloy et al. (2009) runs north-south across 150 Runnymede Road, to the east of the survey area **Figure 9.** This linkage is associated with the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup Ecological Linkage. Patches of vegetation along the northern and eastern boundaries of the survey area are directly connected to vegetation associated with this linkage and have been assigned the highest 1a pv rating. Vegetation in the western portion of the survey area has been assigned a 1b pv rating.

Patches of vegetation in the central and southern portions of the survey area have not been assigned a pv, most likely due to the small size and fragmented nature of these patches within a predominately cleared part of the property.

4.9 Environmentally Sensitive Areas

ESAs are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. They are selected for their environmental values at State or National levels (Government of Western Australia 2005). They include:

- Defined wetlands and riparian vegetation within 50 m
- Areas covered by Threatened ecological communities
- Area of vegetation within 50 m of Threatened flora
- Bush Forever sites
- Declared World Heritage property sites.

There are no areas defined as ESA's within the survey area (DWER-046). The closest ESA, associated with a conservation category wetland, is located 1.3 km to the east.

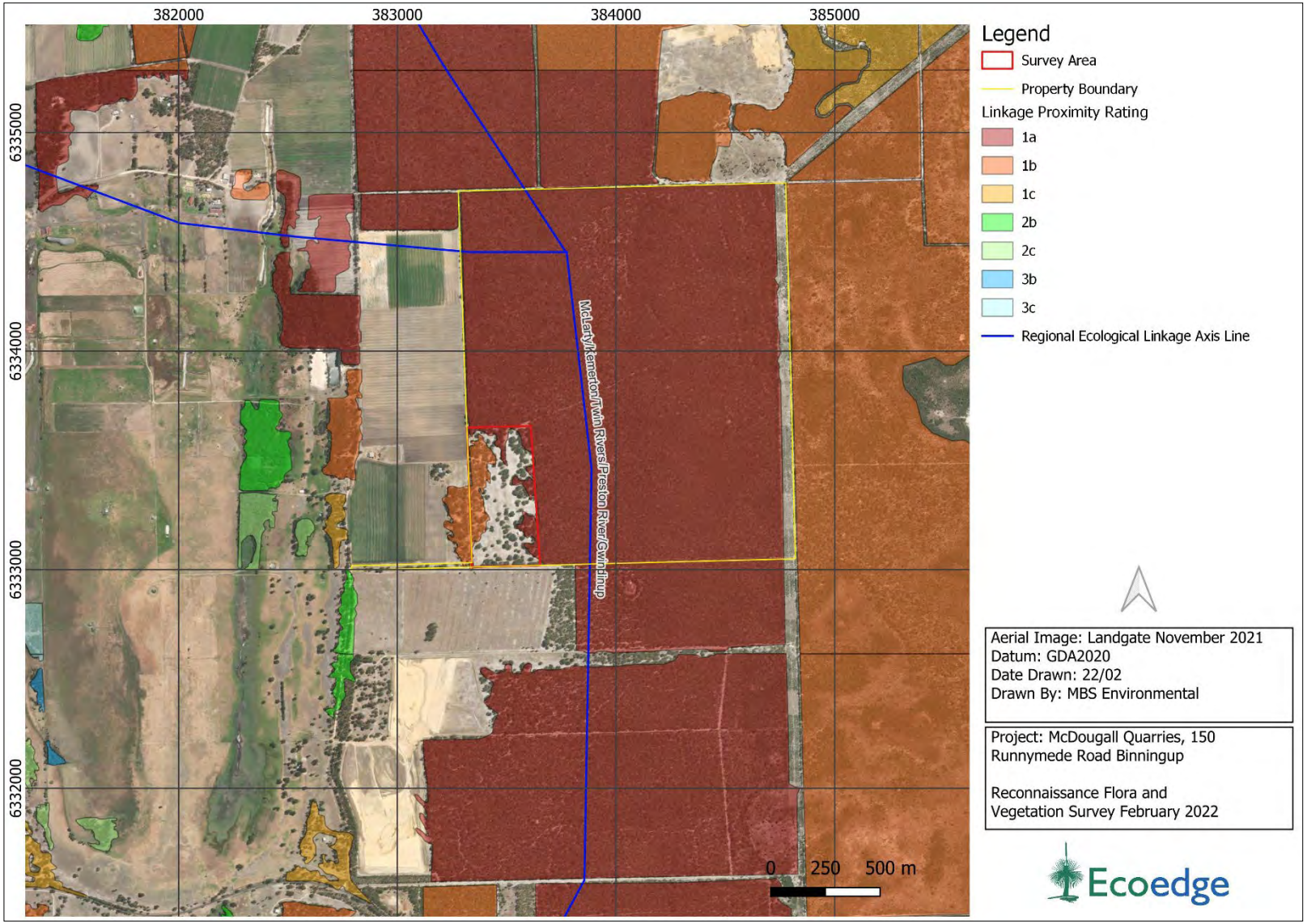

Figure 9. The survey area in relation to regional ecological linkages (Molloy et al. 2009).

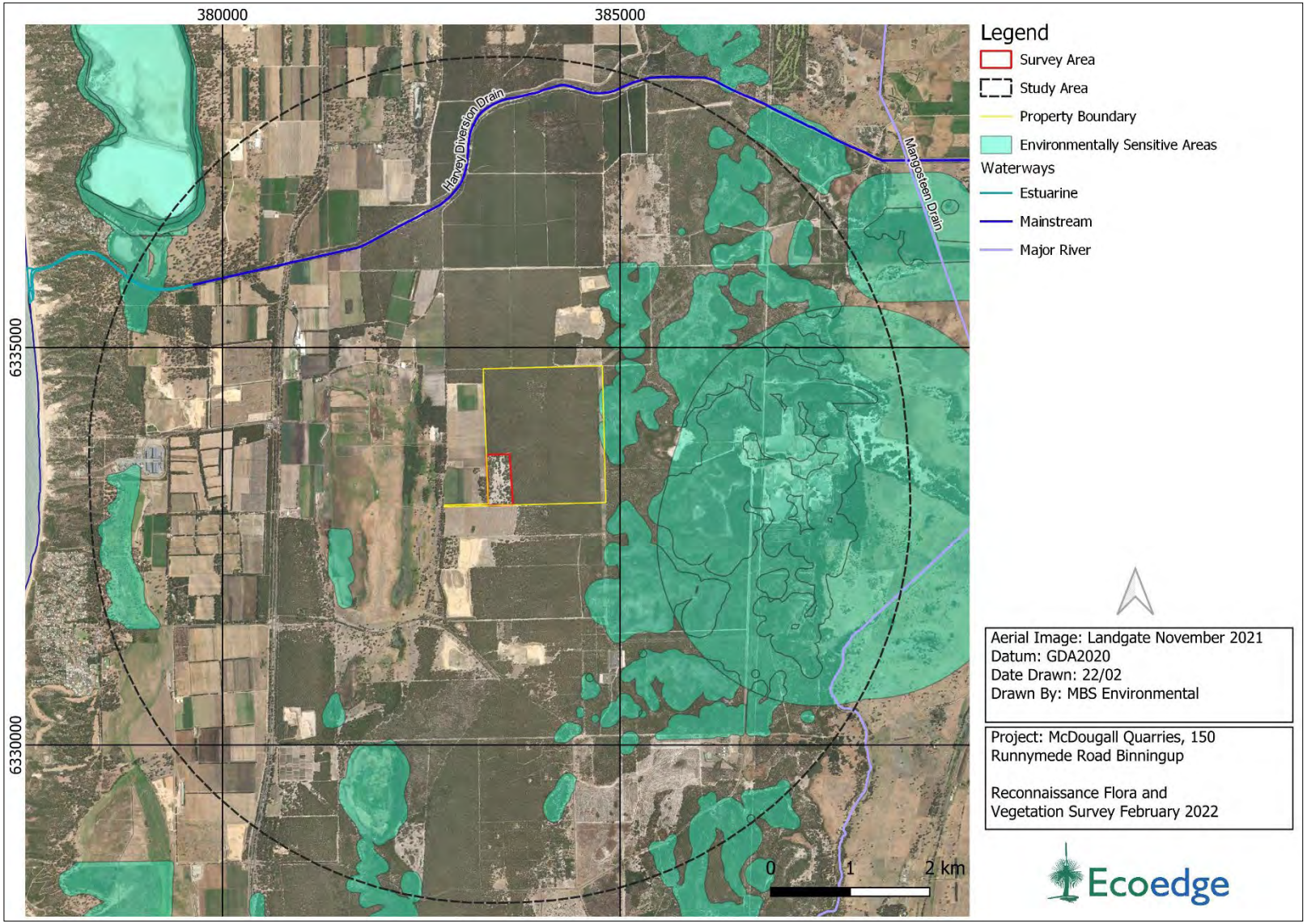

Figure 10. ESAs within study area (DWER 2020).

5 Survey results

Tracklog and relevés were recorded, and locations are shown in **Appendix 9**.

5.1 Flora

Sixty-four species of vascular flora were identified within the survey area, of which 24 (37.5%) were introduced taxa. The most numerous plant family was Poaceae, with 9 species, only one of them being native.

The list of vascular flora for each area recorded during the field survey is included in **Appendix 10**.

5.1.1 Flora of conservation significance

No flora listed as Threatened under the Commonwealth EPBC Act or under the State BC Act were found within the survey area. One State-listed Priority 1 flora species *Acacia* sp. Binningup (**Figure 11**) was recorded as shown in **Figure 12.** No other Priority flora or other flora of conservation significance were found. Further information on *Acacia* sp. Binningup is provided below.

Of the 15 significant flora taxa known to occur within 5 km of the survey area, one (*Acacia* sp. Binningup P1) was recorded in the survey area. Two cryptic orchid species, *Drakaea micrantha* (Threatened) and *Caladenia speciosa* (P4) would have been dormant at the time of the survey and their post-survey likelihood of occurrence remains 'Possible'. The rest were considered to have an 'Unlikely' residual (post-survey) likelihood of occurrence based on suitable habitat not being available or potentially suitable habitat being degraded, and the species not being recorded as part of the survey (**Appendix 8**).

Acacia sp. Binningup

A potentially new acacia was first observed in 2015 in the vicinity of the desalination plant in Binningup. It is a suckering, clumping low shrub (to approximately 1.5 m) with small feathery leaves. It is similar to *A. pulchella* var. *goadbyi* and was initially placed in the *Acacia pulchella* group of species. This group currently has four varieties that are all widespread and variable and their taxonomy has not been settled (DBCA 2019b).

The Binningup plants were considered to represent a new species by WA Herbarium and for the time being, they have been given a temporary name on the Western Australian plant census (they are called *Acacia* sp. Binningup). This species currently includes plants later found growing on roadsides and along drainage canals south of Harvey that could be yet another distinct species (closely related to but different in some respects from the Binningup plants). Preferred habitat of the species is inland sub-coastal dunes in a combination of tuart,

peppermint and banksia woodlands. More work is needed before *Acacia* sp. Binningup can be formally named and described (DBCA 2019b).

FloraBase currently lists 11 known locations *Acacia* sp. Binningup in three local government areas: Shire of Harvey, City of Rockingham and City of Busselton. The records show total abundance of approximately 1,250 plants (Western Australian Herbarium, 1998-).

As part of this survey on 150 Runnymede Road, thirty-nine individuals of *Acacia* sp. Binningup were recorded at seven point locations, all within 100 m of each other. These are expected to be the only individuals within the survey area as it was covered on foot to a sufficient degree. These individuals are the eastern most known records, approximately 3 km further east than the existing records on FloraBase.

Figure 11: *Acacia* sp. Binningup on 150 Runnymede Road in Binningup

5.1.2 Declared pest plants

One species of Declared Pest plants listed under the *Biosecurity and Agriculture Management Act 2007* were found within the survey area, **Solanum linnaeanum* (Apple of Sodom). The location of these pest plants is shown in **Figure 12.**

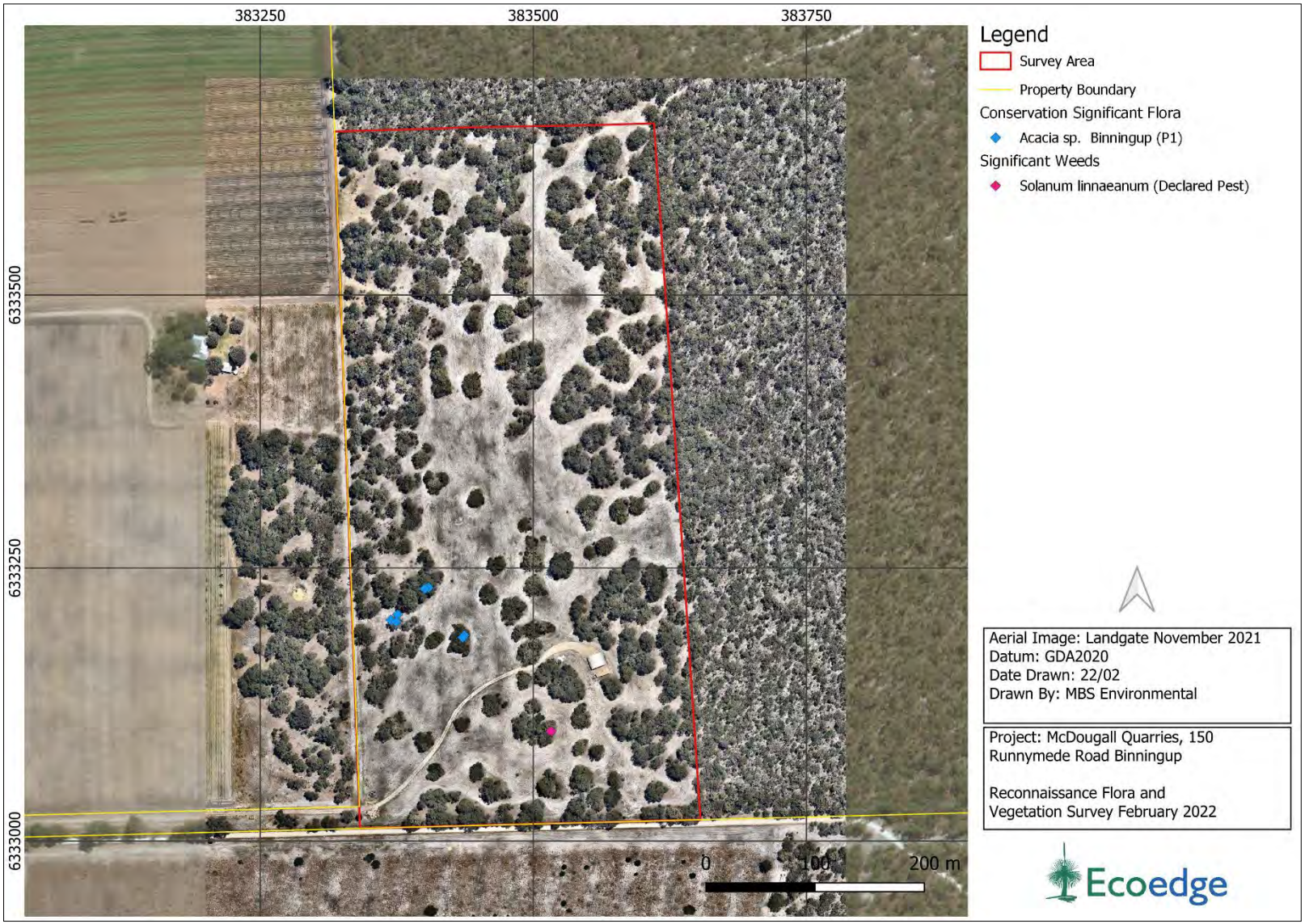

Figure 12. Significant flora and Declared plants within the survey area.

5.2 Vegetation units

Two native vegetation units were identified within the survey area as described below. Photographs are provided in **Appendix 11**.

- **Unit P1 Marri Woodland:** *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.
- **Unit P2 Jarrah-Marri-Banksia Woodland**: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.

These two units may be degraded forms of the same vegetation type occurring in better condition in other parts of the property. The extent and proportion of the total vegetated area of each of these vegetation units is presented in **Table 11**.

Table 11. Vegetation units by area and condition rating in the survey area.

Vegetation Unit	Area (ha)	%
P1 Marri Woodland	7.61	39.4%
P2 Jarrah-Marri-Banksia Woodland	2.21	11.4%
Sub-total	**9.82**	**50.8%**
Cleared	9.49	49.2%
Total	**19.31**	**100.0%**

5.2.1 Significant vegetation

The survey area may have originally supported Banksia Woodlands of the SCP TEC/PEC. However, the disturbance history of the site has resulted in significant changes in species composition and vegetation condition of the survey area. As a result, the vegetation remaining does not meet the criteria for Banksia Woodlands of the SCP TEC/PEC, apart from a small 0.05 ha area along the northern boundary of the survey area in Very Good condition. This area qualifies as the TEC/PEC based on the assumption that it is part of a larger area of Banksia Woodlands on SCP TEC/PEC outside the current survey area. The balance of vegetation on 150 Runnymede Road (outside the survey area) has not been formally surveyed but at least parts of it are expected to represent Banksia Woodlands on SCP TEC/PEC. None of the other TECs or PECs identified in the desktop assessment as having potential to occur in the area, were recorded in the survey area.

5.3 Vegetation condition

Approximately half (49.2%) of the survey area was cleared and the rest largely contained vegetation in Degraded condition (43.9%). On the western side of the survey area, 1.12 ha of vegetation remained in Good condition and 0.05 ha along the northern survey area boundary was in Very Good condition. Summary of vegetation condition classes is shown in Table 12. No vegetation was found to be in Excellent or Pristine condition. The main reason for the generally poor condition of remnant native vegetation in the survey area is the high level of past disturbance caused by partial clearing, grazing, introduction of non-native understorey species and other anthropogenic disturbances over several decades. The distribution of vegetation condition is shown in **Appendix 12**.

Table 12. Summary of vegetation condition classes in the survey area.

Vegetation Condition	Area (ha)	%
Very Good	0.05	0.3%
Good	1.12	5.8%
Degraded	8.39	43.7%
Completely Degraded	0.17	0.9%
Sub-total	9.82	50.8%
Cleared	9.49	49.2%
Total	**19.31**	**100.0%**

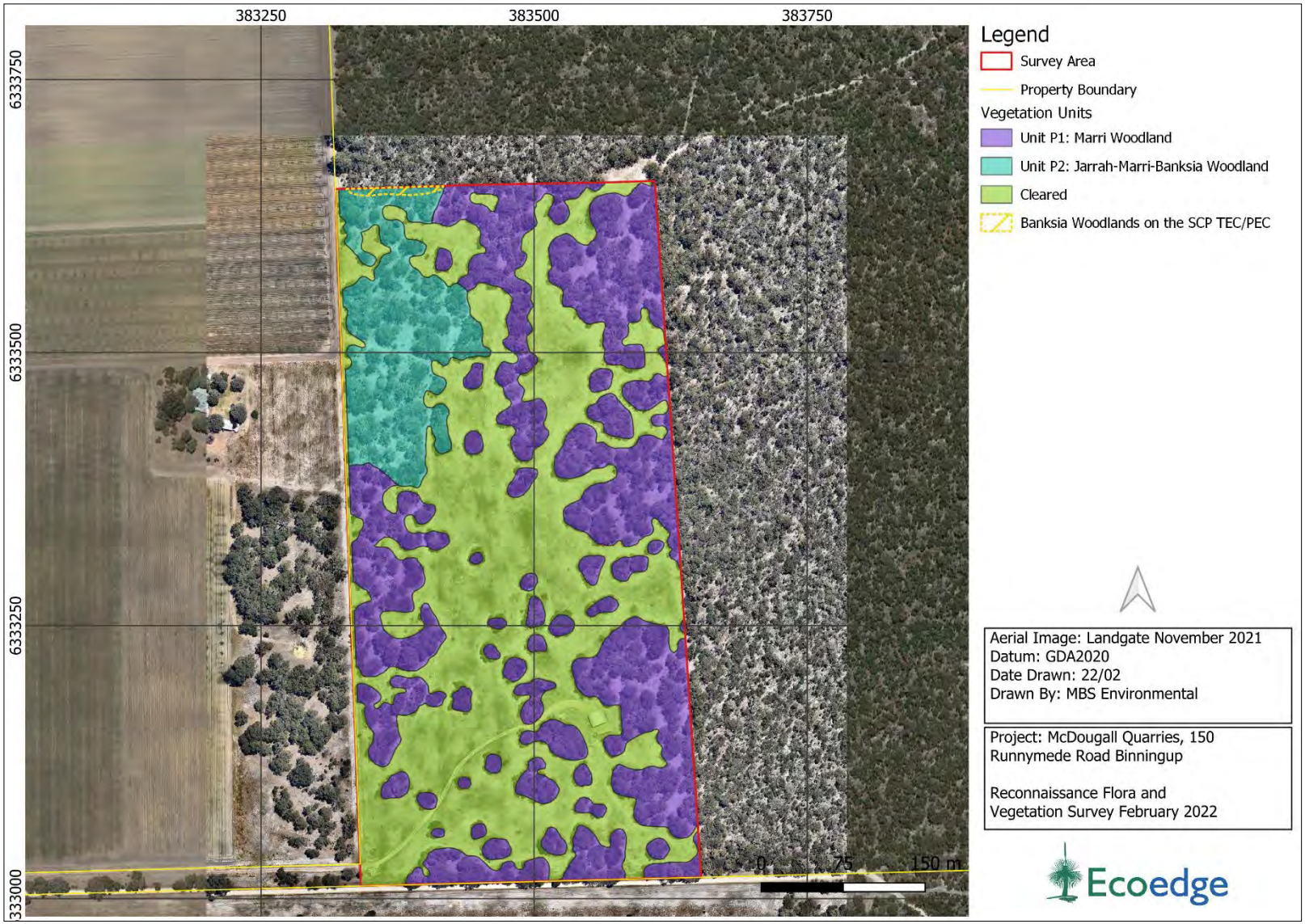

Figure 13. Vegetation units within the survey area.

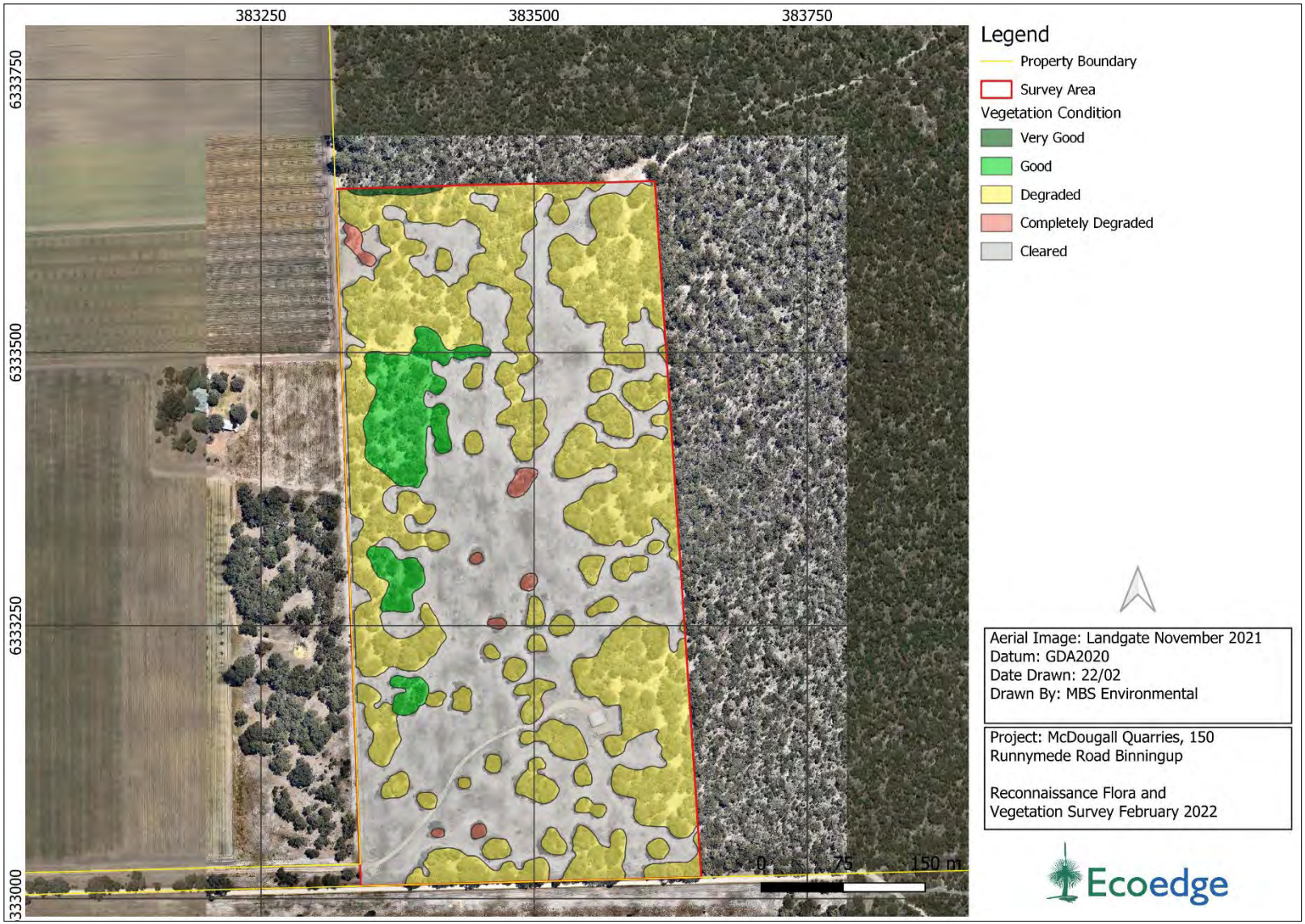

Figure 14. Vegetation condition within the survey area.

6 Discussion and conclusions

A summer survey of about 9.82 ha of native vegetation within a total survey area of 19.31 ha (9.49 ha cleared already) on 150 Runnymede Road in Binningup resulted in 64 flora taxa being identified, of which 24 were introduced species, including one Declared Pest plant.

6.1 Significant flora

No Threatened flora species were recorded, however 39 individuals of *Acacia* sp. Binningup P1 were recorded within the survey area. The species belongs to the *Acacia pulchella* group but has been recognised as a separate species. More work is needed before *Acacia* sp. Binningup can be formally named and described. Considering the similarity of the species to the others in the *Acacia pulchella* group and that identification requires partial excavation of the roots (to determine suckering), it is likely that the species has been under detected in the past and rather reported as one of the other varieties of *Acacia pulchella* that are common in the general area. The individuals recorded as part of this survey were the eastern most known records in DBCA and WA Herbarium databases, by approximately 3 km. As habitat similar to the survey area (but in better condition) is widely available in the local area along the sand dune, there is no obvious reason for the species to be limited to the survey area.

Two cryptic orchid species, *Drakaea micrantha* (Threatened) and *Caladenia speciosa* (P4) would have been dormant at the time of the survey and their post-survey likelihood of occurrence remains 'Possible' in the patches of remnant vegetation that retain native understorey. The remaining significant flora identified in the desktop assessment were considered to have an 'Unlikely' residual (post-survey) likelihood of occurrence based on suitable habitat not being available or potentially suitable habitat being degraded, and the species not being recorded as part of the survey.

6.2 Vegetation units

Two vegetation units were recognised within the survey area: Marri Woodland and Jarrah-Marri-Banksia Woodland. Both of these are likely to be degraded and heavily modified forms of the better condition vegetation found elsewhere on the property. A small 0.05 ha area of Very Good condition vegetation along the northern boundary of the survey area meets the criteria to qualify as Banksia Woodlands of SCP that is a federal TEC and state PEC. This is based on an assumption that the 0.05 ha area forms part of a larger patch of the Banksia Woodlands of SCP TEC/PEC extending north, outside of the survey area. The rest of the vegetation in the survey area does not represent a TEC or PEC.

6.3 Vegetation complexes and associations

One vegetation complex is mapped to occur across the survey area: the Karrakatta Complex - Central and South. This complex has 23.49% of its pre-European extent remaining which is

under the 30% target for an unconstrained area, however 36.23% of the complex remains within Shire of Harvey.

The one Beard vegetation association, Association 6, mapped for the survey area has 23.72% of its pre-European extent remaining at state, IBRA region and IBRA sub-region levels, which is under the 30% target for an unconstrained area, however again 38.18% of the association remains within shire of Harvey.

The vegetation within the survey area is generally characteristic of the mapped complex and association in terms of their dominant species and structure but the vegetation is largely in Degraded condition.

6.4 Regional ecological linkages

Some of the vegetation within the survey area has been assigned the highest 1a or the second highest 1b linkage proximity rating. The 1a areas have vegetation directly linked with an ecological axis line associated with the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup ecological linkage mapped by Molloy et al. (2009) and the 1b areas are <100 m from the 1a areas. There is no statutory basis for the protection of regional ecological linkages. However, in general, the importance of ecological linkages has been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA 2008 and references therein).

150 Runnymede Road retains more than 230 ha of remnant native vegetation in what appears to be Good or better condition and that vegetation contributes to the same ecological linkage as a 1a area. Therefore, the less than 10 ha of vegetation within the survey area that is in largely degraded condition would not be expected to make a significant contribution to the overall functions of or services provided by the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup ecological linkage.

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Appendix 1 Threatened and Priority flora Likelihood of occurrence assessment methodology.

Rating	Presurvey rationale	Post survey rationale
Recorded		Taxon was or has been recorded in the survey area.
Likely	Known to occur within one kilometre (km) of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known to occur within one km of the survey area and very suitable habitat was present, but the taxon was not observed for one of the following reasons. **L1.** The taxon was dormant at the time of survey and could therefore not be located. **L2.** The habitat was compromised, for example due to a recent fire. **L3.** The survey area is challenging to survey.The taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Possible	Known to occur within a five-ten km of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known from within a five to ten km radius of the survey area, and suitable habitat for the species was present, but despite a thorough search being carried out, the species was not observed. The taxon may however be present for any of the following reasons. **P1.** The taxon was dormant at the time of survey and could therefore not be located. **P2.** The habitat was compromised, for example, due to a recent fire. **P3.** The survey area is challenging to survey. Te taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Unlikely	Known or predicted to occur within ten km, but no suitable habitat is known or predicted to occur within the survey area.	The taxon was not found and is unlikely to be present for one or more of the following reasons: **U1.** No suitable habitat was observed, and the taxon is known to be restricted to a narrow and clearly defined habitat type. **U2.** Suitable or potential habitat was present and appropriately searched, but the taxon was not observed. **U3.** Suitable habitat present, but these areas were too degraded for the taxon to occur, for example, due to weed invasion and/or clearing.

Example of application of pre and post-survey likelihood of occurrence

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
Drakaea elastica	T (EN)	Oct-Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	**Likely**	**Unlikely (U3)**

Appendix 2. Vegetation condition scale (EPA 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 3. Categories of Threatened ecological communities under the EPBC Act.

Category	Definition
Critically endangered (CR)	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered (EN)	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable (VU)	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 4. Categories of threatened and priority ecological communities under the BC Act.

Conservation code	Category
(T) Threatened ecological community pursuant to Sect 27 of the *Biodiversity Conservation Act 2016.*	
T	(T) CR – Critically endangered 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.
	(T) EN - Endangered 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.
	(T) VU - Vulnerable 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.
(P) Priority species – possible threatened communities.	
P1	Poorly known communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). 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.

Conservation code	Category
P2	Poorly known communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. 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.
P3	Poorly known communities a) 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: b) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; c) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. 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.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Conservation dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 5. Definitions of conservation codes for Threatened and Priority flora.

Conservation code	Category
(T) Threatened species pursuant to Sect 19 of the BC Act 2016.	
T	(T) CR – Critically endangered Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) EN - Endangered Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) VU - Vulnerable Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".
(P) Priority species – possible Threatened species.	
P1	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.
P2	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.

Conservation code	Category
P3	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.
P4	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix 6. Categories of Threatened species under the EPBC Act.

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

Appendix 7. Protected Matters Search Tool and NatureMap reports

Australian Government
Department of Agriculture, Water and the Environment

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. Please see the caveat for interpretation of information provided here.

Report created: 29-Jan-2022

Summary

Matters of National Environment 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 (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	32
Listed Migratory Species:	28

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

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 Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	36
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	20
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Peel-yalgorup system	Within Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In feature area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding likely to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
FISH			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Galaxiella nigrostriata](#) Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
OTHER			
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In feature area
[Austrostipa bronwenae](#) [87808]	Endangered	Species or species habitat known to occur within area	In feature area
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caladenia procera](#) Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Diuris drummondii](#) Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area	In feature area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arenaria interpres](#) Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius ruficapillus](#) Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
NTWA Bushland covenant (0004)	Conservation Covenant	WA	In buffer area only
NTWA Bushland covenant (0095)	Conservation Covenant	WA	In buffer area only
Yalgorup	National Park	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Yalgorup Lakes System	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Clear 2.86 ha of native vegetation for the purpose of horticulture	2010/5655	Controlled Action	Post-Approval	In feature area
Lot 4 Runnymede Road, Wellesley - Proposed Sand Extraction	2020/8862	Controlled Action	Assessment Approach	In buffer area only
Production horticulture in Lot 6 and Lot 8 Old Coast Road, Myalup	2020/8827	Controlled Action	Assessment Approach	In buffer area only
Sand Extraction Project Lot 5 Wellesley Road, Wellesley Shire of Harvey	2021/9034	Controlled Action	Assessment Approach	In buffer area only
Sand Mine, Lot 122 Old Coast Road, Parkfield, Binningup, WA	2014/7164	Controlled Action	Post-Approval	In buffer area only
Sand Mining on Lot 7 Runnymede Road	2011/5996	Controlled Action	Post-Approval	In feature area
Silica Sand Mine Expansion	2002/910	Controlled Action	Post-Approval	In buffer area only
Southern Seawater Desalination Project	2008/4173	Controlled Action	Post-Approval	In buffer area only
WA Offshore Windfarm	2021/8961	Controlled Action	Assessment Approach	In feature area
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Kemerton Lateral Gas Pipeline Project	2005/2388	Not Controlled Action	Completed	In feature area
Limestone quarry expansion	2005/2268	Not Controlled Action	Completed	In buffer area only
Limestone Quarry Expansion, Lots 3618 and 1794, Finn Road	2005/2332	Not Controlled Action	Completed	In buffer area only
Limestone quarry mining	2006/2942	Not Controlled Action	Completed	In buffer area only
Vegetation Clearance for Horticulture Operation Expansion, Lot 2, Springfield Rd, Parkfield, WA	2014/7196	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Construct and operate a 132kV transmission line and upgrade Kemerton Terminal Si	2008/4484	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Limestone Extraction on Lot 5 Old Coast Road, Myalup, WA	2012/6468	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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

Created By Guest user on 02/12/2021

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 45' 26" E,33° 07' 39" S
Buffer	5km
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	273	1023
Priority 1	2	9
Priority 3	7	21
Priority 4	6	18
Rare or likely to become extinct	10	155
TOTAL	**298**	**1226**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	38480	*Austrostipa bronwenae*		T	
2.	18038	*Caladenia procera*		T	
3.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
4.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
5.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
6.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
7.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
8.	13635	*Drakaea micrantha*		T	
9.	34027	*Galaxiella nigrostriata (Black-stripe Minnow, black-striped dwarf galaxias)*		T	
10.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
Priority 1					
11.	48762	*Acacia sp. Binningup (G. Cockerton et al. WB 37784)*		P1	
12.	16633	*Boronia juncea subsp. juncea*		P1	
Priority 3					
13.	11612	*Boronia capitata subsp. gracilis*		P3	
14.	41641	*Ctenotus ora (Coastal Plains Skink)*		P3	
15.	16245	*Cyathochaeta teretifolia*		P3	
16.	3863	*Dillwynia dillwynioides*		P3	
17.	5038	*Lasiopetalum membranaceum*		P3	
18.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
19.	48297	*Styphelia filifolia*		P3	
Priority 4					
20.	3339	*Acacia flagelliformis*		P4	
21.	3537	*Acacia semitrullata*		P4	
22.	13862	*Caladenia speciosa*		P4	
23.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
24.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
25.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
Non-conservation taxon					
26.	15466	*Acacia applanata*			
27.	3331	*Acacia extensa (Wiry Wattle)*			
28.	3374	*Acacia huegelii*			
29.	3482	*Acacia paradoxa (Kangaroo Thorn)*	Y		
30.	15481	*Acacia pulchella var. glaberrima*			
31.	30036	*Acacia saligna subsp. stolonifera*			
32.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
33.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
34.	24262	*Acanthiza inornata (Western Thornbill)*			
35.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
36.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
37.	1790	*Adenanthos meisneri*			
38.	1791	*Adenanthos obovatus (Basket Flower)*			
39.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
40.	154	*Alisma lanceolatum (Water Plantain)*	Y		
41.	2655	*Amaranthus albus (Tumbleweed)*	Y		
42.	7820	*Ambrosia artemisiifolia (Annual Ragweed, Bitterweed, Hay-feverweed, Hog-weed)*	Y		
43.	200	*Amphipogon turbinatus*			
44.	24312	*Anas gracilis (Grey Teal)*			
45.	24315	*Anas rhynchotis (Australasian Shoveler)*			
46.	24316	*Anas superciliosa (Pacific Black Duck)*			
47.	24561	*Anthochaera carunculata (Red Wattlebird)*			
48.	25670	*Anthus australis (Australian Pipit)*			
49.	3686	*Aotus cordifolia*			
50.	3688	*Aotus gracillima*			
51.	25558	*Ardea ibis (Cattle Egret)*			
52.	41324	*Ardea modesta (great egret, white egret)*			
53.	24340	*Ardea novaehollandiae (White-faced Heron)*			
54.	24341	*Ardea pacifica (White-necked Heron)*			
55.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
56.	6323	*Astroloma ciliatum (Candle Cranberry)*			
57.	17233	*Austrostipa campylachne*			
58.	24318	*Aythya australis (Hardhead)*			
59.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
60.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
61.		*Barnardius zonarius*			
62.	3165	*Billardiera variifolia*			
63.	24319	*Biziura lobata (Musk Duck)*			
64.	4438	*Boronia ramosa*			
65.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
66.	6341	*Brachyloma preissii (Globe Heath)*			
67.	244	*Briza maxima (Blowfly Grass)*	Y		
68.	12770	*Burchardia congesta*			
69.	25716	*Cacatua sanguinea (Little Corella)*			
70.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
71.	1276	*Caesia micrantha (Pale Grass Lily)*			
72.	1592	*Caladenia flava (Cowslip Orchid)*			
73.	15348	*Caladenia flava subsp. flava*			
74.	5415	*Calothamnus lateralis*			
75.	5458	*Calytrix flavescens (Summer Starflower)*			
76.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
77.	1162	*Cartonema philydroides*			
78.	13489	*Cerastium pumilum*	Y		
79.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
80.	1280	*Chamaescilla corymbosa (Blue Squill)*			
81.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
82.	24980	*Christinus marmoratus (Marbled Gecko)*			
83.	25601	*Chrysococcyx lucidus (Shining Bronze Cuckoo)*			
84.	24288	*Circus approximans (Swamp Harrier)*			
85.	27691	*Cladonia ramulosa*			
86.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
87.	6348	*Conostephium pendulum (Pearl Flower)*			
88.	6349	*Conostephium preissii*			
89.	1418	*Conostylis aculeata (Prickly Conostylis)*			
90.	1436	*Conostylis juncea*			
91.	1438	*Conostylis laxiflora*			
92.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
93.	25592	*Corvus coronoides (Australian Raven)*			
94.	24671	*Coturnix pectoralis (Stubble Quail)*			
95.	25595	*Cracticus tibicen (Australian Magpie)*			
96.	25596	*Cracticus torquatus (Grey Butcherbird)*			
97.	13354	*Craspedia variabilis*			
98.	25398	*Crinia georgiana (Quacking Frog)*			
99.	25399	*Crinia glauerti (Clicking Frog)*			
100.	25400	*Crinia insignifera (Squelching Froglet)*			
101.	30893	*Cryptoblepharus buchananii*			
102.	25047	*Ctenotus impar*			
103.	24322	*Cygnus atratus (Black Swan)*			
104.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
105.	7454	*Dampiera linearis (Common Dampiera)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
106.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
107.	3834	*Daviesia polyphylla*			
108.	18541	*Diplopeltis huegelii subsp. huegelii*			
109.	19649	*Disa bracteata*	Y		
110.	48253	*Diuris porphyrochila*			
111.	46858	*Diuris tinctoria*			
112.	24470	*Dromaius novaehollandiae (Emu)*			
113.	48751	*Drosera drummondii*			
114.	3106	*Drosera macrantha (Bridal Rainbow)*			
115.	3118	*Drosera pallida (Pale Rainbow)*			
116.	29178	*Drosera porrecta*			
117.	3131	*Drosera stolonifera (Leafy Sundew)*			
118.	11105	*Echinochloa crus-galli*	Y		
119.	332	*Echinochloa frumentacea (Siberian Millet)*	Y		
120.	338	*Echinochloa telmatophila (Swamp Barnyard Grass)*	Y		
121.	25100	*Egernia napoleonis*			
122.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
123.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
124.	15410	*Eriochilus dilatatus subsp. dilatatus*			
125.	6219	*Eryngium pinnatifidum (Blue Devils)*			
126.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
127.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
128.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
129.	3872	*Euchilopsis linearis (Swamp Pea)*			
130.	835	*Evandra pauciflora*			
131.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
132.	25623	*Falco longipennis (Australian Hobby)*			
133.	24041	*Felis catus (Cat)*	Y		
134.	894	*Fimbristylis velata*			
135.	27748	*Flavoparmelia rutidota*			
136.	25727	*Fulica atra (Eurasian Coot)*			
137.	25530	*Gerygone fusca (Western Gerygone)*			
138.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
139.	24295	*Haliastur sphenurus (Whistling Kite)*			
140.	24296	*Hamirostra isura (Square-tailed Kite)*			
141.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
142.	25410	*Heleioporus eyrei (Moaning Frog)*			
143.	6839	*Hemiandra pungens (Snakebush)*			
144.	25119	*Hemiergis quadrilineata*			
145.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
146.	45534	*Hibbertia hypericoides subsp. hypericoides*			
147.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
148.		*Hibbertia sp.*			
149.	5173	*Hibbertia subvaginata*			
150.	5176	*Hibbertia vaginata*			
151.	25734	*Himantopus himantopus (Black-winged Stilt)*			
152.	24491	*Hirundo neoxena (Welcome Swallow)*			
153.	6222	*Homalosciadium homalocarpum*			
154.	3968	*Hovea trisperma (Common Hovea)*			
155.	12859	*Hovea trisperma var. trisperma*			
156.	12741	*Hyalosperma cotula*			
157.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
158.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
159.	1070	*Hypolaena exsulca*			
160.	917	*Isolepis marginata (Coarse Club-rush)*			
161.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
162.	5832	*Kunzea ericifolia (Spearwood, Pondil)*			
163.	15498	*Kunzea glabrescens (Spearwood)*			
164.	1309	*Laxmannia squarrosa*			
165.	925	*Lepidosperma angustatum*			
166.	1653	*Leporella fimbriata (Hare Orchid)*			
167.	46382	*Leptocarpus roycei*			
168.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
169.	25133	*Lerista elegans*			
170.	6374	*Leucopogon conostephioides*			
171.	6444	*Leucopogon sprengelioides*			
172.	6445	*Leucopogon squarrosus*			
173.	6454	*Leucopogon verticillatus (Tassel Flower)*			
174.	25005	*Lialis burtonis*			
175.	25661	*Lichmera indistincta (Brown Honeyeater)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
176.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
177.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
178.	1228	*Lomandra hermaphrodita*			
179.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
180.	1234	*Lomandra nigricans*			
181.	1243	*Lomandra sericea (Silky Mat Rush)*			
182.	1246	*Lomandra suaveolens*			
183.	1198	*Luzula meridionalis (Field Woodrush)*			
184.	1097	*Lyginia barbata*			
185.	18049	*Lyginia imberbis*			
186.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
187.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
188.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
189.	25654	*Malurus splendens (Splendid Fairy-wren)*			
190.	5952	*Melaleuca preissiana (Moonah)*			
191.	18598	*Melaleuca systena*			
192.	5980	*Melaleuca thymoides*			
193.	24598	*Merops ornatus (Rainbow Bee-eater)*			
194.		*Microcarbo melanoleucos*			
195.	485	*Microlaena stipoides (Weeping Grass)*			
196.	15419	*Microtis media subsp. media*			
197.	8106	*Millotia tenuifolia (Soft Millotia)*			
198.		*Missulena granulosa*			
199.	25191	*Morethia lineoocellata*			
200.	24223	*Mus musculus (House Mouse)*	Y		
201.	6201	*Myriophyllum verrucosum (Red Water Milfoil)*			
202.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
203.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
204.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
205.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
206.	8133	*Olearia elaeophila*			
207.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
208.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
209.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
210.	25253	*Parasuta gouldii*			
211.	25682	*Pardalotus striatus (Striated Pardalote)*			
212.	1762	*Parietaria debilis (Pellitory)*			
213.	533	*Paspalum vaginatum (Salt Water Couch)*			
214.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
215.	4346	*Pelargonium littorale*			
216.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
217.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
218.	16477	*Pericalymma ellipticum var. ellipticum*			
219.	48061	*Petrochelidon nigricans (Tree Martin)*			
220.	48066	*Petroica boodang (Scarlet Robin)*			
221.	2299	*Petrophile linearis (Pixie Mops)*			
222.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
223.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
224.	25699	*Phalacrocorax varius (Pied Cormorant)*			
225.	24409	*Phaps chalcoptera (Common Bronzewing)*			
226.	18529	*Philotheca spicata (Pepper and Salt)*			
227.	1478	*Phlebocarya ciliata*			
228.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
229.		*Phytophthora cinnamomi*			
230.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
231.	24747	*Platycercus spurius (Red-capped Parrot)*			
232.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
233.	6249	*Platysace compressa (Tapeworm Plant)*			
234.	4524	*Platytheca galioides*			
235.	8175	*Podolepis gracilis (Slender Podolepis)*			
236.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
237.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
238.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
239.	25722	*Polytelis anthopeplus (Regent Parrot)*			
240.	4691	*Poranthera microphylla (Small Poranthera)*			
241.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
242.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
243.	25511	*Pseudonaja affinis (Dugite)*			
244.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
245.		*Pterostylis aff. nana*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
246.	10875	*Pterostylis concava*			
247.	1693	*Pterostylis recurva (Jug Orchid)*			
248.	12217	*Pterostylis sanguinea*			
249.	1698	*Pterostylis vittata (Banded Greenhood)*			
250.	4181	*Pultenaea reticulata*			
251.		*Purpureicephalus spurius*			
252.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
253.	24245	*Rattus rattus (Black Rat)*	Y		
254.	48096	*Rhipidura albiscapa (Grey Fantail)*			
255.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
256.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
257.	40426	*Rytidosperma occidentale*			
258.	20063	*Salix babylonica*	Y		
259.	7602	*Scaevola calliptera*			
260.	7614	*Scaevola globulifera*			
261.	984	*Schoenus curvifolius*			
262.	1020	*Schoenus sublateralis*			
263.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
264.	30948	*Smicrornis brevirostris (Weebill)*			
265.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
266.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
267.	25597	*Strepera versicolor (Grey Currawong)*			
268.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
269.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
270.	7798	*Stylidium schoenoides (Cow Kicks)*			
271.	7799	*Stylidium spathulatum (Creamy Triggerplant)*			
272.	24259	*Sus scrofa (Pig)*	Y		
273.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
274.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
275.	48341	*Tetratheca hirsuta subsp. viminea*			
276.	10856	*Thelymitra benthamiana (Leopard Orchid)*			
277.	11143	*Thelymitra graminea*			
278.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
279.	1338	*Thysanotus manglesianus (Fringed Lily)*			
280.	25519	*Tiliqua rugosa*			
281.	25207	*Tiliqua rugosa subsp. rugosa*			
282.	6280	*Trachymene pilosa (Native Parsnip)*			
283.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
284.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
285.	4292	*Trifolium campestre (Hop Clover)*	Y		
286.	8255	*Ursinia anthemoides (Ursinia)*	Y		
287.	28087	*Usnea inermis*			
288.	33537	*Vallisneria australis*	Y		
289.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
290.	25225	*Varanus rosenbergi (Heath Monitor)*			
291.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			
292.	24206	*Vespadelus regulus (Southern Forest Bat)*			
293.	24040	*Vulpes vulpes (Red Fox)*	Y		
294.	7389	*Wahlenbergia preissii*			
295.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
296.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
297.	6289	*Xanthosia huegelii*			
298.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 8. Likelihood of occurrence of species within survey area.

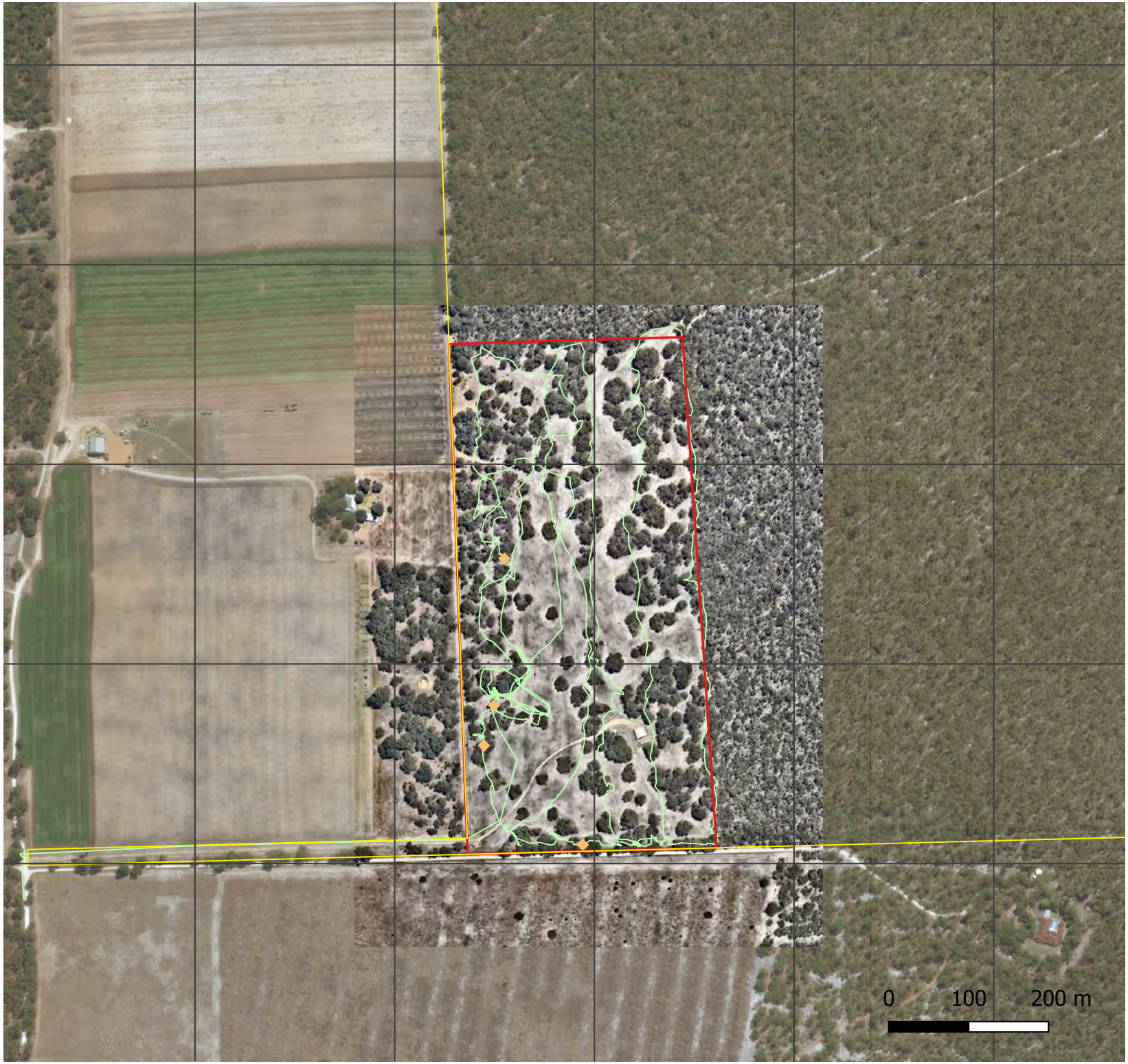
Threatened and Priority List flora known to occur within 5 km of the survey area (DBCA 2021a, DBCA 2021b, DAWE 2022).

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
Acacia sp. Binningup (G. Cockerton et al. WB 37784)	P1	Aug	Suckering, clumping low shrub (to approximately 1.5 m) with small feathery leaves. Inland sub-coastal dunes in a combination of tuart, peppermint and banksia woodlands.	Possible	Recorded
Acacia flagelliformis	P4	May to Sep	Rush-like, erect or sprawling shrub, 0.3-0.75(-1.6) m high. Fl. yellow. Sandy soils. Winter-wet areas.	Unlikely	Unlikely (U1)
Acacia semitrullata	P4	May to Oct	Slender, erect, pungent shrub, (0.1-)0.2-0.7(-1.5) m high. Fl. cream-white. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.	Possible	Unlikely (U2)
Austrostipa bronwenae	T-EN (EN)		Tufted, perennial grass to 0.8 (1.5) m high. Sand, loam, clay. Winter wet/damp.	Unlikely	Unlikely (U1)
Boronia capitata subsp. *gracilis*	P3	Jun to Nov	Slender shrub, 0.3-0.6(-3) m high, branches pilose. Fl. pink. White/grey or black sand. Winter-wet swamps, hillslopes.	Unlikely	Unlikely (U1)
Boronia juncea subsp. *juncea*	P1	Apr	Slender or straggly shrub, pedicels and sepals glabrous. Fl. pink. Sand. Low scrub.	Unlikely	Unlikely (U1)
Caladenia procera	T-CR (CR)	Sep to Oct	Tuberous, perennial, herb, 0.35-0.9 m high. Fl. yellow. Rich clay loam, Alluvial loamy flats, jarrah/marri/peppermint woodland, dense heath, sedges.	Unlikely	Unlikely (U1)
Caladenia speciosa	P4	Sep to Oct	Tuberous, perennial, herb, 0.35-0.6 m high. Fl. white-pink. White, grey or black sand	Possible	Possible (P1)
Cyathochaeta teretifolia	P3		Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high, to	Unlikely	Unlikely (U1)

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
			1.0 m wide. Fl. brown. Grey sand, sandy clay. Swamps, creek edges.		
Dillwynia dillwynioides	P3	Aug to Dec	Decumbent or erect, slender shrub, 0.3-1.2 m high. Fl. red & yellow/orange. Sandy soils. Winter-wet depressions.	Unlikely	Unlikely (U1)
Diuris drummondii	T-VU (VU)	Nov to Dec or Jan	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow. Low-lying depressions, swamps.	Unlikely	Unlikely (U1)
Drakaea elastica	T-CR (EN)	Oct to Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Unlikely	Unlikely (U1)
Drakaea micrantha	T-EN (VU)	Sep to Oct	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow. White-grey sand.	Possible	Possible (P1)
Lasiopetalum membranaceum	P3	Sep to Dec	Multi-stemmed shrub, 0.2-1 m high. Fl. pink-blue-purple. Sand over limestone.	Unlikely	Unlikely (U1)
Tripterococcus sp. Brachylobus (A.S George 14234)	P4	Nov-Dec or Feb	Erect perennial herb to 0.3-0.7 m high Fl. yellow. Grey/black sand. Winter wet depressions.	Unlikely	Unlikely (U1)

*****Note: The BC Act Conservation Status is shown, EPBC Act status, where relevant, is in brackets.

Appendix 9. Tracklogs and Relevés



Legend

- Survey Area
- Property Boundary
- Track Logs
- Relevés

Aerial Image: Landgate November 2021
Datum: GDA2020
Date Drawn: 22/02
Drawn By: MBS Environmental

Project: McDougall Quarries, 150 Runnymede Road Binningup

Reconnaissance Flora and Vegetation Survey February 2022

Ecoedge

Appendix 10. List of vascular flora found within the survey area.

No.	FAMILY NAME	SPECIES NAME	NATURALISED	LISTING
1	Anarthriaceae	*Lyginia imberbis*		
2	Apiaceae	*Daucus glochidiatus*		
3	Asparagaceae	*Lomandra micrantha subsp. micrantha*		
4	Asparagaceae	*Lomandra sp. indet*		
5	Asphodelaceae	**Trachyandra divaricata*	X	
6	Asteraceae	**Carduus pycnocephalus*	X	
7	Asteraceae	**Erigeron sumatrensis*	X	
8	Asteraceae	**Hypochaeris glabra*	X	
9	Asteraceae	**Hypochaeris radicata*	X	
10	Asteraceae	**Ursinia anthemoides subsp. anthemoides*	X	
11	Asteraceae	*Olearia axillaris*		
12	Asteraceae	*Podotheca angustifolia*		
13	Caryophyllaceae	**Cerastium glomeratum*	X	
14	Colchicaceae	*Burchardia congesta*		
15	Dilleniaceae	*Hibbertia cuneiformis*		
16	Dilleniaceae	*Hibbertia hypericoides s.l.*		
17	Dilleniaceae	*Hibbertia racemosa*		
18	Ericaceae	*Brachyloma preissii*		
19	Ericaceae	*Styphelia propinqua*		
20	Ericaceae	*Styphelia racemulosa*		
21	Fabaceae	**Acacia longifolia*	X	
22	Fabaceae	*Acacia extensa*		
23	Fabaceae	*Acacia saligna s.l.*		
24	Fabaceae	*Acacia sp. Binningup (G. Cockerton et al. WB 37784)*		P1
25	Fabaceae	*Bossiaea eriocarpa*		
26	Fabaceae	*Daviesia divaricata*		
27	Fabaceae	*Daviesia physodes*		
28	Fabaceae	*Gompholobium tomentosum*		
29	Fabaceae	*Hardenbergia comptoniana*		
30	Fabaceae	*Hovea trisperma s.l.*		
31	Fabaceae	*Jacksonia furcellata*		
32	Fabaceae	*Kennedia prostrata*		
33	Hemerocallidaceae	*Dianella revoluta s.l.*		

No.	FAMILY NAME	SPECIES NAME	NATURALISED	LISTING
34	Iridaceae	**Romulea rosea s.l.*	X	
35	Loranthaceae	*Nuytsia floribunda*		
36	Myrtaceae	*Agonis flexuosa var. flexuosa*		
37	Myrtaceae	*Corymbia calophylla*		
38	Myrtaceae	*Eucalyptus marginata subsp. marginata*		
39	Myrtaceae	*Kunzea glabrescens*		
40	Orchidaceae	**Disa bracteata*	X	
41	Orchidaceae	*Microtis media s.l.*		
42	Orchidaceae	*Pterostylis sp. indet*		
43	Orobanchaceae	**Orobanche minor*	X	
44	Phyllanthaceae	*Phyllanthus calycinus*		
45	Phytolaccaceae	**Phytolacca octandra*	X	
46	Pinaceae	**Pinus pinaster*	X	
47	Poaceae	**Aira cupaniana*	X	
48	Poaceae	**Avena barbata*	X	
49	Poaceae	**Avena sp. indet*	X	
50	Poaceae	**Briza maxima*	X	
51	Poaceae	**Briza minor*	X	
52	Poaceae	**Bromus sp. indet*	X	
53	Poaceae	**Ehrharta calycina*	X	
54	Poaceae	**Ehrharta longiflora*	X	
55	Poaceae	**Lagurus ovatus*	X	
56	Poaceae	*Austrostipa flavescens*		
57	Proteaceae	*Banksia attenuata*		
58	Proteaceae	*Banksia ilicifolia*		
59	Restionaceae	*Desmocladus flexuosus*		
60	Rubiaceae	*Opercularia vaginata*		
61	Solanaceae	**Solanum nigrum*	X	
62	Solanaceae	**Solanum linnaeanum*	X	DP
63	Xanthorrhoeaceae	*Xanthorrhoea brunonis s.l.*		
64	Zamiaceae	*Macrozamia riedlei*		

Appendix 11. Vegetation Units within survey area.

Unit P1 Marri Woodland: Corymbia calophylla (with occasional Eucalyptus marginata subsp. marginata and Agonis flexuosa var. flexuosa) Woodland to Open Forest over *Acacia longifolia Isolated Tall Shrubs over *Ehrharta calycina, *Avena spp. Open Grassland with *Trachyandra divaricata, *Ursinia anthemoides subsp. anthemoides Sparse to Open Herbland. [Condition mainly Degraded].

Unit P2 Jarrah-Marri-Banksia Woodland: Corymbia calophylla, Eucalyptus marginata subsp. marginata (with occasional Banksia attenuata and Agonis flexuosa var. flexuosa) Woodland to Open Forest over Xanthorrhoea brunonis s.l. Low Sparse Shrubland over *Ehrharta calycina, *Avena spp. Open Grassland with *Trachyandra divaricata, *Ursinia anthemoides subsp. anthemoides Sparse to Open Herbland. [Condition mainly Degraded to Good; small portion in Very Good condition representative of Banksia Woodlands of the Swan Coastal Plain TEC/PEC].

APPENDIX 2: FAUNA SURVEY (MBS ENVIRONMENTAL 2022)

FAUNA ASSESSMENT

LOT 150 RUNNYMEDE ROAD BINNINGUP

PREPARED FOR:

MCDOUGALL QUARRIES PTY LTD

JUNE 2022

PREPARED BY:

Martinick Bosch Sell Pty Ltd
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environmental and geoscience consultants

LOT 150 RUNNYMEDE ROAD BINNINGUP
FAUNA ASSESSMENT

Distribution List:

Company	Contact name	Copies	Date
McDougall Quarries	Kyle Jackson, Director	Electronic	24 June 2022

Document Control for Job Number: MDQRUNEA

Document Status	Prepared By	Authorised By	Date
Draft Report	Dane Vincent Kirsi Kauhanen Greg Harewood	Sue Brand	23 June 2022
Final Report	Kirsi Kauhanen	Sue Brand	24 June 2022

EXECUTIVE SUMMARY

This report details the results of a fauna assessment of approximately 19.31 hectares (ha) of parkland cleared native vegetation in the southwest corner of Lot 150 Runnymede Road, Binningup (Figure 1, Figure 2). The results of this fauna assessment will be utilised for land use planning and also by regulatory authorities to assess the potential impacts any proposal imposes on native fauna and fauna habitats of the site during relevant approval processes.

The scope of these works was to conduct a basic fauna assessment of the survey area, as well as complete a targeted survey for black cockatoo habitat and western ringtail possums. These surveys have been completed to satisfy requirements of *Technical Guidance -Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA 2020).

The field component of the fauna assessment was carried out on 24 February 2022 (day time survey) and 1 March 2022 (night time survey) by Greg Harewood (Zoologist). MBS Environmental (Senior Environmental Scientist Dr Kirsi Kauhanen) also visited the site on 18 January 2022 and botanical consultant Ecoedge undertook a reconnaissance level flora and vegetation survey of the site on 1 February 2022.

The survey area included approximately 9.82 ha of native vegetation, comprising mainly degraded Marri woodland with some Jarrah-Marri-Banksia woodland. The third fauna habitat type was cleared land. The majority of the vegetation was in a Degraded condition, with 1.12 ha in Good and 0.05 ha in Very Good condition.

The overall fauna habitat quality of the survey area was low due to the remaining native vegetation being limited to small patches and isolated trees, with limited native ground cover. Many of the trees were relatively recent regrowth from previous selective logging and not old enough to form hollows. Limited debris or logs were available on ground as these have been regularly removed as part of maintaining the cleared areas and reducing fuel loads. Considering the nature of the habitat available, the fauna assemblage present in the survey area would be depauperate in comparison to the surrounding areas of better quality habitat, in particular in relation to ground dwelling reptile and mammal species.

The subject site was found to contain 92 potential “black cockatoo breeding habitat trees” (DBH >50 cm). One tree appeared to contain two spouts with larger entrances (greater than ~10 cm) that appeared big enough to possibly allow the entry of a black cockatoo into a suitably sized and orientated branch/trunk, though it showed no sign of current or previous use by cockatoos for this purpose. Sections of the subject site represent black cockatoo foraging habitat mainly given the presence of jarrah and marri, though the exact extent is difficult to quantify given the tree species in question vary in density from area to area. No existing roosting trees (trees used at night by black cockatoos to rest) were positively identified during the survey.

The subject site does contain restricted areas of what superficially looks like suitable habitat for the WRP, however no evidence of the species utilising the subject site was found during the day or night surveys (i.e., no dreys, scats or individuals). This would suggest that they were either absent from the area surveyed or present in very low densities. WRPs have therefore been listed as a potential species as a precautionary measure, but they may in fact not use the site except on rare occasions.

One conservation significant fauna species was positively identified (Forest red-tailed black cockatoo) and two are considered likely to occur (Carnaby's cockatoo and Baudin's cockatoo). A further seven significant fauna species are considered to have some potential to occur (Coastal Plains Skink, Perth Lined Lerista, Peregrine Falcon, South-Western Brush-tailed Phascogale, Western Ringtail Possum, Western Brush Wallaby and Western False Pipistrelle).

The potential impacts on fauna species of conservation significance and/or their habitat will need to be taken into consideration during ongoing planning and construction phases of the proposed project. If approval for the project is obtained it is recommended that a fauna relocation program be implemented prior to and during clearing works to ensure direct impact on fauna are minimised.

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Tables

Figures

APPENDICES

1. INTRODUCTION

This report details the results of a fauna assessment over a part of Lot 150 Runnymede Road, Binningup, in the Shire of Harvey (Figure 1). The survey area comprised approximately 19.31 hectares (ha) of parkland cleared native vegetation in the southwest corner of the property (Figure 2). The survey was undertaken for the landowner, McDougall Quarries Pty Ltd, that is considering the option of sand extraction within the survey area. Information obtained as part of this fauna assessment will be used in conjunction with other environmental investigations to guide project planning, which will aim to minimise potential environmental impacts. The results of this fauna assessment report will also be utilised by regulatory authorities to assess the potential impacts any proposal on native fauna and fauna habitats of the site during relevant approval processes.

2. SCOPE OF WORKS

The scope of these works was to conduct a basic fauna assessment and a targeted survey for black cockatoo habitat and western ringtail possums. These surveys have been completed in accordance with *Technical Guidance -Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA 2020) and relevant federal guidance. For the purposes of this report the term black cockatoo is in reference to Baudin's black cockatoo (*Calyptorhynchus baudinii)*, Carnaby's black cockatoo (*Calyptorhynchus latirostris)* and the Forest Red-Tailed Black Cockatoo (*Calyptorhynchus banksii naso).*

The basic fauna assessment included a desktop assessment and a low intensity field survey to map and describe fauna habitat types and undertake opportunistic fauna observations.

The targeted black cockatoo habitat assessment was inclusive of foraging, breeding, and roosting habitat evaluation, covering suitable habitat trees, existing and potential nest hollows and evidence of foraging and roosting within the survey area.

The targeted western ringtail possum survey covered day and night time searches for suitable habitat and evidence of use (foraging, refuge and dispersal habitat and individuals).

Scale: 1:100000
Original Size: A4
Image: Copernicus Sentinel Data 2020
Grid: GDA94

0 2.5 5 km

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 1

Location Plan

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West Perth WA 6005
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MBS ENVIRONMENTAL

W:\McDougall Quarries\Runnymede Rd\GIS-Common\LocationPlan_150Runnymederd.qgz 28/04/2022

Scale: 1: 5,000
Original Size: A4
Aerial Image Date: Nov 2021
Grid: GDA94 / MGA zone 50
0 75 150 m

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 2

Survey Area

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www.mbsenvironmental.com.au

MBS ENVIRONMENTAL

W:\McDougall Quarries\Runnymede Rd\Studies\Fauna\GIS\150 Runnymede Rd Fauna_Harewood.qgz 28/04/2022 F2 Survey Area

3. METHODOLOGY

3.1 DESKTOP ASSESSMENT

3.1.1 Database Searches

Fauna species with potential to occur in the survey area, in particular conservation significant fauna, were identified based on following database searches:

- NatureMap database with 10 km search buffer (DBCA 2021).
- DBCA Threatened and Priority Fauna database with 10 km search buffer (DBCA 2022).
- Protected Matters Search Tool (DAWE 2022).

Search results for the first two databases include known records of the species within the search area whereas the latter also covers species that may occur if suitable habitat is available. It is noted that some of the records are old and may represent populations that are no longer present (e.g., local extinctions). Also, the data may contain errors. Therefore, information from these sources should be taken as indicative only and verified against other information sources.

3.1.2 Previous Fauna Surveys

There are no known previous fauna surveys of the current survey area, however several fauna surveys have been undertaken in the surrounding areas. The following relatively recent reports that are publicly available have been used as additional evidence to assess the potential occurrence of significant fauna in the survey area.

- 360 Environmental. 2013. Australind Piggery Flora, Vegetation and Fauna Survey. Prepared for GD Pork.
- Bamford Consulting Ecologists. 2020. Kemerton Strategic Industrial Area Fauna Assessment. Prepared for Development WA.
- Dell, J. and Hyder, B. 2009. An Assessment of the Avifauna of the Area between Dawesville and Binningup, Southern Swan Coastal Plain. Prepared for Environmental Protection Authority.
- Eco Logical. 2020. Winter 2020 Ecological Assessments – Benger Switchyard. Prepared for South Energy.
- Eco Logical. 2017. Kemerton Industrial Area Spring Flora and Fauna Survey. Prepared for S2V Consulting.
- Eco Logical. 2017. Kemerton Strategic Industrial Area Flora and Fauna Survey. Prepared for LandCorp.
- GHD. 2021. Flora and Fauna Spring Survey Brine Pipeline and Outfall. Prepared for Harvey Water.
- Harewood, G. 2020. Fauna Assessment of Lot 4 Runnymede Road, Wellesley. Prepared for B&J Catalano Pty Ltd.
- Harewood, G. 2018. Fauna Assessment of Lot 5 Wellesley Road, Wellesley. Prepared for Carbone Brothers Pty Ltd.
- Harewood, G. 2017. Fauna Assessment for Lot 43 Stanley Road, Kemerton. Prepared for Peel Resource Recovery.
- Harewood, G. 2009. Fauna Assessment (Level 1) and Targeted Fauna Survey (Western Ringtail Possum and Southern Brush-tailed Phascogale) in the Mine Expansion Area. Prepared for Kemerton Silica Pty Ltd.
- Hyder, B. and Dell, J. 2009. An Assessment of the Non-Volant Mammal Fauna of the Area Between Dawesville and Binningup, Southern Swan Coastal Plain. Prepared for Environmental Protection Authority.
- SW Environmental. 2020. Level 1 and Targeted Fauna Survey of Lots 6 and 8 Old Coast Road, Myalup. Prepared for Patane Produce.

3.2 SITE SURVEYS

The field component of the fauna assessment was carried out on 24 February 2022 (day time survey) and 1 March 2022 (night time survey) by Greg Harewood (Zoologist). MBS Environmental (Senior Environmental Scientist Dr Kirsi Kauhanen) also visited the site on 18 January 2022 and botanical consultant Ecoedge undertook a reconnaissance level flora and vegetation survey of the site on 1 February 2022.

3.2.1 Fauna Habitat Assessment

Vegetation units identified by Ecoedge (2022) have been used together with landform and soil information to define broad scale fauna habitats across the survey area. This information has been supplemented with observations made during field surveys by Greg Harewood and Kirsi Kauhanen.

As part of the desktop assessment, available information on the habitat requirements of the species of conservation significance listed as possibly occurring was researched. During the daytime survey, the habitats within the survey area were assessed and specific elements identified, to determine the likelihood of significant fauna occurring and the likely overall value of the habitats for fauna locally and regionally.

The main objective of the assessment was to determine if it were likely that species of conservation significance would utilise the habitats identified as occurring within the survey area based on their documented habitat preference and current known distribution.

3.2.2 Black Cockatoo Habitat Assessment

The following methods were employed to comply with the defined scope of works and are based on Commonwealth of Australia (2012) guidelines which state that surveys for Carnaby's, Baudin's and forest red-tailed black cockatoo habitat should:

- Be done by a suitably qualified person with experience in vegetation or cockatoo surveys, depending on the type of survey being undertaken.
- Maximise the chance of detecting the species' habitat and/or signs of use.
- Determine the context of the site within the broader landscape — for example, the amount and quality of habitat nearby and in the local region (for example, within 10 km).
- Account for uncertainty and error (false presence and absences).
- Include collation of existing data on known locations of breeding and feeding birds and night roost locations.

The Commonwealth of Australia (2012) places habitats used by black cockatoos into the following three categories:

- Breeding Habitat.
- Foraging Habitat.
- Night Roosting Habitat.

3.2.2.1 Black Cockatoo Breeding Habitat

The black cockatoo breeding habitat assessment identified all suitable breeding tree species within the survey area that have a diameter at breast height (DBH) equal to or greater than 50cm. The DBH of each tree was estimated using a pre-made "calliper".

Target tree species included marri, jarrah, tuart and flooded gum and any other Corymbia/Eucalyptus species of a suitable size that was present. Peppermints, Banksia, Sheoak and Melaleuca tree species (for example) were not assessed as they typically do not develop hollows used by black cockatoos.

The location of each tree identified as being over the threshold DBH was recorded with a GPS and details on tree species, number, and size of hollows (if any) noted. Trees observed to contain hollows (of any size/type) were marked with "H" using spray paint.

Hollow/potential hollows were placed into one of four categories, based on the size of the apparent hollow entrance, these being:

- Small = ~<5 cm diameter (i.e., entrance too small for a black cockatoo).
- Medium = ~5 cm – 10 cm diameter (i.e., entrance too small for a black cockatoo).
- Large = ~>10 cm diameter (entrance large enough for a black cockatoo but hollow appears unsuitable for nesting i.e., wrong orientation, appears too small, too low, or too shallow).
- Large (cockatoo) = ~>10 cm diameter (entrance and apparent hollow appears big enough and suitably sized/orientated for a black cockatoo to use for nesting).

Based on this assessment, trees present within the survey area were placed into one of four categories:

- Tree <50 cm DBH of an unsuitable species (these were not assessed/recorded).
- Tree >50 cm DBH, no hollows seen.
- Tree >50 cm DBH, one or more hollows seen, none of which were considered suitable for black cockatoos to use for nesting.
- Tree >50 cm DBH, one or more hollows seen, with at least one considered suitable for black cockatoos to use for nesting.

For the purposes of this assessment, a tree containing a potential black cockatoo nest hollow was defined as:

Generally, any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) or possible hollows suitable for occupation by black cockatoo for the purpose of nesting/breeding. Hollows that had an entrance greater than about 10 cm in diameter and would allow the entry of a black cockatoo into a suitably orientated and sized branch/trunk, were recorded as a "potential nest hollow".

Identified hollows were examined using binoculars for evidence of actual use by black cockatoos (e.g., chewing around hollow entrance, scarring and scratch marks on trunks and branches). Details recorded included hollow size, height, type, orientation, comments on suitability, and any evidence of use.

Trees with possible nest hollows were also scratched and raked with a large stick in attempt to flush any sitting birds from hollows and calls of chicks were listened for. Where the assessment was inconclusive, and if possible, trees identified as having potential nest hollows were subsequently examined and photographed using a drone (DJI Mavic Air).

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo breeding habitat areas in the vicinity of the survey area.

3.2.2.2 Black Cockatoo Foraging Habitat

The location and nature of black cockatoo foraging evidence (e.g., chewed fruits around base of trees) observed during the field survey was recorded. The nature and extent of potential foraging habitat present was also documented irrespective of the presence of any actual foraging evidence. Foraging habitat is represented by plant species that are known to provide a food source for black cockatoos. This can be in the form of seeds, flowers and also boring grubs that are extracted from some plant species.

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo foraging habitat areas in the vicinity.

3.2.2.3 Black Cockatoo Roosting Habitat

Direct and indirect evidence of black cockatoos roosting within trees on site was noted where observed (e.g., branch clippings, droppings, or moulted feathers).

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo roosting habitat areas in the vicinity.

3.2.3 Western Ringtail Possum Survey

3.2.3.1 Diurnal Survey

A diurnal survey to locate and record dreys, obvious tree hollows, scats and individual WRPs was completed and involved a series of traverses on foot across the survey area.

3.2.3.2 Nocturnal Survey

A single nocturnal survey to locate and record individual WRPs was completed. This involved a series of transects across the survey area, on foot using a LED head torch to locate animals by way of eyeshine.

3.2.3.3 Habitat Assessment

Description and delineation of the spatial extent and quality of WRP habitat within the survey area is provided, based upon field survey observations.

3.2.4 Fauna Observations

The likelihood or evidence of conservation significant fauna (inclusive of suitable habitat) was investigated and recorded concurrent with other site surveys. Opportunistic observations of any significant fauna species were recorded during all field survey work.

This aspect of the assessment included but was not limited to:

- Undertaking a series of transects across the survey area.
- Searching for evidence (i.e., individuals, tracks, scats, calls) of potential conservation significant species under logs, rocks, and leaf litter.
- Observing bird species with binoculars.

3.3 Likelihood of Occurrence

A likelihood of occurrence assessment for significant fauna was undertaken on the basis of the desktop assessment findings combined with the site survey findings.

4. SURVEY CONSTRAINTS

Seasonal sampling was not in the scope of this fauna assessment. The conclusions presented are based upon field observations conducted during a limited period of time. These results are inherently indicative of the environmental condition of the site at the time of the field assessment. It should be noted that site conditions can change with time, and this may alter the fauna composition and suitability of the site.

Several fauna species are reported with potential to occur based upon the presence of suitable habitat (quality and extent) within the site or in the immediately adjacent land. There is potential that certain fauna species may not have been observed or detected during the field assessment due to:

- Seasonal inactivity.
- Lack of survey in microhabitat.
- Cryptic species avoiding detection.
- Transient and widely distributed species are not present during the field assessment.

The lack of observational records of species that align with these factors should not necessarily be taken as an indication of absence or unlikely to utilise relevantly suitable fauna habitats within the site at times.

The habitat requirements and ecology of several species known to occur in the surrounding area is often poorly understood or documented. It can therefore be difficult to report species as unlikely or not known to occur based on an apparent lack of suitable habitat or microhabitats within the subject site. As a consequence of this limitation, the likelihood of occurrence list is likely an overestimation of species that actually utilise the survey site in some capacity. Some species may be present within the surrounding area but only utilise the subject site in a vagrant or transient nature.

In light of these survey limitations, a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the subject area or immediately adjacent land has been assumed to have some potential to occur, as identified through desktop reviews, local experts/residents and/or the habitat knowledge of the authors.

The black cockatoo habitat assessment analysed trees with evident hollows. It should be recognised that identifying hollows suitable for fauna utilisation from ground level imposes several limitations. The complete characteristics of any hollow cannot be accurately recorded, as internal dimensions are impossible to observe. In addition, not all hollows within all trees would be observed as some would naturally be concealed from ground level.

Observational data was recorded utilising a handheld GPS unit. The accuracy of the GPS cannot be guaranteed beyond a level of 5 to 10 metres, though it should be noted that this accuracy can increase or decrease as a result of favourable environmental conditions and other circumstances that influence the range of the unit.

5. RESULTS

5.1 DESKTOP ASSESSMENT

Desktop search results are provided in Appendix 2 and Appendix 3. The results included a range of conservation significant marine, migratory, wetland, riverine and shoreline species for which no suitable habitat is available within the survey area or immediate surrounds. These species were excluded from further consideration. This left 12 species of conservation significant with known records in the local area including:

- Baudin's cockatoo (*Calyptorhynchus baudinii*) - T(EN)
- Carnaby's cockatoo (*Calyptorhynchus latirostris*) - T(EN)
- Coastal Plains Skink (*Ctenotus ora*) - P3
- Chuditch (*Dasyurus geoffroii*) - T(VU)
- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) - T(VU)
- Peregrine falcon (*Falco peregrinus*) - OS
- Perth lined skink (*Lerista lineata*) - P3
- Quenda (*Isoodon fusciventer*) - P4
- South-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) - CD
- Western brush wallaby (*Notamacropus irma*) - P4
- Western false pipistrelle (*Falsistrellus mackenziei*) - P4
- Western ringtail possum (*Pseudocheirus occidentalis*) - T(CR)

5.2 SITE SURVEYS

5.2.1 Fauna Habitats

The survey area is located in the central section of the southern Swan Coastal Plain. The Swan Coastal Plain (SWA) was classified as part of the Interim Biogeographic Regionalisation for Australia (IBRA) and is in broad terms described as a:

"*Low lying coastal plain mainly covered with Woodlands. It is dominated by Banksia or Tuart on sandy soils, Allocasuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah Woodland. Warm Mediterranean. Three phases of marine sand dune development provide relief. The outwash plains, once dominated by A. obesa – Marri Woodlands and Melaleuca shrublands, are extensive only in the south.*" (Thackway and Cresswell, 1996).

The survey area itself is within a further defined subregion of the SWA referred to as the Swan Coastal Plan subregion or the Perth subregion (SWA2). This is defined as:

"*Colluvial and aeolian sands, alluvial river flats, coastal limestone. Heath and/or Tuart woodlands on limestone, Banksia and Jarrah - Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. Includes a complex series of seasonal wetlands and also includes Rottnest, Carnac and Garden Islands etc. Rainfall ranges between 600 and 1000 mm annually and the climate is Mediterranean*". The subregion has an area of about 1, 333,900 ha (Mitchell *et al.* 2002).

The total area surveyed was approximately 19.31 hectares in size of which approximately 9.82 ha was vegetated to some degree. Two native vegetation units were identified within the survey area, and these reflect the fauna habitat types described in Table 1. The third fauna habitat type was cleared land. The majority of the vegetation was in Degraded condition, with 1.12 ha in Good and 0.05 ha in Very Good condition.

The overall fauna habitat quality of the survey area was low due to the remaining native vegetation being limited to small patches and isolated trees, with limited native ground cover. Many of the trees were relatively recent regrowth from previous selective logging and not old enough to form hollows. Limited debris or logs were available on ground as these have been regularly removed as part of maintaining the cleared areas and reducing fuel loads. Considering the nature of the habitat available, the fauna assemblage present in the survey area would be depauperate in comparison to the surrounding areas of better quality habitat, in particular in relation to ground dwelling reptile and mammal species.

Based on available vegetation mapping it is estimated that there is approximately 17,347 ha of native vegetation within 12 km the survey area (DPIRD 2020). Coherent remnant native vegetation present within the survey area (total ~9.82 ha) makes up 0.06% of this total.

Table 1: Main Fauna Habitats within Survey Area

Fauna Habitat Description	Example Image
FH1 Marri Woodland: *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland over sand (covering 7.61 ha)	
FH2 Jarrah-Marri-Banksia Woodland: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland over sand (covering 2.21 ha)	
FH3 Cleared: Cleared sandy soil covered in pasture grasses and other introduced flora species (covering 9.49 ha).	

Scale: 1: 3,500
Original Size: A4
Grid: GDA94 / MGA zone 50

0 50 100 m

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 3

Fauna Habitats

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MBS ENVIRONMENTAL

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5.2.2 Black Cockatoo Habitat Assessment

5.2.2.1 Black Cockatoo Breeding Habitat

Trees considered potentially suitable for black cockatoos to use as nesting habitat (subject to a suitable hollow being present and other factors) which were found within the survey area comprised the following species:

- Jarrah - *Eucalyptus marginata*;
- Marri – *Corymbia calophylla*; and
- Dead unidentified species.

A summary of the potential black cockatoo habitat trees using DAWE criteria i.e., DBH >50 cm (Commonwealth of Australia 2012) observed within the survey area is provided in Table 2 below and their location shown in Figure 4.

Table 2: Summary of Black Cockatoo Habitat Trees in the Survey Area

Total Number of Habitat Trees Recorded	Number of Trees with No Hollows Observed	Number of Trees with Hollows Considered Unsuitable	Number of Trees with Hollows Considered Possibly Suitable	Tree Species		
				Marri	Jarrah	Dead Unknown
92	91	0	1	74	16	2

The assessment identified 92 trees within the survey area with a DBH of >50 cm. The vast majority of these trees (91) appeared to not contain hollows of any size. One tree (Dead Unknown) appeared to contain two large potential spouts classified as Large (cockatoo), considered suitably sized and orientated for black cockatoos to use for nesting purposes, but no actual signs of use were noted, and the hollows were only observed from the ground. Additional details on each tree observed can be found in Appendix 4.

Based on available mapping, there is approximately 17,347 ha of remnant native vegetation within 12 km of the survey area (DPIRD 2021). Much of this is likely to contain "potential" breeding habitat as defined by DAWE (i.e., suitable tree species with a DBH >50cm).

5.2.2.2 Black Cockatoo Foraging Habitat

The following flora species, known to be or potentially used as a direct food source (e.g., seeds, flowers, nectar, bark or grubs) by one or more species of black cockatoo were recorded within the survey area:

- Marri – *Corymbia calophylla;*
- Jarrah – *Eucalyptus marginata;*
- Banksia spp.
- Grey Stinkwood - *Jacksonia furcellata*; and
- Peppermint – *Agonis flexuosa.*

It should be noted that some of the above-mentioned species (e.g., peppermint) while foraged upon on occasions would make up only a small proportion of any one bird's diet relative to more favoured plant species such as marri and banksia. Some species are also represented by only a small number of specimens and therefore do not contribute to the overall resource to a significant degree.

Evidence of black cockatoos foraging was observed during the field survey at two opportunistic locations, not attributed to individual trees. The evidence was in the form of chewed fruits from marri fruits. The foraging activity

was attributed to the forest red-tailed black cockatoo. Examples of the foraging debris observed are provided in Table 3.

Table 3: Black Cockatoo Foraging Evidence

Foraging Evidence Description	Example Image
Marri fruits - foraging activity attributed to the Forest Red-tailed Black Cockatoo	
Jarrah fruits - foraging activity attributed to the Forest Red-tailed Black Cockatoo	

Quality foraging habitat within the survey area can mainly be defined as the areas containing the densest areas of vegetation comprising Marri, and Jarrah with some Banksia. The vegetation is mostly degraded, and parkland cleared with native vegetation limited to small patches and isolated trees. While black cockatoo foraging species are present, the nature and density of the vegetation results in the foraging habitat being considered of low to moderate value for all three black cockatoo species.

Based on available mapping there is approximately 17.347 ha of remnant native vegetation within 12 km of the survey area (DPIRD 2021). Much of this is likely to represent black cockatoo foraging habitat of some type.

5.2.2.3 Black Cockatoo Roosting Habitat

No evidence of black cockatoo roosting within trees located within the survey area was observed during the field survey.

There are vast areas of similar habitat in vegetation bordering the subject site and it can be reasonably expected that these areas contain many roosting options for black cockatoos.

Scale: 1: 5,000
Original Size: A4
Aerial Image Date: Nov 2021
Grid: GDA94 / MGA zone 50
0 75 150 m

McDougall Quarries Pty Ltd
150 Runnymede Road
Binningup

Figure 4

Habitat Trees (DBH>50cm)

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W:\McDougall Quarries\Runnymede Rd\Studies\Fauna\GIS\150 Runnymede Rd Fauna_Harewood.qgz 28/04/2022 F4 Habitat Trees

5.2.3 Western Ringtail Possum Survey

The subject site does contain what superficially looks like suitable habitat for the species (i.e. peppermint trees), however no evidence of western ringtail possums utilising the subject site was found during the day or night surveys i.e., no dreys, no scats and no individuals. This would suggest that they were either absent from the area surveyed or present in very low densities.

WRPs have been listed as a potential species for the site as a precautionary measure, but they may in fact not use the site, except on rare occasions. Previous surveys carried out by in this general area (i.e., south on Runnymede Road and Wellesley Road) have also failed to find individuals of the species, though it is very likely to occur at some locations, in particular along the Wellesley/Brunswick Rivers further to the south and eastwards of the survey area. The surrounding area vegetation contains suitable habitat that would be considered more likely to support this species in comparison to the survey area.

5.2.4 Fauna Observations

A total of 14 fauna species (mainly common bird species) were observed, or secondary evidence of their presence recorded during the field survey. A full listing of the species observed is provided in Appendix 5.

Evidence of the Forest Red-tailed Black Cockatoo (vulnerable) constituted the singular conservation significant fauna species recorded within the survey area. No evidence of any other fauna species of conservation significance was observed. However, this does not eliminate the potential for some species to still occur, if only infrequently.

As noted in Section 5.2.1, considering the nature of the habitat available, the fauna assemblage present in the survey area would be depauperate in comparison to the surrounding areas of better quality habitat, in particular in relation to ground dwelling reptile and mammal species.

5.3 Significant Fauna Likelihood of Occurrence

Based on information gathered during the basic site survey and the documented distribution and habitat preferences of the species of conservation significance identified as potentially occurring in the general area, their likelihood of occurrence in the survey area was assessed as summarised in Appendix 6.

One significant fauna species was positively identified during the survey as occurring within the survey area:

- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) - T(VU). Foraging evidence attributed to this species was detected. The survey area contains areas of potential black cockatoo breeding habitat (trees with DBH ≥ 50 cm), but the number of possibly suitable hollows is low (two recorded in one tree). The majority of the native vegetation within the survey area represents low to moderate quality foraging habitat for the species. No evidence of roosting was observed.

Two significant fauna species were assessed as likely to occur in the survey area:

- Baudin's Cockatoo (*Calyptorhynchus baudinii*) - T(EN). No evidence of this species was recorded. The survey area contains areas of potential black cockatoo breeding habitat (trees with DBH ≥ 50 cm), but the number of possibly suitable hollows is low (two recorded in one tree). The majority of the native vegetation within the survey area represents low to moderate quality foraging habitat for the species. No evidence of roosting was observed.
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) - T(EN). No evidence of this species was recorded. The survey area contains areas of potential black cockatoo breeding habitat (trees with DBH ≥ 50 cm), but the number of possibly suitable hollows is low (two recorded in one tree). The majority of the native vegetation within the survey area represents low to moderate quality foraging habitat for the species. No evidence of roosting was observed.

Several additional species of conservation significance may utilise the survey area for some purpose at times, but their status on site and/or in the general area is difficult to determine because they were not sighted during the field survey and no evidence of their use of the area observed either:

- Coastal Plains Skink (*Ctenotus ora*) - P3. Status of this species in the survey is difficult to determine without a detailed survey, however given the location within its documented range, some recent nearby records and the presence of habitat that appears suitable, the species is considered to have potential to occur.
- Perth Lined Lerista (*Lerista lineata*) - P3. Status of this species in the survey is difficult to determine without a detailed survey, however given the location within its documented range, some recent nearby records and the presence of habitat that appears suitable, the species is considered to have potential to occur.
- Peregrine Falcon (*Falco peregrinus*) - OS. The species potentially utilises some sections of the survey area as part of a much larger home range though it is only likely to occur infrequently. Also has potential to breed in the area though no evidence of nesting was observed.
- South-western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) - CD. Status of this species in the survey is difficult to determine without a detailed survey, however given the location within its documented range, some recent nearby records and the presence of habitat that appears suitable, the species is considered to have potential to occur.
- Western Ringtail Possum (*Pseudocheirus occidentalis*) - T(CR). The species or evidence of it was not recorded in the survey area despite targeted day time and night time searches. The species is known to occur in the general area, however, appears to be more commonly encountered west of the Forrest Highway. Listed as a potential species to occur based on available information.
- Western Brush Wallaby (*Notamacropus irma*) - P4. Known to occur in the Kemerton area and given the presence of suitable habitat, it is considered to have the potential to occur, though probably only occasionally and in low numbers.
- Western False Pipistrelle (*Falsistrellus mackenziei*) - P4. Status of this species in the survey is difficult to determine without a targeted survey, however given the location within its documented range, some recent nearby records and the presence of habitat that appears suitable, the species is considered to have potential to occur.

A number of other species of conservation significance, while possibly present in the general area were not considered to have potential to occur within the survey area due to known localised extinction, lack of suitable habitat and/or the presence of feral predators.

6. CONCLUSION

The fauna assessment within the subject site was undertaken for the purposes of delineating and characterising the fauna habitats and faunal assemblages present. Targeted black cockatoo and western ringtail possum assessments were also carried out.

The overall fauna habitat quality of the survey area was low due to the remaining native vegetation being limited to small patches and isolated trees, with limited native ground cover. Considering the nature of the habitat available, the fauna assemblage present in the survey area would be depauperate in comparison to the surrounding areas of better quality habitat, in particular in relation to ground dwelling reptile and mammal species.

The subject site was found to contain 92 potential "black cockatoo breeding habitat trees" (DBH >50 cm). One tree appeared to contain two spouts with larger entrances (greater than ~10 cm) that appeared big enough to possibly allow the entry of a black cockatoo into a suitably sized and orientated branch/trunk, though it showed no sign of current or previous use by cockatoos for this purpose. Sections of the subject site represent black cockatoo foraging habitat mainly given the presence of jarrah and marri, though the exact extent is difficult to quantify given the tree species in question vary in density from area to area. No existing roosting trees (trees used at night by black cockatoos to rest) were positively identified during the survey.

The subject site does contain restricted areas of what superficially looks like suitable habitat for the WRP, however no evidence of the species utilising the subject site was found during the day or night surveys (i.e., no dreys, scats or individuals). This would suggest that they were either absent from the area surveyed or present in very low densities. WRPs have therefore been listed as a potential species as a precautionary measure, but they may in fact not use the site except on rare occasions.

One conservation significant fauna species was positively identified (Forest red-tailed black cockatoo) and two are considered likely to occur (Carnaby's cockatoo and Baudin's cockatoo). A further seven significant fauna species are considered to have some potential to occur (Coastal Plains Skink, Perth Lined Lerista, Peregrine Falcon, South-Western Brush-tailed Phascogale, Western Ringtail Possum, Western Brush Wallaby and Western False Pipistrelle).

The potential impacts on fauna species of conservation significance and/or their habitat will need to be taken into consideration during ongoing planning and construction phases of the proposed project. If approval for the project is obtained it is recommended that a fauna relocation program be implemented prior to and during clearing works to ensure direct impact on fauna are minimised.

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APPENDICES

APPENDIX 1: CONSERVATION CODES

EPBC Act (1999) Threatened Fauna Categories

Threatened fauna may be listed under Section 178 of the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)* in any one of the following categories in Appendix 1 Table 1.

Appendix 1 Table 1: *EPBC Act (1999) Threatened Fauna Categories*

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) 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	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: a) Is not critically endangered; and; b) Is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species a) Is not critically endangered or endangered; and b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation Dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	a) all migratory species that are: i) native species; and ii) From time to time included in the appendices to the Bonn Convention; and b) All migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and c) All native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ma	Species in the list established under s248 of the EPBC Act

Note: Only species in those categories marked with an asterix (*) are matters of national environmental significance (NES) under the EPBC Act.

Wildlife Conservation (Specially Protected Fauna) Notice 2018 Categories

Published as Specially Protected under the Wildlife Conservation Act 1950, and listed under Schedules 1 to 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed in Appendix 1 Table 2..

Appendix 1 Table 2: Wildlife Conservation (Specially Protected Fauna) Notice 2018 Categories

Category	Code	Description
Schedule 1 (S1) Critically Endangered Species	CR	Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
Schedule 2 (S2) Endangered Species	EN	Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
Schedule (S3) Vulnerable Species	VU	Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Schedule 4 (S4) Presumed Extinct Species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last member of the species has died.
Schedule 5 (S5) Migratory Birds Protected under an International Agreement	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
Schedule 6 (S6) Fauna that is of special conservation need as conservation dependant fauna	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Schedule 7 (S7) Other specially protected fauna	OS	Fauna otherwise in need of special protection to ensure their conservation.

Western Australian DBCA Priority Fauna Categories

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna 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. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution n WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations (Appendix 1 Table 3)

Appendix 1 Table 3: Western Australian DBCA Priority Fauna Categories

Category	Code	Description
Priority 1 (P1) Poorly Known Species.	P1	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 (P2) Poorly Known Species.	P2	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 (P3) Poorly Known Species.	P3	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 (P4)Poorly Known Species.	P4	a) Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. b) Near Threatened: Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. c) (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

**Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g., a family, genus, species or any infraspecific category i.e., subspecies or variety, or a distinct population).*

IUCN Red List Threatened Species Categories

The *IUCN Red List of Threatened Species*™ is a checklist of taxa that have undergone an extinction risk assessment using the IUCN Red List Categories and Criteria. Categories are summarized in Appendix 1 Table 4..

Appendix 1 Table 4: IUCN Red List Threatened Species Categories

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa which is known only to survive in cultivation, in captivity or and as a naturalised population well outside its past range and it has not been recorded in known or expected habitat despite exhaustive survey over a time frame appropriate to its life cycle and form.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the wild.
Near Threatened	NT	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.
Not Evaluated	NE	Taxa which has not been evaluated.

A full list of categories and their meaning are available at http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categoriescriteria

APPENDIX 2: NATUREMAP SEARCH RESULTS

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 02/12/2021

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 45' 26" E,33° 07' 39" S
Buffer 10km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	673	5040
Other specially protected fauna	3	10
Priority 1	3	19
Priority 3	12	38
Priority 4	12	262
Protected under international agreement	13	74
Rare or likely to become extinct	23	326
TOTAL	**739**	**5769**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24209	*Arctocephalus tropicalis (Subantarctic fur-seal)*		T	
2.	38480	*Austrostipa bronwenae*		T	
3.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
4.	18038	*Caladenia procera*		T	
5.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
6.	24790	*Calidris tenuirostris (Great Knot)*		T	
7.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
8.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
9.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
10.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
11.	34031	*Carcharodon carcharias (Great White Shark)*		T	
12.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
13.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
14.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
15.	10796	*Diuris drummondii (Tall Donkey Orchid)*		T	
16.	12938	*Diuris micrantha*		T	
17.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
18.	13635	*Drakaea micrantha*		T	
19.	24043	*Eubalaena australis (Southern Right Whale)*		T	
20.	34027	*Galaxiella nigrostriata (Black-stripe Minnow, black-striped dwarf galaxias)*		T	
21.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
22.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
23.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Protected under international agreement					
24.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
25.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
26.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
27.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
28.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
29.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
30.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
31.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
32.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
33.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
34.	48597	*Thalasseus bergii (Crested Tern)*		IA	
35.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
36.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Other specially protected fauna					
37.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
38.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
39.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
Priority 1					
40.	48762	*Acacia sp. Binningup (G. Cockerton et al. WB 37784)*		P1	
41.	16633	*Boronia juncea subsp. juncea*		P1	
42.	31673	*Puccinellia vassica*		P1	
Priority 3					
43.	11612	*Boronia capitata subsp. gracilis*		P3	
44.	41641	*Ctenotus ora (Coastal Plains Skink)*		P3	
45.	16245	*Cyathochaeta teretifolia*		P3	
46.	3863	*Dillwynia dillwynioides*		P3	
47.	6859	*Hemigenia microphylla*		P3	
48.	5038	*Lasiopetalum membranaceum*		P3	
49.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
50.	33638	*Meionectes tenuifolia*		P3	
51.	6193	*Myriophyllum echinatum*		P3	
52.	17731	*Schoenus sp. Waroona (G.J. Keighery 12235)*		P3	
53.	48297	*Styphelia filifolia*		P3	
54.	12392	*Verticordia attenuata*		P3	
Priority 4					
55.	3339	*Acacia flagelliformis*		P4	
56.	3537	*Acacia semitrullata*		P4	
57.	13862	*Caladenia speciosa*		P4	
58.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
59.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
60.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
61.	47975	*Ixobrychus dubius (Australian Little Bittern)*		P4	
62.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
63.	4183	*Pultenaea skinneri (Skinner's Pea)*		P4	
64.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
65.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
66.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
Non-conservation taxon					
67.	15466	*Acacia applanata*			
68.	3294	*Acacia dentifera*			
69.	3331	*Acacia extensa (Wiry Wattle)*			
70.	3374	*Acacia huegelii*			
71.	3409	*Acacia lasiocarpa (Panjang)*			
72.	11611	*Acacia lasiocarpa var. lasiocarpa*			
73.	3482	*Acacia paradoxa (Kangaroo Thorn)*	Y		
74.	3502	*Acacia pulchella (Prickly Moses)*			
75.	15481	*Acacia pulchella var. glaberrima*			
76.	3504	*Acacia pycnantha (Golden Wattle)*	Y		
77.	30036	*Acacia saligna subsp. stolonifera*			
78.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
79.	3584	*Acacia truncata*			
80.	3602	*Acacia willdenowiana (Grass Wattle)*			
81.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
82.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
83.	24262	*Acanthiza inornata (Western Thornbill)*			
84.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
85.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
86.	25536	*Accipiter fasciatus (Brown Goshawk)*			
87.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
88.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
89.	1790	*Adenanthos meisneri*			
90.	1791	*Adenanthos obovatus (Basket Flower)*			
91.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
92.	5316	*Agonis flexuosa (Peppermint, Wonil)*			
93.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
94.	187	*Aira praecox (Early Hairgrass)*	Y		
95.	154	*Alisma lanceolatum (Water Plantain)*	Y		
96.	2652	*Alternanthera nodiflora (Common Joyweed)*			
97.	6565	*Alyxia buxifolia (Dysentery Bush)*			
98.	2655	*Amaranthus albus (Tumbleweed)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
99.	7820	*Ambrosia artemisiifolia (Annual Ragweed, Bitterweed, Hay-feverweed, Hog-weed)*	Y		
100.	200	*Amphipogon turbinatus*			
101.		*Aname mainae*			
102.		*Aname tepperi*			
103.	24310	*Anas castanea (Chestnut Teal)*			
104.	24312	*Anas gracilis (Grey Teal)*			
105.	24315	*Anas rhynchotis (Australasian Shoveler)*			
106.	24316	*Anas superciliosa (Pacific Black Duck)*			
107.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
108.	1409	*Anigozanthos humilis (Catspaw)*			
109.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
110.	6949	*Anthocercis littorea (Yellow Tailflower)*			
111.	24561	*Anthochaera carunculata (Red Wattlebird)*			
112.	12724	*Anthotium junciforme*			
113.	25670	*Anthus australis (Australian Pipit)*			
114.	3686	*Aotus cordifolia*			
115.	3688	*Aotus gracillima*			
116.	1117	*Aphelia cyperoides*			
117.	6211	*Apium prostratum (Sea Celery)*			
118.	24285	*Aquila audax (Wedge-tailed Eagle)*			
119.	25558	*Ardea ibis (Cattle Egret)*			
120.	41324	*Ardea modesta (great egret, white egret)*			
121.	24340	*Ardea novaehollandiae (White-faced Heron)*			
122.	24341	*Ardea pacifica (White-necked Heron)*			
123.		*Argiope protensa*			
124.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
125.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
126.	20283	*Astartea scoparia (Common Astartea)*			
127.	42801	*Astartea zephyra*			
128.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
129.	6323	*Astroloma ciliatum (Candle Cranberry)*			
130.	6334	*Astroloma pallidum (Kick Bush)*			
131.	2452	*Atriplex cinerea (Grey Saltbush)*			
132.	17233	*Austrostipa campylachne*			
133.	17240	*Austrostipa flavescens*			
134.	234	*Avena fatua (Wild Oat)*	Y		
135.	24318	*Aythya australis (Hardhead)*			
136.		*Baetidae sp.*			
137.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
138.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
139.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
140.		*Barnardius zonarius*			
141.	743	*Baumea juncea (Bare Twigrush)*			
142.	7046	*Bellardia trixago (Bellardia)*	Y		
143.	3165	*Billardiera variifolia*			
144.	24319	*Biziura lobata (Musk Duck)*			
145.	749	*Bolboschoenus caldwellii (Marsh Club-rush)*			
146.	4413	*Boronia crenulata (Aniseed Boronia)*			
147.	4417	*Boronia dichotoma*			
148.	4438	*Boronia ramosa*			
149.	4441	*Boronia spathulata (Boronia)*			
150.	48782	*Bossiaea angustifolia*			
151.	14397	*Bossiaea aquifolium subsp. laidlawiana*			
152.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
153.	6341	*Brachyloma preissii (Globe Heath)*			
154.	32327	*Breutelia affinis*			
155.	244	*Briza maxima (Blowfly Grass)*	Y		
156.	245	*Briza minor (Shivery Grass)*	Y		
157.	247	*Bromus arenarius (Sand Brome)*			
158.	12770	*Burchardia congesta*			
159.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
160.	24721	*Cacatua galerita subsp. galerita (Sulphur-crested Cockatoo)*	Y		
161.	25715	*Cacatua roseicapilla (Galah)*			
162.	25716	*Cacatua sanguinea (Little Corella)*			
163.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
164.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
165.		*Caenidae sp.*			
166.	1276	*Caesia micrantha (Pale Grass Lily)*			
167.	3002	*Cakile maritima (Sea Rocket)*	Y		
168.	1586	*Caladenia discoidea (Dancing Orchid)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
169.	1592	*Caladenia flava (Cowslip Orchid)*			
170.	15348	*Caladenia flava subsp. flava*			
171.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
172.	17760	*Caladenia nobilis*			
173.	15503	*Caladenia paludosa*			
174.		*Calamoecia clitellata*			
175.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			
176.	5415	*Calothamnus lateralis*			
177.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
178.	5439	*Calytrix angulata (Yellow Starflower)*			
179.	5458	*Calytrix flavescens (Summer Starflower)*			
180.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
181.	43241	*Carex thecata*			
182.	1162	*Cartonema philydroides*			
183.	2957	*Cassytha racemosa (Dodder Laurel)*			
184.	11799	*Cassytha racemosa forma racemosa*			
185.	41564	*Cenchrus clandestinus (Kikuyu Grass)*	Y		
186.	1120	*Centrolepis alepyroides*			
187.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
188.	1125	*Centrolepis drummondiana*			
189.	1132	*Centrolepis mutica*			
190.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
191.	13489	*Cerastium pumilum*	Y		
192.		*Ceratopogonidae sp.*			
193.	24086	*Cercartetus concinnus (Western Pygmy-possum, Mundarda)*			
194.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
195.	18156	*Chamaecytisus palmensis (Tagasaste)*	Y		
196.	1280	*Chamaescilla corymbosa (Blue Squill)*			
197.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
198.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
199.		*Chironominae sp.*			
200.	763	*Chorizandra enodis (Black Bristlerush)*			
201.	24980	*Christinus marmoratus (Marbled Gecko)*			
202.		*Chroicocephalus novaehollandiae*			
203.	25601	*Chrysococcyx lucidus (Shining Bronze Cuckoo)*			
204.	24288	*Circus approximans (Swamp Harrier)*			
205.	7937	*Cirsium vulgare (Spear Thistle, Scotch Thistle)*	Y		
206.	27691	*Cladonia ramulosa*			
207.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
208.	10804	*Clematis linearifolia*			
209.		*Coenagrionidae sp.*			
210.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
211.	4552	*Comesperma confertum*			
212.	4559	*Comesperma polygaloides (Small Milkwort)*			
213.	4564	*Comesperma virgatum (Milkwort)*			
214.	6348	*Conostephium pendulum (Pearl Flower)*			
215.	6349	*Conostephium preissii*			
216.	1418	*Conostylis aculeata (Prickly Conostylis)*			
217.	12109	*Conostylis aculeata subsp. preissii*			
218.	1436	*Conostylis juncea*			
219.	1438	*Conostylis laxiflora*			
220.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
221.		*Corixidae sp.*			
222.	25592	*Corvus coronoides (Australian Raven)*			
223.	12945	*Corybas recurvus*			
224.	1285	*Corynotheca micrantha (Sand Lily)*			
225.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
226.	24671	*Coturnix pectoralis (Stubble Quail)*			
227.	25701	*Coturnix ypsilophora (Brown Quail)*			
228.	25595	*Cracticus tibicen (Australian Magpie)*			
229.	25596	*Cracticus torquatus (Grey Butcherbird)*			
230.	13354	*Craspedia variabilis*			
231.	11221	*Crassula alata var. alata*	Y		
232.	3137	*Crassula colorata (Dense Stonecrop)*			
233.	11563	*Crassula colorata var. colorata*			
234.	25398	*Crinia georgiana (Quacking Frog)*			
235.	25399	*Crinia glauerti (Clicking Frog)*			
236.	25400	*Crinia insignifera (Squelching Froglet)*			
237.	17964	*Crinum moorei*	Y		
238.	13484	*Cryptandra arbutiflora var. tubulosa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
239.	4802	*Cryptandra mutila*			
240.	30893	*Cryptoblepharus buchananii*			
241.	25047	*Ctenotus impar*			
242.	25049	*Ctenotus labillardieri*			
243.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
244.	768	*Cyathochaeta avenacea*			
245.	24322	*Cygnus atratus (Black Swan)*			
246.	283	*Cynodon dactylon (Couch)*	Y		
247.	792	*Cyperus eragrostis (Umbrella Sedge)*	Y		
248.	815	*Cyperus tenellus (Tiny Flatsedge)*	Y		
249.	10916	*Cyrtostylis huegelii*			
250.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
251.	7454	*Dampiera linearis (Common Dampiera)*			
252.	7484	*Dampiera trigona (Angled-stem Dampiera)*			
253.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
254.	5508	*Darwinia citriodora (Lemon-scented Darwinia)*			
255.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
256.	6218	*Daucus glochidiatus (Australian Carrot)*			
257.	3807	*Daviesia divaricata (Marno)*			
258.	3832	*Daviesia physodes*			
259.	3834	*Daviesia polyphylla*			
260.	1259	*Dianella revoluta (Blueberry Lily)*			
261.	11313	*Dianella revoluta var. revoluta*			
262.	306	*Dichelachne crinita (Longhair Plumegrass)*			
263.	1287	*Dichopogon capillipes*			
264.	4454	*Diplolaena dampieri (Southern Diplolaena)*			
265.	18541	*Diplopeltis huegelii subsp. huegelii*			
266.	19649	*Disa bracteata*	Y		
267.	11049	*Diuris corymbosa*			
268.	48254	*Diuris cruenta*			
269.	1635	*Diuris longifolia (Common Donkey Orchid)*			
270.	48253	*Diuris porphyrochila*			
271.	46858	*Diuris tinctoria*			
272.	1640	*Drakaea glyptodon (King-in-his-carriage)*			
273.	24470	*Dromaius novaehollandiae (Emu)*			
274.	48751	*Drosera drummondii*			
275.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
276.	3097	*Drosera gigantea (Giant Sundew)*			
277.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
278.	3106	*Drosera macrantha (Bridal Rainbow)*			
279.	3109	*Drosera menziesii (Pink Rainbow)*			
280.	3112	*Drosera myriantha (Star Rainbow)*			
281.	3118	*Drosera pallida (Pale Rainbow)*			
282.	29178	*Drosera porrecta*			
283.	8911	*Drosera rosulata*			
284.	3131	*Drosera stolonifera (Leafy Sundew)*			
285.	33500	*Dysphania ambrosioides (Mexican Tea)*	Y		
286.		*Dytiscidae sp.*			
287.	11105	*Echinochloa crus-galli*	Y		
288.	332	*Echinochloa frumentacea (Siberian Millet)*	Y		
289.	338	*Echinochloa telmatophila (Swamp Barnyard Grass)*	Y		
290.		*Ecnomidae sp.*			
291.		*Edelia vittata*			
292.	25100	*Egernia napoleonis*			
293.		*Egretta garzetta*			
294.		*Egretta novaehollandiae*			
295.	346	*Ehrharta brevifolia (Annual Veldt Grass)*	Y		
296.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
297.		*Elanus axillaris*			
298.	822	*Eleocharis acuta (Common Spikerush)*			
299.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
300.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
301.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
302.		*Eolophus roseicapillus*			
303.		*Ephydridae sp.*			
304.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
305.	24567	*Epthianura albifrons (White-fronted Chat)*			
306.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
307.	15410	*Eriochilus dilatatus subsp. dilatatus*			
308.	4332	*Erodium botrys (Long Storksbill)*	Y		

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309.		*Erpobdellidae sp.*			
310.	6219	*Eryngium pinnatifidum (Blue Devils)*			
311.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
312.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
313.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
314.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
315.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
316.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
317.	3872	*Euchilopsis linearis (Swamp Pea)*			
318.	25746	*Eudyptula minor (Little Penguin)*			
319.	24818	*Eudyptula minor subsp. novaehollandiae (Little Penguin)*			
320.	3880	*Eutaxia virgata*			
321.	835	*Evandra pauciflora*			
322.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
323.	25621	*Falco berigora (Brown Falcon)*			
324.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
325.	25623	*Falco longipennis (Australian Hobby)*			
326.	24041	*Felis catus (Cat)*	Y		
327.	11445	*Ferraria crispa subsp. crispa*	Y		
328.	894	*Fimbristylis velata*			
329.	32365	*Fissidens leptocladus*			
330.	32367	*Fissidens megalotis*			
331.	32469	*Fissidens taylorii var. taylorii*			
332.	27748	*Flavoparmelia rutidota*			
333.	25727	*Fulica atra (Eurasian Coot)*			
334.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
335.	32370	*Funaria hygrometrica*			
336.	907	*Gahnia trifida (Coast Saw-sedge)*			
337.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
338.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
339.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
340.		*Gambusia affinis*			
341.	20505	*Gastrolobium celsianum*			
342.	32379	*Gemmabryum inaequale*			
343.	32380	*Gemmabryum pachythecum*			
344.	3936	*Genista linifolia (Flaxleaf Broom)*	Y		
345.	25404	*Geocrinia leai (Ticking Frog)*			
346.	4339	*Geranium molle (Dove's Foot Cranesbill)*	Y		
347.	4340	*Geranium retrorsum*			
348.	4341	*Geranium solanderi (Native Geranium)*			
349.	25530	*Gerygone fusca (Western Gerygone)*			
350.	1518	*Gladiolus angustus (Long Tubed Painted Lady)*	Y		
351.	17043	*Glyceria declinata*	Y		
352.	3948	*Gompholobium capitatum*			
353.	10909	*Gompholobium confertum*			
354.	3954	*Gompholobium polymorphum*			
355.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
356.	6160	*Gonocarpus paniculatus*			
357.	8614	*Goodenia claytoniacea*			
358.	24443	*Grallina cyanoleuca (Magpie-lark)*			
359.	37500	*Grammatotheca bergiana var. bergiana*	Y		
360.		*Gyrinidae sp.*			
361.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
362.	2179	*Hakea marginata*			
363.	2197	*Hakea prostrata (Harsh Hakea)*			
364.	2212	*Hakea sulcata (Furrowed Hakea)*			
365.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
366.	2216	*Hakea varia (Variable-leaved Hakea)*			
367.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
368.	24295	*Haliastur sphenurus (Whistling Kite)*			
369.	24296	*Hamirostra isura (Square-tailed Kite)*			
370.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
371.	25410	*Heleioporus eyrei (Moaning Frog)*			
372.	3016	*Heliophila pusilla*	Y		
373.	6710	*Heliotropium europaeum (Common Heliotrope)*	Y		
374.	16933	*Hemiandra glabra*			
375.	6839	*Hemiandra pungens (Snakebush)*			
376.		*Hemicorduliidae sp.*			
377.	25119	*Hemiergis quadrilineata*			
378.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			

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379.	45534	*Hibbertia hypericoides subsp. hypericoides*			
380.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
381.		*Hibbertia sp.*			
382.	5172	*Hibbertia stellaris (Orange Stars)*			
383.	5173	*Hibbertia subvaginata*			
384.	5176	*Hibbertia vaginata*			
385.	47965	*Hieraaetus morphnoides (Little Eagle)*			
386.	25734	*Himantopus himantopus (Black-winged Stilt)*			
387.	24491	*Hirundo neoxena (Welcome Swallow)*			
388.	445	*Holcus setiger (Annual Fog)*	Y		
389.	6222	*Homalosciadium homalocarpum*			
390.	3968	*Hovea trisperma (Common Hovea)*			
391.	12859	*Hovea trisperma var. trisperma*			
392.	12741	*Hyalosperma cotula*			
393.	5216	*Hybanthus calycinus (Wild Violet)*			
394.	6226	*Hydrocotyle callicarpa (Small Pennywort)*			
395.	6229	*Hydrocotyle diantha*			
396.		*Hydrophilidae sp.*			
397.		*Hydropsychidae sp.*			
398.	5817	*Hypocalymma angustifolium (White Myrtle, Kudjid)*			
399.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
400.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
401.	9352	*Hypochaeris radicata (Flat Weed, Cats-ear)*	Y		
402.	1070	*Hypolaena exsulca*			
403.	16836	*Hypolaena viridis*			
404.	917	*Isolepis marginata (Coarse Club-rush)*			
405.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
406.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
407.	8092	*Ixiolaena viscosa (Sticky Ixiolaena)*			
408.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
409.	4017	*Jacksonia horrida*			
410.	1295	*Johnsonia acaulis*			
411.	1178	*Juncus bufonius (Toad Rush)*	Y		
412.	1180	*Juncus capitatus (Capitate Rush)*	Y		
413.	1184	*Juncus holoschoenus (Jointleaf Rush)*			
414.	1185	*Juncus kraussii (Sea Rush)*			
415.	1191	*Juncus polyanthemus*	Y		
416.	1195	*Juncus subsecundus (Finger Rush)*			
417.	4037	*Kennedia coccinea (Coral Vine)*			
418.	4044	*Kennedia prostrata (Scarlet Runner)*			
419.	5832	*Kunzea ericifolia (Spearwood, Pondil)*			
420.	15498	*Kunzea glabrescens (Spearwood)*			
421.	5835	*Kunzea micrantha*			
422.	20019	*Lachnagrostis filiformis*			
423.	29046	*Lactuca serriola forma serriola*	Y		
424.		*Laetesia mollita*			
425.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
426.	4052	*Latrobea tenella*			
427.	1309	*Laxmannia squarrosa*			
428.	1051	*Lemna disperma (Duckweed)*			
429.	925	*Lepidosperma angustatum*			
430.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
431.	945	*Lepidosperma squamatum*			
432.	1653	*Leporella fimbriata (Hare Orchid)*			
433.	1077	*Leptocarpus canus (Hoary Twine-rush)*			
434.	1078	*Leptocarpus coangustatus*			
435.	46375	*Leptocarpus decipiens*			
436.	46382	*Leptocarpus roycei*			
437.	1080	*Leptocarpus scariosus*			
438.		*Leptoceridae sp.*			
439.	2342	*Leptomeria cunninghamii*			
440.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
441.		*Leptophlebiidae sp.*			
442.	1085	*Lepyrodia glauca*			
443.	25133	*Lerista elegans*			
444.	16449	*Leucophyta brownii*			
445.	6360	*Leucopogon australis (Spiked Beard-heath)*			
446.	6374	*Leucopogon conostephioides*			
447.	6375	*Leucopogon cordatus*			
448.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			

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449.	6436	*Leucopogon propinquus*			
450.	6444	*Leucopogon sprengelioides*			
451.	6445	*Leucopogon squarrosus*			
452.	6454	*Leucopogon verticillatus (Tassel Flower)*			
453.	7677	*Levenhookia stipitata (Common Stylewort)*			
454.	25005	*Lialis burtonis*			
455.		*Libellulidae sp.*			
456.	25661	*Lichmera indistincta (Brown Honeyeater)*			
457.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
458.	7073	*Limosella australis (Common Mudwort)*			
459.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
460.	25388	*Litoria moorei (Motorbike Frog)*			
461.	7408	*Lobelia tenuior (Slender Lobelia)*			
462.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
463.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
464.	1228	*Lomandra hermaphrodita*			
465.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
466.	1234	*Lomandra nigricans*			
467.	1236	*Lomandra odora (Tiered Matrush)*			
468.	1243	*Lomandra sericea (Silky Mat Rush)*			
469.	1246	*Lomandra suaveolens*			
470.	1092	*Loxocarya cinerea*			
471.	1198	*Luzula meridionalis (Field Woodrush)*			
472.	1097	*Lyginia barbata*			
473.	18049	*Lyginia imberbis*			
474.	34736	*Lysinema pentapetalum*			
475.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
476.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
477.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
478.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
479.	25654	*Malurus splendens (Splendid Fairy-wren)*			
480.		*Maratus pavonis*			
481.		*Marsilea sp.*			
482.	25758	*Megalurus gramineus (Little Grassbird)*			
483.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
484.	20297	*Melaleuca osullivanii*			
485.	5946	*Melaleuca pauciflora*			
486.	5952	*Melaleuca preissiana (Moonah)*			
487.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
488.	18598	*Melaleuca systena*			
489.	5978	*Melaleuca teretifolia (Banbar)*			
490.	5980	*Melaleuca thymoides*			
491.	5987	*Melaleuca viminea (Mohan)*			
492.	19827	*Melilotus siculus*	Y		
493.	25184	*Menetia greyii*			
494.	6883	*Mentha pulegium (Pennyroyal)*	Y		
495.	24598	*Merops ornatus (Rainbow Bee-eater)*			
496.	953	*Mesomelaena graciliceps*			
497.		*Mesoveliidae sp.*			
498.		*Microcarbo melanoleucos*			
499.	485	*Microlaena stipoides (Weeping Grass)*			
500.	1658	*Microtis atrata (Swamp Mignonette Orchid)*			
501.	15419	*Microtis media subsp. media*			
502.	8106	*Millotia tenuifolia (Soft Millotia)*			
503.	24213	*Mirounga leonina (Southern Elephant Seal)*			
504.		*Missulena granulosa*			
505.	4666	*Monotaxis occidentalis*			
506.	19179	*Moraea flaccida (One-leaf Cape Tulip)*	Y		
507.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
508.	25191	*Morethia lineoocellata*			
509.	24223	*Mus musculus (House Mouse)*	Y		
510.	25610	*Myiagra inquieta (Restless Flycatcher)*			
511.	7289	*Myoporum caprarioides (Slender Myoporum)*			
512.	6201	*Myriophyllum verrucosum (Red Water Milfoil)*			
513.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
514.	24738	*Neophema elegans (Elegant Parrot)*			
515.	25252	*Notechis scutatus (Tiger Snake)*			
516.		*Notonectidae sp.*			
517.		*Nunciella aspera*			
518.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			

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519.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
520.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
521.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
522.	11937	*Olea europaea subsp. europaea*	Y		
523.	8133	*Olearia elaeophila*			
524.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
525.		*Oligochaeta sp.*			
526.		*Oniscidae sp.*			
527.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
528.	46316	*Orianthera serpyllifolia subsp. angustifolia*			
529.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
530.		*Orthocladiinae sp.*			
531.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
532.	30375	*Oxalis exilis*			
533.	4355	*Oxalis perennans*			
534.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
535.	24693	*Pachyptila desolata (Antarctic Prion)*			
536.		*Palaemonidae sp.*			
537.	23500	*Paracaleana hortiorum*			
538.	25253	*Parasuta gouldii*			
539.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
540.	25682	*Pardalotus striatus (Striated Pardalote)*			
541.	1762	*Parietaria debilis (Pellitory)*			
542.	528	*Paspalum distichum (Water Couch)*	Y		
543.	533	*Paspalum vaginatum (Salt Water Couch)*			
544.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
545.	30472	*Patersonia occidentalis var. occidentalis*			
546.	43760	*Pauridia occidentalis*			
547.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
548.	4346	*Pelargonium littorale*			
549.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
550.		*Pentasteron intermedium*			
551.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
552.	16477	*Pericalymma ellipticum var. ellipticum*			
553.	13911	*Persicaria decipiens*			
554.	11020	*Persicaria hydropiper*			
555.	2273	*Persoonia saccata (Snottygobble)*			
556.		*Perthiidae sp.*			
557.	48061	*Petrochelidon nigricans (Tree Martin)*			
558.	48066	*Petroica boodang (Scarlet Robin)*			
559.	2299	*Petrophile linearis (Pixie Mops)*			
560.	19825	*Petrorhagia dubia*	Y		
561.	25697	*Phalacrocorax carbo (Great Cormorant)*			
562.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
563.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
564.	25699	*Phalacrocorax varius (Pied Cormorant)*			
565.	24409	*Phaps chalcoptera (Common Bronzewing)*			
566.	32411	*Philonotis tenuis*			
567.	18529	*Philotheca spicata (Pepper and Salt)*			
568.	1173	*Philydrella pygmaea (Butterfly Flowers)*			
569.	1478	*Phlebocarya ciliata*			
570.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
571.	4675	*Phyllanthus calycinus (False Boronia)*			
572.	4	*Phylloglossum drummondii (Pigmy Clubmoss)*			
573.		*Physidae sp.*			
574.		*Phytophthora cinnamomi*			
575.	5252	*Pimelea lanata*			
576.	42260	*Pithocarpa ramosa*			
577.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
578.	25720	*Platycercus icterotis (Western Rosella)*			
579.	24747	*Platycercus spurius (Red-capped Parrot)*			
580.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
581.	6249	*Platysace compressa (Tapeworm Plant)*			
582.	4524	*Platytheca galioides*			
583.	577	*Poa poiformis (Coastal Poa)*			
584.	25703	*Podargus strigoides (Tawny Frogmouth)*			
585.	8175	*Podolepis gracilis (Slender Podolepis)*			
586.	8179	*Podolepis nutans (Nodding Podolepis)*			
587.	8182	*Podotheca angustifolia (Sticky Longheads)*			
588.	25510	*Pogona minor (Dwarf Bearded Dragon)*			

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589.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
590.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
591.	25722	*Polytelis anthopeplus (Regent Parrot)*			
592.	4691	*Poranthera microphylla (Small Poranthera)*			
593.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
594.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
595.	24769	*Porzana fluminea (Australian Spotted Crake)*			
596.	25732	*Porzana pusilla (Baillon's Crake)*			
597.	24771	*Porzana tabuensis (Spotless Crake)*			
598.	1669	*Prasophyllum cyphochilum (Pouched Leek Orchid)*			
599.	1671	*Prasophyllum elatum (Tall Leek Orchid)*			
600.	1677	*Prasophyllum macrostachyum (Laughing Leek Orchid)*			
601.		*Pseudogobius olorum*			
602.	25511	*Pseudonaja affinis (Dugite)*			
603.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
604.	41651	*Pteridium esculentum subsp. esculentum*			
605.		*Pterostylis aff. nana*			
606.	10875	*Pterostylis concava*			
607.	1693	*Pterostylis recurva (Jug Orchid)*			
608.	12217	*Pterostylis sanguinea*			
609.	49034	*Pterostylis sp. Bloated snail orchid (W. Jackson BJ 486)*			
610.	1698	*Pterostylis vittata (Banded Greenhood)*			
611.	4181	*Pultenaea reticulata*			
612.		*Purpureicephalus spurius*			
613.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
614.	8195	*Quinetia urvillei*			
615.	24245	*Rattus rattus (Black Rat)*	Y		
616.		*Raveniella peckorum*			
617.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
618.	11341	*Rhagodia baccata subsp. baccata*			
619.	48096	*Rhipidura albiscapa (Grey Fantail)*			
620.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
621.	13312	*Rhodanthe pyrethrum*			
622.	2430	*Rumex brownii (Swamp Dock)*	Y		
623.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
624.	40426	*Rytidosperma occidentale*			
625.	2906	*Sagina apetala (Annual Pearlwort)*	Y		
626.	20063	*Salix babylonica*	Y		
627.	6484	*Samolus repens (Creeping Brookweed)*			
628.	7595	*Scaevola anchusifolia*			
629.	7602	*Scaevola calliptera*			
630.	7614	*Scaevola globulifera*			
631.	984	*Schoenus curvifolius*			
632.	985	*Schoenus discifer*			
633.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
634.	1006	*Schoenus odontocarpus*			
635.	17614	*Schoenus plumosus*			
636.	1020	*Schoenus sublateralis*			
637.	1023	*Schoenus tenellus*			
638.		*Scirtidae sp.*			
639.		*Scolopendra laeta*			
640.	25884	*Senecio pinnatifolius var. latilobus*			
641.	25883	*Senecio pinnatifolius var. pinnatifolius*			
642.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
643.	2909	*Silene gallica (French Catchfly)*	Y		
644.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
645.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
646.		*Simuliidae sp.*			
647.	30948	*Smicrornis brevirostris (Weebill)*			
648.	7020	*Solanum linnaeanum (Apple of Sodom)*	Y		
649.	7037	*Solanum symonii*			
650.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
651.	616	*Sorghum bicolor (Grain Sorghum)*	Y		
652.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
653.		*Sphaeriidae sp.*			
654.	4211	*Sphaerolobium vimineum (Leafless Globe Pea)*			
655.	4828	*Spyridium globulosum (Basket Bush)*			
656.	2918	*Stellaria media (Chickweed)*	Y		
657.	636	*Stenotaphrum secundatum (Buffalo Grass)*	Y		
658.	24329	*Stictonetta naevosa (Freckled Duck)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
659.	2316	*Stirlingia latifolia (Blueboy)*			
660.	25597	*Strepera versicolor (Grey Currawong)*			
661.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
662.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
663.	7696	*Stylidium calcaratum (Book Triggerplant)*			
664.	7699	*Stylidium carnosum (Fleshy-leaved Triggerplant)*			
665.	7734	*Stylidium guttatum (Dotted Triggerplant)*			
666.	7742	*Stylidium inundatum (Hundreds and Thousands)*			
667.	7745	*Stylidium junceum (Reed Triggerplant)*			
668.	7772	*Stylidium perpusillum (Tiny Triggerplant)*			
669.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
670.	7785	*Stylidium repens (Matted Triggerplant)*			
671.	7798	*Stylidium schoenoides (Cow Kicks)*			
672.		*Stylidium sp.*			
673.	7799	*Stylidium spathulatum (Creamy Triggerplant)*			
674.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
675.	24259	*Sus scrofa (Pig)*	Y		
676.	25902	*Symphyotrichum squamatum (Bushy Starwort)*	Y		
677.	2329	*Synaphea spinulosa*			
678.	15532	*Synaphea spinulosa subsp. spinulosa*			
679.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
680.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
681.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
682.		*Tanypodinae sp.*			
683.	1036	*Tetraria octandra*			
684.	48341	*Tetratheca hirsuta subsp. viminea*			
685.	10856	*Thelymitra benthamiana (Leopard Orchid)*			
686.	1707	*Thelymitra flexuosa (Twisted Sun Orchid)*			
687.	11143	*Thelymitra graminea*			
688.	1710	*Thelymitra mucida (Plum Orchid)*			
689.	5105	*Thomasia triphylla*			
690.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
691.	1319	*Thysanotus arenarius*			
692.	1338	*Thysanotus manglesianus (Fringed Lily)*			
693.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
694.	1343	*Thysanotus patersonii*			
695.	1351	*Thysanotus sparteus*			
696.	1354	*Thysanotus tenellus*			
697.	25519	*Tiliqua rugosa*			
698.	25207	*Tiliqua rugosa subsp. rugosa*			
699.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
700.	1368	*Trachyandra divaricata*	Y		
701.	19041	*Trachymene coerulea subsp. coerulea*			
702.	6280	*Trachymene pilosa (Native Parsnip)*			
703.	1481	*Tribonanthes australis (Southern Tiurndin)*			
704.	1485	*Tribonanthes violacea (Violet Tiurndin)*			
705.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
706.	8251	*Trichocline spathulata (Native Gerbera)*			
707.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
708.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
709.	4292	*Trifolium campestre (Hop Clover)*	Y		
710.	1141	*Trithuria submersa*			
711.	33438	*Trymalium odoratissimum subsp. trifidum*			
712.	48147	*Turnix varius (Painted Button-quail)*			
713.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
714.	99	*Typha orientalis (Bulrush, Cumbungi)*			
715.	8254	*Urospermum picroides (False Hawkbit)*	Y		
716.	8255	*Ursinia anthemoides (Ursinia)*	Y		
717.	28087	*Usnea inermis*			
718.	7157	*Utricularia violacea (Violet Bladderwort)*			
719.	33537	*Vallisneria australis*	Y		
720.	24386	*Vanellus tricolor (Banded Lapwing)*			
721.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
722.	25225	*Varanus rosenbergi (Heath Monitor)*			
723.		*Veliidae sp.*			
724.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
725.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			
726.	24206	*Vespadelus regulus (Southern Forest Bat)*			
727.	4325	*Viminaria juncea (Swishbush, Koweda)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
728.	24040	*Vulpes vulpes (Red Fox)*	Y		
729.	722	*Vulpia bromoides (Squirrel Tail Fescue)*	Y		
730.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
731.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
732.	7389	*Wahlenbergia preissii*			
733.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
734.	1251	*Xanthorrhoea brunonis*			
735.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
736.	6289	*Xanthosia huegelii*			
737.	2331	*Xylomelum occidentale (Woody Pear, Djandin)*			
738.	1049	*Zantedeschia aethiopica (Arum Lily)*	Y		
739.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 3: Protected Matters Search Tool Results

Australian Government
Department of Agriculture, Water and the Environment

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. Please see the caveat for interpretation of information provided here.

Report created: 29-Jan-2022

Summary

Matters of National Environment 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 (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	32
Listed Migratory Species:	28

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

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 Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	36
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	20
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Peel-yalgorup system	Within Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In feature area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding likely to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
FISH			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Galaxiella nigrostriata](#) Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
OTHER			
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In feature area
[Austrostipa bronwenae](#) [87808]	Endangered	Species or species habitat known to occur within area	In feature area
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caladenia procera](#) Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Diuris drummondii](#) Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area	In feature area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arenaria interpres](#) Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius ruficapillus](#) Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
NTWA Bushland covenant (0004)	Conservation Covenant	WA	In buffer area only
NTWA Bushland covenant (0095)	Conservation Covenant	WA	In buffer area only
Yalgorup	National Park	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Yalgorup Lakes System	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Clear 2.86 ha of native vegetation for the purpose of horticulture	2010/5655	Controlled Action	Post-Approval	In feature area
Lot 4 Runnymede Road, Wellesley - Proposed Sand Extraction	2020/8862	Controlled Action	Assessment Approach	In buffer area only
Production horticulture in Lot 6 and Lot 8 Old Coast Road, Myalup	2020/8827	Controlled Action	Assessment Approach	In buffer area only
Sand Extraction Project Lot 5 Wellesley Road, Wellesley Shire of Harvey	2021/9034	Controlled Action	Assessment Approach	In buffer area only
Sand Mine, Lot 122 Old Coast Road, Parkfield, Binningup, WA	2014/7164	Controlled Action	Post-Approval	In buffer area only
Sand Mining on Lot 7 Runnymede Road	2011/5996	Controlled Action	Post-Approval	In feature area
Silica Sand Mine Expansion	2002/910	Controlled Action	Post-Approval	In buffer area only
Southern Seawater Desalination Project	2008/4173	Controlled Action	Post-Approval	In buffer area only
WA Offshore Windfarm	2021/8961	Controlled Action	Assessment Approach	In feature area
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Kemerton Lateral Gas Pipeline Project	2005/2388	Not Controlled Action	Completed	In feature area
Limestone quarry expansion	2005/2268	Not Controlled Action	Completed	In buffer area only
Limestone Quarry Expansion, Lots 3618 and 1794, Finn Road	2005/2332	Not Controlled Action	Completed	In buffer area only
Limestone quarry mining	2006/2942	Not Controlled Action	Completed	In buffer area only
Vegetation Clearance for Horticulture Operation Expansion, Lot 2, Springfield Rd, Parkfield, WA	2014/7196	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Construct and operate a 132kV transmission line and upgrade Kemerton Terminal Si	2008/4484	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Limestone Extraction on Lot 5 Old Coast Road, Myalup, WA	2012/6468	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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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APPENDIX 4: HABITAT TREE DETAILS

Habitat Trees - Diameter at Breast Height > 50 cm

Datum: GDA94

Entrance size ranges: Small = >5cm, Medium = 5 to 10 cm, Large = >10 cm

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimate Hollow Entrance Size Range (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt001	50H	383388	6333015	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt002	50H	383412	6333032	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt003	50H	383415	6333021	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt004	50H	383418	6333022	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt005	50H	383418	6333020	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt006	50H	383426	6333020	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt007	50H	383438	6333021	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt008	50H	383440	6333021	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt009	50H	383440	6333023	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt010	50H	383443	6333022	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt011	50H	383447	6333023	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt012	50H	383445	6333025	Dead Unknown	15-20	>50	2+	Large (cockatoo)	No Signs	No Signs	Yes	Two large potential spouts
wpt013	50H	383451	6333026	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt014	50H	383461	6333044	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt015	50H	383450	6333061	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt016	50H	383490	6333023	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt017	50H	383501	6333031	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt018	50H	383513	6333048	Marri	15-20	>50	0		No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimate Hollow Entrance Size Range (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt019	50H	383542	6333035	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt020	50H	383554	6333024	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt021	50H	383567	6333037	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt022	50H	383548	6333055	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt023	50H	383576	6333059	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt024	50H	383599	6333082	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt025	50H	383612	6333077	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt026	50H	383617	6333053	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt027	50H	383634	6333029	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt028	50H	383627	6333026	Dead Unknown	0-5	>50	0		No Signs	No Signs	No	
wpt029	50H	383641	6333028	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt030	50H	383634	6333068	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt031	50H	383642	6333192	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt032	50H	383605	6333184	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt033	50H	383604	6333169	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt034	50H	383610	6333228	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt035	50H	383590	6333249	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt036	50H	383589	6333246	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt037	50H	383581	6333238	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt038	50H	383578	6333238	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt039	50H	383563	6333336	Marri	15-20	>50	0		No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimate Hollow Entrance Size Range (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt040	50H	383592	6333351	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt041	50H	383597	6333347	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt042	50H	383590	6333363	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt043	50H	383603	6333417	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt044	50H	383568	6333450	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt045	50H	383556	6333445	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt046	50H	383598	6333463	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt047	50H	383593	6333558	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt048	50H	383588	6333570	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt049	50H	383581	6333576	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt050	50H	383606	6333583	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt051	50H	383595	6333646	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt052	50H	383596	6333647	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt053	50H	383556	6333629	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt054	50H	383558	6333626	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt055	50H	383527	6333594	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt056	50H	383477	6333634	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt057	50H	383345	6333638	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt058	50H	383333	6333630	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt059	50H	383341	6333531	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt060	50H	383341	6333532	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt061	50H	383330	6333503	Jarrah	15-20	>50	0		No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimate Hollow Entrance Size Range (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt062	50H	383334	6333486	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt063	50H	383334	6333471	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt064	50H	383342	6333461	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt065	50H	383447	6333310	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt066	50H	383525	6333395	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt067	50H	383476	6333477	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt068	50H	383486	6333541	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt069	50H	383454	6333579	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt070	50H	383416	6333580	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt071	50H	383395	6333396	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt072	50H	383393	6333235	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt073	50H	383398	6333236	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt074	50H	383389	6333227	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt075	50H	383387	6333222	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt076	50H	383347	6333189	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt077	50H	383402	6333093	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt078	50H	383460	6333122	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt079	50H	383462	6333125	Jarrah	15-20	>50	0		No Signs	No Signs	No	
wpt080	50H	383489	6333106	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt081	50H	383498	6333103	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt082	50H	383533	6333140	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt083	50H	383535	6333140	Marri	15-20	>50	0		No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimate Hollow Entrance Size Range (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt084	50H	383574	6333144	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt085	50H	383567	6333185	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt086	50H	383564	6333194	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt087	50H	383551	6333197	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt088	50H	383556	6333206	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt089	50H	383543	6333210	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt090	50H	383540	6333212	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt091	50H	383524	6333249	Marri	15-20	>50	0		No Signs	No Signs	No	
wpt092	50H	383499	6333257	Marri	15-20	>50	0		No Signs	No Signs	No	

APPENDIX 5: FAUNA OBSERVATIONS

Observed Vertebrate Fauna Listing

Lot 150 - Runnymeade Road

Compiled by Greg Harewood - Feb 2022

Class **Family** *Species*	Common Name	Conservation Status
Aves		
Psittacidae Parrots		
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	S3 VU Bp LC
Platycercus spurius	Red-capped Parrot	LC
Platycercus zonarius	Australian Ringneck	LC
Acanthizidae Thornbills, Geryones, Fieldwrens & Whitefaces		
Acanthiza apicalis	Broad-tailed Thornbill	Bh LC
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	LC
Gerygone fusca	Western Gerygone	LC
Smicrornis brevirostris	Weebill	LC
Petroicidae Australian Robins		
Petroica multicolor	Scarlet Robin	Bh LC
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo		
Rhipidura fuliginosa	Grey Fantail	LC
Campephagidae Cuckoo-shrikes, Trillers		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC
Cracticidae Currawongs, Magpies & Butcherbirds		
Cracticus tibicen	Australian Magpie	LC
Strepera versicolor	Grey Currawong	LC

BC Act Status - S1 to S7, EPBC Act Status - CR = Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, DBCA Priority Status - P1 to P4, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions LC = Least Concern - see http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status
Corvidae Ravens, Crows		
Corvus coronoides	Australian Raven	LC

Mammalia

Macropodidae Kangaroos, Wallabies		
Macropus fuliginosus	Western Grey Kangaroo	LC

BC Act Status - S1 to S7, EPBC Act Status - CR = Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, DBCA Priority Status - P1 to P4, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions LC = Least Concern - see http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

APPENDIX 6: SIGNIFICANT FAUNA LIKELIHOOD OF OCCURRENCE

Significant Fauna Likelihood of Occurrence for Survey Area

Common Name *(Species Name)*	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Potential Impacts
	BC Act/DBCA Priority	EPBC Act				
Baudin's Cockatoo *(Calyptorhynchus baudinii)*	T(EN)	T(EN)	Primarily eucalypt forests, feeding primarily on Marri seeds	Yes	Likely to Occur	Loss/modification of an area of habitat.
Carnaby's Cockatoo (*Calyptorhynchus latirostris)*	T(EN)	T(EN)	Forests, woodlands, heathlands, farms; typically feeding on *Banksia, Hakea* and Marri	Yes	Likely to Occur	Loss/modification of an area of habitat.
Chuditch *(Dasyurus geoffroii)*	T(VU)	T(VU)	Forest, mallee shrublands, woodlands and desert. Abundant populations are typically found in riparian jarrah forest	Yes	Unlikely to Occur: Presumed locally extinct.	No impact anticipated.
Coastal Plains Skink (*Ctenotus ora)*	P3	-	Sandy substrates with low vegetation (including heath) in open *Eucalyptus/Corymbia* woodland over *Banksia*	Yes	Potentially Occurrs.	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	T(VU)	T(VU)	Eucalypt forests, feeding on marri, jarrah, blackbutt, karri, sheoak and snottygobble.	Yes	Known to Occur	Loss/modification of an area of habitat.
Peregrine Falcon *(Falco peregrinus)*	OS	-	Diverse habitat ranging from rainforest to arid shrublands, coastal heath to alpine. Primarily around cliffs, along coasts, rivers and ranges, as well as wooded watercourses and lakes	Yes	Rare but possible occurrence.	Loss/modification of an area of habitat.
Perth Lined Lerista (*Lerista lineata)*	P3	-	White sands under shrubland and heathland, preferring loose soil and leaf litter particularly in association with Banksia spp.	Yes	Potentially Occurs.	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Quenda (*Isoodon fusciventer)*	P4	-	Dense scrubby, often swampy, vegetation with dense cover	No	Unlikely to Occur	No impacts anticipated

Common Name *(Species Name)*	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Potential Impacts
	BC Act/DBCA Priority	EPBC Act				
South-western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*)	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees with sparse ground cover	Yes	Potentially Occurs.	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Western Brush Wallaby (*Notamacropus irma)*	P4	-	Open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets	Yes	Potentially Occurs	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Western False Pipistrelle (*Falsistrellus mackenziei)*	P4	-	Wet sclerophyll forest dominated by karri and in high rainfall zones of the jarrah and marri forest.	Yes	Potentially Occurs.	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Western Ringtail Possum (*Pseudocheirus occidentalis*)	T(CR)	T(CR)	Coastal peppermint, coastal peppermint-tuart, jarrah-marri associations, sheoak woodland, eucalypt woodland and mallee.	Yes	Potentially Occurs.	Loss/modification of an area of habitat. Death/injury of individuals during clearing and operational activities.
Migratory Shorebirds/Wetland Species/Marine Species (various reptiles, birds and mammals	Various	Ma, Mi, Various	Varies between species but includes open ocean, beaches, and permanent/temporary wetlands, varying from billabongs, swamps, lakes. Floodplains, sewerage farms, saltwork ponds, estuaries, lagoons, mudflat sandbars, pastures, airfields, sports fields and lawns	No	Would Not Occur.	No Impact

CR = Critically Endangered, EN = Endangered, VU = Vulnerable, Mi = Migratory, Ma = Marine, CD = Conservation Dependent, P = Priority T = Threatened, OS = Other Specially Protected Fauna