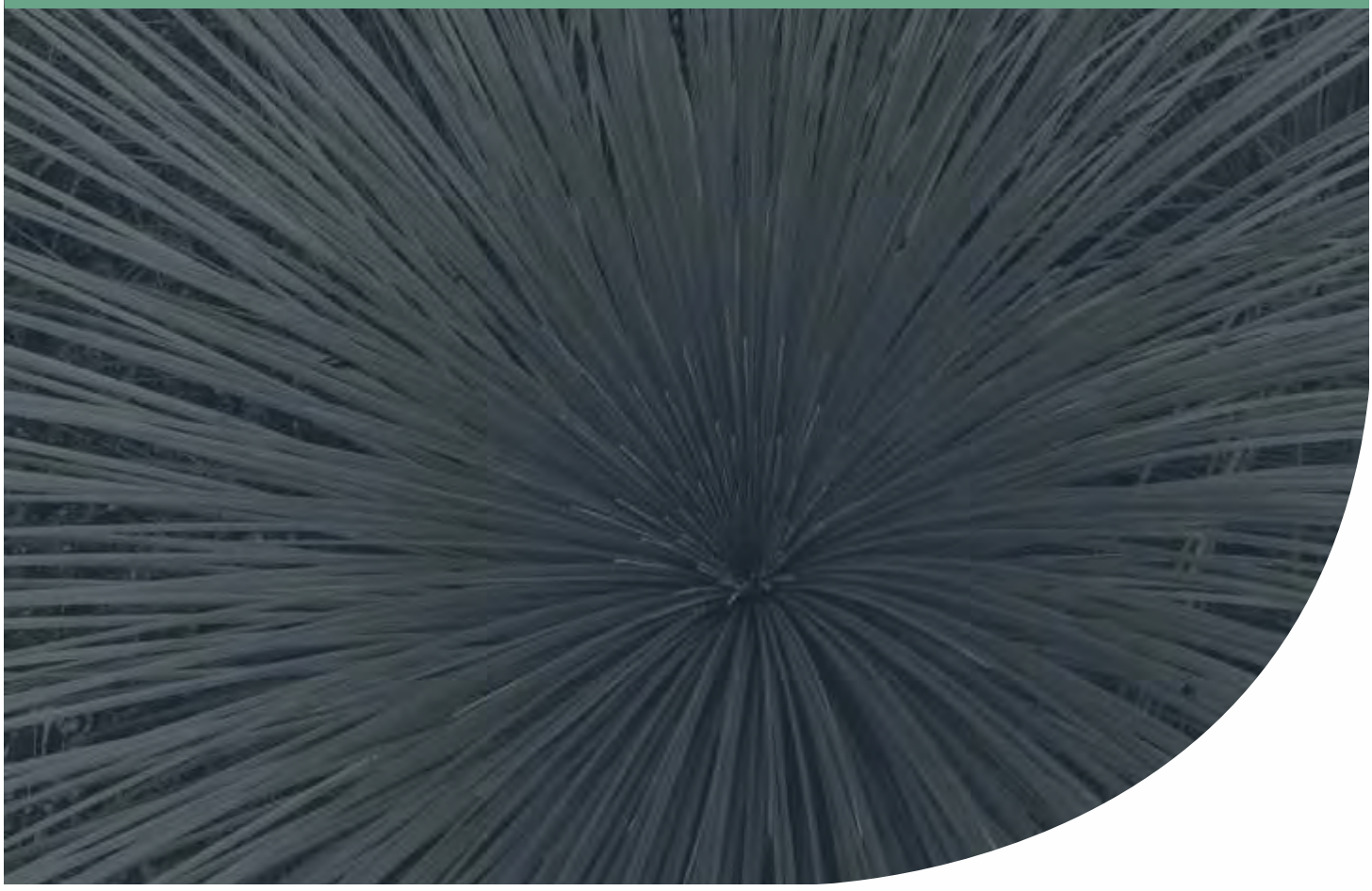
# Environmental Assessment Report: Local Scheme Amendment

## Former Glen Iris Golf Course

Project No: EP20-009(08)

**Prepared for Acumen Development Solutions on behalf of Eastcourt Property Group**
**September 2021**



# Document Control

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# Executive Summary

ECP Acquisitions 6 Pty Ltd (the proponent) plans to develop the former Glen Iris Golf Course into a residential estate (referred to herein as 'the site'). The proponent engaged Emerge Associates (Emerge) to prepare this *Environmental Assessment Report* (EAR) to support the proposed residential development.

The site is currently zoned 'Special Use 1', 'Special Use 6', and 'Residential' under the City of Cockburn (CoC) *Town Planning Scheme No. 3* (TPS No.3) and 'Urban' under the Metropolitan Region Scheme (MRS). The site was operated as a Golf Course until it was permanently closed and then sold to ECP Acquisitions 6 (a development entity associated with Eastcourt Property Group) in early 2020 who intends to develop the land as a residential estate. A local scheme amendment is therefore being sought to best facilitate the site's redevelopment.

The site is approximately 53.7 hectares (ha) in size and is surrounded by residential subdivision and the Yangebup freight rail line to the north, Kwinana Freeway to the west, 'Resource' zones and 'Special Use' reserves to the west, and existing residential dwellings and areas zoned 'Mixed Business' and 'Industrial' to the south. The central portion of the site was historically developed as a golf course in the early 1960s. Northern and southern extensions of the golf course were cleared and developed during different periods in the early 1990s, alongside the residential development of the area between the golf course and Kwinana Freeway. Prior to this time, the northern and southern portions of the site supported native vegetation. By 1995 the majority of the vegetation was cleared within the northern and southern extension areas with some scattered native vegetation retained and non-endemic landscape plantings established.

The relevant environmental attributes and values of the site are summarised as follows:

- The elevation of the site ranges from 25 m in relation to the Australian height datum (mAHD) in the southern portion to 40 mAHD in the northern portion of the site.
- The site is not known to contain any restricted landforms or unique geological features.
- The site is classified as having a 'moderate to low' risk of Acid Sulfate Soils (ASS) occurring within 3 m of natural soil surface across the site.
- Given the extent of historic clearing and the previous land use of the site, existing vegetation is predominantly mapped as 'completely degraded'.
- Native vegetation only exists in scattered patches and occurs over approximately 4% of the entire site area, primarily as the **EmB** vegetation community.
- Four plant communities were identified during site surveys with the largest extent being 35.7 ha determined to be 'bare ground and turf' given that the site was used a golf course until March 2020. The next largest by extent was 'planted trees and shrubs predominantly non-native trees' covering an area of 13.6 ha.
- No threatened or priority listed flora species were identified or considered to occur on the site due to the high level of historic disturbance and previous land use.
- The site survey identified the presence of suitable habitat for two threatened and five priority flora species, primarily associated with the **EmB** vegetation community.
- Historical disturbance has significantly compromised the fauna habitat value within the site due to the clearing of native vegetation and the current extent of bare ground within the site.

- Five fauna habitats have been identified during a site survey as providing habitat scattered across the site.
- Two fauna species considered of conservation significance were recorded, Carnaby's black cockatoo which is listed as endangered under the EPBC Act and quenda which is listed as a Priority 4 species in WA.
- During site surveys 11 potential breeding habitat trees were identified for black cockatoos, and none of the trees contained suitable breeding hollows.
- A total of 4.76 ha of foraging habitat was mapped within the site for Carnaby's black cockatoo and 4.88 ha for forest red-tailed black cockatoo. This was not quality foraging habitat, and is considered to be of marginal foraging value.
- One of the introduced fauna species recorded, *Oryctolagus cuniculus (rabbit), is listed as a declared pest pursuant to the *Biosecurity and Agriculture Management Act 2007*.
- No wetlands with conservation values (i.e. Conservation or Resource Enhancement management category) are mapped within or in close proximity to the site.
- Artificial ponds were established over the site in the past.
- No Registered Aboriginal Heritage Sites are mapped as being present within the site.
- No Bush Forever sites occur within the site. A number of Bush Forever sites occur to the east and west of the site.
- Key sources of future noise emissions surrounding the site were determined to be:
  - Road noise generated from Kwinana Freeway and Berrigan Drive
  - Rail noise generated from Yangebup freight rail line and the Thornlie-Cockburn rail line
  - Aircraft noise associated with Jandakot Airport
  - Industry situated to the south of the site.
- There is 'Industrial' zoned land and industrial development/operations to the south of the site, with the uses within 500m of the site largely comprising smaller depots, work yards and storage yards, with the exception being Fremantle Steel Group's steel fabrication facilities being located approximately 200m from the nearest portion of the site. A search of the Department of Water and Environmental Regulation's Environmental Regulation's (DWER) Licences and Works Approvals database for the City of Cockburn area does not indicate that there are any existing prescribed premises within 500m of the site. Given the nature of the uses (currently and likely into the future) it is expected that noise would be the primary consideration in relation to new sensitive uses in close proximity to the site, and there is no reason to expect that there would be significant dust or odour emissions, or higher levels of risk that would be of concern or require larger separations that would preclude residential development within the site. Any new industrial uses in the future within the industrial zoned land to the south would need to give appropriate consideration to the existing residential dwellings situated on Imlah Court, which are situated closer than the site.

The proposed scheme amendment is unlikely to result in development that would significantly impact environmental attributes or values, or nearby land uses, and any potential impacts can be managed through the standard planning processes associated with structure planning and subdivision/development. This is considered further in **Section 0** and **Section 0** of this report, but overall:

- Acid Sulfate Soils: As the site is classed as having a "moderate to low" risk of having ASS within the soil 3 m below the natural soil surface, and in the absence of any significant excavations

that would disturb any ASS, this issue is not considered to be an issue requiring further detailed consideration.

- Native Vegetation: The majority of the 1.9 ha of native woodland vegetation (Plant Community **EmB**) within the site will be retained. It is expected that the scheme text provisions will include a requirement for future local structure plans to accommodate this vegetation in areas of Public Open Space to provide for the future retention of its environmental values.
- Fauna: Black cockatoo foraging habitat will be retained in the in areas of Public Open Space. Quenda habitat on the site will be retained to ensure that this Priority 4 species can continue to occupy this site.
- Hydrology: The current hydrological functions of the site can be managed through the application of the Better Urban Water Management Framework (implemented through the standard planning process). This will be detailed in the Local Water Management Strategy (LWMS) prepared to support the proposed Local Structure Plan for the site.
- Noise: Emissions associated with surrounding uses were predicted to be within acceptable levels within the relevant time periods or could be effectively mitigated at the time of subdivision through:
  - The incorporation of quiet house design (Package A) within some lots in close proximity to Kwinana Freeway and Berrigan Drive
  - Built form responses (including the installation of 6.38mm laminated glazing) to respond to aircraft noise.
  - While not expected to be an issue due to existing noise sensitive premises further to the south of the site, built form responses and the provision of solid fencing along Princep Road and Imlah Court would further mitigate noise emissions form industrial uses to the south of the site.
- Surrounding land uses: Noise would be the key emission from these areas in relation to new sensitive uses (i.e. residential) within the site. Existing residential dwellings along Imlah Court would be nearer to the existing (and any future) industrial activities and therefore set an existing compliance requirement for maximum noise emissions.
- Bushfire risks: A bushfire hazard level assessment has been undertaken as part of the Bushfire Management Plan (BMP) (eco logical Australia 2021) prepared to support the scheme amendment. The BMP has not identified any bushfire hazards that would render the site unsuitable for urban development. Further detailed bushfire risk assessments will be required to support structure planning and subdivision or development stages in accordance with SPP 3.7, the Guidelines and AS 3959 based on the proposed layout and bushfire hazards, existing or proposed. Bushfire risk mitigation would not cause any limitation in any proposed environmental/vegetation retention outcomes.

In conclusion, there are no significant environmental issues or constraints within the site to the extent that it would preclude the site being rezoned to 'Development' under TPS 3. The identified environmental values will be appropriately protected through the future planning processes, including structure planning and subdivision/development applications.

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Detailed Flora and Vegetation Assessment

**Appendix B**

Basic Fauna Assessment

**Appendix C**

Targeted Black Cockatoo Assessment

**Appendix D**

Arboricultural Assessment

**Appendix E**

Acoustic Assessment

# List of Abbreviations

*Table A1: Abbreviations – General terms*

| General terms | |
|---|---|
| AHIS | Aboriginal Heritage Inquiry System |
| ANEF | Australian Noise Exposure Forecast |
| ASS | Acid Sulfate Soil |
| BSA | Bassendean Soil Association |
| CBC | Carnaby's black cockatoo |
| CBD | Central Business District |
| DBH | Diameter at Breast Height |
| EAR | Environmental Assessment Report |
| ESA | Environmentally Sensitive Area |
| ha | Hectares |
| IBRA | Interim Biogeographic Regionalisation of Australia |
| m AHD | Metres Australian Height Datum |
| MNES | Matters of National Environmental Significance |
| PEC | Priority Ecological Community |
| PDWSA | Public Drinking Water Source Area |
| TEC | Threatened Ecological Community |

*Table A2: Abbreviations – Legislation and policies*

| Legislation and policies | |
|---|---|
| AH Act | *Aboriginal Heritage Act 1972* |
| BAM Act | *Biosecurity and Agriculture Management Act 2007* |
| BC Act | *Biodiversity Conservation Act 2016* |
| EP Act | *Environmental Protection Act 1986* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |

*Table A3: Abbreviations – Organisations*

| Organisations | |
|---|---|
| CoC | City of Cockburn |
| DAWE | Department of Agriculture, Water and the Environment |
| DBCA | Department of Biodiversity Conservation and Attractions |
| DoW | Department of Water (now known as Department of Water and Environmental Regulation) |
| DPLH | Department of Planning, Lands and Heritage |
| DWER | Department of Water and Environmental Regulation |
| EPA | Environmental Protection Authority |
| WAPC | Western Australian Planning Commission |

*Table A4: Abbreviations – Planning and building terms*

| Planning and building terms | |
|---|---|
| LSP | Local Structure Plan |
| MRS | Metropolitan Region Scheme |
| TPS | Town Planning Scheme |

# 1. Introduction

ECP Acquisitions 6 Pty Ltd (a company related to Eastcourt Property Group) intends to develop the former Glen Iris Golf Course into a residential estate. The former Golf Course comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court in Jandakot (referred to herein as the 'site'). The site is located approximately 16 kilometres (km) South of the Perth Central Business District (CBD) within the City of Cockburn (CoC). The site is zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Special Use 1', 'Special Use 6', and 'Residential' under the CoC *Town Planning Scheme No. 3* (TPS No.3). A request to initiate an amendment to TPS No.3 has been submitted to rezone the site to 'Development'.

The site is approximately 53.7 hectares (ha) in size, as shown in Figure 1, and is surrounded by suburban and rural residential properties and the Yangebup freight rail line to the north, Kwinana Freeway and existing residential dwellings to the west, Jandakot Airport to the northeast, commercial and industrial uses to the south east, and existing residential dwellings and an area zoned Mixed Business to the south.

## 1.1. Purpose of report

ECP Acquisitions 6 Pty Ltd (the proponent) engaged Emerge Associates to undertake an assessment of the potential environmental impacts that could arise from the rezoning the site to 'Development', that would likely occur through future development associated with the change in zoning. This assessment accompanies the submission of the amendment initiation request to the CoC TPS No. 3.

This Environmental Assessment Report (EAR) provides a synthesis of information regarding the environmental values and attributes of the site, gathered from a range of information sources, such as local and regional reports, databases, mapping and site-specific investigations.

Emerge Associates and others have undertaken a range of site-specific surveys to prepare the following documents for the site, which have informed this EAR, and include:

- Detailed Flora and Vegetation Assessment (attached as **Appendix A**).
- Basic Fauna Assessment (attached as **Appendix B**).
- Targeted Black Cockatoo Assessment (attached as **Appendix C)**.
- Arboricultural Assessment (attached as **Appendix D**).
- Acoustic Assessment (Herring Storer Acoustics 2021), attached as **Appendix E**).

The outcomes of these site-specific investigations, as well as the comprehensive desktop review of available information, has provided context for the following within the site:

- Landforms, topography and soils.
- Flora and vegetation.
- Terrestrial fauna.
- Surface and groundwater hydrology.
- Aboriginal and non-indigenous heritage.
- Historical and existing land uses within and surrounding the site.

# 2. Existing Environment

## 2.1. Landform and soils

### 2.1.1. Topography

The elevation of the site ranges from 25 m Australian Height Datum (m AHD) in the southern portion to 40 mAHD in the northern portion of the site (DoW 2008), as shown in **Figure 2**.

### 2.1.2. Landform, soils and geology

Landform and soils influence vegetation types at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area.

Examinations of broad scale soil mapping places the site within Bassendean soil association (BSA) (Churchward and McArthur 1980). The BSA comprises sand plains with low dunes and occasional swamps, iron or humus podzols and area of complex steep dunes.

It was confirmed during Emerge Associates' field surveys that the site is located on Bassendean sands which typically are very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz and moderately well sorted of eolian origin (Purdie *et al.* 2004). Desktop research and the Emerge Associates' field surveys did not identify any restricted landforms or unique geological features at the site.

In November and December 2020, a geotechnical investigation was carried out under the direction of CMW Geosciences Pty Ltd to provide further information on the ground conditions and provide recommendations with respect to geotechnical aspects of the proposed future residential development of the site (CMW Geosciences 2021). 55 test pits were excavated to depths of up to 2.2 m to investigate the underlying soil conditions, facilitate sampling for laboratory testing, and to assess excavatability and inform earthworks recommendations. These investigations generally confirmed the broad scale soils and landforms mapping.

### 2.1.3. Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. However, when oxidised, ASS can pose issues through the production of sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environmental Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2021). A review of the DWER mapping indicates that the entire site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of natural soil surface, but 'high to moderate' risk of ASS beyond 3m of the natural soil surface.

## 2.2. Biodiversity and natural assets

### 2.2.1. Flora and vegetation

Emerge Associates has undertaken a Detailed Flora and Vegetation Assessment for the site, which is provided in **Appendix A**. This section provides a summary of the key outcomes of this assessment.

#### 2.2.1.1. Historical context

Historical aerial images available from 1953 and onwards show that the northern and southern portions of the site, separated by Berrigan Drive, were subject to vegetation clearing at different occasions, as shown in **Plate 1** to **Plate 4**. The northern area of the site consisted of native vegetation until construction of the central part of the golf course commenced, which is visible in aerial imagery from 1965 shown in **Plate 2**. By 1995 the remainder of the vegetation on the northern area was cleared for further golf course construction, shown in **Plate 3** and **Plate 4**. Scattered remnant native trees appear to have been retained between the course fairways, however most of the vegetation has been cleared for golf course construction. The southern portion of the site, except two patches near the southern boundary, was completely cleared of native vegetation for the golf course in the early 1990s. The vegetation on the site is therefore highly disturbed and sat within an artificial landscape setting.

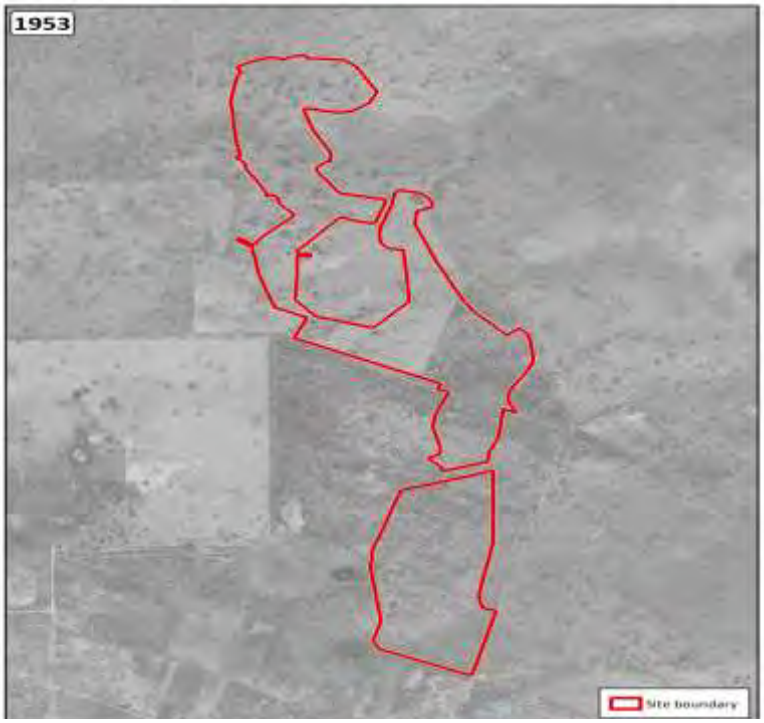



*Plate 1: 1953 Glen Iris Golf Course historical aerial imagery.*




*Plate 2: 1965 Glen Iris Golf Course historical aerial imagery.*




*Plate 3: 1985 Glen Iris Golf Course historical aerial imagery.*




*Plate 4: 1995 Glen Iris Golf Course historical aerial imagery.*

#### 2.2.1.2. Regional context

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides the Swan Coastal Plain into two floristic subregions (Environment Australia 2000). The site is contained within the 'SWA02' or Perth subregion, which is characterised as mainly containing *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types.

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Heddle *et al.* (1980) mapping shows the site as comprising the 'Bassendean central and south' complex, which is described as vegetation ranging from woodland of *Eucalyptus marginata – Allocasuarina fraseriana-Banksia spp*. to low woodland of *Melalecua spp*. and sedgelands on the moister sites. This complex was determined to have 26.87% remaining as of 2019 (Government of Western Australia 2019).

The EPA's *Environmental Guidance for Planning and Development Studies* (EPA 2008) states that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent. The Guidance also references the biodiversity conservation national objective and target of retaining 30% of the original extent of each vegetation complex, and the states' minimum target of 10% for constrained urban areas such as the Swan Coastal Plain. The percentage remaining of the 'Bassendean central and south' complex falls below the 30% retention objective but is above the 10% minimum retention target for the Swan Coastal Plain.

#### 2.2.1.3. Site specific investigations

A flora and vegetation assessment to the standard required of a detailed survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) was undertaken to support the preparation of the EAR.

An ecologist from Emerge visited the site on 11 March 2020 to conduct the initial reconnaissance flora and vegetation assessment (Emerge Associates 2020). During the survey, an assessment was made of the type, condition and values of vegetation across the site, and weed mapping was also undertaken. The site was traversed on foot and the composition and condition of vegetation was recorded.

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m relevés. A total of three relevés were sampled and the position of each sample location was recorded on a hand-held GPS unit.

The data recorded within each sample included:

- Site details (site name, site number, observers, date, and location).
- Environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event).
- Biological information (vegetation structure and condition, degree of disturbance and species present).

Additionally plant taxa that were not observed within the samples were recorded as the ecologist traversed the site. Photographs were taken throughout the field visit to show particular site conditions. Assessments were done to determine whether suitable habitat was present for conservation significant species identified as potentially occurring within the site. All plant specimens that were collected during the field survey were dried, pressed and named in accordance with requirements of the Western Australia Herbarium.

Vegetation conditions were assigned at each sample and changes in vegetation condition were recorded and mapped across the site. For vegetation in the site containing Banksia spp., the condition scale provided in the conservation advice for the 'banksia Woodlands of the Swan Coastal Plain TEC' (DoEE 2016) was applied in addition to the Keighery scale.

Further to this, Emerge have undertaken additional site visits and survey during Winter and Spring 2021 to update the flora and vegetation survey to a detailed survey. Additional site visits have occurred in August and September, and the information/data generated from this used to update the survey report.

#### 2.2.1.4. Plant communities

Based on the findings from the survey, four native plant communities were recorded in the site, as described below in **Table 1** and shown in **Figure 3,** with representative photographs of each community provided in **Plate 5** to **Plate 8**.

*Table 1: Description and extent of plant communities identified within the site*

| Plant community | Description | Area (ha) |
|---|---|---|
| **EmB** | Woodland to open woodland *Eucalyptus marginata* subsp. *marginata*, *Banksia attenuata* and *Banksia menziesii* over mixed shrubland *Xanthorrhoea preissii*, *Allocasuarina humilis* and *Hibbertia hypericoides* over open sedgeland *Mesomelaena pseudostygia* over non-native grassland **Ehrharta calycina* (**Plate 5**). | 1.9 |
| **TdSt** | Closed sedgeland *Typha domingensis*, *Schoenoplectus tabernaemontani, *Cortaderia selloana* and *Baumea* sp. (**Plate 6**). | 0.2 |
| **Planted trees and shrubs** | Predominantly scattered non-native planted trees and shrubs such as **Corymbia* spp., **Eucalyptus* spp., *Melaleuca* spp. and *Grevillea* spp. with occasional native plants (**Plate 7).** | 13.6 |
| **Turf and bare ground** | Closed non-native grassland (turf) and bare ground (**Plate 8**). | 35.7 |
| | **Total** | 51.4[1] |

Note 1: excludes areas of infrastructure and open water (2.3 ha)

Plant community **TdSt** exists as multiple small patches on the edges of artificial lakes and is considered to be likely planted or a combination of planted and naturally generated vegetation. Plant community **EmB** exists as scattered patches in the northern, central and south western portion of the site. Plant communities **planted trees and shrubs** and **turf and bare ground** exist across the site and were likely previously installed for the site's historic use as a golf course.

The remainder of the site supports multiple artificial lakes, buildings and hardstand comprising an area approximately 2.3 ha in size.



*Plate 5: Plant community **EmB** in 'very good – good' condition/Woodland fauna habitat*



*Plate 6: Plant community **TdSt** in 'good – degraded' condition/Riparian fauna habitat*



*Plate 7: **Planted trees and shrubs** in 'completely degraded' condition*



*Plate 8: **Turf and bare ground** in 'completely degraded' condition*

#### 2.2.1.5. Vegetation condition

Plant community **EmB** comprises the most intact native vegetation within the site, covering approximately 4% of the site. One small patch of this community was mapped as being in 'Very Good' condition as it supported the general structure expected of the Banksia woodland community and have a moderate native species diversity. Other patches of **EmB** that were more disturbed with an altered structure, lower native species diversity and higher weed cover were mapped as being in 'Good' and 'Good-Degraded' condition.

Plant community **TdSt**, covering less than 1% of the site, was identified as being in 'Good-Degraded' condition as it comprises combination of native and non-native species that only exist in the site due to the presence of the artificial lakes.

The **planted trees and shrubs** (25% coverage) and the **turf and bare ground** (66% coverage) plant communities were mapped as being in 'Completely Degraded' condition as they were dominated by non-native species or present only as bare non-vegetated areas on the site. The artificial lakes, buildings and hardstand were not assigned a condition category.

The extent of vegetation by condition category is detailed in **Table 2** and shown in **Figure 4**.

*Table 2: Extent of vegetation condition categories within the site*

| Condition category (Keighery 1994) | Size (ha) |
|---|---|
| Pristine | 0 |
| Excellent | 0 |
| Very good | 0.43 |
| Very good – good | 0.0 |
| Good | 0.69 |
| Good – degraded | 0.22 |
| Degraded | 0.8 |
| Completely degraded | 49.25 |

#### 2.2.1.6. Threatened and Priority Ecological Communities.

Threatened Ecological Communities (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). TECs listed under the EPBC Act are categorised as either 'critically endangered', 'endangered' or 'vulnerable'.

Within Western Australia, state listed TECs are statutorily protected through the *Biodiversity Conservation Act 2016* (BC Act). While no TECs are currently listed for protection under the BC Act, they will likely be listed at a future date, and then require Ministerial authorisation where a proposed development is likely to disturbed or modify an identified TEC. In the meantime, the Minister for Environment has listed certain ecological communities as threatened through a non-statutory process if the community was presumed to be totally destroyed or at risk of becoming totally destroyed. These listing are then applied through other statutory environmental approval processes, such as under Part IV and Part V of the *Environmental Protection Act 1986* (EP Act).

An ecological community under consideration for listing as a TEC in Western Australia, but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a 'Priority Ecological Community' (PEC). Whilst PECs are not afforded formal protection in Western Australia, they are also considered during environmental approval processes.

A search was conducted for TEC and PEC that may occur or have been recorded within a 10 km radius of the site using the Protected Matters Search Tool (DAWE 2020a) and NatureMap (DBCA 2020).

The structure and composition of plant community **EmB** indicates that is has the potential to represent Commonwealth listed TEC 'Banksia Woodland of the Swan Coastal Plain' (BWTEC) and the state listed PEC 'banksia dominated woodlands of the Swan Coastal Plain IBRA region'. BWTEC is listed as 'endangered' under the EPBC Act. Whether a patch of vegetation is considered to represent the BWTEC depends on a number of diagnostic criteria included within *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community (TSSC 2016)* including geographic location, soils, landforms, structure, and composition, condition and patch size (DoEE 2016).

As outlined in **Table 3**, none of the **EmB** vegetation patches satisfies the criteria to be considered a patch of the BWTEC due to the small size of the patches.

*Table 3: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from (TSSC 2016)*

| Criteria | Requirements for meeting criteria | Site implications |
|---|---|---|
| Must meet key diagnostic characteristics | A variety of factors relating to:<br>Location<br>Soils<br>Structure<br>Composition | Site meets location and soils criteria.<br>The **EmB** vegetation includes the key diagnostic feature of a tree layer of *Banksia attenuata, Banksia menziesii* and *Banksia ilicifolia*.<br>The **EmB** vegetation within site also meets structure and composition criterion. It is likely to represent FCT 23a which is identified as one of the FCTs comprising the banksia woodland TEC. |
| Must meet condition thresholds | A patch should at least meet the 'good' condition category. | The **EmB** vegetation is present in 'Very Good', 'Good' and 'Good – Degraded' condition, which meets this criterion.<br>The conservation advice indicates that a single patch may include areas of variable condition, meaning the 'Good – Degraded' condition may still be considered the TEC.<br>The patches of **EmB** vegetation that are adjacent to each other would be considered part of the same patch. Therefore, six 'patches' of **EmB** vegetation exist within the site. |
| Must meet minimum patch size | Minimum size of patch:<br>Pristine=no minimum size<br>Excellent=0.5 ha<br>Very Good=1 ha<br>Good=2 ha | The six patches of **EmB** vegetation are each less than 1 ha in size and do not meet this criterion. |
| Must incorporate surrounding context | Breaks (e.g. tracks) < 30 m do not separate vegetation into separate patches<br>Buffer zones may apply (20-50 m recommended from patch edge)<br>The site should be thoroughly sampled (two surveys in same spring).<br>Survey timing should be appropriate.<br>Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat) | The patches of **EmB** vegetation are isolated from other areas of banksia woodland and no relevant surrounding context considerations apply. |
| Result | The site does not support any vegetation that represents the banksia woodland TEC. | |

DBCA's Priority Ecological Community list indicates that the description, area and condition thresholds that apply to the EPBC Act listed TEC of the same name also apply to the 'Banksia woodlands of the Swan Coastal Plain PEC (DBCA 2020b). Since the **EmB** vegetation does not represent the Banksia woodland TEC is also does not represent the PEC.

The remainder of the site is not identified as being representative of any other TEC or PEC.

#### 2.2.1.7. Weeds

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds. A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to the state *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. At a National level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2019c).

As part of the flora and vegetation assessment (Emerge Associates 2020), mapping of weed species was undertaken within the site. The weed cover within the site was widespread, with moderate – high coverage across the site, particularly in the areas subject to historical disturbance. The areas within the site classified as turf and bare ground are also consistent with wide spread weed cover.

No species listed as a declared pest pursuant to BAM Act or WoNS were recorded within the site during the site assessments.

#### 2.2.1.8. Significant flora

Certain flora species that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora species may be listed as 'threatened' pursuant to the EPBC Act. At a State level, plant species may also be classed as 'threatened' under the BC Act. Species which are potentially rare or threatened; meet the criteria for near threatened; or have recently been removed from the threatened species list are classed as 'priority' flora species. However, priority flora species are not afforded statutory protection.

No locally or regionally significant flora species were recorded within the site, including during the 2021 Winter and Spring survey visits.

#### 2.2.1.9. Dieback

Opportunistic observations of signs of Phytophthora dieback were made during the site assessments. Signs of dieback include where sensitive species were noticeably dead, dying or absent, in particular where other less sensitive species were not. Sensitive species were identified from literature and sources such as the Dieback Working Group (2020)

No signs of Phytophthora dieback were observed within the site.

### 2.2.2. Bush Forever

The Government of Western Australia's Bush Forever Policy (Government of WA 2000) is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of Bush Forever is to protect comprehensive representations of all original vegetation complexes by targeting a minimum of 10% of each for protection (Government of WA 2000). Bush Forever sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No Bush Forever sites occur within the site. A number of Bush Forever sites occur to the east and west of the site.

### 2.2.3. Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The Perth Biodiversity Project (PBP), supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004).

There are no PBP mapped ecological linkages on the site. One biodiversity ecological linkage (No.48) is located approximately 0.8 km to the north of the site and extends to the west and east.

In addition to the PBP identified regional ecological linkages, ecological linkages can also exist at a local level, such as those identified in Towards Establishing a Green Network (WALGA 2014). This identified potential local ecological linkages situated immediately to the east and south of the site. Existing native vegetation further to the east and south of the site, would provide a local level ecological linkage function. The extent to which the site contributes to these linkages is limited by the lack of native remnant vegetation within the site.

### 2.2.4. Environmentally Sensitive Areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding values such as significant wetlands, threatened flora, threatened communities and *Bush Forever* sites.

No ESAs are present within or in close proximity to the site. A number of ESAs occur to the east and west of the site.

### 2.2.5. Fauna

Emerge Associates (Emerge) has prepared a Basic Fauna Assessment and a Targeted Black Cockatoo Assessment for the site, and these are provided in **Appendix B** and **Appendix C** respectively. This section provides a summary of the key outcomes of these assessments.

#### 2.2.5.1. Site specific surveys and investigations

A fauna assessment to the standard required of a 'basic' fauna survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Terrestrial fauna Surveys* (EPA 2016a) was conducted by Emerge. Emerge also conducted a 'Targeted Black Cockatoo Assessment' with reference to the EPA's technical guidance and the EPBC Act's black cockatoo referral guidelines (DSEWPaC 2012). In addition, following concerns raised by local residents regarding quenda, camera traps were installed during April 2021 to monitor for their presence.

An ecologist from Emerge visited the site on 11 March, between 10:30 am to 4:30 pm, and 28 May 2020, between 2:00 pm to 6:00 pm, to determine the fauna values associated with the site.

Transects were traversed during both days across the site, during daylight hours, and the characteristics of fauna habitat and presence of fauna species was recorded. Microhabitats such as logs, rocks and leaf litter were investigated and secondary evidence of species presence such as tracks, scats, skeletal remains, foraging evidence or calls was also noted.

A fauna list was compiled, and fauna habitat values were described, with particular reference to 'threatened' and 'priority' fauna species with potential to occur within the site. Taxonomy and nomenclature for vertebrate fauna species was taken from the *Western Australian Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (Western Australian Museum 2019).

The banks of the artificial lakes within the site were also searched on the second day of the survey.

A zoologist and an ecologist from Emerge visited the site on 11 March and 12 November 2020 during the day to conduct the 'Targeted Black Cockatoo Assessment'. The assessment is further supported by an Arboricultural Assessment, see **Appendix D**.

Transects were traversed across the site and potential night roosting, breeding and foraging habitat was identified and recorded. Secondary evidence of any black cockatoo activity such as chew marks, branch clippings, droppings, moulted feathers and chewed fruit was also investigated and recorded.

#### 2.2.5.2. Fauna habitat

Fauna habitats were identified according to the most dominant flora species and vegetation types present within the site, as determined from observations made during the site survey. The identified fauna habitats were then mapped on aerial images with boundaries interpreted from aerial photography, plant communities and notes taken in the field.

Information from the fauna desktop study for the habitat requirements for conservation significant vertebrate fauna species were also compiled and compared with the collected data of species identified during the site assessments. This was done to identify whether any conservation significant fauna species are considered to have the potential to utilise the site.

Historical disturbance has significantly compromised habitat values within the site with most of native vegetation having been removed during the construction of the golf course. The site now predominantly comprises areas consisting of non-native vegetation and weed species with scattered patches of native vegetation and non-native trees and shrubs.

Five fauna habitats were recorded in the site, as shown in **Figure 5**. **Native woodland** is present as scattered patches and has the highest fauna habitat values due to the presence of native trees, shrubs and ground cover and contains microhabitats such as logs, rocks, and leaf litter. The **riparian** and **water** habitats provide value for aquatic fauna species and those associated with riparian areas. The **planted trees and shrubs** habitat mainly provides habitat for avian species as the majority is devoid of understorey vegetation. The **turf and bare ground** habitat extends over a large portion of the site and has minimal habitat values for native fauna species.

During the 'Targeted Black Cockatoo Assessment' a total of 11 black cockatoo habitat trees were recorded within the site, the locations of the habitat trees are shown in **Figure 6**. All the habitat trees were *Eucalyptus marginata* (jarrah) with each determined not to be suitable for breeding due to the absence of suitable hollows.

Foraging habitat was also identified during the site assessment predominantly comprised of *Banksia attenuata* (candlestick banksia), *Banksia menziesii* (firewood banksia), *Eucalyptus patens* (Swan River blackbutt), jarrah, marri, *Melia azedarach* (Cape lilac) and *Tipuana tipu* (tipuana). A total of 4.76 ha of foraging habitat was mapped within the site for Carnaby's black cockatoo (CBC), shown in **Figure 7**, and 4.88 ha for forest red-tailed black cockatoo (FRTBC), as shown in **Figure 8**. The foraging habitat for both species of black cockatoo is comprised of vegetation providing a high, moderate or low value feeding resource, see **Appendix C**, with the vast majority of the vegetation being in the low resource category, see **Figure 7** and **Figure 8**.

The overall black cockatoo habitat quality score for the site, which evaluates the site's foraging, roosting, and breeding habitat, was determined to be five out of ten for the FRTBC representing a 'moderate' score and three out of ten for the CBC representing a 'low' score.

A description of the habitat and the corresponding area is provided in **Table 1** and representative photographs are provided in **Plate 5** to **Plate 8**, in **Section 2.2.1.4**.

#### 2.2.5.3. Vertebrate species of conservation significance

Certain fauna species that are considered to be rare or under threat warrant protection under state and/or federal legislation. At a federal level, fauna species may be listed as 'threatened' pursuant to the EPBC Act. At a state level, fauna species can be classed as 'threatened' under the BC Act. In addition to this, DBCA maintains a list of priority fauna species which, while not considered threatened under the BC Act and therefore not protected directly, elicit some concern over their long-term survival and hence, are considered during state approval processes.

A total of 15 native, three introduced and two conservation significant fauna species were recorded in the site during the on-ground surveying. The conservation significant species recorded were:

- Carnaby's black cockatoo listed as 'endangered' under the EPBC Act
- Quenda, listed as Priority 4 at the state level.

Based on the results of the fauna survey and the camera trap monitoring, these two fauna species of conservation significance were positively identified as utilising the site for some purpose.

*Calyptorhynchus latirostris* (Carnaby's black cockatoo (CBC))

- Approximately 20 CBC were recorded perching in trees during the site assessment on 11 March 2020 within the central portion of the site.
- No signs of foraging or night roosting were recorded or observed, however the native woodland and planted trees and shrubs plant communities support plants known to be suitable foraging habitat for.
- The site contains trees with the potential to provide breeding or roosting habitat for black cockatoos. However, currently there are no suitable hollows in these trees, there were no signs of roosting during the field visits, and there are no records in the BirdLife Australia datasets indicating that black cockatoos roost at the site.
- The site is located outside the CBC's breeding range.

*Isoodon fusciventer* (quenda)

- During the site assessment quenda diggings were found and recorded in the southern portion of the site within dense understorey vegetation within the planted trees and shrubs and riparian habitats.
- The site assessment recorded three habitats within the site that may support up to 15.73 ha of habitat for the quenda: Native Woodland, Riparian (not inundated), planted trees and shrubs (where understory vegetation is present and dense).
- The camera trapping undertaken in April 2021 confirmed the presence of quenda on the site.

In addition, 45 further species of conservation significance have potential to occur on the site. The majority of these are birds which may only use the site intermittently if at all, including forest red-tailed black cockatoo (FRTBC) which are 'likely' to occur due to potential habitat present at the site.

## 2.3. Hydrology

### 2.3.1. Groundwater

Information on the regional groundwater resources obtained from the Department of Water (DoW) Water Register (DoW 2015) indicates that the site is underlain by a multi-layered aquifer system comprised of the following resources:

- Perth - Superficial Swan (unconfined).
- Perth - Leederville (confined).
- Perth - Yarragadee North (confined).

The DWER *Water Information Reporting Tool* (DoW 2015) includes groundwater and surface water monitoring information from bores and wells across the state. The current water table at the northern portion of the site is 18 m below surface level with the base of the aquifer 59 m below surface level. The southern portion of the site has a water table of 4 m below surface level with the base of aquifer 47 m below surface level.

### 2.3.2. Surface water

There are no natural surface water bodies present within the site.

The site does not have a connection to any arterial drainage scheme and all stormwater that is generated on site is infiltrated. Currently the site provides stormwater storage and infiltration areas for adjacent developed areas which drain into the site, including 18 bubble-up pit outlets.

### 2.3.3. Wetlands

Wetlands include "areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries" (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al*. 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017)
- *A Directory of Important Wetlands in Australia* (DBCA 2018a).

No Ramsar or listed 'important wetlands' are located within the site.

The Department of Biodiversity Conservation and Attractions (DBCA) maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2018b), which categorises geomorphic wetland features into specific management categories to guide land use and conservation.

A review of the dataset indicated that no wetlands with conservation values (i.e. Conservation or Resource Enhancement management category) occur within or near the site. There are some Multiple Use management category wetlands in close proximity to the site, but these areas do not support any conservation values and have been partially developed in surrounding areas. The location of these wetlands are shown in **Figure 2**.

### 2.3.4. Public Drinking Water Source Areas

Public Drinking Water Source Areas (PDWSAs) are proclaimed by DWER to protect identified drinking water sources, including surface water and groundwater sources (DoW 2009). They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas. PDWSAs supply drinking water to local populations and can be vulnerable to contamination from a range of land uses. Once an area is identified as a PDWSA, consideration needs to be given to the intended land uses and associated activities within the area, to ensure that they are appropriate in meeting the PDWSA's water protection quality objectives.

Parts of the site are located within a Priority 3 (P3) PDWSA, the '*Jandakot Underground Water Pollution Control Area'* (UWPCA). A review of the *Land use compatibility tables for public drinking water source areas* (DoW 2016) indicates that land zoned for urban purposes is an acceptable use within a P3 PDWSA.

The past use of the site as a Golf Course posed potential risks to transmit nutrients, pesticides and chemicals to the water table (Water Corporation 2006). The historic use of fertilizers on the golf course posed a significant risk as the site is located within the wellhead protection zone of a number of public drinking water supply bores, with the hazard presenting a medium management priority (Water Corporation 2006). The preventative measures that were applied included frequent water quality monitoring, land planning controls, fertilizer and pesticide use controls and the implementation of *State Planning Policy (SPP) 2.3 Jandakot Groundwater Protection* (WAPC 2017a).

## 2.4. Heritage

### 2.4.1. Indigenous heritage

The Aboriginal Heritage Inquiry System (AHIS) is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* by the Department of Planning, Lands and Heritage (DPLH) and contains information on Registered Aboriginal Heritage Sites and Other Heritage Places throughout Western Australia.

In accordance with the *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013), a search of the AHIS online database was undertaken. No Registered Aboriginal Heritage Sites or Other Heritage Places have been identified within the site.

### 2.4.2. Non-Indigenous heritage

A desktop search of the Australian Heritage Database (Department of the Environment 2019), the State Heritage Office database (Heritage Council 2019) and the CoC Local Government Inventory and Heritage List (City of Cockburn 2021) indicated there are no registered heritage sites located within, or in proximity to the site.

## 2.5. Bushfire

Portions of the site are within a 'bushfire prone area' as shown on the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019), see **Plate 9**. Strategic planning proposals, including scheme amendments, require a bushfire hazard level assessment under the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017).




*Plate 9: Bushfire Prone areas.*

A Bushfire Management Plan (BMP) (eco logical Australia 2021) has been prepared to support the TPS amendment. The BMP includes an assessment of vegetation within and surrounding the site to determine applicable bushfire hazards, in accordance with *Australian Standard 3959:2018 Construction of buildings in bushfire-prone areas* (AS 3959), and an assessment of the bushfire protection criteria outlined in the Guidelines.

The majority of the on-site vegetation is proposed to be cleared to enable urban development, which will be set amongst landscaped buffers, managed Public Open Space (POS) and various easements. The BMP concludes that the current on-site vegetation will not be a bushfire hazard issue post-development, since these hazards can be managed through a staged clearing process, adequate separation of future built assets from bushfire classified vegetation, and ongoing fuel management that can be undertaken in and around individual development stages.

On this basis, the BMP considers that the bushfire hazards within and adjacent to the site and the associated bushfire risk is readily manageable through standard management responses and compliance with acceptable solutions outlined in the Guidelines. Therefore, the BMP has determined that TPS amendment is consistent with the aim and objectives of SPP 3.7 and associated guidelines.

## 2.6. Other land use considerations

### 2.6.1. Historic and existing land uses

As discussed in **Section 2.2.1.1**, the central portion of the site has been used as a golf course since the early 1960s, with the remainder of the site undisturbed bushland until residential development and extensions to the golf course commenced in the early 1990s. Based on a review of aerial photography (Landgate 2021), the previous use of the site as a golf course continued uninterrupted since 1995.

### 2.6.2. Potential site contamination

A review of the DWER *Contaminated Sites Database* indicates that the site is not registered as a contaminated site pursuant to the *Contaminated Sites Act 2003*. A 'Remediated for restricted use' site is located adjacent on the south-east portion of the site.

Residual construction and demolition debris may be present across the site at the locations of former buildings. During site investigations by CMW Geosciences, segments of suspected asbestos containing materials (ACM) in the form of fractured cement pipe were found in the upper 0.5 m of soil in three locations in an area along the western boundary of the central precinct adjacent to Hartwell Parade (CMW Geosciences 2021). Such occurrences are not uncommon, being a legacy of the ACM pipework previously used by the Water Corporation, some of which is still actively used for water supply. The proponent will remove this ACM before any development commences.

### 2.6.3. Surrounding land uses

The site is generally located within a developed area with residential development to the west adjacent to the Kwinana Freeway, residential and rural-residential development to the east between the site and Jandakot Airport, and residential areas and industrial development to the south of the

site. Located to the south-east of the site is approximately 36 ha of remnant vegetation which is classified as a 'Rural-water protection zone' under the Metropolitan Region Scheme (MRS).

#### 2.6.3.1. Acoustic Impacts

The central and southern portion of the site is within the predicted Australian Noise Exposure Forecast (ANEF) 20 to 25 contour for Jandakot Airport, see **Figure 2**. The ANEF system is a tool used to illustrate the impact of aircraft noise in an area using visual contours and provides guidance on the acceptability of new development sites within each of the ANEF zones.

A Noise Assessment has been undertaken by Herring Storer Acoustics (Herring Storer Acoustics 2021) to support planning for the proposed redevelopment of the site, and to understand the potential noise impacts on future residential development caused by road traffic (Kwinana Freeway and Berrigan Drive), rail traffic (Yangebup Freight Rail Line and the Thornlie passenger railway line) aircraft associated with Jandakot Airport, and industrial activities to the south of the site, see **Appendix E**.

The noise assessment indicates that quiet house design is likely to be required in some locations in close proximity to Kwinana Freeway and Berigan Drive. The lots in these areas will also require notification on titles. Rail noise from the Yangebup freight rail line and Thornlie passenger rail line was predicted to be within acceptable levels.

Based on the guidance within *SPP 5.3 Land Use Planning in the Vicinity of Jandakot Airport*, the majority of the northern portion of the site is not adversely impacted by aircraft noise. An area of the central and southern portion of the site is within the ANEF 20 to 25 contour. As a consequence, development approvals for future residential development on lots within this area will be conditioned such that the internal noise levels from aircraft noise events are to meet the criteria in AS2021 (*Australian Standard 2021 Acoustics-Aircraft noise intrusion-building siting and construction*). These lots will also require notifications on titles for aircraft noise. In addition, the City of Cockburn's *Local Planning Policy (LPP) 1.12: Noise Attenuation* identifies the site as being within the 'Jandakot Airport Frame Area', and therefore recommends consideration should be given to noise attenuation for noise sensitive premises corresponding to the requirements of the Western Australian Planning Commission publication Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport, and in particular the installation of 6.38mm laminated glazing, for all areas within the Jandakot Frame Area.

# 3. Planning framework and proposal

## 3.1. Proposed Town Planning Scheme Amendment

This EAR has been prepared to provide the proponent with an assessment of the environmental factors identified within the site, to support the lodgement of a local planning scheme amendment request with the City of Cockburn. The proposed scheme amendment will seek to rezone the site to 'Development' under the current City of Cockburn *Town Planning scheme No.3*.

Once the scheme amendment request has been received by the responsible authority, it will be referred to the EPA under Section 48A of the EP Act, prior to being initiated. The EPA will then decide on whether the proposed scheme amendment requires formal assessment. The EPA may also provide informal advice on the proposed scheme amendment without formally assessing the scheme or determine that the proposed amendment is not capable of being environmentally acceptable. The environmental factors and objectives considered by the EPA are discussed further in **section 0**.

## 3.2. Future planning approvals process

### 3.2.1. Local Structure Plans

A Local Structure Plan (LSP) will provide a framework for the provision of future land use, subdivision, and development within the site. It will assist in the coordination and provision of utility networks, transport networks, public open space, urban water management, development standards and other infrastructure development.

The environmental features of the site will be assessed and managed appropriately through the LSP preparation and design process. The process will be documented in an Environmental Assessment and Management Strategy (EAMS).

### 3.2.2. Subdivision and development

Following approval of the LSP, the area within the LSP will be subdivided and developed for urban land uses. The subdivision application process will need to address the requirements of any relevant local scheme provisions or other requirements included within the approved LSP. Once issued, subdivision approval/s would include a range of conditions, some of which may relate to environmental matters, which will need to be implemented as part of the subdivision and development process, before titles for subdivided lots are issued. Other components of development may be progressed through development approval, for example forward bulk earthworks or other non-subdivision works.

It is anticipated that all environmental impacts associated with implementation of urban subdivision and development works across the site will be considered by the EPA, under Section 48A of the EP Act, during its review of the TPS 3 scheme amendment.

## 3.3. Future environmental approvals

### 3.3.1. State process

The clearing of any native vegetation to enable approved subdivision works to proceed is exempt from the need for a Native Vegetation Clearing Permit pursuant to Part V of the EP Act. Any clearing of native vegetation not related to subdivision works will require a permit.

### 3.3.2. Federal process

The site contains foraging habitat for black cockatoos which are listed as Matters of National Environmental Significant (MNES) in accordance with the EPBC Act. Any proposed action which is considered likely to result in a 'significant impact' upon a MNES should be referred to DAWE for a determination as to whether the action requires an EPBC Act approval.

Using the outcomes of the Targeted Black Cockatoo Assessment (Emerge Associates, 2021), a preliminary self-assessment against the *Matters of National Environmental Significance Significant Impact Guidelines* (DotE 2013) was undertaken to determine the likelihood of whether future subdivision or development approval applications will require referral pursuant to the EPBC Act. It was concluded that due the limited extent of foraging habitat and the absence of any trees with suitable breeding hollows on the site, future development is highly unlikely to significantly impact any species of black cockatoo and a referral pursuant to the EPBC Act is presently considered unnecessary.

Once detailed designs have been progressed to the stage that they can support a subdivision or development application, sufficient certainty will be available to confirm the extent of any impact to black cockatoo species. Using this information, the self-assessment in accordance with the *Matters of National Environmental Significance Significant Impact Guidelines* will be reviewed to determine if the confirmed impact extent raises any issues that might alter the current view that any impact to black cockatoo species will not be significant.

# 4. Environmental Factors Considered by the EPA

The EPA identifies a number of environmental principles, factors and objectives within the *Statement of Environmental Principles, Factors and Objectives* (EPA 2018) which are used to guide the determination of significant environmental impacts and whether impacts can be appropriately mitigated or managed. An assessment of the proposed scheme amendment (and subsequent development of the site) against the relevant environmental factors has been provided in **Table 4**, as well as consideration of whether the objective for each factor is likely to be met.

Overall, the consideration of the EPA factors and objectives indicates that the proposed scheme amendment has the potential to result in development outcomes that support the EPA's objectives and provide opportunities for improvements in urban water management.

*Table 4: Summary of EPA environmental factors and objectives relevant to the proposed future land use*

| Environmental factor | EPA objective | Can the proposed future development meet the EPA objective? |
|---|---|---|
| Flora and vegetation | To protect flora and vegetation so that biological diversity and ecological integrity are maintained. | Most of the site is covered by turf and bare ground, and there are no conservation significant plant species or vegetation communities present on the site.<br><br>It is the proponent's intention, subject to the approval of future development plans, to retain as much as possible of the native flora and vegetation on the site, with the urban development predominately focused on the areas of turf and bare ground.<br><br>As part of future construction, a Construction and Environment Management Plan (CEMP) will be prepared to guide the management of the environmental values during work. The CEMP will include measures to ensure that weeds and dieback are not bought into the site, including the washing down of vehicles and bringing in clean fill and mulch.<br><br>As the rezoning of the site to 'Development' will not give rise to significant clearing of native vegetation, this objective can be met. |
| Landforms | To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected. | The site is not known to contain any restricted landforms or unique geological features.<br><br>This objective can be met. |
| Terrestrial environmental quality | To maintain the quality of land and soils so that environmental values are protected. | This objective relates to managing potential contaminants and pathways leading to soil quality being impacted, as well as erosion, ASS and salinity.<br><br>The regional ASS risk mapping indicates that there is no known risk of ASS occurring within 3 m of the natural soil surface. In addition, there are no contaminated sites identified within the site, nor are there any historic land uses which are likely to cause contamination within the site.<br><br>In addition, any risk of land degradation can be mitigated through controls applied during clearing and construction, such as dust suppression, mulching, erosion control etc.<br><br>This objective can be met. |

*Table 4: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)*

| Environmental factor | EPA objective | Can the proposed future development meet the EPA objective? |
|---|---|---|
| Terrestrial fauna | To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. | The majority of the site supports turf, bare ground and infrastructure which provides low habitat values for native fauna. The native woodland habitat provides the highest relative value but, as this habitat extends over a small portion of the site (4%) and occurs as scattered patches, the importance of this habitat to native fauna is limited. The remainder of the site supports planted trees and shrubs which provide varying habitat values depending on plant species and density.<br><br>Two fauna species of conservation significance were recorded within the site: Carnaby's black cockatoo (CBC) (threatened) and quenda (Priority 4). One other threatened species, forest red-tailed black cockatoo (FRTBC), is considered likely to occur in the site. A total of 11 habitat trees were recorded in the site of which none contain hollows suitable for breeding by black cockatoos. Approximately 4.76 ha of CBC and 4.88 ha of FRTBC foraging habitat exists on the site, which was identified as being of low and moderate quality respectively. Potential foraging habitat for CBC and FRTBC is mapped in extensive areas to the south-east and east of the site within a 6 km radius, with both species of black cockatoo likely to prefer these larger patch sizes to the fragmented habitat on the site. Mapped black cockatoo roosting habitat within a 6 km radius of the site supports this proposition.<br><br>It is the proponent's intention, subject to the approval of future development plans, to retain the majority of the conservation significant fauna habitat on the site, with the urban development predominately focused on the areas of turf and bare ground. The creation of public open space areas, planted with a range of native plant species present an opportunity to provide additional fauna habitat and foraging habitat for species of black cockatoos.<br><br>As the rezoning of the site to 'development' will not give rise to the significant clearing of conservation significant fauna habitat, this objective can be met. |
| Inland waters | To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected. | No natural surface water features or wetlands have been identified within or adjacent to the site. Groundwater and surface water (generated as runoff from the proposed and existing carriageways) will be managed in accordance with the endorsed *Better Urban Water Management Framework*, (including Water Sensitive Urban Design principles).<br><br>For water quality treatment and major event management, the stormwater management system will consist of lot soakwells, road drainage pits, piped drainage, overland flows paths, swales and distributed bioretention and flood storage areas within areas of public open space and road reserves. Compared to the maintenance of the golf course, the use of bore water for irrigation will reduced by between 60-70%.<br><br>The adoption of Water Sensitive Urban Design principles and Urban Water Management Plans for any future development means that the existing hydrological regimes at the site can be either maintained or improved upon; therefore, this objective can be met. |
| Air quality | To maintain air quality and minimise emissions so that environmental values are protected. | As the rezoning of the site to 'Development' will not give rise to significant air pollution emissions, therefore this objective can be met. |

*Table 4: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)*

| Environmental factor | EPA objective | Can the proposed future development meet the EPA objective? |
|---|---|---|
| Greenhouse Gas Emissions | To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change. | The proposed urban development of the site will progress in accordance with the requirements of *State Planning Policy 7.0 Design of the Built Environment* (DPLH 2019), which promotes well-designed homes that minimise energy use and in turn the greenhouse gas emissions associated with fossil fuel powered electricity generation.<br><br>The site's location in close proximity to the CBD, and the Cockburn Train station, will enable future residents to reduce their reliance on (fossil fuel powered) car use.<br><br>The proposed future development presents a range of opportunities to reduce greenhouse gas emissions, when compared to traditional housing designs and structure plan layouts; therefore, this objective can be meet. |
| Social Surroundings | To protect social surroundings from significant harm. | This objective is relevant to aesthetic, cultural, economic and/or social values which may be impacted by the proposed land use. The site is located within an urban context and the proposed land use is therefore consistent with the surroundings. There are no significant cultural heritage sites within or adjacent to the site that would be impacted.<br><br>Although the site currently comprises open space, it is in private ownership meaning that public access is not available. The proposed future urban development of the site will incorporate areas of public open space, which while not as expansive, will be accessible at all times and appropriately maintained. As part of the detailed design of the urban form, landscaping treatments will be determined to align with the existing landscape and complement the future urban development.<br><br>As the site is in close proximity to the Kwinana Freeway, Yangebup Freight rail line and Thornlie rail line and Jandakot Airport, future development may be subject to noise from surrounding land uses. The central and southern portions of the site are subject to the predicted Australian Noise Exposure Forecast (ANEF) 20 to 25 contour for Jandakot Airport. Existing industrial development to the southeast and south of the south is not expected to pose significant amenity impacts or concerns. A noise assessment has been undertaken to understand the potential impacts from these sources to the proposed residential development within the site.<br><br>On this basis, the future redevelopment of the site for urban land uses will not significantly the social surrounding; therefore, this objective can be met. |

*Table 4: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)*

| Environmental factor | EPA objective | Can the proposed future development meet the EPA objective? |
|---|---|---|
| Human health | To protect human health from significant harm. | The proposed urban redevelopment of the site presents the opportunity to provide active areas of public open space containing play spaces and exercise equipment, and a network of walking and cycling trails, which will provide healthy life style opportunities to existing local and future residents.<br><br>The only potential risk to human health arising from residential development is the introduction of increased numbers of motor vehicles on the roads within and surrounding the development. The design of the future road network will be compliant with the requirement of the Western Australian government's Liveable Neighbourhoods Policy (WAPC 2009) and supported by Traffic Impact Assessments; meaning that any risks will be managed to acceptable levels.<br><br>Through the provision of open space and the appropriate management of motor vehicle movement this objective can be met. |

# 5. Environmental Assessment and Future Environmental Management Framework

**Table 5** below summarises the environmental values that have been considered for the site and outlines the values that will require further specific consideration as part of the future development of the site, as well as an outline of the future management considerations.

*Table 5: Summary of environmental value, consideration of potential impacts and future management requirements*

| Environmental Value | Relevant Consideration and potential for impact | Applicable Legislation/ policy and/or guidelines | Management considerations/requirements for future development |
|---|---|---|---|
| Acid Sulfate Soils | A review of the DWER mapping indicates that the entire site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of natural soil surface, but 'high to moderate' risk of ASS beyond 3m of the natural soil surface. | • *Environmental Protection Act 1986*<br>• *Acid Sulfate Soils Planning Guidelines* (WAPC 2008a)<br>• *Identification and investigations of acid sulfate soils and acidic landscapes* (DEC 2013)<br>• *SPP2 Environment and Natural Resources Policy (2003)* | As there is appropriate separation to groundwater, and the regional ASS mapping indicates that there is 'moderate to low' risk of encountering ASS within 3 m of the natural soil surface, ASS is not considered to pose a significant constraint to the proposed urban development of the site. Nevertheless, any future ASS considerations can be identified and suitably managed as part of the future construction in accordance with the WAPC's *Acid Sulfate Soils Planning Guidelines* (2008). |
| Flora and vegetation | Native vegetation located within the site is mapped in varying condition with the vast majority in a 'completely degraded' condition. Approximately 0.67 ha of the vegetation was classified to be in 'very good-good' condition.<br><br>No threatened flora species and no TECs or PECs were identified within the site. | • *Environmental Protection and Biodiversity Conservation Act 1999*<br>• *Environmental Protection Act 1986*<br>• *Biodiversity Conservation Act 2016*<br>• *SPP2 Environment and Natural Resources Policy (2003)* | Where it is possible, retain vegetation, this will be determined as part of the future detailed planning of the proposed public open space areas. The **EmB** vegetation community was identified to hold the best value and will be considered for retention where possible.<br><br>It is considered that future development is highly unlikely to significantly impact any MNES. As such, it is presently not anticipated that a referral pursuant to the EPBC Act will be required. This issue will be reviewed as the detailed designs for the site evolve.<br><br>As part of future construction, a CEMP will be prepared, which will identify areas within the site that may be retained as future development progresses. |

*Table 5: Summary of environmental value, consideration of potential impacts and future management requirements (continued)*

| Environmental Value | Relevant Consideration and potential for impact | Applicable Legislation/ policy and/or guidelines | Management considerations/requirements for future development |
|---|---|---|---|
| Terrestrial Fauna | Two conservation significant fauna species have been identified within the site, the Carnaby's black cockatoo (CBC) and quenda. In addition, it is possible that the forest red-tailed black cockatoo (FRTBC) may utilise the site. Approximately 4.76 ha of vegetation within the site was identified as potential CBC foraging habitat, and approximately 4.88 ha as foraging habitat for FRTBC. A total of 11 black cockatoo breeding habitat trees were identified within the site, none contained hollows suitable for black cockatoo breeding.<br><br>There was no evidence of breeding or roosting recorded at any trees within the site at the time of the survey, and the foraging habitat within the site is limited compared to the larger extent of foraging habitat within the broader area, including Bibra Lake Reserve less than 2 km north-west of the site. It is highly unlikely that the proposed urban development will have a significant impact on the black cockatoo species.<br><br>Quenda were recorded on the site, however most of the **planted trees and shrubs** community does not provide favourable habitat for quenda, lacking the dense understorey vegetation and cover that the species refers. It is likely that the proposed urban development and associated public open space areas will provide suitable habitat for this species in the long term.<br><br>The urban redevelopment of the site will occur in stages over several years, meaning that the removal of existing habitat used by the quenda will not occur all at once. Over time it is likely that the majority of the quenda population existing on the site will migrate to more suitable habitat in surrounding remnant bushland. As such it is unlikely that the proposed development will have an adverse impact on the quenda population. | • *Environmental Protection and Biodiversity Conservation Act 1999*<br>• *Environmental Protection Act 1986*<br>• *Biodiversity Conservation Act 2016*<br>• *Local Biodiversity Plan 2018/19 – 2023/24* (CoW 2018)<br>• *SPP2 Environment and Natural Resources Policy (2003)* | Given the fragmented nature of existing native vegetation within the site, it is considered unlikely that the site would contain any habitat critical to the survival of any terrestrial fauna species or any species of conservation significance.<br><br>Where possible, trees will be retained as part of construction, with tree retention opportunities identified as part of the detailed design phase. Where trees are to be retained, these will be detailed within the CEMP. If trees to be removed contain a hollow, these will be inspected for use by cockatoos and other fauna prior to clearing occurring.<br><br>Native plant species will be preferred for the planting of the proposed public open space areas and green spaces, which will provide native fauna habitat.<br><br>It is considered that future development is highly unlikely to significantly impact any MNES. As such, it is presently not anticipated that a referral pursuant to the EPBC Act will be required. This issue will be reviewed as the detailed designs for the site evolve.<br><br>As part of future construction, a CEMP will be prepared, which will identify necessary measures to avoid impacts on fauna during construction activities as future development progresses. |

*Table 5: Summary of environmental value, consideration of potential impacts and future management requirements (continued)*

| Environmental Value | Relevant Consideration and potential for impact | Applicable Legislation/ policy and/or guidelines | Management considerations/requirements for future development |
|---|---|---|---|
| Groundwater | The current water table at the northern portion of the site is 18 m from surface level with the base of the aquifer 59 m below surface level. The southern portion of the site has a water table of 4 m from surface level with the base of aquifer 47 m below surface level.<br><br>The site is located within a P3 PDWSA, however as identified in the *Land use compatibility tables for public drinking water source areas* (DoW 2016), urban development is an acceptable use within a P3 PDWSA. | • *State Planning Policy 2.3 Jandakot Groundwater Protection (WAPC 2017b)*<br>• *State Planning Policy 2.7 Public Drinking Water Source Policy* (WAPC 2003)<br>• *State Planning Policy 2.9 Water Resources (WAPC 2006)*<br>• *Better Urban Water Management Framework* (WAPC 2008b)<br>• *Water quality protection note 36 – Protection public drinking water source areas* (DoW 2009) | It is unlikely that provision of appropriate separation distance between surface levels and groundwater will require further consideration within the site.<br><br>Groundwater and surface water runoff will be managed in accordance with the endorsed *Better Urban Water Management Framework* (BUWMF) and will aid the Local Water Management Strategy for the site.<br><br>All future stages of planning are to be consistent with the BUWMF including Urban Water Management Plans. |
| Surface water | Regional hydrography mapping does not identify any natural surface water features specifically within or adjacent to the site. | • *State Planning Policy 2.9 Water Resources* (WAPC 2006)<br>• *Better Urban Water Management Framework* (WAPC 2008b) | Surface water runoff will be managed in accordance with the *Better Urban Water Management Framework*, which includes maintenance of the post-development environment in accordance with the pre-development environment. This will ensure that the proposed urban development does not impact on surrounding environmental values.<br><br>The location of surface water treatment areas can be determined as part of the detailed design of the urban development; however, they will comprise drainage swales and sumps located within road reserves and areas of public open space. |

*Table 5: Summary of environmental value, consideration of potential impacts and future management requirements (continued)*

| Environmental Value | Relevant Consideration and potential for impact | Applicable Legislation/ policy and/or guidelines | Management considerations/requirements for future development |
|---|---|---|---|
| Aboriginal Heritage | No Registered Aboriginal Heritage Sites were identified within the site. | • *Aboriginal Heritage Act 1972* | Under the AH Act, all Aboriginal sites are protected whether they are known or not. As part of ground disturbing activities, if Aboriginal artefacts or sites (not previously identified) are uncovered, works will cease, and a suitably qualified expert will survey the potential site. Based on the outcome of the survey, additional consent pursuant to the AH Act may be required to manage and disturb the site. |
| Bushfire | The site is located within an identified 'bushfire prone area' (OBRM 2019). Therefore, the bushfire risk for the proposed scheme amendment was assessed through a bushfire management plan to demonstrate that the proposed land use can comply with the aim of SPP 3.7, and the bushfire compliance criteria as outlined in the Guidelines. | • *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)<br>• *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017) | Further bushfire management plans with be prepared to support the future planning stages e.g. LSP and subdivision. |

| Environmental Value | Relevant Consideration and potential for impact | Applicable Legislation/ policy and/or guidelines | Management considerations/requirements for future development |
|---|---|---|---|
| Surrounding Land Uses | The site is generally located within a developed area with dense urban residential development to the west, adjacent to the Kwinana Freeway, scattered residential development to the east between the site and Jandakot Airport and industrial development to the south of the site past Berrigan Drive and Jandakot Road. Located to the south-east of the site are approximately 36 ha of remnant native vegetation, which is classified as a 'rural-water protection zone' under the Metropolitan Region Scheme. This remnant native vegetation will be available to accommodate any native fauna, e.g. quenda, that migrate from the site during its staged urban redevelopment.<br><br>Due to the close proximity of the site to Jandakot Airport, the central and southern portions of the site are within the ANEF 20 to 25 contours for Jandakot Airport. Kwinana Freeway is adjacent to the site, and the noise assessment identified two areas within the site which exceed the 55 dB(A) target based on future traffic flows on the freeway.<br><br>There are existing and potentially additional industrial land uses situated to the south of the site. | • *Environmental Protection (Noise) Regulations 1997* | It is unlikely that any noise emissions resulting from a change in land use/rezoning will be significant and any potential emissions during the staged redevelopment can be managed throughout the CEMP.<br><br>Potential dust emissions throughout the staged redevelopment can be appropriately managed through typical dust suppression measures such as, limiting the size and number of stockpiles and the regular wetting of construction areas. Dust management can be addressed through the preparation of a CEMP.<br><br>The exceedance of the road traffic noise target is marginal and will not require any noise mitigation measures. The impact of aircraft noise can be managed through adherence to the requirements of AS2021. Furthermore, future residents will be made aware of noise impacts through notifications on the titles of potential affected lots.<br><br>Existing residential dwellings situated along the southern side of Imlah Court provide an existing threshold for noise emission compliance from industrial activities to the south. The accommodation of additional noise mitigation to respond to aircraft noise will further mitigate any noise emissions, as will opportunities for other interface treatments, such as solid fencing etc. |

# 6. Implementation Framework

A summary of how the proposed development responds to the environmental values and attributes discussed in **section 0** has been provided in **Table 6**. This table also outlines the proposed future management required as part of the construction process.

*Table 6: Environmental management framework implementation table*

| Factor | Scheme amendment | Design phase |
|---|---|---|
| Acid sulfate soils | Review ASS risk mapping published by DWER. | Completion of ASS self-assessment for and preparation of an Acid Sulfate Soil and Dewatering Management Plan, if required. |
| Native vegetation | Assessment of flora and vegetation values. | Consideration of a combination of potential mitigation measures during the detailed design stage including revegetation of temporarily cleared areas and retention of good or better vegetation and priority species where possible.<br>If clearing is not exempt, application for a Native Vegetation Clearing Permit in accordance with Part V of the EP Act.<br>Inclusion of measures for flora and vegetation management within the CEMP. |
| Native fauna | Assessment of fauna values. | Preparation of the CEMP to minimise impacts to fauna, particularly black cockatoo species and quenda.<br>Reconsideration of requirement for an EPBC Act referral in relation to black cockatoo species.<br>Consideration of a combination of potential mitigation measures during the detailed design stage including revegetation of temporarily cleared areas and retention of CBC foraging and quenda habitat where possible.<br>Inclusion of measures for fauna management within the CEMP. |
| Hydrology | Review existing surface and groundwater data published by DWER. | Consideration of the *Better Urban Water Management* framework (including Water Sensitive Urban Design principles) as part of construction, through the preparation of a CEMP. |
| Surrounding land uses | Identification of sensitive land uses | Inclusion of measures for dust suppression within the CEMP.<br>Adoption of noise mitigation in built form to address noise associated with aircraft and other potential noise sources. |

# 7. Summary and Conclusions

This EAR has been prepared on behalf of ECP Acquisitions 6 Pty Ltd, to support an amendment to the City of Cockburn Town Planning Scheme No.3 to rezone the site to 'Development'. Based on an assessment against the EPA's *Statement of Principles, Factors and Objectives*, the proposed scheme amendment is unlikely to result in a change in land use that would lead to future significant impacts on environmental attributes or values, or nearby land uses. The consideration of the EPA factors and objectives indicates that the proposed scheme amendment is likely to result in development that will provide opportunities to improve the site's previous water management regime through a 60-70% reduction in bore water use and reduce greenhouse gas emissions.

The proposed urban development of the former golf course will be suitably assessed and managed through the following management framework, in accordance with relevant federal, state and local government legislation policies, guidelines and best management practices:

- Native Vegetation: The development of the site will proceed in accordance with the conditions of approved subdivisions, meaning that clearing of native vegetation will be exempt from the need for a Native Vegetation Clearing Permit pursuant to Part V of the EP Act. However, any clearing of vegetation that is not part of the subdivision approval will require a clearing permit. Any trees identified for retention during the design process will need to be appropriately managed during construction. The clearing of any vegetation within the site will not require a referral pursuant to the EPBC Act, as there would be no significant impacts to any Matters of National Environmental Significance.
- Native Fauna: Areas of CBC and FRTBC foraging habitat and breeding habitat trees will be retained and suitably protected and managed during the stages of construction works. Likewise quenda habitat, to ensure conditions conducive to the continued presence of this species on the site post development. As no significant impacts to any MNES are presently anticipated, there is no requirement for a referral pursuant to the EPBC Act.
- Hydrology: While there are no natural surface water features or wetlands within the site, stormwater and groundwater management requirements (i.e. detention of run-off) will need to occur in accordance with the *Better Urban Water Management Framework*, to ensure that the hydrological regime of the site and surrounding area is not adversely impacted. It is expected that urban development within the site will have positive impacts on groundwater and stormwater quality taking into consideration the previous land use of the site.
- Noise: Mitigation will be required to address road noise and also aircraft noise in accordance with Australian Standard AS 2021:2015 Acoustics - Aircraft Noise Intrusion and the City of Cockburn's *Local Planning Policy 1.12 Noise Attenuation*. This, combined with possible interface treatments on the northern side of Imlah Court and western side of Princep Road would mitigate any noise emissions from existing industrial uses, and can be resolved through structure planning and future subdivision.
- Bushfire: A bushfire hazard level assessment has been undertaken as part of the Bushfire Management Plan (BMP) prepared to support the scheme amendment. The BMP has not identified any bushfire hazards that would render the site unsuitable for urban development.

Further detailed bushfire risk assessments and BMPs will be required to support structure planning, subdivision or development stages.

Overall, the environmental attributes and values of the site can be accommodated through the future detailed design stages, with the proposed scheme amendment compliant with the management objective for each of the EPA's environmental factors.

# 8. References

## 8.1. General references

The references listed below have been considered as part of preparing this document.

Beard, J. S. 1990, *Plant Life of Western Australia*, Kangaroo Press Pty Ltd., Kenthurst, N.S.W.

Churchward, H. M. and McArthur, W. M. 1980, *'Landforms and Soils of the Darling System, Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Department of Conservation and Environment.

CMW Geosciences 2021, *Proposed Residential Subdivision Glen Iris Golf Course, Jandakot, WA Geotechnical Investigation Report* PER2020-0452AB, Version 1.

City of Wanneroo (CoW) 2018, *Local Biodiversity Plan 2018/19 - 2023/2024*, Wanneroo.

Department of Aboriginal Affairs (DAA) 2013, *Aboriginal Heritage Due Diligence Guidelines (Version 3.0)*, Department of Aboriginal Affairs, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017, *Ramsar Sites (DBCA-010)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018a, *Directory of Important Wetlands in Australia - Western Australia (DBCA-045)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018b, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Environment and Energy (DoEE) 2016, *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*, Canberra.

Department of the Environment (DotE) 2013, *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*, Canberra.

Department of Water (DoW) 2008, *LiDAR Elevation Dataset, Swan Coastal Plain*, Perth.

Department of Water (DoW) 2009, *Protecting public drinking water source areas*, Government of Western Australia, Perth.

Department of Water (DoW) 2016, *Water quality protection note no. 25: land use compatiblity tables for public drinking water source areas*, Perth.

Department of Sustainability Environment Water Populations and Communities (DSEWPaC) 2012, *EPBC Act referral guidelines for three threatened black cockatoo species*, Commonwealth of Australia, Canberra.

eco logical Australia 2021, *Bushfire Management Plan: Scheme Amendment: Glen Iris* 20PER-15185, Version 1.

Emerge Associates 2020, *Detailed Flora and Vegetation Assessment - Breakwater Drive Duplication, Two Rocks*, EP19-095(04)--006C RAW, Version C.

Environment Australia 2000, *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 - Summary Report*, Department of Environment and Heritage.

Environmental Protection Authority (EPA) 2008, *Guidance Statement No. 33. Environmental Guidance for Planning and Development*, Perth.

Environmental Protection Authority (EPA) 2016a, *Technical Guidance - Terrestrial Fauna Surveys*, Perth.

Environmental Protection Authority (EPA) 2016b, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.

Environmental Protection Authority (EPA) 2018, *Statement of Environmental Principles, Factors and Objectives*, Perth.

Government of WA 2000, *Bush Forever - Volume 1: Policies, principles and processes*, Perth.

Heddle, E. M., Loneragan, O. W. and Havel, J. J. 1980, *'Vegetation Complexes of the Darling System Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Perth.

Herring Storer Acoustics 2021, *Acoustic Assessment Glen Iris Golf Course* 27789-1-20325, Version 1.

Hill, A. L., Semeniuk, C. A., Semeniuk, V. and Del Marco, A. 1996, *Wetlands of the Swan Coastal Plain: Volume 2A - Wetland Mapping, Classification and Evaluation*, Water and Rivers Commission and the Department of Environmental Protection, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Purdie, B., Tille, P. and Schoknecht, N. 2004, *Soil-landscape mapping in south-Western Australia: an overview of methodology and outputs. Resource Management Technical Report 280*, State of Western Australia.

Threatened Species Scientific Committee (TSSC) 2016, *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*.

Western Australian Local Government Association and Perth Biodiversity Project (WALGA and PBP) 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, Perth.

Western Australian Planning Commission (WAPC) 2003, *State Planning Policy No 2.7: Public Drinking Water Source Policy*, Perth.

Western Australian Planning Commission (WAPC) 2006, *State Planning Policy 2.9: Water Resources*, Gazetted in December 2006, Perth.

W. A. P. Commission (WAPC) 2008a, *Acid Sulfate Soils Planning Guidelines*, Perth.

Western Australian Planning Commission (WAPC) 2008b, *Better Urban Water Management*, Perth.

Western Australian Planning Commission (WAPC) 2009, *Liveable Neighbourhoods (Edition 4)*, Western Australian Planning Commission and Department for Planning and Infrastructure, Perth.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth.

W. A. P. Commission (WAPC) 2017a, *IPWEA Local Government Guidelines for Subdivisional Development 2.3*, Perth.

Western Australia Planning Commission (WAPC) 2017b, *State Planning Policy 2.3 Jandakot Groundwater Protection*.

Western Australian Planning Commission and Department of Fire and Emergency Services (WAPC and DFES) 2017, *Guidelines for Planning in Bushfire Prone Areas Version 1.3*, Western Australia. December 2017.

Water Corporation 2006, *Jandakot Underground Water Pollution Control Area Drinking Water Source Protection Review* Perth.

Western Australian Museum 2019, *WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia*, Perth, Western Australia.

Wetlands Advisory Committee 1977, *The status of reserves in System Six*, Environmental Protection Authority, Perth.

## 8.2. Online references

City of Cockburn 2021, *Inventory and Heritage List,* viewed 26 March 2021, https://www.cockburn.wa.gov.au/Building-Planning-and-Roads/Heritage/Inventory-and-Heritage-List

Department of Planning, Lands and Heritage (DPLH) 2017, *Aboriginal Heritage Enquiry System*, viewed March 2021, https://maps.daa.wa.gov.au/AHIS/.

Department of Water Environment Regulation (DWER) 2018a, *Contaminated Sites Database*, viewed March 2021, https://dow.maps.arcgis.com/apps/webappviewer/index.html?id=c2ecb74291ae4da2ac32c441819c6d47.

Department of Water and Environmental Regulation (DWER) 2018b, *Perth Groundwater Map,* viewed March 2021, https://maps.water.wa.gov.au/#/webmap/gwm.

Department of Water and Environmental Regulation (DWER) 2018c, *ASS Risk Maps,* viewed on March 24, 2021, https://gmapgis.com/acid_sulfate_soils_risk_map_western_australia.htm.

Dieback Working Group Inc (2020) *About Dieback – Diagnosis,* viewed 20/03/2020, https://www.dwg.org.au/about-dieback/diagnosis/

Office of Bushfire Risk management (OBRM) 2019, *Map of Bush Fire Prone Areas*, viewed November 2019, https://maps.slip.wa.gov.au/landgate/bushfireprone/

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# Figures

*Figure 1: Site Location*

*Figure 2: Environmental Features*

*Figure 3: Plant Communities*

*Figure 4: Vegetation Condition*

*Figure 5: Fauna Habitat*

*Figure 6: Black Cockatoo Habitat Trees*

*Figure 7: Potential Carnaby'sBlack Cockatoo Foraging Habitat*

*Figure 8: Potential Forest Red-tailed Black Cockatoo Foraging Habitat*




**Figure 1: Site Location**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(08)--F29

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/04/2021 |
| Checked: | PPS |
| Approved: | ALB |
| Date: | 04/06/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

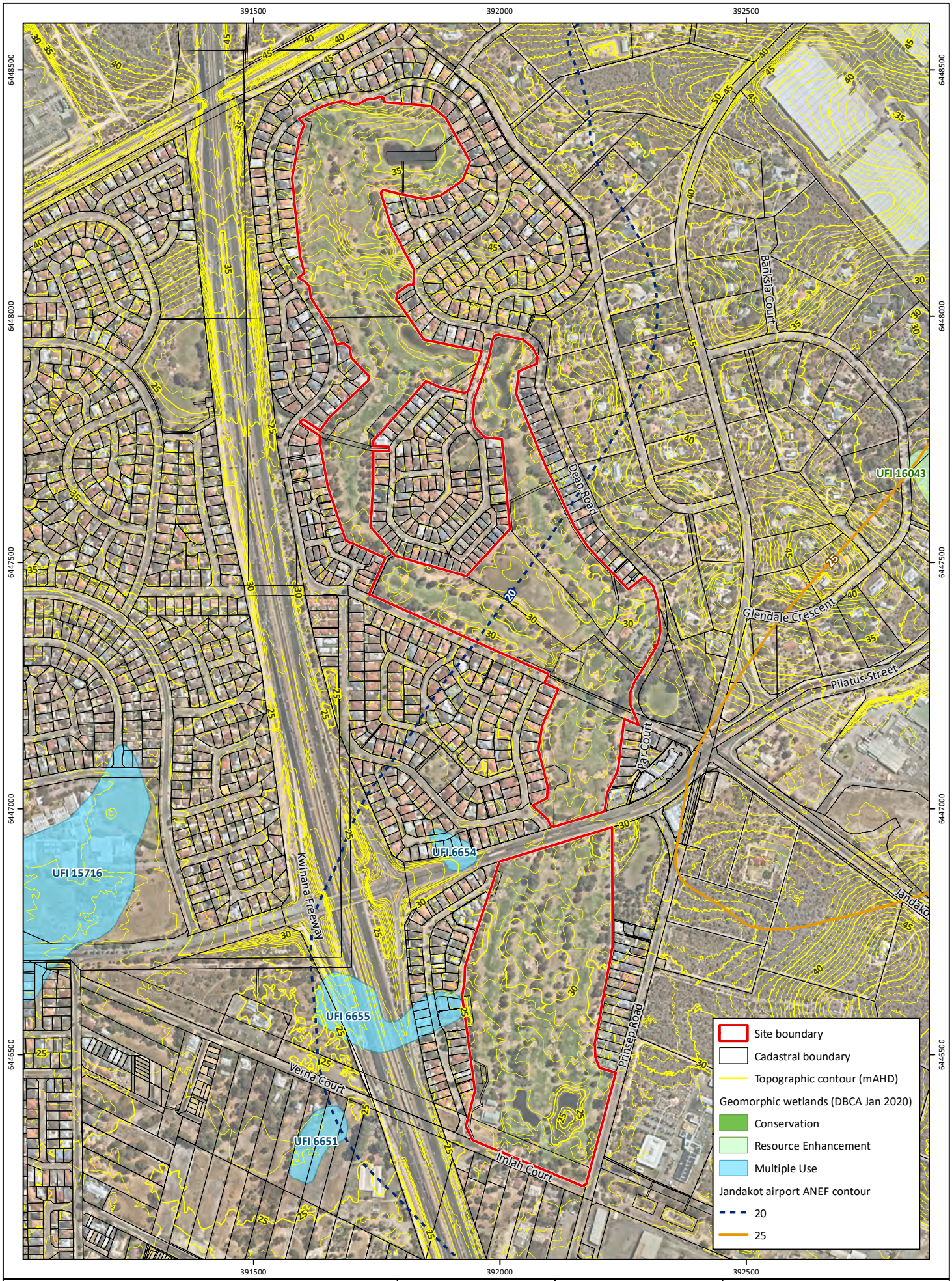



**Figure 2: Environmental Features**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(08)--F30

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/04/2021 |
| Checked: | PPS |
| Approved: | ALB |
| Date: | 04/06/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

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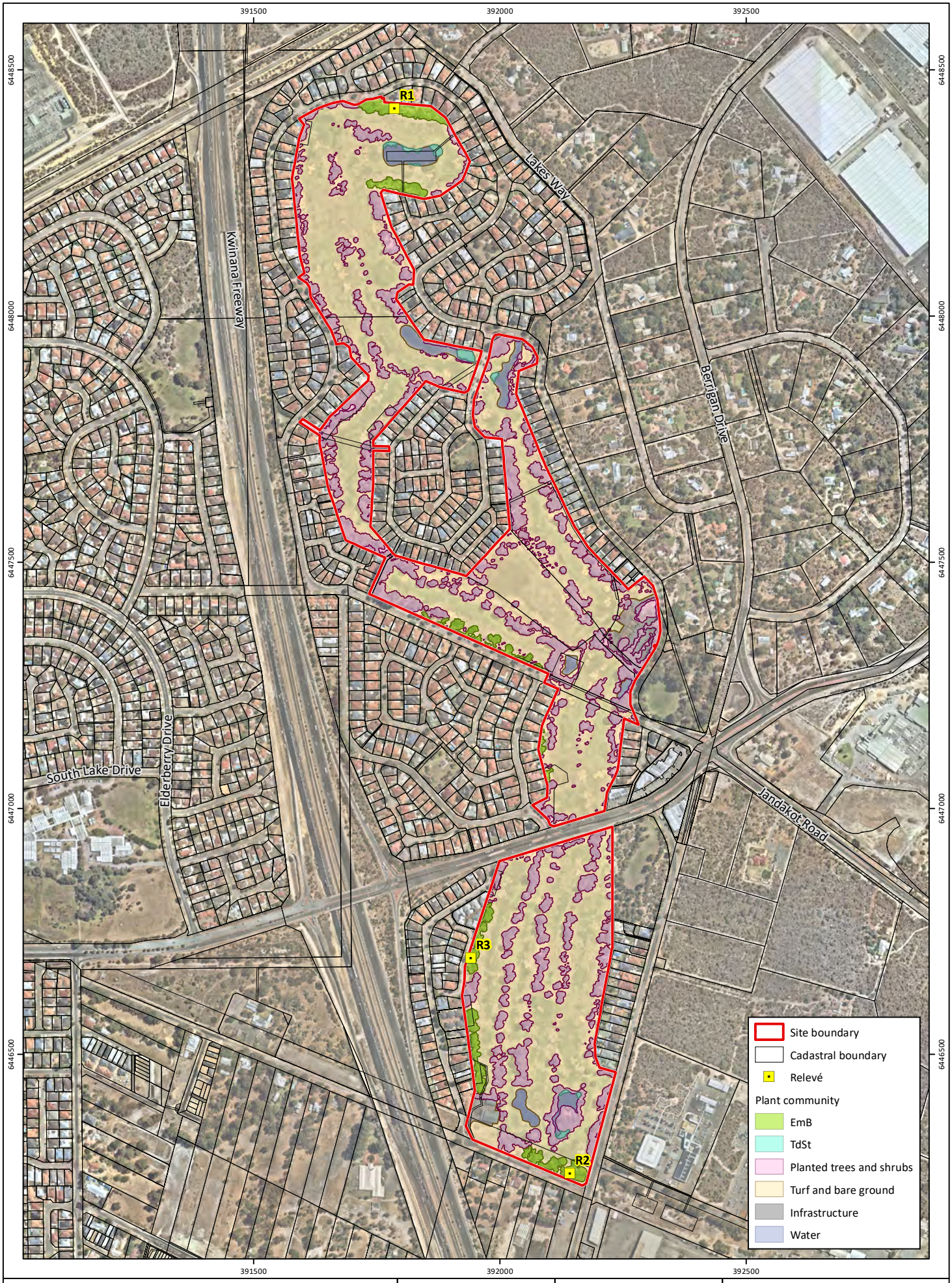



**Figure 3: Plant Communities**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(08)--F31a**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 17/09/2021 |
| Checked: | JDH |
| Approved: | JDH |
| Date: | 17/09/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

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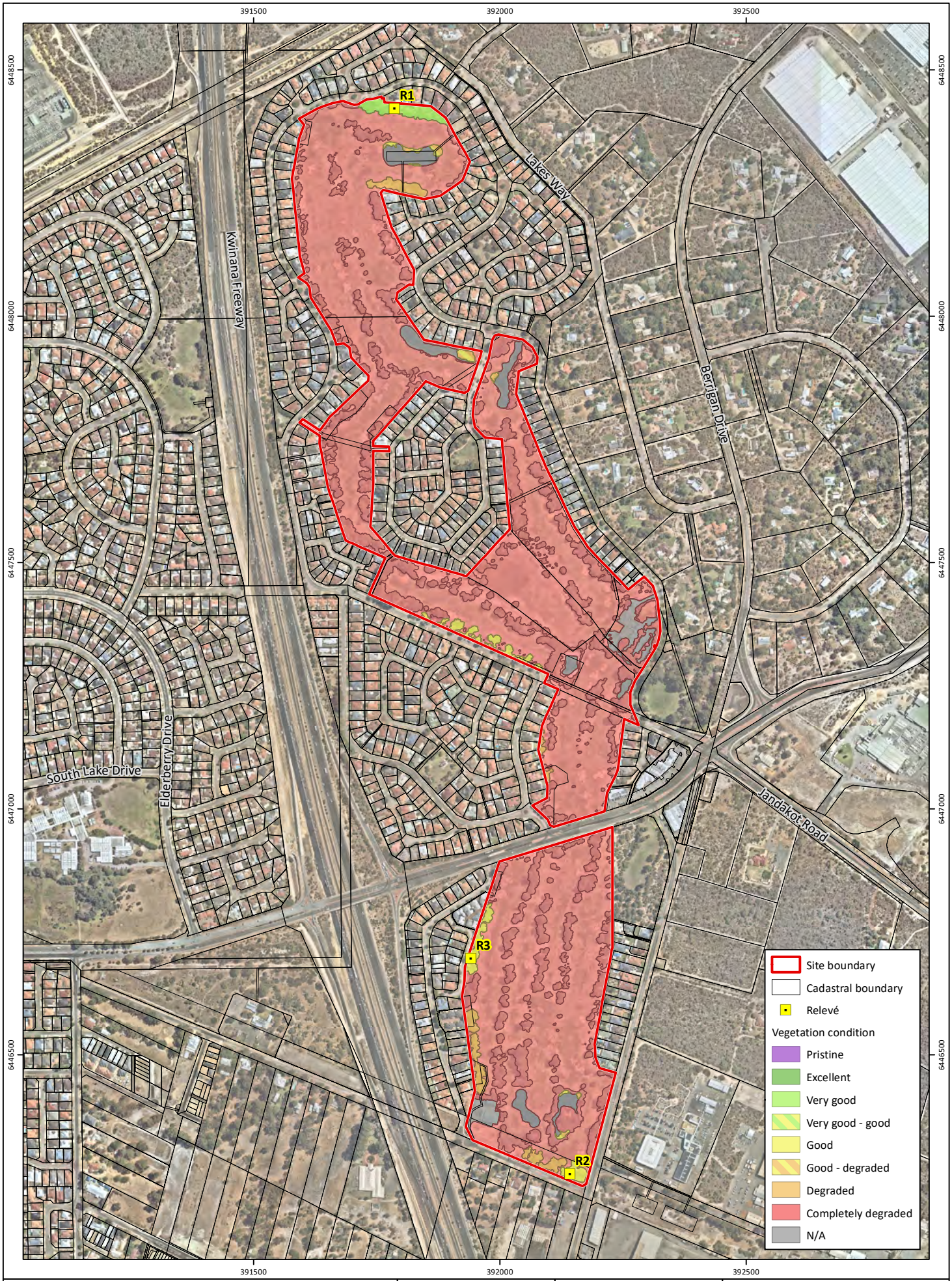



**Figure 4: Vegetation Condition**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(08)--F32a**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 17/09/2021 |
| Checked: | JDH |
| Approved: | JDH |
| Date: | 17/09/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

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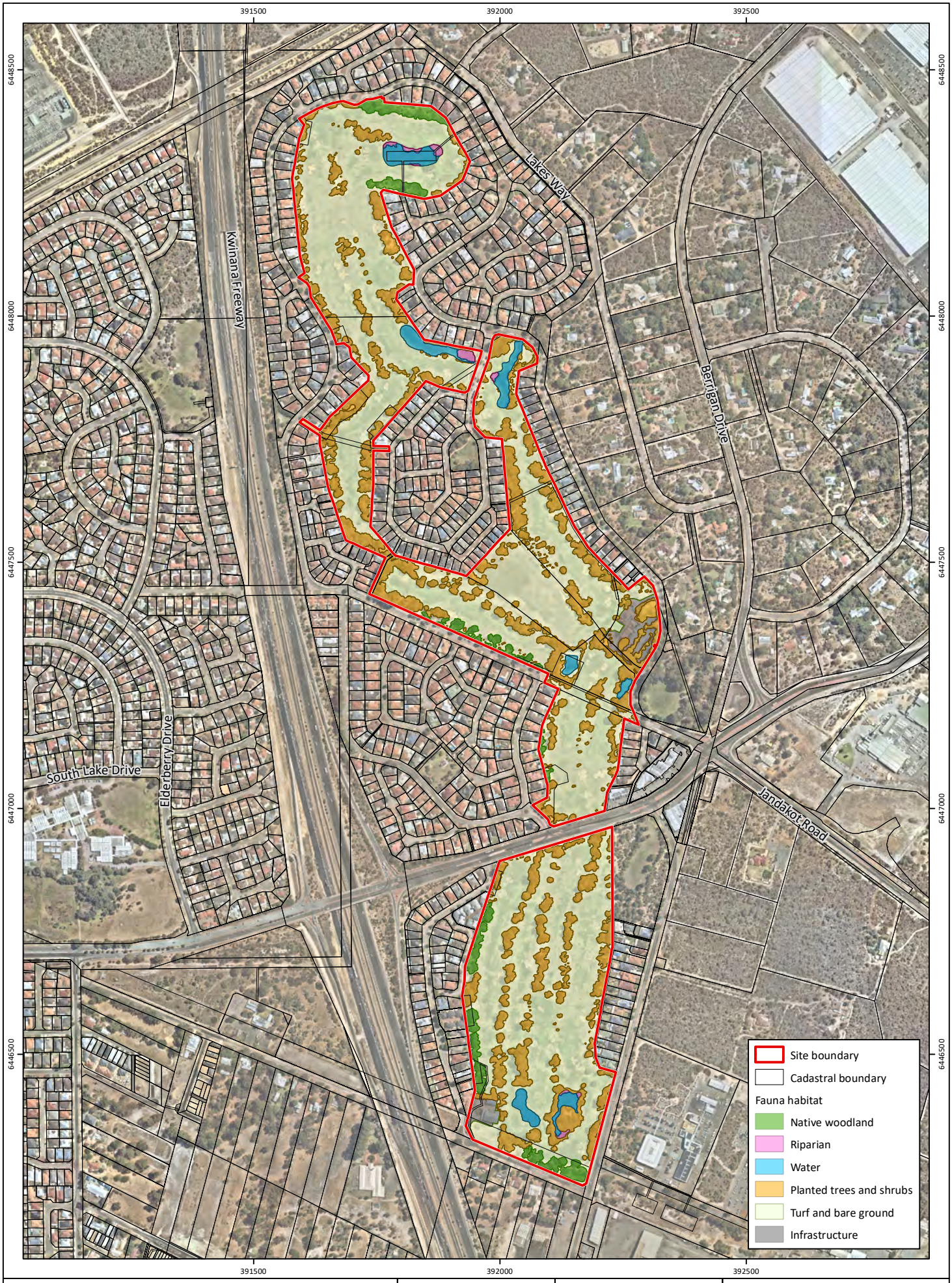



**Figure 5: Fauna Habitat**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(08)--F34**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/04/2021 |
| Checked: | PPS |
| Approved: | ALB |
| Date: | 04/06/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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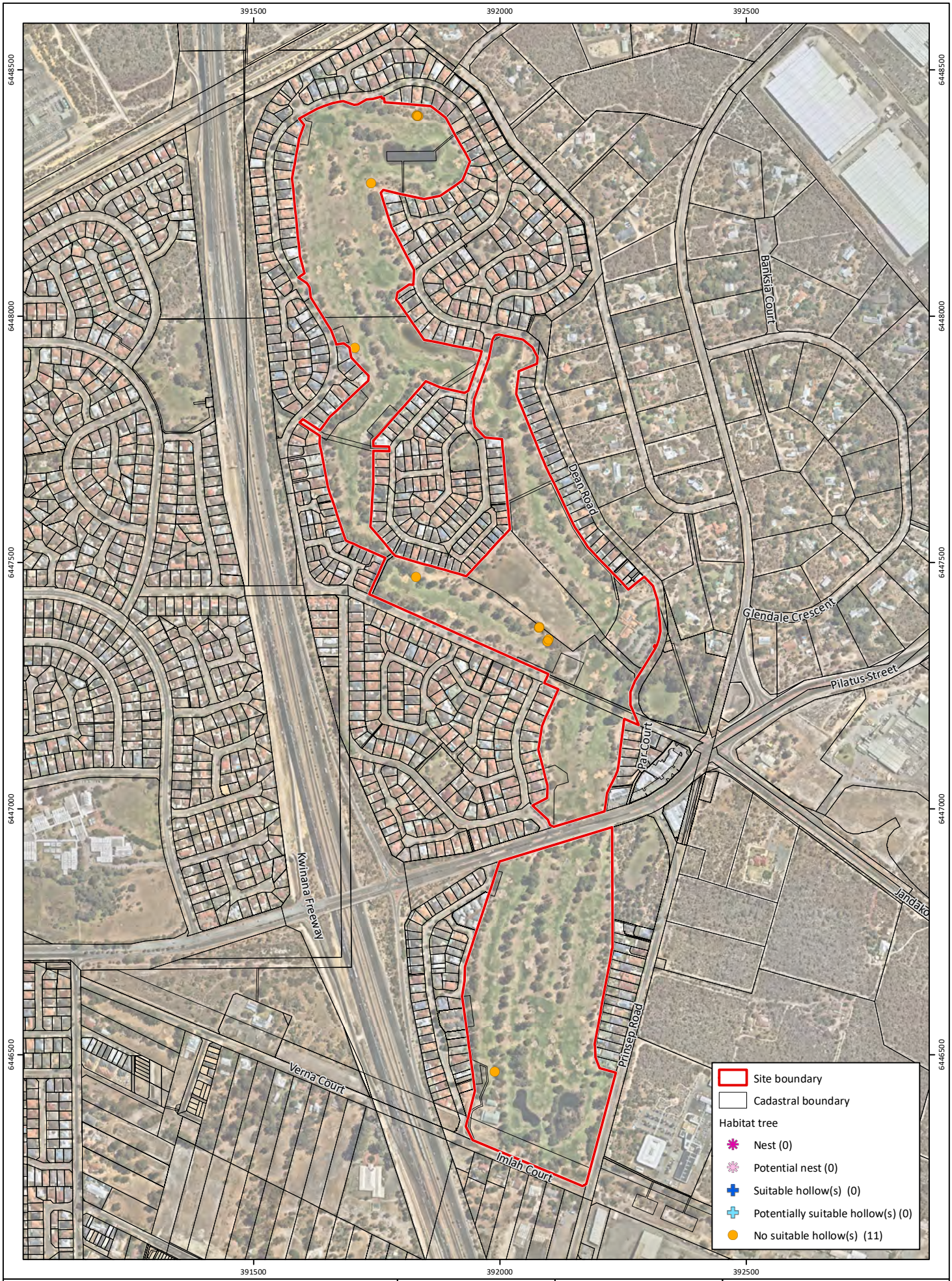



**Figure 6: Black Cockatoo Habitat Trees**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(08)--F35**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/04/2021 |
| Checked: | PPS |
| Approved: | ALB |
| Date: | 04/06/2021 |

N

0 100 200 300
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

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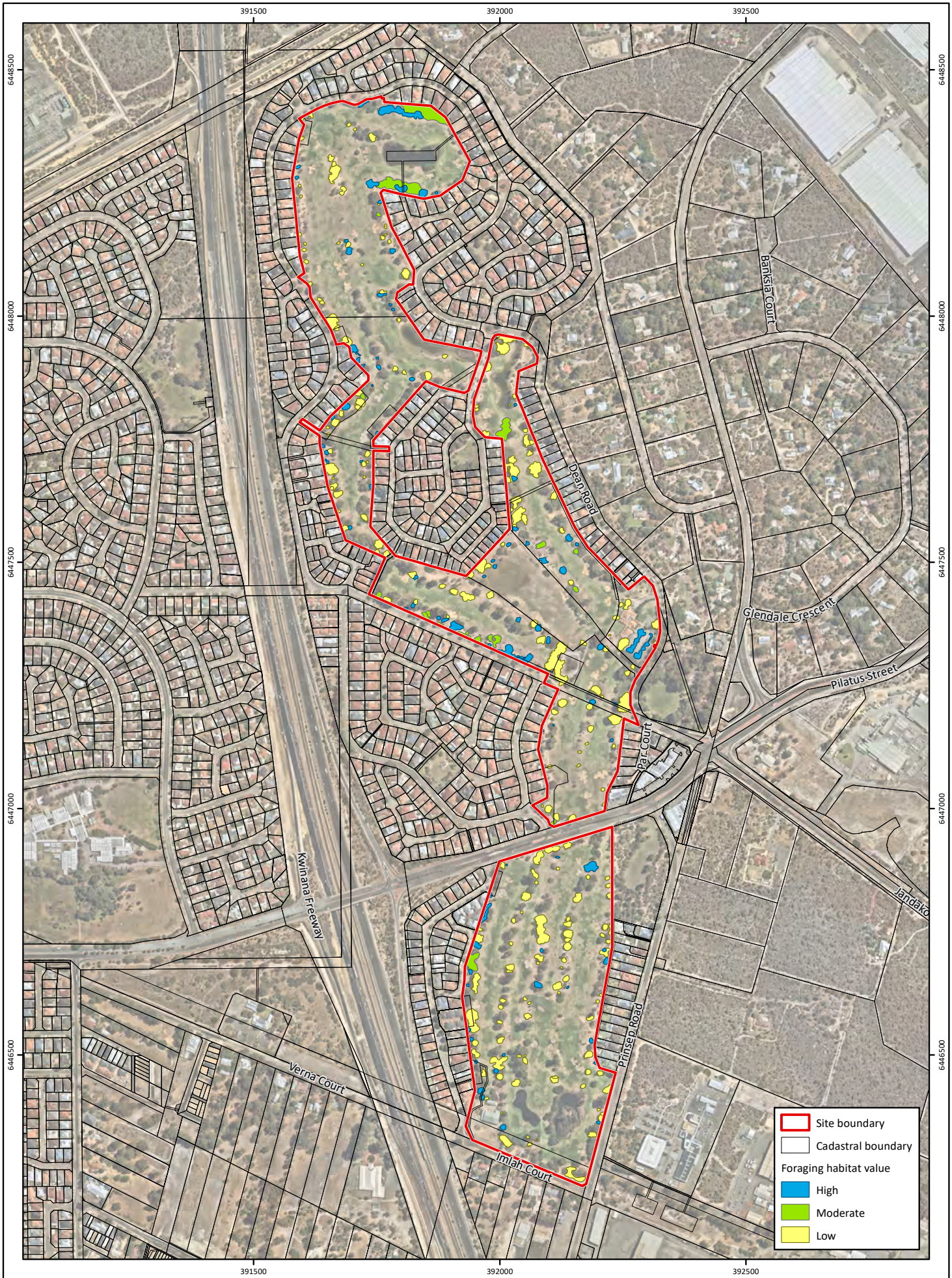



**Figure 7: Potential Carnaby's Cockatoo Foraging Habitat**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(08)--F36a

| | |
|---|---|
| Drawn: | GAR |
| Date: | 22/06/2021 |
| Checked: | PPS |
| Approved: | ALB |
| Date: | 22/06/2021 |

N

0 100 200 300
Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

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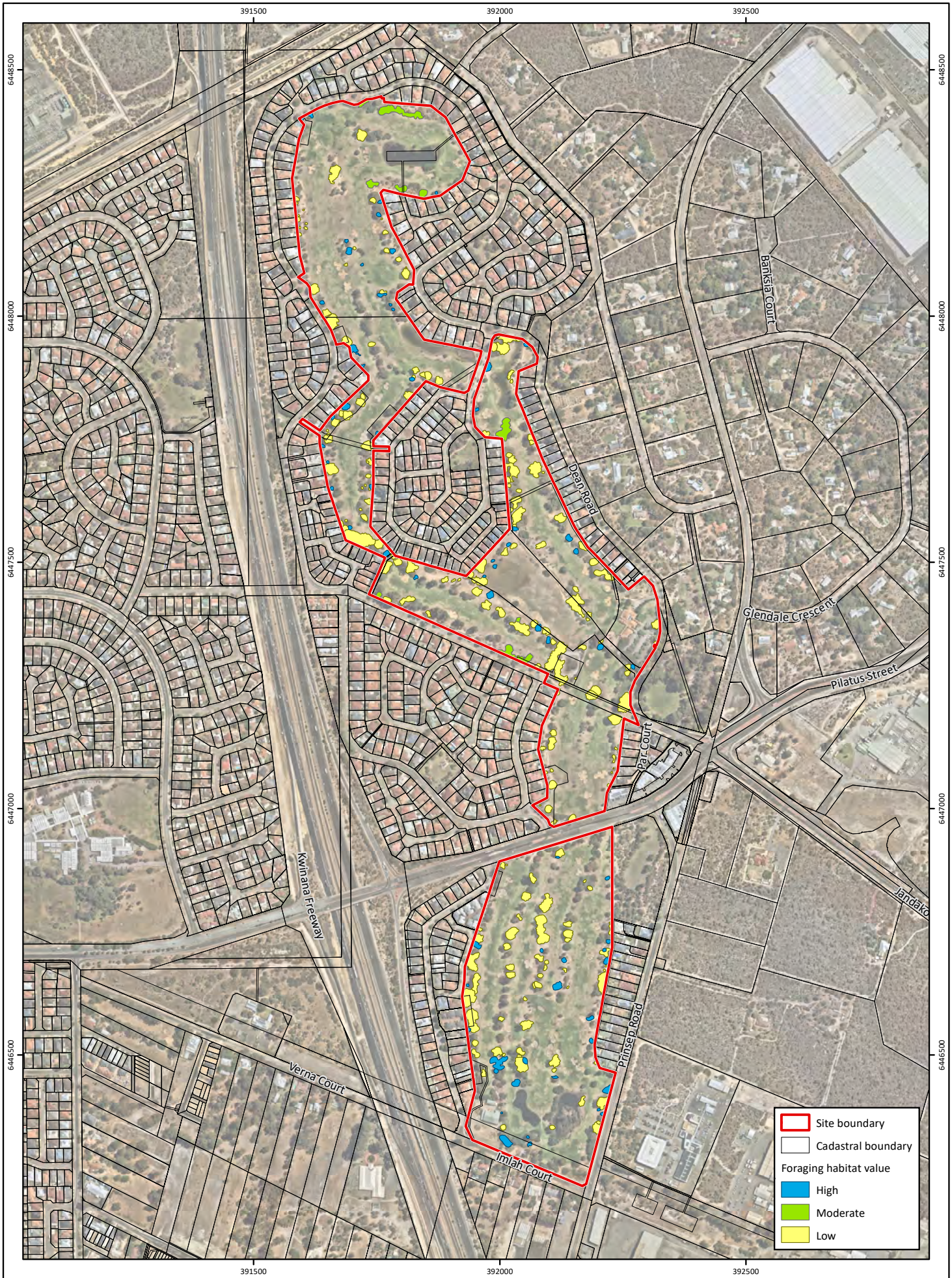



**Figure 8:** **Potential Forest Red-tailed Black Cockatoo Foraging Habitat**

**Project:** Environmental Assessment Report
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(08)--F37a

| | | |
|---|---|---|
| Drawn: | GAR | |
| Date: | 22/06/2021 | |
| Checked: | PPS | |
| Approved: | ALB | |
| Date: | 22/06/2021 | |

N

0 100 200 300

Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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# Appendix A

Detailed Flora and Vegetation Assessment

# Detailed Flora and Vegetation Assessment

## Former Glen Iris Golf Course

Project No: EP20-009(03)

**Prepared for ECP Acquisitions 6 Pty Ltd**
**October 2021**



# Document Control

| Doc name: | Detailed Flora and Vegetation Assessment<br>Former Glen Iris Golf Course | | | | |
|---|---|---|---|---|---|
| Doc no.: | EP20-009(03)--002D RAW | | | | |
| **Version** | **Date** | **Author** | | **Reviewer** | |
| 1 | June 2020 | Rachel Weber | RAW | Tom Atkinson | TAA |
| | Report prepared for client review | | | | |
| A | April 2021 | Rachel Weber | RAW | Tom Atkinson | TAA |
| | Minor updates to reflect change in site boundary | | | | |
| B | June 2021 | Rachel Weber | RAW | Tom Atkinson | TAA |
| | Minor updates to numeric decimal places | | | | |
| C | September 2021 | Sarah Paul | SKP | Tom Atkinson | TAA |
| | Updated to include targeted spring surveys for conservation significant species | | | | |
| D | October 2021 | Sarah Paul | SKP | Rachel Weber | RAW |
| | Updated to include additional targeted spring surveys for conservation significant species | | | | |

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# Executive Summary

Emerge Associates (Emerge) were engaged by ECP Acquisitions 6 Pty Ltd to conduct a 'detailed' and 'targeted' level assessment within the former Glen Iris Golf Course (referred to herein as the 'site') to provide information on the flora and vegetation values.

As part of the assessment a desktop review of relevant background information was completed, and site surveys were undertaken on 11 March 2020, 19 August, 9 September, 7 and 28 October 2021. Outcomes of the flora and vegetation assessment include the following:

- A total of 80 native and 51 non-native (weed) species were recorded in the site.
- Four plant communities were recorded within the site:
  - Plant community **EmB** extends over 1.9 ha (4% of the site) and comprises remnant native vegetation in 'very good', 'good' and 'degraded' condition. This vegetation occurs as scattered patches and is considered likely to represent floristic community type (FCT) 23a 'Central *Banksia attenuata – B. menziesii* woodlands'.
  - Plant community **TdSt** extends over 0.2 ha (<1% of the site) and comprises riparian vegetation that is likely planted or a combination of planted and naturally regenerated and was mapped as being in 'good – degraded' condition.
  - Plant community **planted trees and shrubs** extends over 13.6 ha (25% of the site) and comprises predominantly scattered non-native species in 'completely degraded' condition.
  - Plant community **turf and bare ground** extends over 35.7 ha (66% of the site) and comprises the previous golf fairway and bare ground in 'completely degraded' condition.
- The remainder of the site comprises artificial lakes, buildings and hardstand which extend over 2.3 ha (4% of the site) and were not assigned to a vegetation condition category.
- No threatened or priority flora species were recorded within the site and none are considered likely to occur.
- No threatened or priority ecological communities occur within the site and none are considered likely to occur.

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Conservation Significant Communities and Likelihood of Occurrence Assessment

**Appendix E**

Sample Data

# Abbreviation Tables

*Table A1: Abbreviations – Organisations*

| Organisations | |
|---|---|
| EPA | Environmental Protection Authority |
| DBCA | Department of Biodiversity, Conservation and Attractions |
| DoW | Department of Water (now DWER) |
| DWER | Department of Water and Environmental Regulation |
| WALGA | Western Australia Local Government Association |

*Table A2: Abbreviations – General terms*

| General terms | |
|---|---|
| ESA | Environmentally sensitive area |
| FCT | Floristic community type |
| IBRA | Interim Biogeographic Regionalisation of Australia |
| MUW | Multiple use wetland |
| NVIS | National Vegetation Inventory System (ESCAVI 2003) |
| P1 | Priority 1 |
| P2 | Priority 2 |
| P3 | Priority 3 |
| P4 | Priority 4 |
| P5 | Priority 5 |
| PEC | Priority ecological community |
| T | Threatened |
| TEC | Threatened ecological community |
| UFI | Unique feature identifier |

*Table A3: Abbreviations –Legislation*

| Legislation | |
|---|---|
| BAM Act | *Biosecurity and Agriculture Management Act 2007* |
| EP Act | *Environmental Protection Act 1986* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| BC Act | *Biodiversity Conservation Act 2016* |
| BC Regs | *Biodiversity Conservation Regulations 2018* |

*Table A4: Abbreviations – planning*

| Planning terms | |
|---|---|
| MRS | Metropolitan region scheme |

*Table A5: Abbreviations – units of measurement*

| Units of measurement | |
|---|---|
| cm | Centimetre |
| ha | Hectare |
| m | Metre |
| m AHD | m in relation to the Australian height datum |
| mm | Millimetre |

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# 1 Introduction

## 1.1 Project background

ECP Acquisitions 6 Pty Ltd intends to develop the former privately run Glen Iris Golf Course into a residential estate. The former Glen Iris Golf Course comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court in Jandakot (referred to herein as the 'site').

The site is located approximately 16 kilometres (km) south of the Perth Central Business District within the City of Cockburn and is zoned 'urban' under the *Metropolitan Region Scheme* (MRS) and 'development contribution area 13 special use 1', 'development contribution area 13 special use 6', 'development contribution area 13 residential-R40' under the City of Cockburn *Town Planning Scheme No. 3*.

The site is approximately 53.7 hectares (ha) in size and is surrounded by residential subdivision, with a railway to the north and Kwinana Freeway to the west. The site comprises two areas separated by Berrigan Drive. The location and extent of the site is shown in **Figure 1**.

## 1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Acumen Development Solutions, on behalf of ECP Acquisitions 6 Pty Ltd, to provide environmental consultancy services to support the planning process for the site. The purpose of this survey is to provide sufficient information on the flora and vegetation values within the site to inform this process.

The scope of work was specifically to undertake a flora and vegetation assessment to the standard required of a detailed and a targeted survey with reference to the Environmental Protection Authority's (EPA's) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- Compilation of a comprehensive list of flora species recorded as part of the field survey.
- Mapping of conservation significant flora and vegetation, plant communities and vegetation condition.
- Identification of potential habitat for conservation significant flora and vegetation and likelihood of occurrence.
- Targeted searches for conservation significant flora within areas of suitable habitat.
- Documentation of the desktop assessment, survey methodology and results into a report.

# 2 Environmental Context

## 2.1 Climate

Climate has a strong influence on the types of vegetation that grow in a region and the life cycles of the flora present. It is therefore critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The south-west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters. In Mediterranean type climates some flora species will typically spend part of their lifecycle as either underground storage organs or as seed. This is an adaptation to unfavourable environmental conditions such as excessive heat and drought that occur over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter when favourable conditions return and are most visible during spring, which is the flowering period for a majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south-west of WA.

An average of 719.6 millimetres (mm) of rainfall is recorded annually from the Jandakot Aero weather station, which is the closest weather station, located approximately 2 km east of the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Jandakot Aero weather station range from 18.0$^{o}$C in July to 31.6$^{o}$C in February, while mean minimum temperatures range from 6.9$^{o}$C in July to 17.2$^{o}$C in February (BoM 2020).

A total of 600.6 mm of rain was recorded between May and August 2021 prior to the surveys which is higher than the combined long-term average of 558.5 mm for the same months (BOM 2021). This high rainfall was considered to have been sufficient to promote the flowering and emergence of native flora.

## 2.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area.

The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side has formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side is comprised of three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Examination of broad scale soil mapping places the site within the Bassendean soil association (Churchward and McArthur 1980). The Bassendean association comprises sand plains with low dunes and occasional swamps, iron or humus podzols and areas of complex steep dunes.

Finer scale mapping by (Gozzard 2011) also places the site in Bassendean sand (S8) which was later confirmed during the field survey. The Bassendean sands typically very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin (Purdie *et al.* 2004).

The site is not known to contain any restricted landforms or unique geological features.

## 2.3 Topography

The elevation of the site ranges from 25 m in relation to the Australian height datum (mAHD) in the southern portion to 40 mAHD in the northern portion of the site (DoW 2008) (**Figure 2**).

## 2.4 Hydrology and wetlands

Wetlands include "areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries" (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al*. 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017b)
- *A Directory of Important Wetlands in Australia* (DBCA 2018).

No Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows that no wetland or water related features are mapped within the site.

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period). The Department of Biodiversity, Conservation and Attractions (DBCA) maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2020a), which further categorises geomorphic wetland features into specific management categories to guide land use and conservation. Note that as this dataset was drafted at a regional scale the boundaries of mapped wetland features are often inconsistent with physical wetland boundaries.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset (DBCA 2020a) indicated that no wetland features are mapped within the site. Two 'multiple use' category wetland features (UFIs 6654 and 6655) occur adjacent to the south-western portion of the site.

The locations of the geomorphic wetlands surrounding the site are shown in **Figure 2**.

## 2.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides the Swan Coastal Plain into two floristic subregions (Environment Australia 2000). The site is contained within the 'SWA02' or Perth subregion, which is characterised as mainly containing *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types.

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Heddle *et al.* (1980) mapping shows the majority of the site as comprising the 'Bassendean central and south' complex, which is described as vegetation ranging from woodland of *Eucalyptus marginata - Allocasuarina fraseriana - Banksia* spp. to low woodland of *Melaleuca* spp. and sedgelands on the moister sites. This complex was determined to have 26.87% remaining in 2019, of which 2.15% is under formal protection (Government of Western Australia 2019).

## 2.6 Historic land use

Review of historical images available from 1953 (WALIA 2020) onwards shows that the northern and southern portions of the site, separated by Berrigan Drive, have been subject to vegetation clearing at different times.

The northern portion of the site supported native vegetation until construction of the central part of the Glen Iris Golf Course commenced, which is first visible in imagery from 1965. The remainder of the northern portion of the site was cleared of native vegetation by 1995 for further golf course construction. Scattered remnant native trees appear to have been retained between the golf course fairway but the majority of the vegetation was cleared during construction of the golf course.

The southern portion of the site supported native vegetation until construction of the golf course commenced, which is first visible in imagery from 1995. The entirety of the southern portion of the site, except two areas near the southern boundary, were completely cleared of native vegetation for the golf course.

The Glen Iris Golf Course was formally closed by the previous owners in March 2020 and has been in caretaker and maintenance ever since.

## 2.7 Significant flora and vegetation

### 2.7.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threatened flora species listed under the EPBC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia flora species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). Similarly, it is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes. Further information on threatened and priority species and their categories is provided in **Appendix A**.

### 2.7.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DoEE 2019b). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. Similar to flora species, TECs listed under the EPBC Act are assigned a conservation status. Any action likely to have a significant impact on a community listed under the EPBC Act requires Ministerial approval.

TECs are also listed within Western Australia under the BC Act and the BC Regulations. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

A plant community that is under consideration for listing as a TEC in Western Australia, but does not yet meet survey criteria or has not been adequately defined, may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes. Further information on categories of TECs and PECs is provided in **Appendix A**.

### 2.7.3 Local and regional significance

Flora species and ecological communities may be significant for a number of reasons irrespective of whether they have special protection under policy or legislation.

Two reasons that vegetation within the site may be significant are listed below:

- The vegetation within the site has potential value as habitat for threatened or priority fauna species including, in particular, Carnaby's black cockatoo and the forest red-tailed black cockatoo, which are listed as 'vulnerable' under the EPBC Act and 'endangered' under the BC Act.

- The vegetation supports flora species Listed in *Bush Forever* 'significant flora' list for the Bassendean dunes (Government of WA 2000).

### 2.7.4 Weeds

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. At a National level, the Australian government has compiled a list of 32 *Weeds of National Significance* (WoNS) (DoEE 2019c). Whilst the WoNS list is non-statuatory, many WoNS are also listed under the BAM Act. Further information on categories of declared pests is provided in **Appendix A**.

Due to historical disturbance weed species are expected to be present at the site.

## 2.8 Bush Forever

The Government of Western Australia's *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* is to protect comprehensive representations of all original ecological communities by targeting a minimum of 10% of each vegetation complex for protection (Government of WA 2000). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No *Bush Forever* sites occur within the site. Multiple *Bush Forever* sites occur to the east and west of the site.

## 2.9 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. This exchange of genetic material between vegetation remnants improves the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004).

There are no mapped ecological linkages within the site. One biodiversity ecological linkage (no. 48) is located approximately 800 m to the north of the site and extends to the west and east.

## 2.10 Previous surveys

No previous flora and vegetation surveys are known to have been undertaken within the site.

# 3 Methods

## 3.1 Desktop assessment

### 3.1.1 Database searches

A search was conducted for threatened and priority flora that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a) and *NatureMap* (DBCA 2020).

A search was also conducted for TECs and PECs that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a) and the *Weed and Native Flora Dataset* (Keighery *et al.* 2012).

Prior to undertaking the field survey, information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. This was compared to existing environmental information available for the site, such as geomorphology, soils, regional vegetation and historic land use, to identify species and communities for which habitat may occur in the site.

## 3.2 Field survey

An ecologist from Emerge visited the site on 11 March 2020, 19 August, 9 September, 7 and 28 October 2021 to conduct the flora and vegetation field surveys.

### 3.2.1 Flora and vegetation

The site was traversed on foot and the composition and condition of vegetation was recorded.

Detailed sampling of the vegetation was undertaken using non-permanent relevés. Each relevé was completed over an approximately 10 x 10 m area. A total of three relevés were sampled and the position of each sample location was recorded with a hand-held GPS unit, as shown in **Figure 3**. The data recorded within each relevé included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)
- biological information (vegetation structure and condition, degree of disturbance and species present).

Additional plant taxa not observed within samples were recorded opportunistically as the ecologist traversed the site. Photographs were taken throughout the field visit to show particular site conditions.

The suitability of habitat within the site for conservation significant species identified in the desktop assessment was assessed (refer **Section 3.1**). Areas of suitable habitat were searched for conservation significant species as required.

All plant specimens collected during the field survey were dried, pressed and then named in accordance with requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using methods from Keighery (1994). For vegetation in the site containing *Banksia* spp., the condition scale provided in the conservation advice for the 'banksia Woodlands of the Swan Coastal Plain TEC' (TSSC 2016) was applied in addition to the Keighery scale (as shown in **Table 1**).

*Table 1: Vegetation condition scale applied during the field assessment*

| Condition category | Definition (Keighery 1994) | Indicator (TSSC 2016) | |
|---|---|---|---|
| | | Typical native vegetation composition | Typical weed cover |
| Pristine | Pristine or nearly so, no obvious signs of disturbance. | Native plant species diversity fully retained or almost so | Zero or close to |
| Excellent | Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. | High native plant species diversity | Less than 10% |
| Very good | Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing | Moderate native plant species diversity | 5-20% |
| Good | Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. | Low native plant species diversity | 5-50% |
| Degraded | Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing. | Very low native plant species diversity | 20-70% |
| 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 or shrubs. | Very low to no native species diversity | Greater than 70% |

## 3.3 Mapping and data analysis

### 3.3.1 Likelihood of occurrence of conservation significant flora and vegetation

Information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. Based on existing conditions such as plant community, vegetation condition, land use and disturbance, an assessment of the likelihood of occurrence of threatened and priority flora species and communities within the site was undertaken using the categories outlined in **Table 2**.

*Table 2: Likelihood of occurrence assessment categories and definitions*

| Likelihood | Definition |
|---|---|
| Recorded | The species was recorded during the current field survey. |
| Likely | The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site. |
| Possible | The site contains suitable habitat for the species but there is no other information to suggest that the species may occur within or close to the site. |
| Unlikely | The site does not contain suitable habitat for the species or the site contains suitable habitat for the species within which thorough targeted searches were completed and conclusion has been made that the species is unlikely to be present. |

### 3.3.2 Plant community identification and description

The local plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were mapped on aerial photography from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography based on the locations and notes recorded during the field survey to define areas with differing condition.

### 3.3.3 Floristic community type assignment

Where possible, each plant community was assigned a 'floristic community type' (FCT), as defined by Gibson *et al.* (1994). This was determined by comparing the flora species recorded within each sample to those in the regional datasets *A floristic survey of the southern Swan Coastal Plain* Gibson *et al.* (Gibson *et al.* 1994) and *Weed and Native Flora Data for the Swan Coastal Plain* (Keighery *et al.* 2012). No statistical FCT analysis was undertaken due to the high level of disturbance across most of the site and small size of vegetation patches in better quality.

Ultimately the flora species present and contextual information relating to the soils, landforms and known locations of FCTs within the region were used to determine the appropriate FCT for vegetation within the site.

### 3.3.4 Threatened and priority ecological communities

Areas of native vegetation potentially representing a TEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds provided in the following document:

- *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community (TSSC 2016).*

## 3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 3**.

*Table 3: Evaluation of survey methodology against standard constraints outlined in EPA (2016)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| Availability of contextual information | No limitation | The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context. |
| | | No previous relevant surveys are known to have been undertaken within the site. |
| | No limitation | Regarding assignment of FCTs, the authoritative Gibson *et al.* (1994) dataset was derived from a necessarily limited sample of vegetation from largely publicly owned land which is now more than 20 years out of date. Consequently, it is unknown to what degree official FCTs are appropriate reference to biodiverse vegetation across the Swan Coastal Plain.<br>In lieu of an alternative and as recommended by DBCA, the Gibson *et al.* (1994) dataset was used to assign an FCT where possible.<br>Comparison of species in the patches of vegetation in better condition with the Gibson *et al.* (1994) dataset, in combination with soils, landforms and known locations of FCTs within the region, was sufficient to assign an FCT. |
| Experience level of personnel | No limitation | This flora and vegetation assessment was undertaken by qualified botanists with 6-11 years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 18 years' experience in environmental science in Western Australia. |
| Suitability of timing | No limitation | The survey was conducted in March 2020 and August, September and October 2021 and thus within the main flowering season. High rainfall was recorded from May to August 2021 in the months preceding the site visits. Therefore, it is likely that most plant species would have been in flower and/or visible at the time of survey. The degraded nature of most of the site limits the potential habitat for native geophytic plants such as orchids and the majority of threatened and priority flora species with potential to occur are perennial species. Nevertheless, some orchid species were recorded and able to be identified to species level. No unidentified specimens were collected. The survey timing was considered adequate to allow the detection of all species for which seasonal timing is critical. |
| Temporal coverage | No limitation | Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of multiple, to enable observation of all species present.<br>The portions of the site containing native vegetation were visited five times over two years and three seasons. |

*Table 3: Evaluation of survey methodology against standard constraints outlined in EPA (2016) (continued)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| Spatial coverage and access | No limitation | Site coverage was comprehensive (track logged). |
| | No limitation | All parts of the site could be accessed as required. |
| Sampling intensity | No limitation | A total of 131 species were recorded, comprising 80 native and 51 non-native species. These species were recorded from three sample locations and opportunistic observations across the site. Considering the high level of disturbance within the majority of the site and the small size of the areas of remnant native vegetation, the number of native species recorded was considered sufficient to classify the vegetation for the purposes of this assessment. |
| Influence of disturbance | Minor limitation | Time since fire is greater than 60 years as interpreted form aerial imagery and therefore species reliant on fire to emerge may not have been visible. However, this was not considered a limitation in regards to determining the presence of threatened or priority flora species. |
| | No limitation | Historical ground disturbance was evident in the majority of the site. The disturbance history of the site was considered when undertaking field sampling. |
| Adequacy of resources | No limitation | All resources required to perform the survey were available. |

# 4 Results

## 4.1 General site conditions

The site is gently undulating and comprises sandy white-grey soils. The site was recently used as a golf course and the fairways and lakes were irrigated at the time of the survey.

The site has been highly modified for its use as a golf course and is dominated by non-native vegetation and unvegetated areas. Small areas of remnant native vegetation occur as scattered patches of varying quality.

## 4.2 Flora

### 4.2.1 Desktop assessment

The database search results identified a total of 16 threatened and 34 priority flora species occurring or potentially occurring within a 10 km radius of the site. Information on these species including their habitat preferences is provided in **Appendix B**.

Based on background information available for the site, two threatened flora species and five priority flora species were identified as having potential to occur within the site as shown in **Table 4**.

*Table 4: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences*

| Species | Level of significance | | Life strategy | Habitat | Flowering period |
|---|---|---|---|---|---|
| | State | EPBC Act | | | |
| *Caladenia huegelii* | CR | E | PG | Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels. | Sep-early Nov |
| *Macarthuria keigheryi* | E | E | P | Low-lying winter-wet damp grey/white sands in open patches. | Sep-Dec, Feb-Mar |
| *Stenanthemum sublineare* | P2 | - | P | White sand on coastal plains. | Oct-Dec |
| *Thelymitra variegata* | P2 | - | PG | Sandy clay, sand, laterite. | Jun-Sep |
| *Phlebocarya pilosissima* subsp. *pilosissima* | P3 | - | P | White or grey sand, lateritic gravel. | Aug-Oct |
| *Styphelia filifolia* | P3 | - | P | Brown over pale yellow sand. | Feb-Apr |
| *Jacksonia sericea* | P4 | - | P | Calcareous and sandy soils on Swan Coastal Plain | Dec-Feb |

### 4.2.2 Species inventory

A total of 80 native and 51 non-native (weed) species were recorded within the site during the field survey, representing 45 families and 103 genera. The dominant families containing native taxa were

Myrtaceae (15 native taxa and 13 weed taxa) and Fabaceae (12 native taxa and four weed taxa). A complete species list is provided in **Appendix C**.

### 4.2.3 Threatened and priority flora

No occurrences of threatened or priority flora species were recorded within the site.

The **EmB** vegetation described in **Section 4.3.2** comprises suitable habitat for the threatened and priority flora species identified in **Table 4**. Targeted searches were undertaken for these species during the optimal survey period and they were not recorded. Therefore, no threatened or priority flora species are considered likely to occur in the site.

The likelihood of occurrence assessment is provided in **Appendix B**.

### 4.2.4 Locally and regionally significant flora

No locally or regionally significant flora species were recorded within the site.

### 4.2.5 Declared pests

No species listed as declared pests pursuant to the BAM Act or weeds of national significance (WoNS) were recorded in the site.

## 4.3 Vegetation

### 4.3.1 Desktop assessment

The database search results identified four TECs and three PECs occurring or potentially occurring within a 10 km radius of the site. Information on these communities is provided in **Appendix D**.

Based geomorphology, soils and regional vegetation patterns, the following one TEC and three PECs were considered to have potential to occur in the site:

- 'Banksia woodlands of the Swan Coastal Plain' TEC which is listed as 'endangered' under EPBC Act.
- 'Banksia woodlands of the Swan Coastal Plain' PEC (P3)
- '*Banksia ilicifolia* woodlands, southern Swan Coastal Plain' PEC (P3)
- 'Northern Spearwood shrublands and woodlands' PEC (P3).

### 4.3.2 Plant communities

Four plant communities were identified within the site. Plant community **EmB** exists as scattered patches in the northern, central and south-western portions of the site. Plant community **TdSt** exists as multiple small patches on the edges of artificial lakes and is considered to be likely planted or a combination of planted and naturally generated vegetation. Plant communities **planted trees and shrubs** and **turf and bare ground** exist across the site and were likely previously installed for the sites' historic use as a golf course.

The remainder of the site supports multiple artificial lakes, buildings and hardstand (2.3 ha).

A description and the area of each plant community is provided in **Table 5**, representative photographs of each are provided in **Plate 1** to **Plate 4** and raw sample data is provided in **Appendix E**. The location of each plant community is shown in **Figure 3**.

*Table 5: Description and extent of plant communities identified within the site*

| Plant community | Description | Area (ha) |
|---|---|---|
| **EmB** | Woodland to open woodland *Eucalyptus marginata* subsp. *marginata*, *Banksia attenuata* and *Banksia menziesii* over mixed shrubland *Xanthorrhoea preissii*, *Allocasuarina humilis* and *Hibbertia hypericoides* over open sedgeland *Mesomelaena pseudostygia* over non-native grassland **Ehrharta calycina* (**Plate 1**). | 1.9 |
| **TdSt** | Closed sedgeland *Typha domingensis*, *Schoenoplectus tabernaemontani, *Cortaderia selloana* and *Baumea* sp. (**Plate 2**). | 0.2 |
| **Planted trees and shrubs** | Predominantly scattered non-native planted trees and shrubs such as **Corymbia* spp., **Eucalyptus* spp., *Melaleuca* spp. and *Grevillea* spp. with occasional native plants (**Plate 3**). | 13.6 |
| **Turf and bare ground** | Closed non-native grassland (turf) and bare ground (**Plate 4**). | 35.7 |



*Plate 1: Plant community **EmB** in 'very good' condition*



*Plate 2: Plant community **TdSt** in 'good – degraded' condition*



*Plate 3: **Planted trees and shrubs** in 'completely degraded' condition*



*Plate 4: **Turf and bare ground** in 'completely degraded' condition*

### 4.3.3 Vegetation condition

Plant community **EmB** comprises the most intact native vegetation within the site. Some of the **EmB** vegetation was mapped as being in 'very good' condition as they supported the general structure expected of a banksia woodland community and had moderate native species diversity. The remainder of the **EmB** vegetation was mapped as being in 'good' and 'degraded' condition where it was more disturbed with an altered structure, lower native species diversity and higher weed cover.

Plant community **TdSt** was mapped as being in 'good – degraded' condition as it comprises a combination of native and non-native species that only exist in the site due to the presence of the artificial lakes created for the previous golf course.

The **planted trees and shrubs** and the **turf and bare ground** communities were mapped as being in 'completely degraded' condition as they are dominated by non-native species or comprise unvegetated areas. The remainder of the site, which comprises artificial lakes, buildings and hardstand, were not assigned a condition category (2.3 ha).

The extent of vegetation by condition category is detailed in **Table 6** and shown in **Figure 4**.

*Table 6: Extent of vegetation condition categories within the site*

| Condition category (Keighery 1994) | Size (ha) |
|---|---|
| Pristine | 0 |
| Excellent | 0 |
| Very good | 0.43 |
| Good | 0.69 |
| Good – degraded | 0.22 |
| Degraded | 0.80 |
| Completely degraded | 49.25 |

### 4.3.4 Floristic community types

Plant community **EmB** was determined to likely represent FCT 23a 'Central *Banksia attenuata – B. menziesii* woodlands'. This FCT is listed as 'well reserved' and 'low risk' by Gibson *et al.* (1994).

The other plant communities in the site were considered too degraded to assign to an FCT.

### 4.3.5 Threatened and priority ecological communities

The structure and composition of plant community **EmB** indicates that it has the potential to represent the Commonwealth listed TEC 'banksia woodlands of the Swan Coastal Plain' and the State listed PEC of the same name (P3).

The above TEC, herein referred to as the 'banksia woodland TEC', is listed as 'endangered' under the EPBC Act. Whether a patch of vegetation is considered to represent the banksia woodland TEC depends on a number of diagnostic criteria including geographic location, soils, landform, structure, composition, condition and patch size (DoEE 2016).

As outlined in **Table 7,** the **EmB** vegetation does not satisfy the criteria to be considered a patch of the 'banksia woodland TEC' due to the small size of the patches.

*Table 7: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from (TSSC 2016)*

| Criteria | Requirements for meeting criteria | Site implications |
|---|---|---|
| 1. Must meet key diagnostic characteristics | A variety of factors relating to:<br>• Location<br>• Soils<br>• Structure<br>• Composition | • Site meets location and soils criteria.<br>• The **EmB** vegetation includes the key diagnostic feature of a tree layer of *Banksia attenuata, Banksia menziesii* and *Banksia ilicifolia*.<br>• The **EmB** vegetation within site also meets structure and composition criterion. It is likely to represent FCT 23a which is identified as one of the FCTs comprising the banksia woodland TEC. |
| 2. Must meet condition thresholds | • A patch should at least meet the 'good' condition category (see **Table 1**) | • The **EmB** vegetation is present in 'very good', 'good' and 'degraded' condition, which meets this criterion. The conservation advice indicates that a single patch may include areas of variable condition, meaning the 'degraded' condition may still be considered the TEC.<br>• The patches of **EmB** vegetation that are adjacent to each other would be considered part of the same patch. Therefore, six 'patches' of **EmB** vegetation exist within the site. |
| 3. Must meet minimum patch size | Minimum size of patch:<br>• Pristine=no minimum size<br>• Excellent=0.5 ha<br>• Very Good=1 ha<br>• Good=2 ha | • The six patches of **EmB** vegetation are each less than 1 ha in size and do not meet this criterion. |
| 4. Must incorporate surrounding context | • Breaks (e.g. tracks) < 30 m do not separate vegetation into separate patches<br>• Buffer zones may apply (20-50 m recommended from patch edge)<br>• The site should be thoroughly sampled (2 surveys in same spring).<br>• Survey timing should be appropriate.<br>• Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat) | • The patches of **EmB** vegetation are isolated from other banksia woodland and no relevant surrounding context considerations apply. |
| Result | The site does not support any vegetation that represents the banksia woodland TEC. | |

DBCA's *Priority Ecological Community* list indicates that the description, area and condition thresholds that apply to the Commonwealth-listed TEC of the same name also apply to the 'banksia woodlands of the Swan Coastal Plain' PEC (DBCA 2020b). Since the **EmB** vegetation does not represent the banksia woodland TEC it also does not represent the PEC.

No other TECs or PECs occur within the site.

### 4.3.6 Locally and regionally significant vegetation

Plant communities **EmB** and **planted trees and shrubs** contain multiple foraging species for threatened species of black cockatoo. In addition, a small number of mature *Corymbia calophylla*, *Eucalyptus marginata* and **Eucalyptus* sp. trees with a diameter at breast height larger than 500 mm are also present within plant communities **EmB** and **planted trees and shrubs**. Due to their size these

trees have the potential to provide some value as foraging, roosting and breeding habitat values for black cockatoos, along with other ecological services.

# 5 Discussion

The site has been highly modified and approximately 92% supports vegetation in 'completely degraded' condition. Native vegetation exists as scattered patches that extend over approximately 4% of the site. The remaining 4% of the site comprises artificial lakes, buildings and hardstand. The highest quality vegetation exists within plant community **EmB**.

## 5.1 Threatened and priority flora

Based on the desktop assessment, it was considered that two threatened and five priority flora species had potential to occur within the site. If these species were to occur it was most likely that they would have been found within the **EmB** vegetation, which, while disturbed, is the most intact remnant vegetation in the site.

Intensive targeted searches were undertaken in August, September and October 2021 across the **EmB** vegetation and none of the identified threatened or priority flora species were recorded. The absence of the larger perennial species such as *Jacksonia gracillima*, *Verticordia lindleyi* subsp*. lindleyi* and *Andersonia gracilis* was relatively easy to confirm. However, due to their size and seasonal lifeform, smaller annual or geophytic species such as *Drakaea elastica*, *Thelymitra variegata* and *Caladenia huegelii* can be more difficult to detect. Intensive targeted searches were carried out in August, September and October 2021 to search for *Drakaea elastica*, *Thelymitra variegata* and *Caladenia huegelii*. The searches were conducted during the main growing and flowering period for these species and so they would have been visible, if present. Since these species were not recorded the surveys are considered sufficient to conclude that they do not occur in the site.

## 5.2 Vegetation condition

A vegetation condition score has the greatest implications when the condition of vegetation is close the boundary between 'good' and 'degraded'. This is because good condition is typically accepted as the threshold for conservation significance, while 'degraded' condition implies a low conservation requirement. Separating these two condition categories is further complicated by the fact that good condition is more correctly understood to mean 'average' condition. Applying the Keighery (1994) condition scale good condition vegetation can be expected to be significantly altered, with very obvious disturbance and the presence of aggressive weeds at high density. Therefore, good does not literally mean "good" as the label implies.

The method applied to assess vegetation condition was robust, as it combined the standard qualitative, categorical scheme of Keighery (1994), with the additional indicators for diversity and weed cover outlined in DoEE (2016).

Compound condition categories were applied where the patch of vegetation supported a mosaic of small areas in differing condition and at fine-scale unsuitable for mapping.

## 5.3 Floristic community type assignment

Although no statistical FCT analysis was undertaken, the flora species within the **EmB** vegetation are similar to those recorded within Gibson *et al.* (1994) sites that represent FCT 23a. A total of 15 Gibson *et al.* (1994) and Keighery *et al.* (2012) samples that represent FCT 23a occur within approximately four kilometres of the site and the soils and landform within the site also align with that described for FCT 23a.

## 5.4 Threatened and priority ecological communities

Arriving at the conclusion that the **EmB** vegetation does not represent the banksia woodland TEC/PEC was straightforward as the small patches of this vegetation do not meet defined size thresholds.

## 5.5 Wetlands

The two mapped multiple use wetlands located adjacent to the south-western portion of the site comprise residential lots and extend over portions of the Kwinana Freeway (UFI 6655) and Berrigan Drive (UFI 6654) (**Figure 2**). Neither of these mapped wetlands contain any native wetland vegetation in proximity to the site.

## 5.6 Local and regional significance

Suitable habitat for threatened species of black cockatoo were opportunistically recorded within the site. A separate fauna assessment has been undertaken to determine the fauna habitat within the site and whether other fauna species of conservation significance are likely to occur (Emerge Associates 2021).

# 6 Conclusions

Over 95% of the site has been highly disturbed and modified from its remnant state, with approximately 2.3 ha supporting artificial lakes, buildings and hardstand and 49.2 ha supporting non-native vegetation (planted trees and shrubs and turf and bare ground) in 'completely degraded' condition. The remainder of the site supports remnant native vegetation (1.9 ha) and riparian vegetation that is likely planted or a combination of planted and naturally regenerated (0.2 ha).

No threatened or priority flora species were recorded within the site and none are considered likely to occur.

No TECs or PECs occur within the site and none are considered likely to occur.

# 7 References

## 7.1 General references

Alan Tingay and Associates 1998, *A Strategic Plan for Perth's Greenways - Final Report*. December 1998.

Beard, J. S. 1990, *Plant Life of Western Australia*, Kangaroo Press Pty Ltd., Kenthurst, N.S.W.

Churchward, H. M. and McArthur, W. M. 1980, *'Landforms and Soils of the Darling System, Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Department of Conservation and Environment.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017b, *Ramsar Sites (DBCA-010)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Directory of Important Wetlands in Australia - Western Australia (DBCA-045)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2020a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Biodiversity Conservation and Attractions (DBCA) 2020b, *Priority Ecological Communities for Western Australia Version 30*.

Department of the Environment and Energy (DoEE) 2016, *Banksia Woodlands of the Swan Coastal Plain in Community and Species Profile and Threats Database*, Canberra.

Department of Water (DoW) 2008, *LiDAR Elevation Dataset, Swan Coastal Plain*, Perth.

Department of Water and Environmental Regulation (DWER) 2018, *Hydrography Linear (Heirarchy) (DWER-031)*, Perth.

Emerge Associates 2021, *Level 1 Fauna Assessment - Former Glen Iris Golf Course*, EP20-009(04)--004A RAW, Version A.

Environment Australia 2000, *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 - Summary Report*, Department of Environment and Heritage.

Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth.

ESCAVI 2003, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0*, Department of the Environment and Heritage, Canberra.

Gibson, N., Keighery, B., Keighery, G., Burbidge, A. and Lyons, M. 1994, *A Floristic survey of the southern Swan Coastal Plain*, Department of Conservation and Land Management and the Conservation Council of Western Australia, Perth.

Government of WA 2000, *Bush Forever - Volume 1: Policies, principles and processes*, Perth.

Government of Western Australia 2019, *2018 South West Vegetation Complex Statistics. Current as of March 2019*, WA Department of Biodiversity, Conservation and Attractions, Perth.

Gozzard, J. 2011, *Sea to scarp - geology, landscape, and land use planning in the southern Swan Coastal Plain*, Geological Survey of Western Australia.

Heddle, E. M., Loneragan, O. W. and Havel, J. J. 1980, *'Vegetation Complexes of the Darling System Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Perth.

Hill, A. L., Semeniuk, C. A., Semeniuk, V. and Del Marco, A. 1996, *Wetlands of the Swan Coastal Plain: Volume 2A - Wetland Mapping, Classification and Evaluation*, Water and Rivers Commission and the Department of Environmental Protection, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Keighery, B. J., Keighery, G. J., Longman, V. M. and Clarke, K. A. 2012, *Weed and Native Flora Data for the Swan Coastal Plain*, Departments of Environmental Protection and Conservation and Land Management, Western Australia.

Kendrick, G. W., Wyrwoll, K. H. and Szabo, B. J. 1991, *Pliocene-Pleistocene coastal events and history along the western margin of Australia*, Quaternary Science Reviews, 10: 419-439.

Purdie, B., Tille, P. and Schoknecht, N. 2004, *Soil-landscape mapping in south-Western Australia: an overview of methodology and outputs. Resource Management Technical Report 280*, State of Western Australia.

Seddon, G. 2004, *A Sense of Place: a response to an environment, the Swan Coastal Plain Western Australia*, Blooming Books, Melbourne.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

Threatened Species Scientific Committee (TSSC) 2016, *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*.

Western Australian Local Government Association and Perth Biodiversity Project (WALGA and PBP) 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, Perth.

Wetlands Advisory Committee 1977, *The status of reserves in System Six*, Environmental Protection Authority, Perth.

## 7.2 Online references

Bureau of Meteorology (BoM) 2020, *Climate Averages,* viewed 20 May 2020, <http://www.bom.gov.au/climate/data/>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2020, *NatureMap,* viewed 27 March 2020 <https://naturemap.dbca.wa.gov.au/>.

Department of Agriculture, Water and the Environment (DAWE) 2020a, *Protected Matters Search Tool*, viewed 27 March 2020, <https://www.environment.gov.au/epbc/protected-matters-search-tool>.

Department of Agriculture, Water and the Environment (DAWE) 2020b, *Threatened Ecological Communities*, viewed 20 June 2020, <http://www.environment.gov.au/biodiversity/threatened/communities/about>.

Department of Agriculture, Water and the Environment (DAWE) 2020c, *Weeds of National Significance*, viewed 12 July 2020, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

West Australian Land Information Authority (WALIA) 2020, *Landgate Map Viewer*, viewed 27 March 2020, <http://landgate.wa.gov.au>.

Western Australian Herbarium 2020, *FloraBase – the Western Australian Flora*, Department of Biodiversity, Conservation and Attractions (DBCA), viewed 20 May 2020 <https://florabase.dpaw.wa.gov.au/>.

# Figures

*Figure 1: Site Location*

*Figure 2: Environmental Features*

*Figure 3: Plant Communities*

*Figure 4: Vegetation Condition*




**Figure 1: Site Location**

**Project:** Detailed Flora and Vegetation Assessment
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(03)--F02

| | |
|---|---|
| Drawn: | RAW |
| Date: | 18/05/2020 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 16/06/2020 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

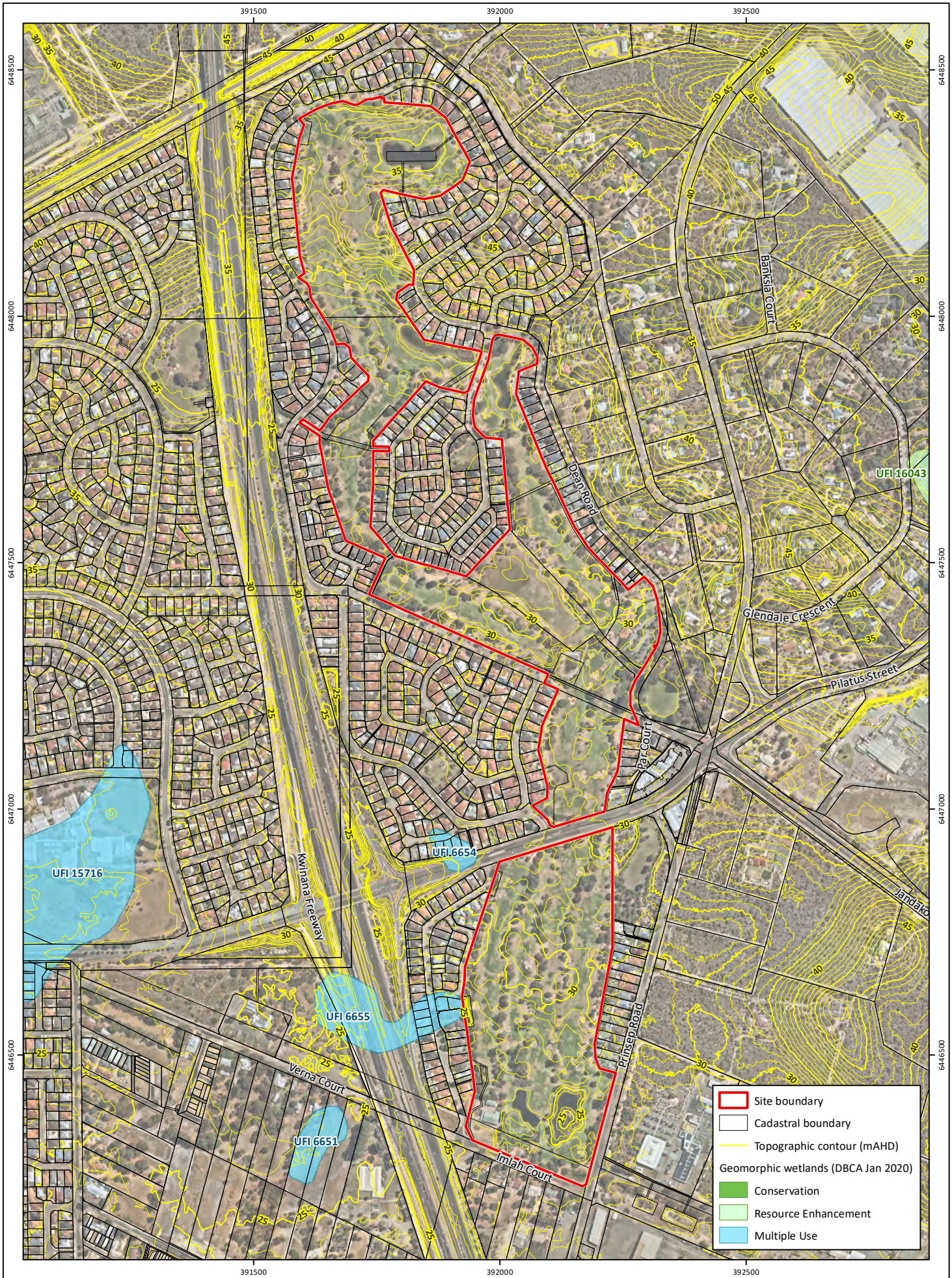



**Figure 2: Environmental Features**

**Project:** Detailed Flora and Vegetation Assessment
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(03)--F03

| | |
|---|---|
| Drawn: | RAW |
| Date: | 18/05/2020 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 16/06/2020 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

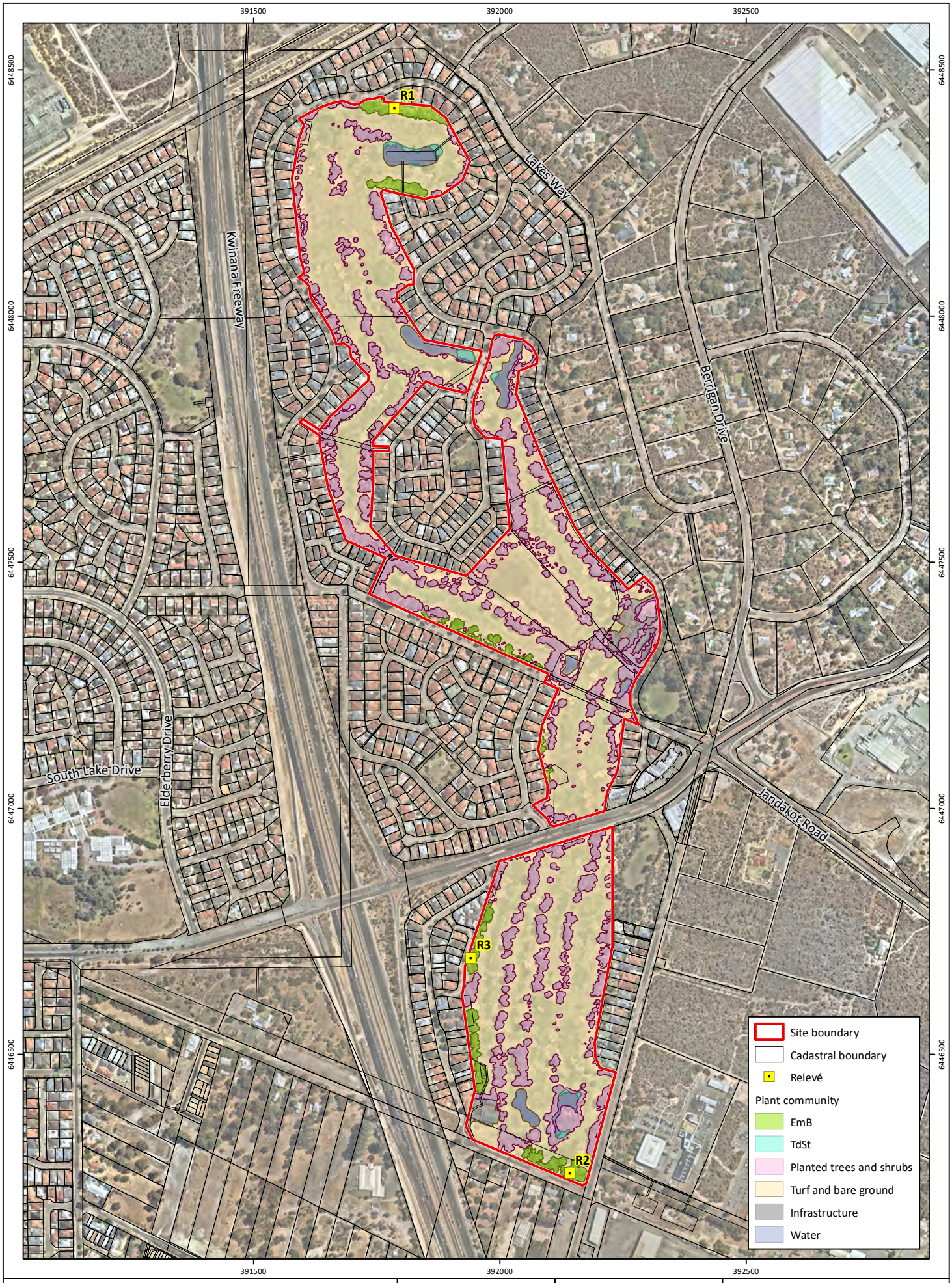



**Figure 3: Plant Communities**

**Project:** Detailed Flora and Vegetation Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(03)--F04a
Drawn: GAR
Date: 14/09/2021
Checked: SKP
Approved: TAA
Date: 15/09/2021

N

0 100 200
Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

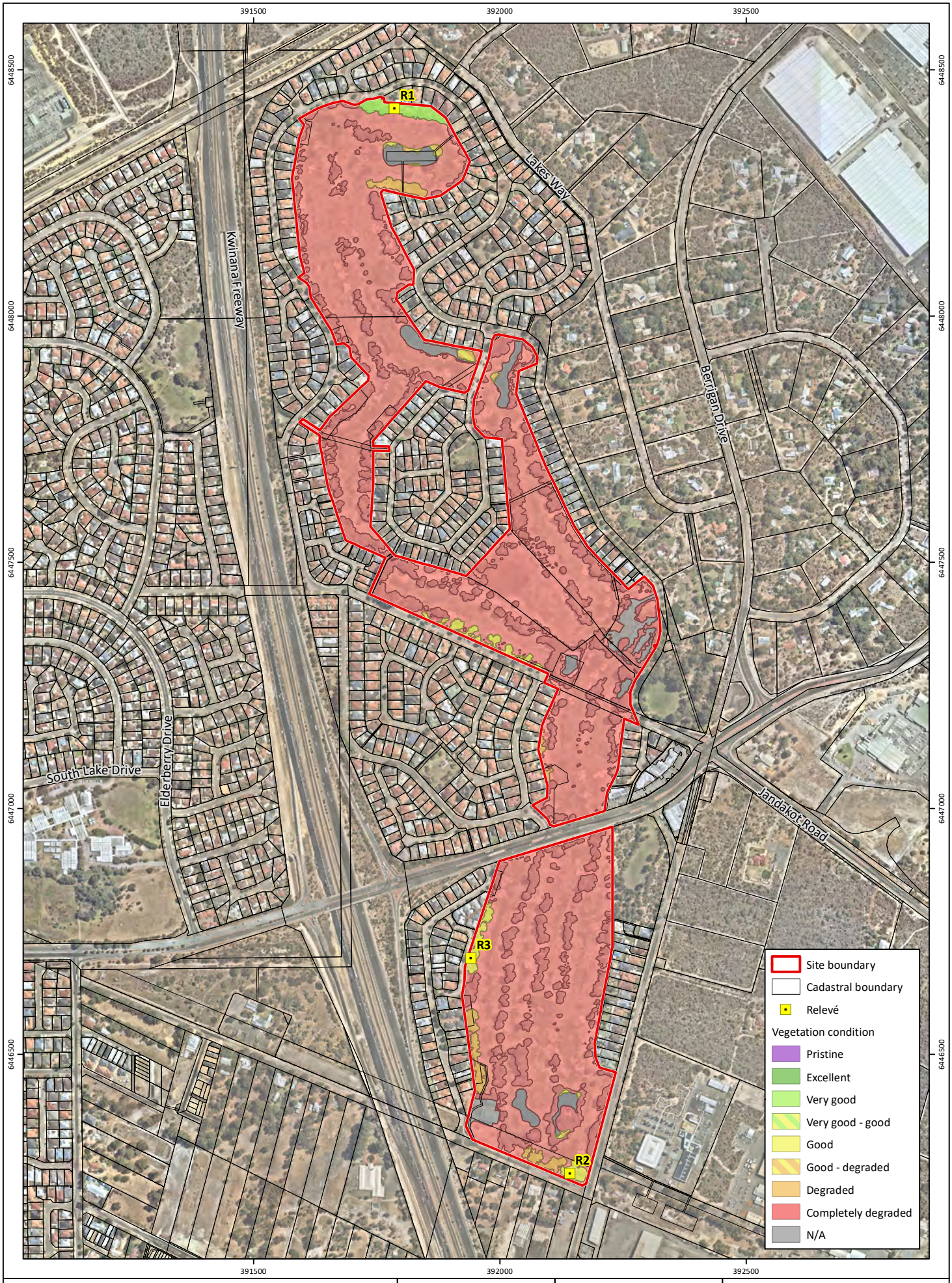



**Figure 4: Vegetation Condition**

**Project:** Detailed Flora and Vegetation Assessment
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(03)--F05a

| | |
|---|---|
| Drawn: | GAR |
| Date: | 14/09/2021 |
| Checked: | SKP |
| Approved: | TAA |
| Date: | 15/09/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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# Appendix A

Additional Information

# Conservation Significant Flora and Vegetation

## Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Flora species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories according to their conservation status, as outlined in **Table 1**.

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done. The definition of threatened flora under the BC Act is provided in **Table 1**.

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018c). Priority flora species are considered during State approval processes. Priority flora categories and definitions are listed in **Table 1**.

*Table 1: Definitions of conservation significant flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2018c)*

| Conservation code | Description |
|---|---|
| EX† | Threatened Flora – Presumed Extinct<br>Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such. |
| T^† | Threatened Flora – Extant<br>Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection. |
| CR^ | Threatened Flora – Critically Endangered<br>Taxa which are considered to be facing an extremely high risk of extinction in the wild. |
| EN^ | Threatened Flora – Endangered<br>Taxa which are considered to be facing a very high risk of extinction in the wild. |
| VU^ | Threatened Flora – Vulnerable<br>Taxa which are considered to be facing a high risk of extinction in the wild. |
| P1 | Priority One – Poorly Known<br>Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey. |
| P2 | Priority Two – Poorly Known<br>Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey. |
| P3 | Priority Three – Poorly Known<br>Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey. |
| P4 | Priority Four – Rare<br>Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years. |

^pursuant to the EPBC Act, †pursuant to the BC Act, on DBCA's *Priority Flora List*

## Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are recognised as ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

Within Western Australia TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs endorsed by the State Minister are published by DBCA (DBCA 2018b).

TECs are assigned to one of the categories outlined in **Table 2** according to their status (in relation to the level of threat). TECs are afforded direct statutory protection at a State level under the BC Act and BC Regulations. Ecological communities are listed under Section 27(1) and 33 of the BC Act. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

*Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009)*

| Conservation code | Description |
|---|---|
| PD | Presumably Totally Destroyed<br>An ecological community that has been adequately searched for but for which no representative occurrences have been located. |
| CE | Critically Endangered<br>An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. |
| E | Endangered<br>An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future. |
| V | Vulnerable<br>An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. |

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2013). Listed PECs are published by DBCA (DBCA 2017b).

*Table 3: Categories of priority ecological communities (DEC 2013)*

| Priority code | Description |
|---|---|
| P1 | Priority One: Poorly known ecological communities<br>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. |
| P2 | Priority Two: Poorly known ecological communities<br>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 | Priority Three: Poorly known ecological communities<br>(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:<br>(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;<br>(iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.<br><br>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 | Priority Four: 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.<br>(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.<br>(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.<br>(iii) Ecological communities that have been removed from the list of threatened communities during the past five years. |
| P5 | Priority Five: Conservation Dependent ecological communities<br>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. |

# Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

## Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

*Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)*

| Category | Description |
|---|---|
| Declared Pest Prohibited - s12 | May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions. |
| Declared Pest s22(2) | Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia |

*Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)*

| Category | Description |
|---|---|
| C1 | Exclusion<br>Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State. |
| C2 | Eradication<br>Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility. |
| C3 | Management<br>Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest. |

*Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)*

| Category | Description |
|---|---|
| Prohibited | Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority. |
| Exempt | No permit or conditions are required for keeping. |
| Restricted | Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals. |

# Wetland Habitat

## Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 7**.

*Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)*

| Level of inundation | Geomorphology | | | |
|---|---|---|---|---|
| | Basin | Flat | Channel | Slope |
| Permanently inundated | Lake | - | River | - |
| Seasonally inundated | Sumpland | Floodplain | Creek | - |
| Seasonally waterlogged | Dampland | Palusplain | - | Paluslope |

## Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 8**.

*Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)*

| Management category | Description of wetland | Management objectives |
|---|---|---|
| Conservation (CCW) | Support high levels of attributes | Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies. |
| Resource enhancement (REW) | Partly modified but still supporting substantial functions and attributes | Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties. |
| Multiple use (MUW) | Few wetland attributes but still provide important hydrological functions | Use, development and management considered in the context of water, town and environmental planning through land care. |

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017a) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

## Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

# References

## General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2017b, *Priority Ecological Communities for Western Australia Version 27*, Species and Communities Branch, Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018b, *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment*, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018c, *Threatened and Priority Flora List 16 January 2018*, Perth.

Department of Environment and Conservation (DEC) 2007, *Protocol for proposing modifications to the Geomorphic Wetlands Swan Coastal Plain dataset*, Perth.

Department of Environment and Conservation (DEC) 2009, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

Department of Environment and Conservation (DEC) 2013, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

English, V. and Blyth, J. 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, ANCA National Reserves System Cooperative Program, Project Number N702, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

## Online references

Department of Environment and Energy (DoEE) 2018, Weeds of National Significance, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

Department of Primary Industries and Regional Development (DPIRD) 2020, The Western Australian Organism List (WAOL), < https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

# Appendix B

Conservation Significant Flora Species and Likelihood of Occurrence Assessment

| Species name | Level of significance | | Life strategy | Habitat | Flowering period | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| | WA | EPBC Act | | | | |
| *Synaphea sp. Fairbridge Farm (D. Papenfus 696)* | CR | CR | P | Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats. | Sep-Nov | Unlikely |
| *Synaphea sp. Fairbridge Farm (D. Papenfus 696)* | CR | CR | P | Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats. | Sep-Nov | Unlikely |
| *Andersonia gracilis* | V | E | P | Seasonally damp, black sandy clay flats near or on the margins of swamps. | Sep-Nov | Unlikely |
| *Caladenia huegelii* | CR | E | PG | Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels. | Sep-early Nov | Unlikely |
| *Diuris purdiei* | E | E | PG | Sand to sandy clay soils in areas subject to winter inundation. | late Sep-mid-Oct, only after a summer or early autumn fire | Unlikely |
| *Drakaea elastica* | CR | E | PG | Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. | Late Sep-Oct/Nove (survey Jul-Aug) | Unlikely |
| *Eucalyptus x balanites* | CR | E | P | Light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (population 1) | Oct - Feb | Unlikely |
| *Grevillea curviloba subsp. incurva* | EN | E | P | Sand, sandy loam. Winter-wet heath. | Aug-Sep | Unlikely |
| *Lepidosperma rostratum* | EN | E | P | Peaty sand and clay amongst low heath, in winter-wet swamps. | May-Jun (survey late Jun-Aug) | Unlikely |
| *Macarthuria keigheryi* | E | E | P | Low-lying winter-wet damp gey/white sands in open patches. | Sep-Dec, Feb-Mar | Unlikely |
| *Thelymitra dedmaniarum* | CR | E | PG | Red brown sandy loam with dolerite and granite outcrops. | Oct-Nov | Unlikely |

| Species name | Level of significance | | Life strategy | Habitat | Flowering period | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| | WA | EPBC Act | | | | |
| *Thelymitra stellata* | E | E | PG | Sandy loam, clay or gravel over laterite or gravel. | Sep-Nov | Unlikely |
| *Diuris drummondii* | V | V | PG | In low-lying depressions in peaty and sandy clay swamps. | Nov-Jan | Unlikely |
| *Diuris micrantha* | V | V | PG | Dark grey-black sandly clay-loam in winter wet depressions or swamps. Often in shallow standing water. | Aug/Sep-early Oct | Unlikely |
| *Drakaea micrantha* | E | V | PG | Open sandy patches often adjacent to winter-wet swamps. | Sept- early Oct | Unlikely |
| *Eleocharis keigheryi* | V | V | P | Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans. | Aug-Dec | Unlikely |
| *Austrostipa jacobsiana* | CR | - | P | Grey sandy clay. | Nov-Jan | Unlikely |
| *Eremophila glabra subsp. chlorella* | EN | - | P | Sandy clay. Winter-wet depressions. | Jul-Nov | Unlikely |
| *Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)* | P1 | - | P | Grey or black sand over clay in winter wet areas. | May-Aug | Unlikely |
| *Hydrocotyle striata* | P1 | - | A | Sand and clay in springs and creeklines. | Nov | Unlikely |
| *Acacia benthamii* | P2 | - | P | Sand, typically on limestone breakaways | Aug - Sept | Unlikely |
| *Poranthera moorokatta* | P2 | - | A | Sandy or clay soils. Dampland or low sandy dunes. | Oct or Feb | Unlikely |
| *Stenanthemum sublineare* | P2 | - | P | White sand on coastal plains. | Oct-Dec | Unlikely |
| *Thelymitra variegata* | P2 | - | P | Sandy clay, sand, laterite. | Jun-Sep | Unlikely |
| *Thysanotus sp. Badgingarra (E.A. Griffin 2511)* | P2 | - | P | Grey sand with lateritic gravel. | Dec | Unlikely |
| *Angianthus micropodioides* | P3 | - | A | Saline sandy soils on edge of rivers, depressions and clay pans. | Nov-Dec or Jan-Feb | Unlikely |
| *Byblis gigantea* | P3 | - | P | Sandy-peat swamps. Seasonally wet areas. | Sep-Jan | Unlikely |
| *Cyathochaeta teretifolia* | P3 | - | P | Grey sand, sandy clay in swamps and creek edges. | Oct-Jan | Unlikely |
| *Dampiera triloba* | P3 | - | P | Damp peat/loam soil. | Aug-Dec | Unlikely |
| *Dillwynia dillwynioides* | P3 | - | P | Winter wet depressions on sandy soils | Aug - Dec | Unlikely |

| Species name | Level of significance | | Life strategy | Habitat | Flowering period | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| | WA | EPBC Act | | | | |
| *Jacksonia gracillima* | P3 | - | P | Sand, often adjacent to winter wet areas | Sep-Dec | Unlikely |
| *Phlebocarya pilosissima subsp. pilosissima* | P3 | - | P | White or grey sand, lateritic gravel. | Aug-Oct | Unlikely |
| *Pimelea calcicola* | P3 | - | P | sand, limestone, coastal ridges | Sep-Nov | Unlikely |
| *Schoenus benthamii* | P3 | - | P | White, grey ands, sandy clay in winter wet flats and swamps | Oct-Nov | Unlikely |
| *Schoenus capillifolius* | P3 | - | A | Brown mud in claypans | Oct-Nov | Unlikely |
| *Schoenus pennisetis* | P3 | - | A | Grey or peaty sand in swamps and winter-wet depressions. | Aug-Sep | Unlikely |
| *Stylidium aceratum* | P3 | - | A | Sandy soils in swamp heathland. | Oct-Nov | Unlikely |
| *Stylidium paludicola* | P3 | - | P | Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland | Oct-Dec | Unlikely |
| *Styphelia filifolia* | P3 | - | P | Brown over pale yellow sand. | Feb-Apr | Unlikely |
| *Aponogeton hexatepalus* | P4 | - | P | Mud. Freshwater: ponds, rivers, claypans. | Jul-Oct | Unlikely |
| *Dodonaea* | P4 | - | P | Sand, outcropping limestone. | Jul-Oct | Unlikely |
| *Drosera occidentalis* | P4 | - | P | Flat, brown/white/yellow moist | Oct- | Unlikely |
| *Hydrocotyle* | P4 | - | A | Floating in swamps. | Aug-Oct | Unlikely |
| *Jacksonia sericea* | P4 | - | P | Calcareous and sandy soils on Swan Coastal Plain | Dec-Feb | Unlikely |
| *Kennedia beckxiana* | P4 | - | P | Sand or loam on granite hills and | Sep-Dec | Unlikely |
| *Microtis quadrata* | P4 | - | PG | Sand, loam or peat in winter wet areas | Oct-Dec | Unlikely |
| *Ornduffia submersa* | P4 | - | A | Sandy clay in inundated | Aug-Nov | Unlikely |
| *Stylidium longitubum* | P4 | - | A | Seasonal wetlands. | Oct-Dec | Unlikely |
| *Tripterococcus sp.* | P4 | - | P | Winter-wet areas on grey sand. | Oct-Feb | Unlikely |
| *Verticordia lindleyi subsp. lindleyi* | P4 | - | P | Sand and sandy clay in winter wet areas. | May or Nov-Jan | Unlikely |

Note: T=threatened, CE=critically endangered, E=endangered, V=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual. Species considered to potentially occur within the site are shaded green

# Appendix C

Flora Species List

| Family | Status | Species |
|---|---|---|
| **Aizoaceae** | | |
| | * | *Carpobrotus edulis* |
| **Anacardiaceae** | | |
| | * | *Schinus terebinthifolia* |
| **Anarthriaceae** | | |
| | | *Lyginia imberbis* |
| **Apocynaceae** | | |
| | | *?Alyxia buxifolia* |
| | * | *Nerium oleander* |
| **Arecaceae** | | |
| | * | *Washingtonia filifera* |
| **Asparagaceae** | | |
| | | *Lomandra caespitosa* |
| | | *Lomandra hermaphrodita* |
| | | *Sowerbaea laxiflora* |
| **Asteraceae** | | |
| | * | *Conyza bonariensis* |
| | * | *Hypochaeris ?glabra* |
| | * | *Lactuca seriata* |
| | * | *Sonchus oleraceus* |
| | * | *Ursinia anthemoides* |
| **Casuarinaceae** | | |
| | | *Allocasuarina fraseriana* |
| | | *Allocasuarina humilis* |
| **Chenopodiaceae** | | |
| | | *Rhagodia baccata subsp. baccata* |
| **Colchicaceae** | | |
| | | *Burchardia congesta* |
| **Convolvulaceae** | | |
| | * | *Ipomoea cairica* |
| **Cupressaceae** | | |
| | | *Callitris preissii* |
| **Cyperaceae** | | |
| | | *Baumea sp.* |
| | * | *Cyperus congestus* |
| | | *Lepidosperma sp.* |
| | | *Mesomelaena pseudostygia* |
| | | *?Schoenus sp.* |
| | | *Schoenoplectus tabernaemontani* |
| **Dasypogonaceae** | | |
| | | *Dasypogon bromeliifolius* |
| **Dilleniaceae** | | |
| | | *Hibbertia huegelii* |
| | | *Hibbertia hypericoides* |
| **Droseraceae** | | |
| | | *Drosera erythrorhiza* |
| | | *Drosera menziesii* |

| Family | Status | Species |
|---|---|---|
| **Ericaceae** | | |
| | | *Conostephium pendulum* |
| | | *Leucopogon sp.* |
| | | *Styphelia propinqua* |
| **Fabaceae** | | |
| | * | *Acacia baileyana* |
| | * | *Acacia longifolia* |
| | | *Acacia pulchella* |
| | | *Acacia rostellifera* |
| | | *Acacia saligna* |
| | | *Acacia stenoptera* |
| | | *Bossiaea eriocarpa* |
| | | *Daviesia nudiflora* |
| | | *Daviesia triflora* |
| | | *Gastrolobium capitatum* |
| | | *Gompholobium tomentosum* |
| | | *Hardenbergia comptoniana* |
| | | *Jacksonia furcellata* |
| | | *Jacksonia sternbergiana* |
| | * | *Robinia sp.* |
| | * | *Trifolium sp.* |
| **Geraniaceae** | | |
| | * | *Pelargonium capitatum* |
| **Goodeniaceae** | | |
| | | *Dampiera linearis* |
| | | *Lechenaultia biloba* |
| | | *Scaevola canescens* |
| | | *Scaevola repens* |
| **Haemodoraceae** | | |
| | | *Conostylis aculeata* |
| | | *Conostylis setigera* |
| | | *Phlebocarya ciliata* |
| **Hemerocallidaceae** | | |
| | | *Arnocrinum preissii* |
| | | *Corynotheca micrantha var. micrantha* |
| | | *Tricoryne elatior* |
| **Iridaceae** | | |
| | * | *Gladiolus caryophyllaceus* |
| | * | *Patersonia occidentalis* |
| **Juncaceae** | | |
| | | *Juncus pallidus* |
| **Lamiaceae** | | |
| | * | *Salvia rosmarinus* |
| **Loranthaceae** | | |
| | | *Nuytsia floribunda* |
| **Malvaceae** | | |
| | * | *Lagunaria patersonia* |
| **Meliaceae** | | |

| Family | Status | Species |
|---|---|---|
| | * | *Melia azedarach* |
| **Myrtaceae** | | |
| | | *Agonis flexuosa* |
| | | *?Calytrix sp* |
| | | *Corymbia calophylla* |
| | *Pl | *Corymbia citriodora* |
| | *Pl | *Corymbia ficifolia* |
| | *Pl | *Corymbia maculata* |
| | | *Eremaea pauciflora* |
| | *Pl | *Eucalyptus caesia* |
| | *Pl | *Eucalyptus camaldulensis* |
| | | *Eucalyptus gomphocephala var. gomphocephala* |
| | *Pl | *Eucalyptus grandis* |
| | | *Eucalyptus marginata subsp. marginata* |
| | *Pl | *Eucalyptus sideroxylon* |
| | *Pl | *Eucalyptus sp. 1* |
| | *Pl | *Eucalyptus sp. 2* |
| | | *Eucalyptus todtiana* |
| | *Pl | *Eucalyptus utilis* |
| | | *Hypocalymma angustifolium* |
| | | *Hypocalymma robustum* |
| | | *Kunzea glabrescens* |
| | * | *Leptospermum laevigatum* |
| | *Pl | *Lophostemon confertus* |
| | *Pl | *Melaleuca sp.* |
| | | *?Melaleuca systena* |
| | | *Melaleuca thymoides* |
| | | *Regelia ciliata* |
| | | *Regelia inops* |
| | | *Scholtzia involucrata* |
| **Nyctaginaceae** | | |
| | * | *Bougainvillea sp.* |
| **Oleaceae** | | |
| | *Pl | *Olea europaea subsp. europaea* |
| **Orchidaceae** | | |
| | | *Caladenia latifolia* |
| | | *Microtis media* |
| **Pinaceae** | | |
| | *Pl | *Pinus sp.* |
| **Poaceae** | | |
| | * | *Avena barbata* |
| | * | *Briza maxima* |
| | * | *Bromus diandrus* |
| | * | *Cenchrus clandestinus* |
| | * | *Cortaderia selloana* |
| | * | *Cynodon dactylon* |
| | * | *Ehrharta calycina* |
| | * | *Eragrostis curvula* |

| Family | Status | Species |
|---|---|---|
| | * | *Lagurus ovatus* |
| | * | *Paspalum dilatatum* |
| | * | *Sporobolus africanus* |
| **Portulacaceae** | | |
| | | *Portulaca oleracea* |
| **Proteaceae** | | |
| | | *Adenanthos cygnorum* |
| | | *Banksia attenuata* |
| | | *Banksia ilicifolia* |
| | | *Banksia menziesii* |
| | *Pl | *Grevillea sp.* |
| | | *Persoonia saccata* |
| | | *Petrophile linearis* |
| | *Pl | *Protea sp.* |
| | | *Stirlingia latifolia* |
| **Restionaceae** | | |
| | | *Desmocladus flexuosus* |
| | | *Hypolaena exsulca* |
| **Santalaceae** | | |
| | | *Exocarpos sparteus* |
| **Simaroubaceae** | | |
| | * | *Ailanthus altissima* |
| **Thymelaeaceae** | | |
| | | *Pimelea suaveolens* |
| **Typhaceae** | | |
| | | *Typha domingensis* |
| **Violaceae** | | |
| | | *Hybanthus calycinus* |
| **Xanthorrhoeaceae** | | |
| | | *Xanthorrhoea preissii* |
| **Zamiaceae** | | |
| | | *Macrozamia fraseri* |

Note: * denotes non-native species, Pl denotes planted

# Appendix D

Conservation Significant Communities and Likelihood of Occurrence Assessment

**Conservation significant communities known or likely to occur within 10 km of the site**

**Former Glen Iris Golf Course**

| Code | Community name | TEC/PEC | Level of significance | |
|---|---|---|---|---|
| | | | State | EPBC Act |
| | Clay pans of the Swan Coastal Plain | TEC | VU/EN | CR |
| | Tuart (*Eucalyptus gomphocephala* ) woodlands and forests of the Swan Coastal Plain | TEC | - | CR |
| SCP22 | *Banksia ilicifolia* woodlands, southern Swan Coastal Plain | TEC/PEC | P3 | EN (Banksia woodlands of the Swan Coastal Plain) |
| SCP24 | Northern Spearwood shrublands and woodlands | TEC/PEC | P3 | |
| | Banksia woodlands of the Swan Coastal Plain | TEC/PEC | P3 | EN |
| | Subtropical and temperate coastal saltmarsh | TEC | - | VU |
| | | | | |

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P3=priority 3

# Appendix E

Sample Data

# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R1

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R1: Page 2 of 3

**Quadrat and landform details**

| | | | |
|---|---|---|---|
| Sample type: | releve | Size: | other |
| NW corner easting: | 391786 | NW corner northing: | 6448422 |
| Altitude (m): | N/A | Geographic datum/zone: | GDA94/Zone 50 |
| Soil water content: | dry | Landform: | flat |
| Time since fire: | > 5 yrs | Disturbance: | moderate - weeds |
| Soil type/texture | sand/ | Bare ground (%): | 10 |
| Rocks (%) and type: | No rocks | Soil colour: | brown/white |
| Litter: | 30% (leaves,branches,) | Vegetation condition: | very good |



# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R1

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R1: Page 2 of 3

**Species Data**

* denotes non-native species

| Status | Confirmed name |
|---|---|
| | *Acacia pulchella* |
| | *Acacia stenoptera* |
| | *Allocasuarina humilis* |
| | *Banksia attenuata* |
| | *Banksia menziesii* |
| * | *Carpobrotus edulis* |
| | *Conostephium pendulum* |
| | *Conostylis ?aculeata* |
| | *Dampiera linearis* |
| | *Daviesia nudiflora* |
| | *Desmocladus flexuosus* |
| * | *Ehrharta calycina* |
| * | *Eragrostis curvula* |
| | *Eucalyptus marginata subsp. marginata* |
| | *Gastrolobium capitatum* |
| | *Gompholobium tomentosum* |
| *Pl | *Grevillea sp.* |
| | *Hardenbergia comptoniana* |
| | *Hibbertia hypericoides* |
| | *Jacksonia furcellata* |
| | *Jacksonia sternbergiana* |
| | *Lepidosperma sp.* |
| * | *Leptospermum laevigatum* |
| | *Lyginia imberbis* |
| | *Mesomelaena pseudostygia* |
| * | *Nerium oleander* |
| | *Patersonia occidentalis* |
| * | *Pelargonium capitatum* |
| | *Petrophile linearis* |
| | *Phlebocarya ciliata* |
| | *Scaevola canescens* |
| | *Stirlingia latifolia* |
| | *Xanthorrhoea preissii* |
| | *Pimelea ?suaveolens subsp. suaveolens* |
| | *Tricoryne elatior* |

# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R1

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R1: Page 3 of 3

*Conostylis setigera*
*Hybanthus calycinus*
*Sowerbaea laxiflora*
*Drosera menziesii*
*Hypocalymma robustum*
*Lomandra caespitosa*

* = non-native, Pl=planted

# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R2

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R2: Page 2 of 2

**Quadrat and landform details**

| | | | |
|---|---|---|---|
| Sample type: | releve | Size: | other |
| NW corner easting: | 392142 | NW corner northing: | 6446258 |
| Altitude (m): | N/A | Geographic datum/zone: | GDA94/Zone 50 |
| Soil water content: | dry | Landform: | flat |
| Time since fire: | no evidence | Disturbance: | moderate - weeds |
| Soil type/texture | sand/ | Bare ground (%): | 30 |
| Rocks (%) and type: | No rocks | Soil colour: | brown/white |
| Litter: | 15% (leaves,twigs,) | Vegetation condition: | very good |



# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R2

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R2: Page 2 of 2

**Species Data**

* denotes non-native species

| Status | Confirmed name |
|---|---|
| * | *Acacia longifolia* |
| | *Allocasuarina fraseriana* |
| | *Burchardia congesta* |
| * | *Cynodon dactylon* |
| | *Dasypogon bromeliifolius* |
| * | *Ehrharta calycina* |
| | *Hypolaena exsulca* |
| | *Kunzea glabrescens* |
| * | *Lagurus ovatus* |
| | *Lyginia imberbis* |
| | *Melaleuca thymoides* |
| | *Scholtzia involucrata* |
| | *Xanthorrhoea preissii* |

* = non-native

# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R3

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R3: Page 2 of 2

**Quadrat and landform details**

| | | | |
|---|---|---|---|
| Sample type: | releve | Size: | other |
| NW corner easting: | 391941 | NW corner northing: | 6446696 |
| Altitude (m): | N/A | Geographic datum/zone: | GDA94/Zone 50 |
| Soil water content: | dry | Landform: | flat |
| Time since fire: | > 5 yrs | Disturbance: | moderate - weeds |
| Soil type/texture | sand/ | Bare ground (%): | 20 |
| Rocks (%) and type: | No rocks | Soil colour: | brown/white |
| Litter: | 20% (leaves,branches,) | Vegetation condition: | very good |



# Vegetation Sample Data
# Former Glen Iris Golf Course

## Sample Name: R3

**Project no.:** EP20-009
**Date:** 11/03/2020, 19/08/21, 9/9/21 **Status** Non-permanent
**Author:** TAA,SKP R3: Page 2 of 2

**Species Data**

* denotes non-native species

| Status | Confirmed name |
|---|---|
| | *Adenanthos cygnorum* |
| | *Allocasuarina humilis* |
| | *Banksia attenuata* |
| | *Banksia menziesii* |
| | *Callitris preissii* |
| * | *Carpobrotus edulis* |
| | *Conostephium pendulum* |
| | *Daviesia nudiflora* |
| | *Daviesia triflora* |
| * | *Ehrharta calycina* |
| *Pl | *Eucalyptus caesia* |
| | *Eucalyptus marginata subsp. marginata* |
| | *Gastrolobium capitatum* |
| | *Gompholobium tomentosum* |
| | *Hibbertia hypericoides* |
| | *Hypocalymma angustifolium* |
| | *Jacksonia furcellata* |
| | *Lomandra hermaphrodita* |
| | *Lyginia imberbis* |
| | *Macrozamia fraseri* |
| | *Mesomelaena pseudostygia* |
| | *Patersonia occidentalis* |
| * | *Pelargonium capitatum* |
| | *Persoonia saccata* |
| | *Scaevola repens* |
| | *Scholtzia involucrata* |
| | *Stirlingia latifolia* |
| | *Styphelia propinqua* |
| | *Caladenia latifolia* |
| | *Hypocalymma robustum* |

* = non-native, Pl=planted

# Appendix B

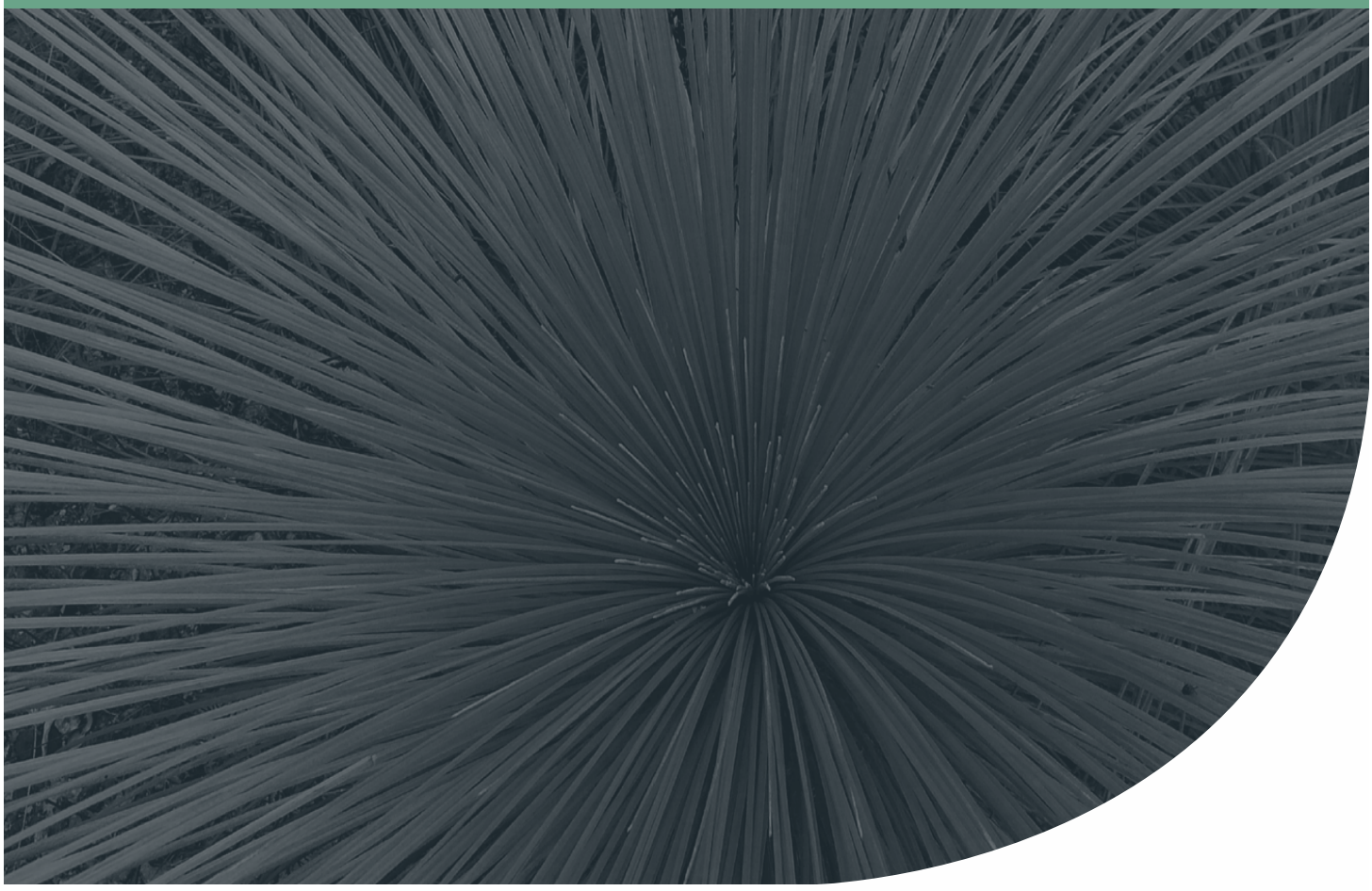
Basic Fauna Assessment

# Level 1 Fauna Assessment

## Former Glen Iris Golf Course

Project No: EP20-009(04)

**Prepared for ECP Acquisitions 6 Pty Ltd**
**June 2021**



# Document Control

| Doc name: | Level 1 Fauna Assessment<br>Former Glen Iris Golf Course | | | | |
|---|---|---|---|---|---|
| **Doc no.:** | **EP20-009(04)--004B RAW** | | | | |
| **Version** | **Date** | **Author** | | **Reviewer** | |
| 1 | June 2020 | Rachel Weber | RAW | Tom Atkinson | TAA |
| | Initial report submitted for client review | | | | |
| A | April 2021 | Melanie Schubert | MS | Rachel Weber | RAW |
| | Minor updates to reflect change in site boundary | | | | |
| B | June 2021 | Rachel Weber | RAW | Tom Atkinson | TAA |
| | Minor updates to numeric decimal places | | | | |

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# Executive Summary

ECP Acquisitions 6 Pty Ltd intends to develop the former Glen Iris Golf Course into a residential estate (referred to herein as 'the site'). Emerge were engaged to conduct a 'level 1' fauna assessment to provide information on the fauna values within the site to inform the development.

As part of the assessment a desktop review of relevant background information was completed and a site survey was undertaken on 11 March and 28 May 2020. During the survey an assessment was made on the type and conservation significance of fauna habitat across the site.

Outcomes of the level 1 fauna assessment include the following:

- Five fauna habitats were recorded in the site:
  - The **native woodland** habitat has the highest fauna habitat values but extends over a small portion of the site (4%) and occurs as scattered patches.
  - The **riparian** and **water** habitats, although artificial, also provide habitat for native fauna and occur as small patches (3% of the site).
  - The **planted trees and shrubs** habitat provides varying habitat values according to the plant species and density and extends over 25% of the site.
  - The remainder of the site (68%) supports turf, bare ground and infrastructure which provide low habitat values for native fauna.
- A total of 15 native and three introduced fauna species were recorded in the site, including Carnaby's cockatoo (threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) and quenda (Priority 4 in Western Australia).
- The **native woodland** and **planted trees and shrubs** habitats support plants known to be foraged by threatened species of black cockatoos including Carnaby's cockatoo. These habitats may also support trees suitable for use by black cockatoos as breeding or roosting habitat. A targeted assessment would be required to confirm the black cockatoo habitat values within the site.
- The portions of the **native woodland**, **planted trees and shrubs** and **riparian** habitats with dense understorey vegetation provide suitable habitat for quenda.
- An additional 45 species of conservation significance have potential to occur in the site. The majority of these species are birds which may only use the site intermittently, if at all. The **native woodland** habitat also provides a relatively small area of potential habitat for two invertebrates and two reptiles of conservation significance.

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Figure 1: Site Location
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# Appendices

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Additional Information

**Appendix B**

Database Search Results

**Appendix C**

Conservation Significant Species and Likelihood of Occurrence Assessment

**Appendix D**

Species List

# Abbreviation Tables

*Table A1: Abbreviations – Organisations*

| Organisations | |
|---|---|
| EPA | Environmental Protection Authority |
| DBCA | Department of Biodiversity, Conservation and Attractions |
| DAWE | Department of Agriculture, Water and the Environment |
| WA Museum | Western Australian Museum |

*Table A2: Abbreviations – General terms*

| General terms | |
|---|---|
| T | Threatened |
| EN | Endangered |
| EX | Extinct |
| VU | Vulnerable |
| MI | Migratory |
| HT | Habitat tree |
| P1 | Priority 1 |
| P2 | Priority 2 |
| P3 | Priority 3 |
| P4 | Priority 4 |
| P5 | Priority 5 |

*Table A3: Abbreviations –Legislation*

| Legislation | |
|---|---|
| BAM Act | *Biosecurity and Agriculture Management Act 2007* |
| EP Act | *Environmental Protection Act 1986* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| BC Act | *Biodiversity Conservation Act 2016* |
| BC Regs | *Biodiversity Conservation Regulations 2018* |

*Table A4: Abbreviations – planning*

| Planning terms | |
|---|---|
| MRS | Metropolitan Region Scheme |

*Table A5: Abbreviations – units of measurement*

| Units of measurement | |
|---|---|
| cm | Centimetre |
| ha | Hectare |
| km | Kilometre |
| m | Metre |

# 1 Introduction

## 1.1 Project background

ECP Acquisitions 6 Pty Ltd intends to develop the former Glen Iris Golf Course into a residential estate. The former Glen Iris Golf Course comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court in Jandakot (referred to herein as the 'site').

The site is located approximately 16 kilometres (km) south of the Perth Central Business District within the City of Cockburn and is zoned 'urban' under the Metropolitan Region Scheme (MRS) and 'development contribution area 13 special use 1', 'development contribution area 13 special use 6', 'development contribution area 13 residential-R40' under the City of Cockburn *Town Planning Scheme No. 3.*

The site is approximately 53.7 hectares (ha) in size and is surrounded by residential subdivision, with a railway to the north and Kwinana Freeway to the west. The site comprises two areas separated by Berrigan Drive. The location and extent of the site is shown in **Figure 1**.

## 1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Acumen Development Solutions, on behalf of ECP Acquisitions 6 Pty Ltd, to provide environmental consultancy services to support the planning process for the site. The purpose of this survey is to provide sufficient information on the fauna values within the site to inform this process.

The scope of work was specifically to conduct a fauna assessment to the standard required of a 'level 1' fauna survey with reference to the Environmental Protection Authority's (EPA's) *Technical Guidance – Terrestrial fauna Surveys* (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of background information regarding fauna species relevant to the site and surrounds.
- Compilation of a list of fauna species opportunistically recorded as part of the field survey.
- Identification of potential habitat for conservation significant fauna species and likelihood of occurrence.
- Documentation of the desktop assessment, survey methodology and results into a report.

# 2 Environmental Context

## 2.1 Significant fauna

### 2.1.1 Threatened fauna species

Certain fauna taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, fauna taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment.

In Western Australia fauna species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Threatened fauna species listed under the EPBC Act and/or BC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Further information on threatened species and their categories is provided in **Appendix A**.

### 2.1.2 Priority fauna species

Fauna species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the Department of Biodiversity, Conservation and Attractions (DBCA) *Priority Fauna List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes. Further information on priority species and their categories is provided in **Appendix A**.

### 2.1.3 Migratory fauna species

Migratory fauna species that migrate to Australia and its external territories, or pass though or over Australian waters during their annual migrations warrant special protection under Commonwealth and State legislation. At a Commonwealth level, migratory fauna taxa may be listed as 'migratory' under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment.

In Western Australia migratory fauna taxa may be listed as 'specially protected species' and classed as 'migratory' under the *Biodiversity Conservation Act 2016* (BC Act). Further information on migratory species is provided in **Appendix A**.

### 2.1.4 Specially protected fauna species

In Western Australia, fauna species that are of special conservation interest, including migratory species, cetaceans, species subject to international agreement or species otherwise in need of special protection, may be listed as 'specially protected' under the BC Act.

### 2.1.5 Pest fauna species

The term 'pest fauna' can refer to any animal that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native fauna species and some fauna species native to Australia but not Western Australia are considered to be pest fauna.

A particularly invasive or detrimental pest species may be listed as a 'declared pest' pursuant to Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. Further information on categories of declared pests is provided in **Appendix A.**

## 2.2 Bush Forever

The Government of Western Australia's *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* is to protect comprehensive representations of all original ecological communities by targeting a minimum of 10% of each vegetation complex for protection (Government of WA 2000). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No *Bush Forever* sites occur within the site. Multiple *Bush Forever* sites occur to the east and west of the site.

## 2.3 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improve the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. One biodiversity ecological linkage (No. 48) is located approximately 800 m to the north of the site and extends to the west and east.

## 2.4 Previous surveys

No previous fauna surveys are known to have been undertaken within the site.

# 3 Methods

## 3.1 Desktop assessment

### 3.1.1 Database searches

A search was conducted for fauna species that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020) and *NatureMap* (DBCA 2020).

A total number of species with potential to occur within the site was calculated by adding the total count of non-conservation significant species provided by *NatureMap* to the combined number of conservation significant species provided by *NatureMap* and *Protected Matters Search Tool*.

### 3.1.2 Likelihood of occurrence

Information on habitat preferences and distribution of threatened and priority vertebrate fauna species identified in database searches was reviewed. This was assessed against the general site conditions and fauna habitat types recorded during the field survey.

An assessment of the likelihood of occurrence of threatened and priority fauna species within the site was undertaken and each was assigned to one of the following categories:

- Recorded: The species in question was positively identified as being present within the site during the field survey or from recent literature records.
- Likely: Potentially suitable habitat for the species in question was identified during the field survey and the site lies within the known distribution of the species.
- Possible: Potentially suitable habitat for the species in question was identified but of marginal quality and/or extent. The site lies within or close to the known distribution of the species.
- Unlikely: The site lies outside of the known distribution of the species in question and/or no suitable habitat was identified within the site.

## 3.2 Field survey

An ecologist from Emerge visited the site on the 11 March 2020 during the day from approximately 10:30 am to 4:30 pm to conduct the level 1 fauna survey field survey.

Another ecologist from Emerge also visited the site on 28 May 2020 during the day from approximately 2:00 pm to 6:00 pm to conduct an additional assessment of the fauna in the artificial lakes within the site.

### 3.2.1 Level 1 fauna

During both surveys transects were traversed across the site and the characteristics of fauna habitat and presence of fauna species was recorded. Microhabitats such as logs, rocks and leaf litter were investigated and secondary evidence of species presence such as tracks, scats, skeletal remains, foraging evidence or calls was also noted.

A vertebrate fauna list was compiled and fauna habitat values were described, with particular reference to 'threatened' and 'priority' fauna species with potential to occur within the site. Taxonomy and nomenclature for vertebrate fauna species was taken from the *Western Australian Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (Western Australian Museum 2019). Literature listed in **Appendix A** represent the main publications used to identify fauna species and habitats within the site.

## 3.3 Data analysis, presentation mapping

### 3.3.1 Fauna habitat

Fauna habitats were described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey and information provided in the *Reconnaissance Flora and Vegetation Assessment* for the site (Emerge Associates 2020). The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography, Emerge Associates (2020) plant communities and notes taken in the field.

Information on specific habitat requirements for conservation significant vertebrate fauna species with potential to occur within the site were compiled as part of the desktop assessment. This information was compared to the fauna habitats identified within the site to determine whether any conservation significant fauna species are considered to have potential to utilise the site.

## 3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Terrestrial Fauna Surveys* (EPA 2016) is provided in **Table 1**.

*Table 1: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2016)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| Level of survey | No limitation | A level 1 survey (desktop study and field survey) was considered adequate given the relatively low habitat values within the site and the generally good availability of fauna information for the region. |
| Scope | No limitation | The survey focused on vertebrate fauna and habitat values, with particular focus on conservation significant taxa with potential to occur within the site. |
| Proportion of fauna identified, recorded and/or collected. | No limitation | All observed vertebrate fauna were identified. |
| Sources of information e.g. previously available information (whether historic or recent) as distinct from new data. | No limitation | Adequate information was available from database searches. |

*Table 1: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2016) (continued)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| The proportion of the task achieved and further work which might be needed. | No limitation | The task was achieved in its entirety. |
| Experience level of personnel | Minor limitation | The field surveys were undertaken by two qualified ecologists with three years' and 18 years' experience in environmental science. The report was authored by a qualified ecologist with over nine years' experience. Technical review was undertaken by a senior environmental consultant with 18 years' experience in environmental science in Western Australia. |
| Suitability of timing | Slight limitation | Survey timing is not considered to be of great importance for Level 1 assessments. |
| Completeness | No limitation | The desktop assessment and field survey components were completed. |
| Spatial coverage and access | No limitation | Site coverage was comprehensive (track logged). |
| | No limitation | All parts of the site could be accessed as required. |
| Survey intensity | No limitation | The intensity of the survey was adequate given the size of the site and the relatively low habitat value present. |
| Influence of disturbance | No limitation | The site is highly modified due to historical disturbance. However, no recent disturbance was noted that may have affected outcomes of the survey. |
| Adequacy of resources | No limitation | All resources required to perform the survey were available. |

# 4 Results

## 4.1 General site conditions

The site is gently undulating and comprises sandy white-grey soils. The fairways within the site were irrigated at the time of the survey. Seven artificial lakes occur within the site that were also sustained by irrigation at the time of the survey.

The site has been highly modified for use as a golf course and is dominated by non-native vegetation and unvegetated areas, with native vegetation present as individuals or small scattered patches. The artificial lakes are surrounded by either turf, riparian vegetation or planted trees and shrubs.

## 4.2 Fauna habitat

Historical disturbance has significantly compromised habitat values within the site. The majority of the native vegetation has been removed and vegetation now predominantly comprises cleared area, dominated by non-native and weed species with scattered or patches of native and non-native trees and shrubs.

Five fauna habitats were recorded in the site. **Native woodland** is present as scattered patches and has the highest fauna habitat values due to the presence of native trees, shrubs and ground cover and contains microhabitats such as logs, rocks and leaf litter. The **riparian** and **water** habitats provide value for aquatic fauna species and those associated with riparian areas. The **planted trees and shrubs** habitat mainly provides habitat for avian species as the majority is devoid of understorey vegetation. The **turf and bare ground** habitat extends over a large portion of the site and has minimal habitat values for native fauna species.

The remainder of the site is not considered to provide fauna habitat as it comprises infrastructure such as buildings and hardstand (0.9 ha).

A description and the area of each habitat is provided in **Table 2** and representative photographs of each are provided in **Plate 1** to **Plate 5** . The location of each habitat is shown in **Figure 3.**

*Table 2: Fauna habitats identified within the site*

| Fauna habitat classification | Description | Area (ha) |
|---|---|---|
| **Native woodland** | Woodland to open woodland *Eucalyptus marginata* subsp. *marginata*, *Banksia attenuata* and *Banksia menziesii* over mixed shrubland *Xanthorrhoea preissii*, *Allocasuarina humilis* and *Hibbertia hypericoides* over open sedgeland *Mesomelaena pseudostygia* over non-native grassland **Ehrharta calycina* (**Plate 1**). | 1.9 |
| **Riparian** | Closed sedgeland *Typha domingensis*, *Schoenoplectus tabernaemontani*, **Cortaderia selloana* and *Baumea* sp. (likely planted or a combination of planted and naturally regenerated) (**Plate 2**). | 0.2 |
| **Water** | Water in artificial lakes of varying depth (**Plate 3**). | 1.4 |
| **Planted trees and shrubs** | Predominantly scattered non-native planted trees and shrubs such as **Corymbia* spp., **Eucalyptus* spp., *Melaleuca* spp. and *Grevillea* spp. with occasional native plants (**Plate 4**). | 13.6 |
| **Turf and bare ground** | Closed non-native grassland (turf) and bare ground (**Plate 5**). | 35.7 |



*Plate 1: **Native woodland** habitat*



*Plate 2: **Riparian** habitat*



*Plate 3: **Water** habitat*



*Plate 4:* ***Planted trees and shrubs*** *habitat*



*Plate 5:* ***Turf and bare ground*** *habitat*

## 4.3 Fauna

### 4.3.1 Desktop assessment

A total of 560[1] fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site, as listed in **Appendix B**.

Of these, 92 species are of conservation significance, comprising 38 threatened, 14 priority, 39 migratory fauna and one other specially protected species as listed in **Appendix C**.

### 4.3.2 Species inventory

A total of 15 native and three introduced fauna species were recorded in the site, including two fauna species of conservation significance which is described in **Section 4.3.3**.

Two of the introduced fauna species, **Cherax destructor* (yabby) and **Cyprinus rubrofuscus* (koi fish), were recorded on 28 May 2020 within or adjacent to the artificial lakes. Scats of the other introduced fauna species, **Oryctolagus cuniculus* (rabbit) were recorded across the site during both surveys.

A complete species list is provided in **Appendix D**.

### 4.3.3 Conservation significant fauna

Two fauna species of conservation significance were recorded in the site: Carnaby's cockatoo which is listed as endangered under the EPBC Act and quenda which is listed as P4 in WA.

Approximately 20 individuals of Carnaby's cockatoo were recorded perching in trees on the 11 March 2020 in the central portion of the site. No signs of foraging or night roosting were opportunistically recorded in the site. The **native woodland** and **planted trees and shrubs** habitats support plants known to be foraged by threatened species of black cockatoos including Carnaby's cockatoo. These habitats may also support trees suitable for use as breeding or roosting habitat by black cockatoos.

Diggings of quenda (P4) were recorded in the south eastern portion of the site within the **planted trees and shrubs** and **riparian** habitats, within dense understorey vegetation. The following three mapped habitats may comprise suitable habitat for quenda:

- **native woodland**
- **riparian** (where it is not inundated)
- **planted trees and shrubs** (where understorey vegetation is present and dense).

A total of 48 fauna species of conservation significance were considered to have potential to occur in the site, as shown in **Table 3**. This comprises the two recorded species, one that is considered likely to occur and 45 considered to possibly occur.

The remaining conservation significant fauna species identified in **Section 4.3.1** are not considered to occur in the site due to lack of suitable habitat or because the site lies outside of the species known distribution. The likelihood of occurrence assessment for these species is provided in **Appendix B**.

[1] Includes native and non-native species

*Table 3: Conservation significant fauna species which have potential to occur within the site*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| **Birds** | | | | | |
| *Actitis hypoleucos* | Common sandpiper | MI | MI | Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations wherelow perches are available (Johnstone & Storr 1998). | **Possible** (marginal habitat present) |
| *Apus pacificus* | Pacific swift | MI | MI | Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey & Knight 2012). | **Possible** (may opportunistically occur above the site, potential foraging habitat present) |
| *Ardea alba* | Eastern great egret | - | MA | Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewage ponds, irrigation areas and larger dams (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Ardea ibis* | Cattle egret | - | MA | Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Botaurus poiciloptilus* | Australasian bittern | EN | EN | In or over water, in tall reedbeds, sedges, rushes, cumbungi, lignum. Also occurs in ricefields, drains in tussocky paddocks and occasionally in saltmarshes and brackish wetlands. | **Possible** (marginal habitat present) |
| *Calidris acuminata* | Sharp-tailed sandpiper | MI | MI | Occurs in tidal mudflats, saltmarshes and mangroves, as well as, shallow fresh,brackish or saline inland wetlands. It is also known from floodwaters, irrigated pastures and crops, sewage ponds, saltfields. | **Possible** (marginal habitat present) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Calidris melanotos* | Pectoral sandpiper | MI | MI | Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also samphire flats around estuaries and saltlakes (Johnstone & Storr 1998). | **Possible** (marginal habitat present) |
| *Calidris ruficollis* | Red-necked stint | MI | MI | Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizzey and Knight 2012). | **Possible** (marginal habitat present) |
| *Calidris subminuta* | Long-toed stint | MI | MI | Mainly freshwater swamps (especially when drying and where vegetation is short), river pools, lagoons and claypans; also brackish pools, sewage ponds and samphire flats around estuaries and saltlakes. | **Possible** (marginal habitat present) |
| *Calyptorhynchus banksii naso* | Forest red-tailed black cockatoo | VU | VU | Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding Corymbia calophylla, Eucalyptus marginata, introduced Melia azdarach and Eucalyptus spp. trees. | **Likely** (potential habitat present) |
| *Calyptorhynchus latirostris* | Carnaby's cockatoo | EN | EN | Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Dryandra spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998). | **Recorded** (suitable habitat present) |
| *Charadrius bicinctus* | Double-banded plover | MI | MI | Wide beaches, tidal mudflats, saltmarsh, wide and sparsely vegetated margins of shallow saline and freshwater wetlands, paddocks with sparse vegetation, ploughed fields, airfields. | **Possible** (potential habitat present) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Charadrius dubius* | Little ringed plover | MI | MI | Open, muddy or sandy shores of lakes, swamps, tidal areas, sewage ponds or farm dams. Rare but regular summer migrant to Australia (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Charadrius leschenaultii* | Great sand plover | VU | VU (MI) | Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Charadrius ruficapillus* | Red-capped plover | - | MA | Broad, sandy and shelly beaches; bare margins of saline wetlands and lakes, inland and coastal; saltmarsh; tidal mudflats and sandflats; adjacent dunes; occasionally shallow freshwater wetlands, inland and coastal (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Chlidonias leucopterus* | White-winged black tern | MI | MI | Vegetated and open wetlands, brackish and saline lakes, saltfields, irrigated lands, sewage ponds and occasionally offshore. | **Possible** (potential habitat present) |
| *Falco peregrinus* | Peregrine falcon | OS | - | Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998). | **Possible** (marginal habitat present) |
| *Gallinago hardwickii* | Latham's snipe | MI | MI | Soft, wet ground or shallow water with tussocks and other green or dead growth, wet parts of paddocks, seepage below dams, irrigated areas, scrub or open woodlandfrom sea level to alpine bogs over 2000 m, samphire on saltmarshes and mangrove fringes. Rare visitor to Western Australia. | **Possible** (potential habitat present) |
| *Gallinago megala* | Swinhoe's snipe | MI | MI | Wet, grassy ground; edges of reedy swamps (Pizzey & Knight 2012). | **Possible** (potential habitat present) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Gallinago stenura* | Pin-tailed snipe | MI | MI | Boggy edges of vegetated wetlands; sewage and other ponds; stubbles, grasslands with shrubs, pastures (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Gelochelidon nilotica* | Gull-billed tern | MI | MI | Beaches, mudflats; fresh, brackish wetlands, including far inland; grasslands, crops, ploughed fields, airfields (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Himantopus himantopus* | Black-winged stilt | - | MA | Freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers (Birdlife Australia 2019). | **Possible** (potential habitat present) |
| *Ixobrychus dubius* | Australian little bittern | P4 | - | Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of Typha spp., Baumea spp. and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998). | **Possible** (marginal habitat present) |
| *Limosa limosa* | Black-tailed godwit | MI | MI | Tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures, airfields (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Merops ornatus* | Rainbow bee-eater | - | MA | Open woodlands with sandy, loamy soil; sandridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands and golf courses (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Numenius minutus* | Little curlew | MI | MI | Dry grasslands, floodplains, margins of drying swamps; tidal mudflats, airfields, playing fields, crops, commercial saltfields, sewage ponds (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Numenius phaeopus* | Whimbrel | MI | MI | Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds and lawns. | **Possible** (potential habitat present) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Oxyura australis* | Blue-billed duck | P4 | - | Mainly deeper freshwater swamps and lakes; occasionally saltlakes and estuaries freshened by flood waters (Johnstone and Storr 1998a). | **Possible** (marginal habitat present) |
| *Phalaropus lobatus* | Red-necked phalarope | MI | MI | Shallow pools in commercial saltfields, tidal mudflats, beaches, saltmarshes, freshwater wetlands. | **Possible** (marginal habitat present) |
| *Philomachus pugnax* | Ruff | MI | MI | Fresh, brackish and saline wetlands; tidal mudflats, saltfields, sewage ponds (Pizzey & Knight 2012). | **Possible** (marginal habitat present) |
| *Plegadis falcinellus* | Glossy Ibis | MI | MI | Shallow and adjacent flats of freshwater lakes and swamps, also river pools, flooded samphire and sewage ponds. | **Possible** (marginal habitat present) |
| *Pluvialis fulva* | Pacific golden plover | MI | MI | Estuaries, mudflats, saltmarshes, mangroves; rocky reefs and stranded seaweed on ocean shores; margins of shallow open inland swamps; sewage ponds, short-grass paddocks, sportsgrounds, airfields, ploughed land (Pizzey & Knight 2012). | **Possible** (potential habitat present) |
| *Recurvirostra novaehollandiae* | Red-necked avocet | - | MA | Estuaries, tidal mudflats; fresh, brackish and salt swamps and lakes; claypans, commercial saltfields and sewage ponds (Pizzey & Knight 2012). | **Possible** (marginal habitat present) |
| *Rostratula australis* | Australian painted snipe | EN | EN | Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993). | **Possible** (marginal habitat present) |
| *Thalassarche cauta cauta* | Shy albatross | VU | VU (MI) | Scarce visitor (late May to mid-October) to southwestern and western seas. Breeds on islands off Tasmania and south New Zealand (Johnstone and Storr 1998). | **Possible** (marginal habitat present) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Thinornis rubricollis* | Hooded plover | P4 | VU | Margins and shallows of saltlakes, sandy and seaweedy beaches and estuaries; also dams (Johnstone & Storr 1998). | **Possible** (marginal habitat present) |
| *Tringa glareola* | Wood sandpiper | MI | MI | Mainly shallow fresh waters (lagoons, swamps, claypans, river pools, dams, bore overflows and sewage ponds); occasionally brackish swamps, rarely saltlakes and estuaries. | **Possible** (potential habitat present) |
| *Tringa nebularia* | Common greenshank | MI | MI | Shallow fresh waters (claypans, lagoons, swamps, river pools, dams and sewage ponds) and salt waters (estuaries, mangrove creeks, lakes, samphire flats, reef flats and saltwork ponds). | **Possible** (potential habitat present) |
| *Tringa stagnatilis* | Marsh sandpiper | MI | MI | Mainly shallow fresh or brackish waters: swamps, lakes, river pools, soaks, sewage ponds and bore overflows. Occasionally estuaries and salt ponds, and rarely coasts. | **Possible** (potential habitat present) |
| *Tringa totanus* | Common redshank | MI | MI | Sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). Also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). | **Possible** (marginal habitat present) |
| *Tyto novaehollandiae novaehollandiae* | Australian masked owl | P3 | - | Forests, open woodlands, farmlands with large trees. E.g. river red gums, adjacent cleared country, timbered watercourses, paperbark woodlands and caves (Pizzey & Knight 2012). | **Possible** (marginal habitat present) |
| **Invertebrates** | | | | | |
| *Idiosoma sigillatum* | Swan Coastal Plain shield-backed trapdoor spider | P3 | - | Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003). | **Possible** (suitable habitat present, multiple records nearby) |

*Table 3: Conservation significant fauna species which have potential to occur within the site (continued)*

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | BC Act | EPBC Act | | |
| *Synemon gratiosa* | Graceful sunmoth | P4 | - | Coastal heathland on Quindalup dunes where it is restricted to secondary sand dunes due to the abundance of the preferred host plant Lomandra maritima. Banksia woodland on Spearwood and Bassendean dunes, where the second known host plant L. hermaphrodita is widespread (DEC 2011). | **Possible** (hostplant recorded) |
| *Throscodectes xiphos* | Stylet bush cricket | P1 | - | Species poorly understood and documented. Known from Jandacot area, where it was originally collected in the axial leaf bases of grass trees (Xanthorrhoea preissei) (Invertebrate Solutions 2019). | **Possible** (suitable habitat present, single record nearby, poor knowledge of species) |
| **Mammals** | | | | | |
| *Hydromys chrysogaster* | Rakali | P4 | - | Areas with permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen et al. 1985). | **Possible** (marginal habitat present) |
| *Isoodon fusciventer* | Quenda | P4 | - | Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012a) | **Recorded** (suitable habitat present) |
| **Reptiles** | | | | | |
| *Lerista lineata* | Perth slider | P3 | - | Sandy coastal heath and low scrubland. Banksia spp. woodland, Eucalyptus gomphocephala open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2017). | **Possible** (potential habitat present) |
| *Neelaps calonotos* | Black-striped snake | P3 | - | Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002). | **Possible** (potential habitat present) |

### 4.3.1 Declared pests

One of the introduced fauna species recorded, **Oryctolagus cuniculus* (rabbit), is listed as a declared pest (C3) pursuant to the BAM Act.

# 5 Discussion

## 5.1 Fauna habitat values

Over half of the site (68%) supports turf, bare ground and infrastructure which provide low habitat values for native fauna. The **native woodland** habitat provides the highest habitat values but extends over a small portion of the site (4%) and occurs as scattered patches. The **riparian** and **water** habitats, although artificial, also provide habitat for native fauna and occur as small patches (3% of the site). The remainder of the site supports **planted trees and shrubs** which provide varying habitat values according to the plant species and density. The majority of the **planted trees and shrubs** habitat lacks understorey vegetation and would mainly provide habitat for common avian species.

The 15 native and three introduced fauna taxa recorded within the site are common and widespread on the Swan Coastal Plain region, although two of them are of conservation significance as detailed in **Section 5.2**.

## 5.2 Conservation significant fauna

Threatened Carnaby's cockatoo were recorded in the site and another threatened black cockatoo, forest red-tailed black cockatoo, is considered likely to occur in the site. The **native woodland** and **planted trees and shrubs** habitats support plants known to be foraged by threatened species of black cockatoos including Carnaby's cockatoo and forest red-tailed black cockatoo. These habitats may also support trees suitable for use by black cockatoos as breeding or roosting habitat. Further targeted assessment would be required to confirm the black cockatoo habitat values within the site.

Quenda (P4) diggings were recorded in the site and the **native woodland**, **planted trees and shrubs** and **riparian** habitats are considered to provide suitable habitat for quenda. Quenda inhabit dense scrub/shrub vegetation and therefore only parts of the above habitats with a dense understorey vegetation are considered likely to support this species (DEC 2012). The **planted trees and shrubs** habitat largely lacks understorey and as such the **native woodland** and **riparian** habitats would provide the highest habitat value to quenda in the site.

An additional 45 species of conservation significance have potential to occur in the site. However, the majority of these species are birds which may only use the site intermittently, if at all. The **native woodland** habitat also provides a relatively small area of potential habitat for two invertebrates and two reptiles of conservation significance.

# 6 Conclusions

The majority of the site supports turf, bare ground and infrastructure which provides low habitat values for native fauna. The **native woodland** habitat provides the highest relative value but, as this habitat extends over a small portion of the site (4%) and occurs as scattered patches, the importance of this habitat to native fauna is likely limited. Although artificial, the **riparian** and **water** habitats also provide habitat for native fauna. The remainder of the site supports **planted trees and shrubs** which provide varying habitat values depending on plant species and density.

The 15 native and three introduced fauna taxa recorded within the site are all common and widespread across the Swan Coastal Plain region. Two of them are of conservation significance.

Two fauna species of conservation significance were recorded within the site: Carnaby's cockatoo (threatened) and quenda (P4). One other threatened species, forest red-tailed black cockatoo, is considered likely to occur in the site. A targeted assessment would be required to confirm the black cockatoo habitat values within the site.

An additional 45 species of conservation significance have potential to occur in the site. The majority of these species are birds which may only use the site intermittently, if at all. The **native woodland** habitat also provides a relatively small area of potential habitat for two invertebrates and two reptiles of conservation significance.

# 7 References

## 7.1 General references

Alan Tingay and Associates 1998, *A Strategic Plan for Perth's Greenways - Final Report*. December 1998.

Department of Environment and Conservation (DEC) 2012, *Fauna profiles, Quenda Isoodon obesulus (Shaw, 1797)*, Perth.

Emerge Associates 2020, *Reconnaissance Flora and Vegetation Assessment - Former Glen Iris Golf Course*, EP20-009(03)--002 RAW, Version 1.

Environmental Protection Authority (EPA) 2016, *Technical Guidance - Terrestrial Fauna Surveys*, Perth.

Government of WA 2000, *Bush Forever - Volume 1: Policies, principles and processes*, Perth.

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. 2009, *South West Regional Ecological Linkages Technical Report*, Western Australian Local Government Association and Department of Environment and Conservation, Perth.

Western Australian Local Government Association and Perth Biodiversity Project (WALGA and PBP) 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, Perth.

Western Australian Museum 2019, *WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia*, Perth, Western Australia.

## 7.2 Online references

Department of Parks and Wildlife (DBCA) 2020, *NatureMap,* viewed 27 March 2020 < https://naturemap.dpaw.wa.gov.au/>.

Department of the Environment (DAWE) 2020x, *Protected Matters Search Tool*, viewed 27 March 2020 <https://www.environment.gov.au/epbc/protected-matters-search-tool>.

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# Figures

*Figure 1: Site Location*

*Figure 2: Environmental Features*

*Figure 3: Fauna Habitat*




**Figure 1: Site Location**

| | |
|---|---|
| **Project:** | Level 1 Fauna Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

| | |
|---|---|
| **Plan Number:** | **EP20-009(04)--F07a** |
| Drawn: | GAR |
| Date: | 29/03/2021 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 29/03/2021 |

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

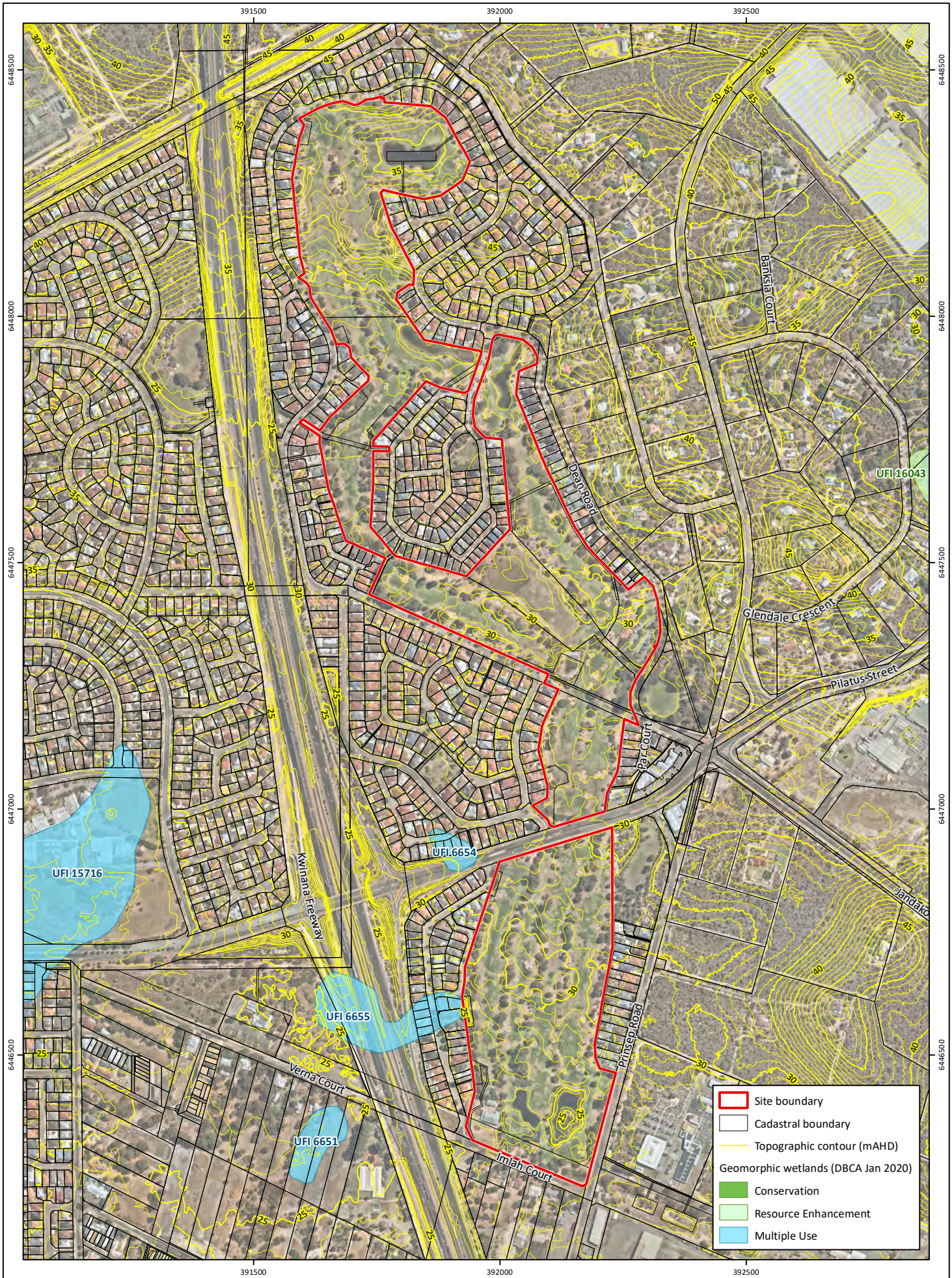



**Figure 2: Environmental Features**

**Project:** Level 1 Fauna Assessment
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(04)--F08a

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/03/2021 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 29/03/2021 |

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emerge ASSOCIATES

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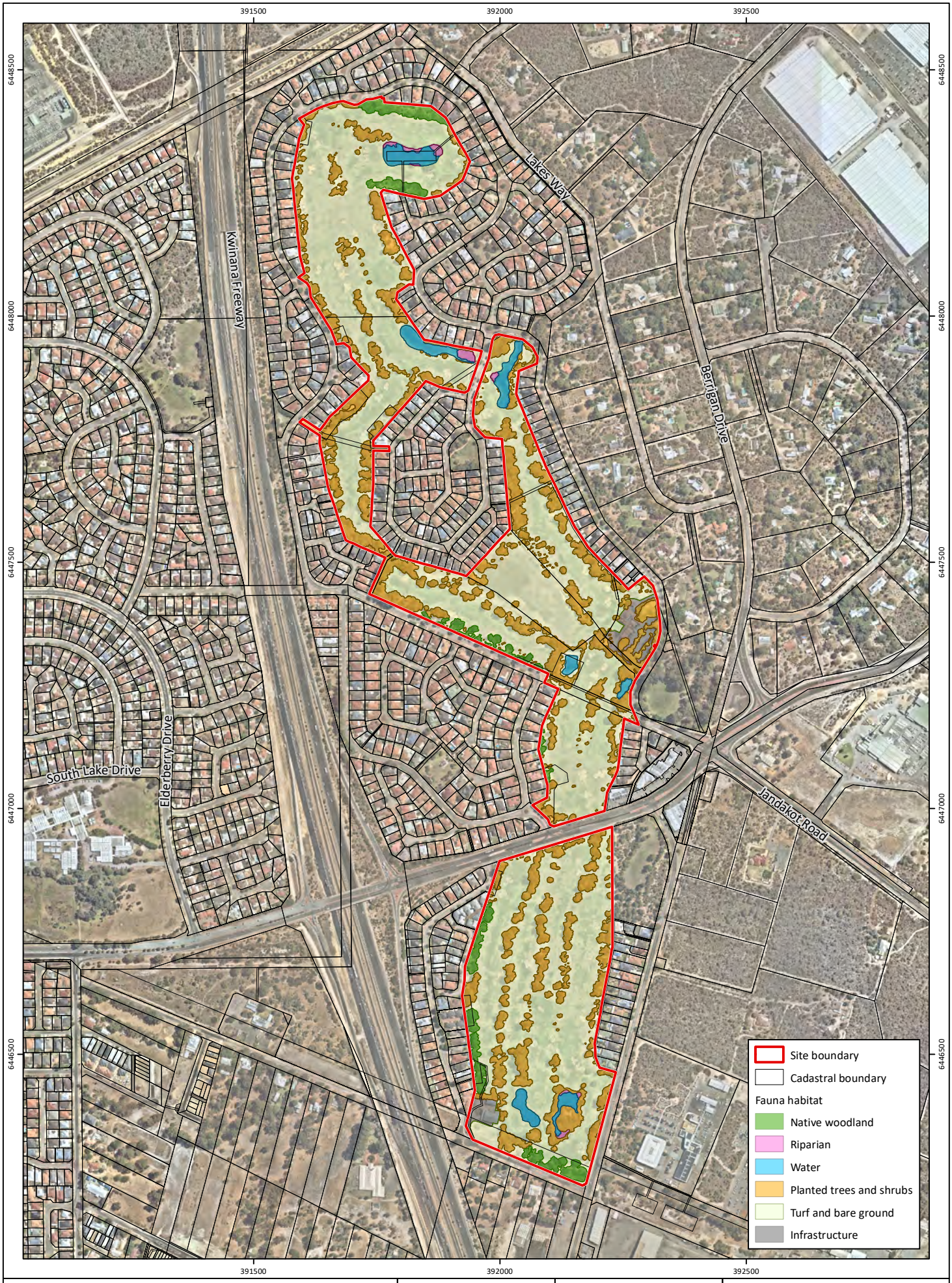



**Figure 3: Fauna Habitat**

**Project:** Level 1 Fauna Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(04)--F09a**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 29/03/2021 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 29/03/2021 |

N

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Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

# Appendix A

Additional Information

# Conservation Significant Fauna

## Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Migratory birds may be recognised under international treaties including:

- *Japan Australia Migratory Bird Agreement 1981* (JAMBA)
- *China Australia Migratory Bird Agreement 1998* (CAMBA)
- *Republic of Korea-Australia Migratory Bird Agreement 2007* (ROKAMBA)
- *Bonn Convention 1979* (The Convention on the Conservation of Migratory Species of Wild Animals).

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as 'matters of national environmental significance' (MNES) under the EPBC Act. Fauna species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories as outlined in **Table 1**.

*Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act*

| Conservation Code | Category |
|---|---|
| X | Threatened Fauna –Extinct<br>There is no reasonable doubt that the last member of the species has died. |
| EW[#] | Threatened Fauna –Extinct in the Wild<br>Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys. |
| CR[#] | Threatened Fauna – Critically Endangered<br>Taxa which are considered to be facing an extremely high risk of extinction in the wild. |
| EN[#] | Threatened Fauna – Endangered<br>Taxa which are considered to be facing a very high risk of extinction in the wild. |
| VU[#] | Threatened Fauna – Vulnerable<br>Taxa which are considered to be facing a high risk of extinction in the wild. |
| Migratory[#] | Migratory Fauna<br>All migratory species that are:<br>(i) native species; and<br>(ii) from time to time included in the appendices to the Bonn Convention; and<br>(b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and<br>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. |
| Ma | Marine Fauna<br>Species in the list established under s248 of the EPBC Act |

[#]matters of national environmental significance (MNES) under the EPBC Act

In Western Australia, fauna taxa may be classed as 'threatened', 'extinct', or 'specially protected' under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019). The definitions of these categories are provided in **Table 2**.

*Table 2: Definitions of specially protected fauna schedules under the BC Act (DBCA 2019)*

| Category | Conservation Code | Definition |
|---|---|---|
| Threatened | CR | Critically endangered<br>Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future. |
| | EN | Endangered<br>Threatened species considered to be facing a very high risk of extinction in the wild in the near future. |
| | VU | Vulnerable<br>Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future. |
| Extinct | EX | Extinct<br>Species where there is no reasonable doubt that the last member of the species has died. |
| | EW | Extinct in the wild<br>Species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form.<br>Note that no species are currently listed as EW. |
| Specially protected | MI | Migratory species<br>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth<br><br>Includes birds that 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. |
| | CD | Species of special conservation interest (conservation dependent fauna)<br>Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. |
| | OS | Other specially protected species<br>Fauna otherwise in need of special protection to ensure their conservation. |

Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those 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 (DBCA 2019).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019).

*Table 3: Definitions of priority fauna categories on DBCA's Priority Fauna List (DBCA 2019)*

| Conservation Code | Category |
|---|---|
| P1 | Priority 1 – Poorly known<br>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 | Priority 2 – Poorly known<br>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. |
| P3 | Priority 3 – Poorly known<br>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) Priority 4 – Rare species<br>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.<br>(b) Priority 4 – Near Threatened<br>Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.<br>(c) Priority 4 – Other<br>Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy. |

# Pest fauna

A number of legislative and policy documents exist in relation to pest fauna management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding pest fauna management in Western Australia and lists declared pest species.

## Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

*Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016)*

| Category | Description |
|---|---|
| Declared Pest Prohibited - s12 | May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions. |
| Declared Pest s22(2) | Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia |

*Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016)*

| Category | Description |
|---|---|
| C1 | Exclusion<br>Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State. |
| C2 | Eradication<br>Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility. |
| C3 | Management<br>Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest. |

*Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016)*

| Category | Description |
|---|---|
| Prohibited | Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority. |
| Exempt | No permit or conditions are required for keeping. |
| Restricted | Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals. |

# References

## General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Threatened and Priority Fauna List 15 February 2018*, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2019, *Conservation Codes for Western Australian Flora and Fauna - last updated 3 January 2019*.

# Appendix B

Database Search Results

Australian Government
Department of the Environment and Energy

# EPBC Act Protected Matters Report

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

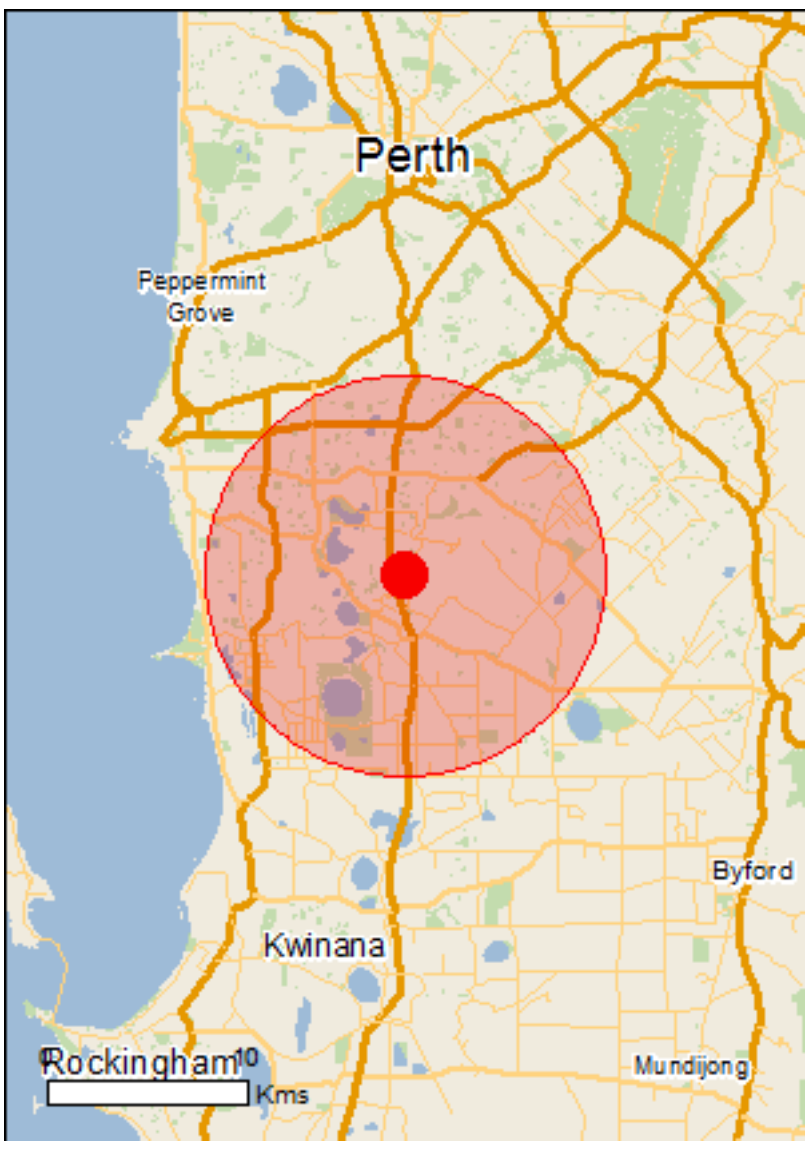
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

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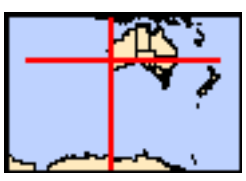

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements


This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km



# Summary

## Matters of National Environmental Significance

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

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | 2 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 4 |
| Listed Threatened Species: | 54 |
| Listed Migratory Species: | 54 |

## Other Matters Protected by the EPBC Act

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

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

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

| | |
|---|---|
| Commonwealth Land: | 1 |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 63 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | 15 |
| Regional Forest Agreements: | None |
| Invasive Species: | 42 |
| Nationally Important Wetlands: | 4 |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

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

| Name | Proximity |
|---|---|
| Forrestdale and thomsons lakes | Within Ramsar site |
| Peel-yalgorup system | 30 - 40km upstream |

### 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.

| Name | Status | Type of Presence |
|---|---|---|
| Banksia Woodlands of the Swan Coastal Plain ecological community | Endangered | Community likely to occur within area |
| Clay Pans of the Swan Coastal Plain | Critically Endangered | Community likely to occur within area |
| Subtropical and Temperate Coastal Saltmarsh | Vulnerable | Community likely to occur within area |
| Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community | Critically Endangered | Community likely to occur within area |

### Listed Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Anous tenuirostris  melanops<br>Australian Lesser Noddy [26000] | Vulnerable | Species or species habitat may occur within area |
| Botaurus poiciloptilus<br>Australasian Bittern [1001] | Endangered | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris tenuirostris<br>Great Knot [862] | Critically Endangered | Foraging, feeding or related behaviour known to occur within area |
| Calyptorhynchus banksii  naso<br>Forest Red-tailed Black-Cockatoo, Karrak [67034] | Vulnerable | Species or species habitat known to occur within area |
| Calyptorhynchus baudinii<br>Baudin's Cockatoo, Long-billed Black-Cockatoo [769] | Endangered | Roosting known to occur within area |
| Calyptorhynchus latirostris<br>Carnaby's Cockatoo,  Short-billed Black-Cockatoo [59523] | Endangered | Species or species habitat known to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Charadrius mongolus<br>Lesser Sand Plover, Mongolian Plover [879] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat may occur within area |
| Diomedea epomophora<br>Southern Royal Albatross [89221] | Vulnerable | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat likely to occur within area |
| Diomedea sanfordi<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat likely to occur within area |
| Leipoa ocellata<br>Malleefowl [934] | Vulnerable | Species or species habitat likely to occur within area |
| Limosa lapponica  baueri<br>Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380] | Vulnerable | Species or species habitat known to occur within area |
| Limosa lapponica  menzbieri<br>Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432] | Critically Endangered | Species or species habitat may occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Pachyptila turtur  subantarctica<br>Fairy Prion (southern) [64445] | Vulnerable | Species or species habitat known to occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat known to occur within area |
| Sternula nereis  nereis<br>Australian Fairy Tern [82950] | Vulnerable | Species or species habitat known to occur within area |
| Thalassarche cauta  cauta<br>Shy Albatross [82345] | Vulnerable | Species or species habitat likely to occur within area |
| Thalassarche cauta  steadi<br>White-capped Albatross [82344] | Vulnerable | Species or species habitat likely to occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| [Thalassarche melanophris](#)<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| **Insects** | | |
| [Neopasiphae simplicior](#)<br>A native bee [66821] | Critically Endangered | Species or species habitat likely to occur within area |
| **Mammals** | | |
| [Dasyurus geoffroii](#)<br>Chuditch, Western Quoll [330] | Vulnerable | Species or species habitat likely to occur within area |
| [Neophoca cinerea](#)<br>Australian Sea-lion, Australian Sea Lion [22] | Vulnerable | Species or species habitat known to occur within area |
| [Pseudocheirus occidentalis](#)<br>Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911] | Critically Endangered | Species or species habitat likely to occur within area |
| **Other** | | |
| [Westralunio carteri](#)<br>Carter's Freshwater Mussel, Freshwater Mussel [86266] | Vulnerable | Species or species habitat may occur within area |
| **Plants** | | |
| [Andersonia gracilis](#)<br>Slender Andersonia [14470] | Endangered | Species or species habitat may occur within area |
| [Austrostipa jacobsiana](#)<br>[87809] | Critically Endangered | Species or species habitat may occur within area |
| [Caladenia huegelii](#)<br>King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309] | Endangered | Species or species habitat known to occur within area |
| [Diuris drummondii](#)<br>Tall Donkey Orchid [4365] | Vulnerable | Species or species habitat known to occur within area |
| [Diuris micrantha](#)<br>Dwarf Bee-orchid [55082] | Vulnerable | Species or species habitat known to occur within area |
| [Diuris purdiei](#)<br>Purdie's Donkey-orchid [12950] | Endangered | Species or species habitat known to occur within area |
| [Drakaea elastica](#)<br>Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753] | Endangered | Species or species habitat known to occur within area |
| [Drakaea micrantha](#)<br>Dwarf Hammer-orchid [56755] | Vulnerable | Species or species habitat known to occur within area |
| [Eleocharis keigheryi](#)<br>Keighery's Eleocharis [64893] | Vulnerable | Species or species habitat may occur within area |
| [Eremophila glabra subsp. chlorella](#)<br>[84927] | Endangered | Species or species habitat likely to occur within area |
| [Eucalyptus x balanites](#)<br>Cadda Road Mallee, Cadda Mallee [87816] | Endangered | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Grevillea curviloba subsp. incurva<br>Narrow curved-leaf Grevillea [64909] | Endangered | Species or species habitat may occur within area |
| Lepidosperma rostratum<br>Beaked Lepidosperma [14152] | Endangered | Species or species habitat likely to occur within area |
| Macarthuria keigheryi<br>Keighery's Macarthuria [64930] | Endangered | Species or species habitat likely to occur within area |
| Synaphea sp. Fairbridge Farm (D. Papenfus 696)<br>Selena's Synaphea [82881] | Critically Endangered | Species or species habitat likely to occur within area |
| Synaphea sp. Serpentine (G.R. Brand 103)<br>[86879] | Critically Endangered | Species or species habitat may occur within area |
| Thelymitra dedmaniarum<br>Cinnamon Sun Orchid [65105] | Endangered | Species or species habitat may occur within area |
| Thelymitra stellata<br>Star Sun-orchid [7060] | Endangered | Species or species habitat may occur within area |
| Reptiles | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |

## Listed Migratory Species [ Resource Information ]

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

| Name | Threatened | Type of Presence |
|---|---|---|
| Migratory Marine Birds | | |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat likely to occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardenna carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Species or species habitat likely to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat may occur within area |
| Diomedea epomophora<br>Southern Royal Albatross [89221] | Vulnerable | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat likely to occur |

| Name | Threatened | Type of Presence within area |
|---|---|---|
| [Diomedea sanfordi](#)<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat likely to occur within area |
| [Macronectes giganteus](#)<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| [Macronectes halli](#)<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| [Sterna dougallii](#)<br>Roseate Tern [817] | | Foraging, feeding or related behaviour likely to occur within area |
| [Thalassarche cauta](#)<br>Shy Albatross [89224] | Vulnerable* | Species or species habitat likely to occur within area |
| [Thalassarche impavida](#)<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| [Thalassarche melanophris](#)<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| [Thalassarche steadi](#)<br>White-capped Albatross [64462] | Vulnerable* | Species or species habitat likely to occur within area |
| **Migratory Marine Species** | | |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| [Lamna nasus](#)<br>Porbeagle, Mackerel Shark [83288] | | Species or species habitat may occur within area |
| [Manta alfredi](#)<br>Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] | | Species or species habitat may occur within area |
| [Manta birostris](#)<br>Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995] | | Species or species habitat may occur within area |
| [Natator depressus](#)<br>Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| **Migratory Terrestrial Species** | | |
| [Motacilla cinerea](#)<br>Grey Wagtail [642] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |
| [Actitis hypoleucos](#)<br>Common Sandpiper [59309] | | Species or species habitat known to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Arenaria interpres<br>Ruddy Turnstone [872] | | Foraging, feeding or related behaviour known to occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Roosting known to occur within area |
| Calidris alba<br>Sanderling [875] | | Foraging, feeding or related behaviour known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat known to occur within area |
| Calidris ruficollis<br>Red-necked Stint [860] | | Roosting known to occur within area |
| Calidris subminuta<br>Long-toed Stint [861] | | Roosting known to occur within area |
| Calidris tenuirostris<br>Great Knot [862] | Critically Endangered | Foraging, feeding or related behaviour known to occur within area |
| Charadrius bicinctus<br>Double-banded Plover [895] | | Foraging, feeding or related behaviour known to occur within area |
| Charadrius dubius<br>Little Ringed Plover [896] | | Roosting known to occur within area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Charadrius mongolus<br>Lesser Sand Plover, Mongolian Plover [879] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Gallinago megala<br>Swinhoe's Snipe [864] | | Roosting likely to occur within area |
| Gallinago stenura<br>Pin-tailed Snipe [841] | | Roosting likely to occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Limosa limosa<br>Black-tailed Godwit [845] | | Roosting known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Numenius minutus<br>Little Curlew, Little Whimbrel [848] | | Roosting likely to occur within area |
| Numenius phaeopus<br>Whimbrel [849] | | Foraging, feeding or related behaviour known to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Pandion haliaetus | | |
| Osprey [952] | | Breeding known to occur within area |
| Phalaropus lobatus | | |
| Red-necked Phalarope [838] | | Foraging, feeding or related behaviour known to occur within area |
| Philomachus pugnax | | |
| Ruff (Reeve) [850] | | Roosting known to occur within area |
| Pluvialis fulva | | |
| Pacific Golden Plover [25545] | | Foraging, feeding or related behaviour known to occur within area |
| Pluvialis squatarola | | |
| Grey Plover [865] | | Foraging, feeding or related behaviour known to occur within area |
| Tringa brevipes | | |
| Grey-tailed Tattler [851] | | Foraging, feeding or related behaviour known to occur within area |
| Tringa glareola | | |
| Wood Sandpiper [829] | | Roosting known to occur within area |
| Tringa nebularia | | |
| Common Greenshank, Greenshank [832] | | Species or species habitat known to occur within area |
| Tringa stagnatilis | | |
| Marsh Sandpiper, Little Greenshank [833] | | Roosting known to occur within area |
| Tringa totanus | | |
| Common Redshank, Redshank [835] | | Foraging, feeding or related behaviour known to occur within area |
| Xenus cinereus | | |
| Terek Sandpiper [59300] | | Foraging, feeding or related behaviour known to occur within area |

## Other Matters Protected by the EPBC Act

### Commonwealth Land [ Resource Information ]

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

| Name |
|---|
| Commonwealth Land - |

### Listed Marine Species [ Resource Information ]

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

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat known to occur within area |
| Anous stolidus | | |
| Common Noddy [825] | | Species or species habitat likely to occur within area |
| Anous tenuirostris  melanops | | |
| Australian Lesser Noddy [26000] | Vulnerable | Species or species habitat may occur within area |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | habitat likely to occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Breeding known to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Arenaria interpres<br>Ruddy Turnstone [872] | | Foraging, feeding or related behaviour known to occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Roosting known to occur within area |
| Calidris alba<br>Sanderling [875] | | Foraging, feeding or related behaviour known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat known to occur within area |
| Calidris ruficollis<br>Red-necked Stint [860] | | Roosting known to occur within area |
| Calidris subminuta<br>Long-toed Stint [861] | | Roosting known to occur within area |
| Calidris tenuirostris<br>Great Knot [862] | Critically Endangered | Foraging, feeding or related behaviour known to occur within area |
| Charadrius bicinctus<br>Double-banded Plover [895] | | Foraging, feeding or related behaviour known to occur within area |
| Charadrius dubius<br>Little Ringed Plover [896] | | Roosting known to occur within area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Charadrius mongolus<br>Lesser Sand Plover, Mongolian Plover [879] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Charadrius ruficapillus<br>Red-capped Plover [881] | | Roosting known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat may occur within area |
| Diomedea epomophora<br>Southern Royal Albatross [89221] | Vulnerable | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Diomedea sanfordi<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat likely to occur within area |
| Gallinago megala<br>Swinhoe's Snipe [864] | | Roosting likely to occur within area |
| Gallinago stenura<br>Pin-tailed Snipe [841] | | Roosting likely to occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Heteroscelus brevipes<br>Grey-tailed Tattler [59311] | | Foraging, feeding or related behaviour known to occur within area |
| Himantopus himantopus<br>Pied Stilt, Black-winged Stilt [870] | | Roosting known to occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Limosa limosa<br>Black-tailed Godwit [845] | | Roosting known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Numenius minutus<br>Little Curlew, Little Whimbrel [848] | | Roosting likely to occur within area |
| Numenius phaeopus<br>Whimbrel [849] | | Foraging, feeding or related behaviour known to occur within area |
| Pachyptila turtur<br>Fairy Prion [1066] | | Species or species habitat known to occur within area |
| Pandion haliaetus<br>Osprey [952] | | Breeding known to occur within area |
| Phalaropus lobatus<br>Red-necked Phalarope [838] | | Foraging, feeding or related behaviour known to occur within area |
| Philomachus pugnax<br>Ruff (Reeve) [850] | | Roosting known to occur within area |
| Pluvialis fulva<br>Pacific Golden Plover [25545] | | Foraging, feeding or related behaviour known to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Pluvialis squatarola<br>Grey Plover [865] | | Foraging, feeding or related behaviour known to occur within area |
| Puffinus carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [1043] | | Species or species habitat likely to occur within area |
| Recurvirostra novaehollandiae<br>Red-necked Avocet [871] | | Roosting known to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat known to occur within area |
| Sterna dougallii<br>Roseate Tern [817] | | Foraging, feeding or related behaviour likely to occur within area |
| Thalassarche cauta<br>Shy Albatross [89224] | Vulnerable* | Species or species habitat likely to occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable* | Species or species habitat likely to occur within area |
| Thinornis rubricollis<br>Hooded Plover [59510] | | Species or species habitat known to occur within area |
| Tringa glareola<br>Wood Sandpiper [829] | | Roosting known to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat known to occur within area |
| Tringa stagnatilis<br>Marsh Sandpiper, Little Greenshank [833] | | Roosting known to occur within area |
| Tringa totanus<br>Common Redshank, Redshank [835] | | Foraging, feeding or related behaviour known to occur within area |
| Xenus cinereus<br>Terek Sandpiper [59300] | | Foraging, feeding or related behaviour known to occur within area |
| **Mammals** | | |
| Neophoca cinerea<br>Australian Sea-lion, Australian Sea Lion [22] | Vulnerable | Species or species habitat known to occur within area |
| **Reptiles** | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | related behaviour known to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |

## Extra Information

| State and Territory Reserves | [ Resource Information ] |
|---|---|
| Name | State |
| Alfred Cove | WA |
| Balannup Lake | WA |
| Canning River | WA |
| Forrestdale Lake | WA |
| Gibbs Road | WA |
| Harry Waring Marsupial Reserve | WA |
| Piara | WA |
| Swan River | WA |
| Thomsons Lake | WA |
| Unnamed WA39752 | WA |
| Unnamed WA44414 | WA |
| Unnamed WA48291 | WA |
| Unnamed WA49362 | WA |
| Unnamed WA49363 | WA |
| Unnamed WA49561 | WA |

## Invasive Species [ Resource Information ]

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

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Acridotheres tristis | | |
| Common Myna, Indian Myna [387] | | Species or species habitat likely to occur within area |
| Anas platyrhynchos | | |
| Mallard [974] | | Species or species habitat likely to occur within area |
| Carduelis carduelis | | |
| European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Columba livia | | |
| Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer domesticus | | |
| House Sparrow [405] | | Species or species habitat likely to occur within area |
| Passer montanus | | |
| Eurasian Tree Sparrow [406] | | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Streptopelia chinensis<br>Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Streptopelia senegalensis<br>Laughing Turtle-dove, Laughing Dove [781] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris<br>Common Starling [389] | | Species or species habitat likely to occur within area |
| Turdus merula<br>Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| **Mammals** | | |
| Bos taurus<br>Domestic Cattle [16] | | Species or species habitat likely to occur within area |
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Funambulus pennantii<br>Northern Palm Squirrel, Five-striped Palm Squirrel [129] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus norvegicus<br>Brown Rat, Norway Rat [83] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Anredera cordifolia<br>Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] | | Species or species habitat likely to occur within area |
| Asparagus aethiopicus<br>Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] | | Species or species habitat likely to occur within area |
| Asparagus asparagoides<br>Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] | | Species or species habitat likely to occur within area |
| Asparagus plumosus<br>Climbing Asparagus-fern [48993] | | Species or species habitat likely to occur within area |
| Brachiaria mutica<br>Para Grass [5879] | | Species or species habitat may occur within |

| Name | Status | Type of Presence |
|---|---|---|
| | | area |
| Cenchrus ciliaris<br>Buffel-grass, Black Buffel-grass [20213] | | Species or species habitat may occur within area |
| Chrysanthemoides monilifera<br>Bitou Bush, Boneseed [18983] | | Species or species habitat may occur within area |
| Chrysanthemoides monilifera subsp. monilifera<br>Boneseed [16905] | | Species or species habitat likely to occur within area |
| Genista linifolia<br>Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800] | | Species or species habitat likely to occur within area |
| Genista monspessulana<br>Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] | | Species or species habitat likely to occur within area |
| Genista sp. X Genista monspessulana<br>Broom [67538] | | Species or species habitat may occur within area |
| Lantana camara<br>Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] | | Species or species habitat likely to occur within area |
| Lycium ferocissimum<br>African Boxthorn, Boxthorn [19235] | | Species or species habitat likely to occur within area |
| Olea europaea<br>Olive, Common Olive [9160] | | Species or species habitat may occur within area |
| Opuntia spp.<br>Prickly Pears [82753] | | Species or species habitat likely to occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | | Species or species habitat likely to occur within area |
| Sagittaria platyphylla<br>Delta Arrowhead, Arrowhead, Slender Arrowhead [68483] | | Species or species habitat likely to occur within area |
| Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii<br>Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] | | Species or species habitat likely to occur within area |
| Salvinia molesta<br>Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] | | Species or species habitat likely to occur within area |
| Solanum elaeagnifolium<br>Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323] | | Species or species habitat likely to occur within area |
| Tamarix aphylla<br>Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018] | | Species or species habitat likely to occur within area |
| Reptiles | | |

| Name | Status | Type of Presence |
|---|---|---|
| Hemidactylus frenatus<br>Asian House Gecko [1708] | | Species or species habitat likely to occur within area |

## Nationally Important Wetlands [ Resource Information ]

| Name | State |
|---|---|
| Booragoon Swamp | WA |
| Gibbs Road Swamp System | WA |
| Swan-Canning Estuary | WA |
| Thomsons Lake | WA |

# Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

# Coordinates

-32.10414 115.85615

# 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 16/06/2020*

**Kingdom** Animalia
**Current Names Only** Yes
**Core Datasets Only** Yes
**Method** 'By Circle'
**Centre** 115° 51' 22" E,32° 06' 15" S
**Buffer** 10km

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 1. | 24559 | *Acanthagenys rufogularis (Spiny-cheeked Honeyeater)* | | | |
| 2. | 24260 | *Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)* | | | |
| 3. | 24261 | *Acanthiza chrysorrhoa (Yellow-rumped Thornbill)* | | | |
| 4. | 24262 | *Acanthiza inornata (Western Thornbill)* | | | |
| 5. | 24560 | *Acanthorhynchus superciliosus (Western Spinebill)* | | | |
| 6. | 25535 | *Accipiter cirrocephalus (Collared Sparrowhawk)* | | | |
| 7. | 25536 | *Accipiter fasciatus (Brown Goshawk)* | | | |
| 8. | 24283 | *Accipiter fasciatus subsp. didimus (Brown Goshawk)* | | | |
| 9. | 24282 | *Accipiter fasciatus subsp. fasciatus (Brown Goshawk)* | | | |
| 10. | | *Acentrogobius bifrenatus* | | | |
| 11. | | *Acercella falcipes* | | | |
| 12. | 42368 | *Acritoscincus trilineatus (Western Three-lined Skink)* | | | |
| 13. | 25755 | *Acrocephalus australis (Australian Reed Warbler)* | | | |
| 14. | 24831 | *Acrocephalus australis subsp. gouldi (Australian Reed Warbler)* | | | |
| 15. | 41323 | *Actitis hypoleucos (Common Sandpiper)* | | IA | |
| 16. | 25544 | *Aegotheles cristatus (Australian Owlet-nightjar)* | | | |
| 17. | | *Afurcagobius suppositus* | | | |
| 18. | | *Akamptogonus novarae* | | | |
| 19. | | *Aldrichetta forsteri* | | | |
| 20. | | *Allothereua maculata* | | | |
| 21. | | *Aname mainae* | | | |
| 22. | | *Aname tepperi* | | | |
| 23. | 24310 | *Anas castanea (Chestnut Teal)* | | | |
| 24. | 24312 | *Anas gracilis (Grey Teal)* | | | |
| 25. | 24313 | *Anas platyrhynchos (Mallard)* | | | |
| 26. | | *Anas platyrhynchos subsp. domesticus* | | | |
| 27. | 24315 | *Anas rhynchotis (Australasian Shoveler)* | | | |
| 28. | 24316 | *Anas superciliosa (Pacific Black Duck)* | | | |
| 29. | 47414 | *Anhinga novaehollandiae (Australasian Darter)* | | | |
| 30. | 44629 | *Anilios australis* | | | |
| 31. | | *Anoplocapros lenticularis* | | | |
| 32. | 24506 | *Anous tenuirostris subsp. melanops (Australian Lesser Noddy)* | | T | |
| 33. | | *Anser anser* | | | |
| 34. | 24561 | *Anthochaera carunculata (Red Wattlebird)* | | | |
| 35. | 24562 | *Anthochaera lunulata (Western Little Wattlebird)* | | | |
| 36. | | *Aploactisoma milesii* | | | |
| 37. | | *Apogon rueppellii* | | | |
| 38. | 24991 | *Aprasia repens (Sand-plain Worm-lizard)* | | | |
| 39. | 25554 | *Apus pacificus (Fork-tailed Swift, Pacific Swift)* | | IA | |
| 40. | 24285 | *Aquila audax (Wedge-tailed Eagle)* | | | |
| 41. | | *Arachnura higginsi* | | | |
| 42. | | *Araneus cyphoxis* | | | |
| 43. | | *Araneus eburneiventris* | | | |
| 44. | | *Araneus senicaudatus* | | | |
| 45. | 24337 | *Ardea garzetta subsp. nigripes (Little Egret)* | | | |
| 46. | 25558 | *Ardea ibis (Cattle Egret)* | | | |
| 47. | 25559 | *Ardea intermedia (Intermediate Egret)* | | | |
| 48. | 41324 | *Ardea modesta (great egret, white egret)* | | | |
| 49. | 24340 | *Ardea novaehollandiae (White-faced Heron)* | | | |
| 50. | 24341 | *Ardea pacifica (White-necked Heron)* | | | |
| 51. | 25560 | *Ardea sacra (Eastern Reef Egret, Eastern Reef Heron)* | | | |
| 52. | 25736 | *Arenaria interpres (Ruddy Turnstone)* | | IA | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 53. | | *Arenigobius bifrenatus* | | | |
| 54. | | *Argiope protensa* | | | |
| 55. | | *Argiope trifasciata* | | | |
| 56. | | *Arkys walckenaeri* | | | |
| 57. | 25566 | *Artamus cinereus (Black-faced Woodswallow)* | | | |
| 58. | 24352 | *Artamus cinereus subsp. melanops (Black-faced Woodswallow)* | | | |
| 59. | 24353 | *Artamus cyanopterus (Dusky Woodswallow)* | | | |
| 60. | | *Artema atlanta* | | | |
| 61. | | *Artoria flavimana* | | | |
| 62. | | *Artoria linnaei* | | | |
| 63. | | *Artoria taeniifera* | | | |
| 64. | | *Artoriopsis eccentrica* | | | |
| 65. | | *Artoriopsis expolita* | | | |
| 66. | | *Artoriopsis joergi* | | | |
| 67. | | *Atherinomorus vaigiensis* | | | |
| 68. | | *Atherinosoma wallacei* | | | |
| 69. | | *Aurecocrypta lugubris* | | | |
| 70. | | *Austracantha minax* | | | |
| 71. | 47713 | *Austronomus australis (White-striped Free-tailed Bat)* | | | |
| 72. | 24318 | *Aythya australis (Hardhead)* | | | |
| 73. | | *Backobourkia heroine* | | | |
| 74. | | *Badumna insignis* | | | |
| 75. | | *Ballarra longipalpus* | | | |
| 76. | | *Barnardius zonarius* | | | |
| 77. | 24319 | *Biziura lobata (Musk Duck)* | | | |
| 78. | 24345 | *Botaurus poiciloptilus (Australasian Bittern)* | | T | |
| 79. | 42380 | *Brachyurophis fasciolatus subsp. fasciolatus (Narrow-banded Shovel-nosed Snake)* | | | |
| 80. | 42381 | *Brachyurophis semifasciatus (Southern Shovel-nosed Snake)* | | | |
| 81. | 25713 | *Cacatua galerita (Sulphur-crested Cockatoo)* | | | |
| 82. | 25714 | *Cacatua pastinator (Western Long-billed Corella)* | | | |
| 83. | 25715 | *Cacatua roseicapilla (Galah)* | | | |
| 84. | 25716 | *Cacatua sanguinea (Little Corella)* | | | |
| 85. | 24729 | *Cacatua tenuirostris (Eastern Long-billed Corella)* | Y | | |
| 86. | 25598 | *Cacomantis flabelliformis (Fan-tailed Cuckoo)* | | | |
| 87. | 24427 | *Cacomantis flabelliformis subsp. flabelliformis (Fan-tailed Cuckoo)* | | | |
| 88. | 42307 | *Cacomantis pallidus (Pallid Cuckoo)* | | | |
| 89. | 24779 | *Calidris acuminata (Sharp-tailed Sandpiper)* | | IA | |
| 90. | 24780 | *Calidris alba (Sanderling)* | | IA | |
| 91. | 25738 | *Calidris canutus (Red Knot, knot)* | | IA | |
| 92. | 24784 | *Calidris ferruginea (Curlew Sandpiper)* | | T | |
| 93. | 24786 | *Calidris melanotos (Pectoral Sandpiper)* | | IA | |
| 94. | 24787 | *Calidris minuta (Little Stint)* | | | |
| 95. | 24788 | *Calidris ruficollis (Red-necked Stint)* | | IA | |
| 96. | | *Calidris sp.* | | | |
| 97. | 24789 | *Calidris subminuta (Long-toed Stint)* | | IA | |
| 98. | 24790 | *Calidris tenuirostris (Great Knot)* | | T | |
| 99. | 25717 | *Calyptorhynchus banksii (Red-tailed Black-Cockatoo)* | | | |
| 100. | 24731 | *Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)* | | T | |
| 101. | 24733 | *Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)* | | T | |
| 102. | 24734 | *Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)* | | T | |
| 103. | 48400 | *Calyptorhynchus sp. (white-tailed black cockatoo)* | | T | |
| 104. | | *Carassius auratus* | | | |
| 105. | 34031 | *Carcharodon carcharias (Great White Shark)* | | T | |
| 106. | 25335 | *Caretta caretta (Loggerhead Turtle)* | | T | |
| 107. | | *Cercophonius sulcatus* | | | |
| 108. | 24186 | *Chalinolobus gouldii (Gould's Wattled Bat)* | | | |
| 109. | 24187 | *Chalinolobus morio (Chocolate Wattled Bat)* | | | |
| 110. | 25574 | *Charadrius dubius (Little Ringed Plover)* | | IA | |
| 111. | 25575 | *Charadrius leschenaultii (Greater Sand Plover)* | | T | |
| 112. | 24377 | *Charadrius ruficapillus (Red-capped Plover)* | | | |
| 113. | | *Cheilodactylus gibbosus* | | | |
| 114. | 43380 | *Chelodina colliei (South-western Snake-necked Turtle)* | | | |
| 115. | 24321 | *Chenonetta jubata (Australian Wood Duck, Wood Duck)* | | | |
| 116. | 47909 | *Cheramoeca leucosterna (White-backed Swallow)* | | | |
| 117. | 33939 | *Cherax cainii (Marron)* | | | |
| 118. | | *Cherax destructor* | | | |
| 119. | | *Cherax preissii* | | | |
| 120. | | *Cherax quinquecarinatus* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 121. | | *Cherax sp.* | | | |
| 122. | 41332 | *Chlidonias leucopterus (White-winged Black Tern, white-winged tern)* | | IA | |
| 123. | 24980 | *Christinus marmoratus (Marbled Gecko)* | | | |
| 124. | | *Chroicocephalus novaehollandiae* | | | |
| 125. | 25601 | *Chrysococcyx lucidus (Shining Bronze Cuckoo)* | | | |
| 126. | 24432 | *Chrysococcyx lucidus subsp. plagosus (Shining Bronze Cuckoo)* | | | |
| 127. | 24288 | *Circus approximans (Swamp Harrier)* | | | |
| 128. | 24289 | *Circus assimilis (Spotted Harrier)* | | | |
| 129. | 24774 | *Cladorhynchus leucocephalus (Banded Stilt)* | | | |
| 130. | | *Clynotis albobarbatus* | | | |
| 131. | | *Cnidoglanis macrocephalus* | | | |
| 132. | 25675 | *Colluricincla harmonica (Grey Shrike-thrush)* | | | |
| 133. | 24399 | *Columba livia (Domestic Pigeon)* | Y | | |
| 134. | 25568 | *Coracina novaehollandiae (Black-faced Cuckoo-shrike)* | | | |
| 135. | 24362 | *Coracina novaehollandiae subsp. novaehollandiae (Black-faced Cuckoo-shrike)* | | | |
| 136. | | *Cormocephalus aurantiipes* | | | |
| 137. | | *Cormocephalus novaehollandiae* | | | |
| 138. | | *Cormocephalus rubriceps* | | | |
| 139. | 24416 | *Corvus bennetti (Little Crow)* | | | |
| 140. | 25592 | *Corvus coronoides (Australian Raven)* | | | |
| 141. | 24417 | *Corvus coronoides subsp. perplexus (Australian Raven)* | | | |
| 142. | 24671 | *Coturnix pectoralis (Stubble Quail)* | | | |
| 143. | 25701 | *Coturnix ypsilophora (Brown Quail)* | | | |
| 144. | 24673 | *Coturnix ypsilophora subsp. australis (Brown Quail)* | | | |
| 145. | 24420 | *Cracticus nigrogularis (Pied Butcherbird)* | | | |
| 146. | 25595 | *Cracticus tibicen (Australian Magpie)* | | | |
| 147. | 24422 | *Cracticus tibicen subsp. dorsalis (White-backed Magpie)* | | | |
| 148. | 24423 | *Cracticus tibicen subsp. tibicen (Black-backed Magpie)* | | | |
| 149. | 25596 | *Cracticus torquatus (Grey Butcherbird)* | | | |
| 150. | 24424 | *Cracticus torquatus subsp. torquatus (Grey Butcherbird)* | | | |
| 151. | | *Craterocephalus mugiloides* | | | |
| 152. | 25398 | *Crinia georgiana (Quacking Frog)* | | | |
| 153. | 25399 | *Crinia glauerti (Clicking Frog)* | | | |
| 154. | 25400 | *Crinia insignifera (Squelching Froglet)* | | | |
| 155. | 25401 | *Crinia pseudinsignifera (Bleating Froglet)* | | | |
| 156. | | *Cristiceps sp.* | | | |
| 157. | | *Crustulina bicruciata* | | | |
| 158. | 30893 | *Cryptoblepharus buchananii* | | | |
| 159. | 25020 | *Cryptoblepharus plagiocephalus* | | | |
| 160. | | *Cryptoerithus quobba* | | | |
| 161. | 30899 | *Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)* | | | |
| 162. | 25027 | *Ctenotus australis* | | | |
| 163. | 25039 | *Ctenotus fallens* | | | |
| 164. | 25040 | *Ctenotus gemmula (Jewelled South-west Ctenotus (Swan Coastal Plain subpop P3), skink)* | | | |
| 165. | 25047 | *Ctenotus impar* | | | |
| 166. | | *Cyclosa trilobata* | | | |
| 167. | 24322 | *Cygnus atratus (Black Swan)* | | | |
| 168. | 24323 | *Cygnus olor (Mute Swan)* | Y | | |
| 169. | | *Cyrtophora parnasia* | | | |
| 170. | 30901 | *Dacelo novaeguineae (Laughing Kookaburra)* | Y | | |
| 171. | | *Dactylopus dactylopus* | | | |
| 172. | | *Daphnia carinata* | | | |
| 173. | 25673 | *Daphoenositta chrysoptera (Varied Sittella)* | | | |
| 174. | 24092 | *Dasyurus geoffroii (Chuditch, Western Quoll)* | | T | |
| 175. | | *Delena cancerides* | | | |
| 176. | 25766 | *Delma fraseri (Fraser's Legless Lizard)* | | | |
| 177. | 24999 | *Delma grayii* | | | |
| 178. | 25468 | *Demansia psammophis (Yellow-faced Whipsnake)* | | | |
| 179. | 25296 | *Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)* | | | |
| 180. | 24324 | *Dendrocygna arcuata (Wandering Whistling Duck, Chestnut Whistling Duck)* | | | |
| 181. | 25346 | *Dermochelys coriacea (Leatherback Turtle)* | | T | |
| 182. | 25607 | *Dicaeum hirundinaceum (Mistletoebird)* | | | |
| 183. | | *Dingosa serrata* | | | |
| 184. | 30836 | *Diomedea exulans subsp. exulans (Snowy Albatross)* | | T | |
| 185. | 44654 | *Diplodactylus lateroides (Speckled Stone Gecko)* | | | |
| 186. | 24470 | *Dromaius novaehollandiae (Emu)* | | | |
| 187. | 25096 | *Egernia kingii (King's Skink)* | | | |
| 188. | 25100 | *Egernia napoleonis* | | | |
| 189. | | *Egretta garzetta* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 190. | | *Egretta novaehollandiae* | | | |
| 191. | | *Elanus axillaris* | | | |
| 192. | 25540 | *Elanus caeruleus (Black-shouldered Kite)* | | | |
| 193. | 24290 | *Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)* | | | |
| 194. | 25250 | *Elapognathus coronatus (Crowned Snake)* | | | |
| 195. | 47937 | *Elseyornis melanops (Black-fronted Dotterel)* | | | |
| 196. | | *Eodelena convexa* | | | |
| 197. | | *Eodelena lapidicola* | | | |
| 198. | | *Eolophus roseicapillus* | | | |
| 199. | | *Epinephelus sp.* | | | |
| 200. | 24567 | *Epthianura albifrons (White-fronted Chat)* | | | |
| 201. | | *Eriophora biapicata* | | | |
| 202. | | *Ero aphana* | | | |
| 203. | | *Erythracarus decoris* | | | |
| 204. | 24379 | *Erythrogonys cinctus (Red-kneed Dotterel)* | | | |
| 205. | | *Ethmostigmus rubripes* | | | |
| 206. | 24368 | *Eurostopodus argus (Spotted Nightjar)* | | | |
| 207. | 25591 | *Eurystomus orientalis (Dollarbird)* | | | |
| 208. | 25621 | *Falco berigora (Brown Falcon)* | | | |
| 209. | 24471 | *Falco berigora subsp. berigora (Brown Falcon)* | | | |
| 210. | 25622 | *Falco cenchroides (Australian Kestrel, Nankeen Kestrel)* | | | |
| 211. | 25623 | *Falco longipennis (Australian Hobby)* | | | |
| 212. | 25624 | *Falco peregrinus (Peregrine Falcon)* | | S | |
| 213. | 24189 | *Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)* | | P4 | |
| 214. | 24041 | *Felis catus (Cat)* | Y | | |
| 215. | 25727 | *Fulica atra (Eurasian Coot)* | | | |
| 216. | 24761 | *Fulica atra subsp. australis (Eurasian Coot)* | | | |
| 217. | 30916 | *Funambulus pennanti (Indian Palm Squirrel)* | Y | | |
| 218. | | *Galaxias maculatus* | | | |
| 219. | 24791 | *Gallinago hardwickii (Latham's Snipe, Japanese snipe)* | | IA | |
| 220. | 24793 | *Gallinago stenura (Pin-tailed Snipe)* | | IA | |
| 221. | 25729 | *Gallinula tenebrosa (Dusky Moorhen)* | | | |
| 222. | 24763 | *Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)* | | | |
| 223. | 25730 | *Gallirallus philippensis (Buff-banded Rail)* | | | |
| 224. | 42314 | *Gavicalis virescens (Singing Honeyeater)* | | | |
| 225. | | *Gea theridioides* | | | |
| 226. | 24959 | *Gehyra variegata* | | | |
| 227. | 47954 | *Gelochelidon nilotica (Gull-billed Tern)* | | IA | |
| 228. | | *Geogarypus taylori* | | | |
| 229. | 24401 | *Geopelia cuneata (Diamond Dove)* | | | |
| 230. | 25530 | *Gerygone fusca (Western Gerygone)* | | | |
| 231. | 24271 | *Gerygone fusca subsp. fusca (Western Gerygone)* | | | |
| 232. | 47962 | *Glyciphila melanops (Tawny-crowned Honeyeater)* | | | |
| 233. | 24443 | *Grallina cyanoleuca (Magpie-lark)* | | | |
| 234. | | *Gymnapistes marmoratus* | | | |
| 235. | 25627 | *Haematopus fuliginosus (Sooty Oystercatcher)* | | | |
| 236. | 24487 | *Haematopus longirostris (Pied Oystercatcher)* | | | |
| 237. | 24293 | *Haliaeetus leucogaster (White-bellied Sea-Eagle)* | | | |
| 238. | 24295 | *Haliastur sphenurus (Whistling Kite)* | | | |
| 239. | 25410 | *Heleioporus eyrei (Moaning Frog)* | | | |
| 240. | 25119 | *Hemiergis quadrilineata* | | | |
| 241. | | *Henicops dentatus* | | | |
| 242. | 24961 | *Heteronotia binoei (Bynoe's Gecko)* | | | |
| 243. | 47965 | *Hieraaetus morphnoides (Little Eagle)* | | | |
| 244. | 25734 | *Himantopus himantopus (Black-winged Stilt)* | | | |
| 245. | 24775 | *Himantopus himantopus subsp. leucocephalus (Black-winged Stilt)* | | | |
| 246. | | *Hippocampus elongatus* | | | |
| 247. | 24491 | *Hirundo neoxena (Welcome Swallow)* | | | |
| 248. | | *Hogna crispipes* | | | |
| 249. | | *Holconia westralia* | | | |
| 250. | 24215 | *Hydromys chrysogaster (Water-rat, Rakali)* | | P4 | |
| 251. | 25366 | *Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)* | | | |
| 252. | 42410 | *Hydrophis ornatus (Ornate Reef Seasnake, Sea Snake)* | | | |
| 253. | 43384 | *Hydrophis platurus (Yellow-bellied Seasnake)* | | | |
| 254. | 48587 | *Hydroprogne caspia (Caspian Tern)* | | IA | |
| 255. | | *Hyperlophus vittatus* | | | |
| 256. | | *Hyporhamphus regularis* | | | |
| 257. | | *Idiommata blackwalli* | | | |
| 258. | | *Idiosoma hirsutum* | | | |
| 259. | 48935 | *Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)* | | P3 | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 260. | 48588 | *Isoodon fusciventer (Quenda, southwestern brown bandicoot)* | | P4 | |
| 261. | | *Isopeda leishmanni* | | | |
| 262. | 47975 | *Ixobrychus dubius (Australian Little Bittern)* | | P4 | |
| 263. | | *Ixodes australiensis* | | | |
| 264. | | *Kangarosa ludwigi* | | | |
| 265. | | *Kangarosa properipes* | | | |
| 266. | | *Lampona brevipes* | | | |
| 267. | | *Lampona cylindrata* | | | |
| 268. | 25637 | *Larus novaehollandiae (Silver Gull)* | | | |
| 269. | 24511 | *Larus novaehollandiae subsp. novaehollandiae (Silver Gull)* | | | |
| 270. | 25638 | *Larus pacificus (Pacific Gull)* | | | |
| 271. | | *Latrodectus hasseltii* | | | |
| 272. | 33982 | *Leioproctus contrarius (a short-tongued bee)* | | P3 | |
| 273. | 25128 | *Lerista christinae* | | | |
| 274. | 25131 | *Lerista distinguenda* | | | |
| 275. | 25133 | *Lerista elegans* | | | |
| 276. | 25147 | *Lerista lineata (Perth Slider, Lined Skink)* | | P3 | |
| 277. | | *Leucauge dromedaria* | | | Y |
| 278. | 25005 | *Lialis burtonis* | | | |
| 279. | 25661 | *Lichmera indistincta (Brown Honeyeater)* | | | |
| 280. | 24582 | *Lichmera indistincta subsp. indistincta (Brown Honeyeater)* | | | |
| 281. | 25415 | *Limnodynastes dorsalis (Western Banjo Frog)* | | | |
| 282. | 30932 | *Limosa lapponica (Bar-tailed Godwit)* | | IA | |
| 283. | 25741 | *Limosa limosa (Black-tailed Godwit)* | | IA | |
| 284. | 24797 | *Limosa limosa subsp. melanuroides (Black-tailed Godwit)* | | IA | |
| 285. | 25378 | *Litoria adelaidensis (Slender Tree Frog)* | | | |
| 286. | 25388 | *Litoria moorei (Motorbike Frog)* | | | |
| 287. | 25683 | *Lonchura castaneothorax (Chestnut-breasted Mannikin)* | | | |
| 288. | | *Longepi woodman* | | | |
| 289. | | *Lophoictinia isura* | | | |
| 290. | | *Lycosa ariadnae* | | | |
| 291. | | *Lycosa australicola* | | | |
| 292. | | *Lycosa gilberta* | | | |
| 293. | | *Lycosa lacertosa* | | | |
| 294. | 24132 | *Macropus fuliginosus (Western Grey Kangaroo)* | | | |
| 295. | 24326 | *Malacorhynchus membranaceus (Pink-eared Duck)* | | | |
| 296. | 25651 | *Malurus lamberti (Variegated Fairy-wren)* | | | |
| 297. | 25654 | *Malurus splendens (Splendid Fairy-wren)* | | | |
| 298. | 24583 | *Manorina flavigula (Yellow-throated Miner)* | | | |
| 299. | | *Maratus pavonis* | | | |
| 300. | 25758 | *Megalurus gramineus (Little Grassbird)* | | | |
| 301. | 47997 | *Melanodryas cucullata (Hooded Robin)* | | | |
| 302. | 25663 | *Melithreptus brevirostris (Brown-headed Honeyeater)* | | | |
| 303. | 24587 | *Melithreptus chloropsis (Western White-naped Honeyeater)* | | | |
| 304. | 24736 | *Melopsittacus undulatus (Budgerigar)* | | | |
| 305. | 25184 | *Menetia greyii* | | | |
| 306. | 24598 | *Merops ornatus (Rainbow Bee-eater)* | | | |
| 307. | | *Microcarbo melanoleucos* | | | |
| 308. | 25693 | *Microeca fascinans (Jacky Winter)* | | | |
| 309. | 25542 | *Milvus migrans (Black Kite)* | | | |
| 310. | | *Missulena granulosa* | | | |
| 311. | | *Missulena occatoria* | | | |
| 312. | | *Mituliodon tarantulinus* | | | |
| 313. | | *Mitzoruga insularis* | | | |
| 314. | | *Molycria vokes* | | | |
| 315. | 25191 | *Morethia lineoocellata* | | | |
| 316. | 25192 | *Morethia obscura* | | | |
| 317. | 48008 | *Morus serrator (Australasian Gannet)* | | | |
| 318. | | *Mugil cephalus* | | | |
| 319. | 24223 | *Mus musculus (House Mouse)* | Y | | |
| 320. | 24042 | *Mustela putorius (European Polecat, Ferret)* | Y | | |
| 321. | | *Myandra bicincta* | | | |
| 322. | 25610 | *Myiagra inquieta (Restless Flycatcher)* | | | |
| 323. | 25420 | *Myobatrachus gouldii (Turtle Frog)* | | | |
| 324. | 24146 | *Myrmecobius fasciatus (Numbat, Walpurti)* | | T | |
| 325. | | *Nanometa gentilis* | | | |
| 326. | 25248 | *Neelaps bimaculatus (Black-naped Snake)* | | | |
| 327. | 25249 | *Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)* | | P3 | |
| 328. | 33984 | *Neopasiphae simplicior (a short-tongued bee)* | | T | |
| 329. | 24738 | *Neophema elegans (Elegant Parrot)* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 330. | 24739 | *Neophema petrophila (Rock Parrot)* | | | |
| 331. | | *Nephila edulis* | | | |
| 332. | | *Nicodamus mainae* | | | |
| 333. | 25747 | *Ninox connivens (Barking Owl)* | | | |
| 334. | 48024 | *Notamacropus eugenii subsp. derbianus (Tammar Wallaby, Tammar)* | | P4 | |
| 335. | 48022 | *Notamacropus irma (Western Brush Wallaby)* | | P4 | |
| 336. | 25252 | *Notechis scutatus (Tiger Snake)* | | | |
| 337. | | *Notiasemus glauerti* | | | |
| 338. | 24798 | *Numenius madagascariensis (Eastern Curlew)* | | T | |
| 339. | 25742 | *Numenius phaeopus (Whimbrel)* | | IA | |
| 340. | 25564 | *Nycticorax caledonicus (Rufous Night Heron)* | | | |
| 341. | 24194 | *Nyctophilus geoffroyi (Lesser Long-eared Bat)* | | | |
| 342. | 24742 | *Nymphicus hollandicus (Cockatiel)* | | | |
| 343. | | *Ocrisiona leucocomis* | | | |
| 344. | 24407 | *Ocyphaps lophotes (Crested Pigeon)* | | | |
| 345. | | *Oecobius navus* | | | |
| 346. | | *Ommatoiulus moreleti* | | | |
| 347. | | *Ommatoiulus moreletii* | | | |
| 348. | | *Ophisurus serpens* | | | |
| 349. | 24085 | *Oryctolagus cuniculus (Rabbit)* | Y | | |
| 350. | 24328 | *Oxyura australis (Blue-billed Duck)* | | P4 | |
| 351. | 25680 | *Pachycephala rufiventris (Rufous Whistler)* | | | |
| 352. | 24624 | *Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)* | | | |
| 353. | 24692 | *Pachyptila belcheri (Slender-billed Prion)* | | | |
| 354. | 48591 | *Pandion cristatus (Osprey, Eastern Osprey)* | | IA | |
| 355. | | *Papillogobius punctatus* | | | |
| 356. | | *Paralamyctes cammooensis* | | | Y |
| 357. | 25253 | *Parasuta gouldii* | | | |
| 358. | 25255 | *Parasuta nigriceps* | | | |
| 359. | 25681 | *Pardalotus punctatus (Spotted Pardalote)* | | | |
| 360. | 25682 | *Pardalotus striatus (Striated Pardalote)* | | | |
| 361. | | *Pediana occidentalis* | | | |
| 362. | | *Pegasus volitans* | | | |
| 363. | | *Pelates sexlineatus* | | | |
| 364. | 24648 | *Pelecanus conspicillatus (Australian Pelican)* | | | |
| 365. | 48060 | *Petrochelidon ariel (Fairy Martin)* | | | |
| 366. | 48061 | *Petrochelidon nigricans (Tree Martin)* | | | |
| 367. | 48066 | *Petroica boodang (Scarlet Robin)* | | | |
| 368. | 24659 | *Petroica goodenovii (Red-capped Robin)* | | | |
| 369. | 24663 | *Phaethon rubricauda (Red-tailed Tropicbird)* | | P4 | |
| 370. | 25697 | *Phalacrocorax carbo (Great Cormorant)* | | | |
| 371. | 24665 | *Phalacrocorax fuscescens (Black-faced Cormorant)* | | | |
| 372. | 25698 | *Phalacrocorax melanoleucos (Little Pied Cormorant)* | | | |
| 373. | 24666 | *Phalacrocorax melanoleucos subsp. melanoleucos (Little Pied Cormorant)* | | | |
| 374. | 24667 | *Phalacrocorax sulcirostris (Little Black Cormorant)* | | | |
| 375. | 25699 | *Phalacrocorax varius (Pied Cormorant)* | | | |
| 376. | | *Phalloceros harpagos* | | | Y |
| 377. | 24409 | *Phaps chalcoptera (Common Bronzewing)* | | | |
| 378. | 25587 | *Phaps elegans (Brush Bronzewing)* | | | |
| 379. | | *Phenasteron longiconductor* | | | |
| 380. | 24802 | *Philomachus pugnax (Ruff, reeve)* | | IA | |
| 381. | | *Pholcus phalangioides* | | | |
| 382. | 48071 | *Phylidonyris niger (White-cheeked Honeyeater)* | | | |
| 383. | 24596 | *Phylidonyris novaehollandiae (New Holland Honeyeater)* | | | |
| 384. | | *Pinkfloydia harveii* | | | |
| 385. | | *Piona cumberlandensis* | | | |
| 386. | 24841 | *Platalea flavipes (Yellow-billed Spoonbill)* | | | |
| 387. | 24842 | *Platalea regia (Royal Spoonbill)* | | | |
| 388. | 25720 | *Platycercus icterotis (Western Rosella)* | | | |
| 389. | 24747 | *Platycercus spurius (Red-capped Parrot)* | | | |
| 390. | 25721 | *Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)* | | | |
| 391. | 24750 | *Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)* | | | |
| 392. | 24843 | *Plegadis falcinellus (Glossy Ibis)* | | IA | |
| 393. | 25509 | *Pletholax gracilis (Keeled Legless Lizard)* | | | |
| 394. | 25007 | *Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)* | | | |
| 395. | 24382 | *Pluvialis fulva (Pacific Golden Plover)* | | IA | |
| 396. | 24383 | *Pluvialis squatarola (Grey Plover)* | | IA | |
| 397. | 25703 | *Podargus strigoides (Tawny Frogmouth)* | | | |
| 398. | 24679 | *Podargus strigoides subsp. brachypterus (Tawny Frogmouth)* | | | |
| 399. | 25704 | *Podiceps cristatus (Great Crested Grebe)* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 400. | | *Podykipus collinus* | | | |
| 401. | 25510 | *Pogona minor (Dwarf Bearded Dragon)* | | | |
| 402. | 24907 | *Pogona minor subsp. minor (Dwarf Bearded Dragon)* | | | |
| 403. | 24681 | *Poliocephalus poliocephalus (Hoary-headed Grebe)* | | | |
| 404. | | *Poltys laciniosus* | | | |
| 405. | 25722 | *Polytelis anthopeplus (Regent Parrot)* | | | |
| 406. | 25731 | *Porphyrio porphyrio (Purple Swamphen)* | | | |
| 407. | 24767 | *Porphyrio porphyrio subsp. bellus (Purple Swamphen)* | | | |
| 408. | 24769 | *Porzana fluminea (Australian Spotted Crake)* | | | |
| 409. | 25732 | *Porzana pusilla (Baillon's Crake)* | | | |
| 410. | 24770 | *Porzana pusilla subsp. palustris (Baillon's Crake)* | | | |
| 411. | 24771 | *Porzana tabuensis (Spotless Crake)* | | | |
| 412. | | *Priolepis nuchifasciata* | | | |
| 413. | | *Prionosternum scutatum* | | | |
| 414. | | *Pseudolampona woodman* | | | |
| 415. | 25511 | *Pseudonaja affinis (Dugite)* | | | |
| 416. | 25259 | *Pseudonaja affinis subsp. affinis (Dugite)* | | | |
| 417. | 42416 | *Pseudonaja mengdeni (Western Brown Snake)* | | | |
| 418. | 25433 | *Pseudophryne guentheri (Crawling Toadlet)* | | | |
| 419. | 48085 | *Psittacula krameri (Indian Ringnecked Parrot, Rose-ringed Parakeet)* | Y | | |
| 420. | 24703 | *Pterodroma lessonii (White-headed Petrel)* | | | |
| 421. | | *Pterygotrigla polyommata* | | | |
| 422. | 24711 | *Puffinus assimilis subsp. assimilis (Little Shearwater)* | | | |
| 423. | 42344 | *Purnella albifrons (White-fronted Honeyeater)* | | | |
| 424. | | *Purpureicephalus spurius* | | | |
| 425. | 25008 | *Pygopus lepidopodus (Common Scaly Foot)* | | | |
| 426. | 24243 | *Rattus fuscipes (Western Bush Rat)* | | | |
| 427. | 24244 | *Rattus norvegicus (Brown Rat)* | Y | | |
| 428. | 24245 | *Rattus rattus (Black Rat)* | Y | | |
| 429. | | *Raveniella arenacea* | | | |
| 430. | | *Raveniella cirrata* | | | |
| 431. | | *Raveniella peckorum* | | | |
| 432. | | *Raveniella subcirrata* | | | |
| 433. | 24776 | *Recurvirostra novaehollandiae (Red-necked Avocet)* | | | |
| 434. | 48096 | *Rhipidura albiscapa (Grey Fantail)* | | | |
| 435. | 25614 | *Rhipidura leucophrys (Willie Wagtail)* | | | |
| 436. | 24454 | *Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)* | | | |
| 437. | 48237 | *Rostratula australis (Australian Painted Snipe)* | | T | |
| 438. | | *Scolopendra laeta* | | | |
| 439. | | *Scomberoides lysan* | | | |
| 440. | 25534 | *Sericornis frontalis (White-browed Scrubwren)* | | | |
| 441. | | *Servaea melaina* | | | |
| 442. | 24145 | *Setonix brachyurus (Quokka)* | | T | |
| 443. | | *Sillago burrus* | | | |
| 444. | | *Simaetha tenuior* | | | |
| 445. | 25266 | *Simoselaps bertholdi (Jan's Banded Snake)* | | | |
| 446. | | *Smeringopus natalensis* | | | |
| 447. | 30948 | *Smicrornis brevirostris (Weebill)* | | | |
| 448. | | *Solaenodolichopus pruvoti* | | | |
| 449. | | *Steatoda capensis* | | | |
| 450. | 24526 | *Sterna hirundo subsp. hirundo (Common Tern)* | | IA | Y |
| 451. | 24528 | *Sterna hybrida subsp. javanica (Whiskered Tern)* | | | |
| 452. | 48594 | *Sternula nereis (Fairy Tern)* | | | |
| 453. | 48595 | *Sternula nereis subsp. nereis (Fairy Tern)* | | T | |
| 454. | 24329 | *Stictonetta naevosa (Freckled Duck)* | | | |
| 455. | | *Stigmatopora argus* | | | |
| 456. | 25597 | *Strepera versicolor (Grey Currawong)* | | | |
| 457. | 25589 | *Streptopelia chinensis (Spotted Turtle-Dove)* | Y | | |
| 458. | 25590 | *Streptopelia senegalensis (Laughing Turtle-Dove)* | Y | | |
| 459. | 30950 | *Streptopelia senegalensis subsp. senegalensis (Laughing Turtle-Dove)* | Y | | |
| 460. | 25518 | *Strophurus spinigerus* | | | |
| 461. | 24942 | *Strophurus spinigerus subsp. spinigerus* | | | |
| 462. | 24946 | *Strophurus strophurus* | | | |
| 463. | | *Supunna funerea* | | | |
| 464. | | *Supunna picta* | | | |
| 465. | 33992 | *Synemon gratiosa (Graceful Sunmoth)* | | P4 | |
| 466. | | *Synothele michaelseni* | | | |
| 467. | | *Synothele rastelloides* | | | |
| 468. | 25705 | *Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)* | | | |
| 469. | 24682 | *Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| | | *throated Grebe)* | | | |
| 470. | 24207 | *Tachyglossus aculeatus (Short-beaked Echidna)* | | | |
| 471. | 25552 | *Tadorna radjah (Radjah Shelduck)* | | | |
| 472. | 24331 | *Tadorna tadornoides (Australian Shelduck, Mountain Duck)* | | | |
| 473. | | *Tamopsis darlingtoniana* | | | |
| 474. | 24167 | *Tarsipes rostratus (Honey Possum, Noolbenger)* | | | |
| 475. | | *Tasmanicosa leuckartii* | | | |
| 476. | | *Tetragnatha demissa* | | | |
| 477. | | *Tetragnatha nitens* | | | |
| 478. | 48597 | *Thalasseus bergii (Crested Tern)* | | IA | |
| 479. | 48135 | *Thinornis rubricollis (Hooded Plover, Hooded Dotterel)* | | P4 | |
| 480. | 48136 | *Threskiornis moluccus (Australian White Ibis)* | | | |
| 481. | 24845 | *Threskiornis spinicollis (Straw-necked Ibis)* | | | |
| 482. | 33994 | *Throscodectes xiphos (Stylet Bush Cricket, Stylet Throsco (Jandakot))* | | P1 | Y |
| 483. | 25203 | *Tiliqua occipitalis (Western Bluetongue)* | | | |
| 484. | 25519 | *Tiliqua rugosa* | | | |
| 485. | 25204 | *Tiliqua rugosa subsp. aspera* | | | |
| 486. | 25207 | *Tiliqua rugosa subsp. rugosa* | | | |
| 487. | | *Tinytrema yarra* | | | |
| 488. | 25549 | *Todiramphus sanctus (Sacred Kingfisher)* | | | |
| 489. | 24309 | *Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)* | | | |
| 490. | | *Torquigener pleurogramma* | | | |
| 491. | 48141 | *Tribonyx ventralis (Black-tailed Native-hen)* | | | |
| 492. | 25723 | *Trichoglossus haematodus (Rainbow Lorikeet)* | | | |
| 493. | 24755 | *Trichoglossus haematodus subsp. moluccanus (Rainbow Lorikeet)* | Y | | |
| 494. | 24754 | *Trichoglossus haematodus subsp. rubritorquis (Red-collared Lorikeet)* | | | |
| 495. | 25521 | *Trichosurus vulpecula (Common Brushtail Possum)* | | | |
| 496. | 24158 | *Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)* | | | |
| 497. | 24803 | *Tringa brevipes (Grey-tailed Tattler)* | | P4 | |
| 498. | 24806 | *Tringa glareola (Wood Sandpiper)* | | IA | |
| 499. | 24808 | *Tringa nebularia (Common Greenshank, greenshank)* | | IA | |
| 500. | 24809 | *Tringa stagnatilis (Marsh Sandpiper, little greenshank)* | | IA | |
| 501. | 48147 | *Turnix varius (Painted Button-quail)* | | | |
| 502. | 24851 | *Turnix velox (Little Button-quail)* | | | |
| 503. | 24852 | *Tyto alba subsp. delicatula (Barn Owl)* | | | |
| 504. | 24855 | *Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))* | | P3 | |
| 505. | | *Urocampus carinirostris* | | | |
| 506. | | *Urodacus novaehollandiae* | | | |
| 507. | 25577 | *Vanellus miles (Masked Lapwing)* | | | |
| 508. | 24386 | *Vanellus tricolor (Banded Lapwing)* | | | |
| 509. | 25218 | *Varanus gouldii (Bungarra or Sand Monitor)* | | | |
| 510. | 25225 | *Varanus rosenbergi (Heath Monitor)* | | | |
| 511. | | *Venator immansueta* | | | |
| 512. | | *Venatrix pullastra* | | | |
| 513. | 24206 | *Vespadelus regulus (Southern Forest Bat)* | | | |
| 514. | 24040 | *Vulpes vulpes (Red Fox)* | Y | | |
| 515. | 34113 | *Westralunio carteri (Carter's Freshwater Mussel)* | | T | |
| 516. | | *Westrarchaea sinuosa* | | | |
| 517. | 41351 | *Xenus cinereus (Terek Sandpiper)* | | IA | |
| 518. | | *Zachria flavicoma* | | | |
| 519. | 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 C

Conservation Significant Species and Likelihood of Occurrence Assessment

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| **Birds** | | | | | |
| *Actitis hypoleucos* | Common sandpiper | MI | MI | Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations wherelow perches are available (Johnstone & Storr 1998). | Possible (marginal habitat present) |
| *Anous stolidus* | Common noddy | MI | MI | Tropical and subtropical seas, cayes, reefs, buoys and piles (Pizzey & Knight 2012). | Unlikely (no suitable habitat) |
| *Anous tenuirostris melanops* | Australian lesser noddy | EN | VU | Very common in blue-water seas around the Abrolhos (endemic to this area, accidental occurrences on lower west coast of Australia) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Apus pacificus* | Pacific swift | MI | MI | Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey & Knight 2012). | Possible (may opportunitcally occur above the site, potential foraging habitat present) |
| *Ardea alba* | Eastern great egret | - | MA | Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewage ponds, irrigation areas and larger dams (Pizzey & Knight 2012). | Possible (potential habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Ardea ibis* | Cattle egret | - | MA | Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Ardenna carneipes* | Flesh-footed shearwater | VU | MI | Marine species that breeds on islands off south coast from near Cape Leeuwin (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Arenaria interpres* | Ruddy turnstone | MI | MI | Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Botaurus poiciloptilus* | Australasian bittern | EN | EN | In or over water, in tall reedbeds, sedges, rushes, cumbungi, lignum. Also occurs in ricefields, drains in tussocky paddocks and occasionally in saltmarshes and brackish wetlands. | Possible (marginal habitat present) |
| *Calidris acuminata* | Sharp-tailed sandpiper | MI | MI | Occurs in tidal mudflats, saltmarshes and mangroves, as well as, shallow fresh,brackish or saline inland wetlands. It is also known from floodwaters, irrigated pastures and crops, sewage ponds, saltfields. | Possible (marginal habitat present) |
| *Calidris alba* | Sanderling | MI | MI | Mainly steeply shelving sandy beaches exposed to ocean swell. Also sandy inlets, estuarine sandbanks and near-coastal saltlakes (including saltwork ponds) (Johnstone & Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Calidris canutus* | Red knot | EN | EN (MI) | Mud and sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds. | Unlikely (no suitable habitat) |
| *Calidris ferruginea* | Curlew sandpiper | CR | CR (MI) | Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds. | Unlikely (no suitable habitat) |
| *Calidris melanotos* | Pectoral sandpiper | MI | MI | Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also samphire flats around estuaries and saltlakes (Johnstone & Storr 1998). | Possible (marginal habitat present) |
| *Calidris ruficollis* | Red-necked stint | MI | MI | Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizzey and Knight 2012). | Possible (marginal habitat present) |
| *Calidris subminuta* | Long-toed stint | MI | MI | Mainly freshwater swamps (especially when drying and where vegetation is short), river pools, lagoons and claypans; also brackish pools, sewage ponds and samphire flats around estuaries and saltlakes. | Possible (marginal habitat present) |
| *Calidris tenuirostris* | Great knot | CR | CR (MI) | Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds. | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Calyptorhynchus banksii naso* | Forest red-tailed black cockatoo | VU | VU | Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding Corymbia calophylla, Eucalyptus marginata, introduced Melia azdarach and Eucalyptus spp. trees. | Likely (potential habitat present) |
| *Calyptorhynchus baudinii* | Baudin's cockatoo | EN | EN | Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998). | Unlikely (outside of modelled distribution, limited foraging habitat) |
| *Calyptorhynchus latirostris* | Carnaby's cockatoo | EN | EN | Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Dryandra spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998). | **Recorded** (potential habitat present) |
| *Charadrius bicinctus* | Double-banded plover | MI | MI | Wide beaches, tidal mudflats, saltmarsh, wide and sparsely vegetated margins of shallow saline and freshwater wetlands, paddocks with sparse vegetation, ploughed fields, airfields. | Possible (potential habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Charadrius dubius* | Little ringed plover | MI | MI | Open, muddy or sandy shores of lakes, swamps, tidal areas, sewage ponds or farm dams. Rare but regular summer migrant to Australia (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Charadrius leschenaultii* | Great sand plover | VU | VU (MI) | Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Charadrius mongolus* | Lesser sand plover | EN | EN (MI) | Sandy beaches and tidal estuarine flats. Also near-coastal saltlakes, including saltwork ponds (Johnstone & Storr 1998). | Unlikely (no suitable habitat) |
| *Charadrius ruficapillus* | Red-capped plover | - | MA | Broad, sandy and shelly beaches; bare margins of saline wetlands and lakes, inland and coastal; saltmarsh; tidal mudflats and sandflats; adjacent dunes; occasionally shallow freshwater wetlands, inland and coastal (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Chlidonias leucopterus* | White-winged black tern | MI | MI | Vegetated and open wetlands, brackish and saline lakes, saltfields, irrigated lands, sewage ponds and occasionally offshore. | Possible (potential habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Diomedea amsterdamensis* | Amsterdam albatross | CR | EN (MI) | The Amsterdam albatross is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks (Weimerskirch et al. 1985). It sleeps and rests on ocean waters when not breeding (Marchant and Higgins 1990) | Unlikely (no suitable habitat) |
| *Diomedea epomophora* | Southern royal albatross | VU | VU (MI) | Rare visitor to Western Australian seas; it breeds on subantarctic islands south of New Zealand (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Diomedea exulans* | Wandering albatross | VU | VU (MI) | Marine, pelagic and aerial species. It breeds on Macquarie Island and feeds in Australian portions of the Southern Ocean (DoE 2018). | Unlikely (no suitable habitat) |
| *Diomedea sanfordi* | Northern royal albatross | EN | EN | Species is marine, pelagic and aerial. Habitat includes subantarctic, subtropical, and occasionally Antarctic waters (Marchant & Higgins 1990). Rare visitors to south Western Australian waters. | Unlikely (no suitable habitat) |
| *Falco peregrinus* | Peregrine falcon | OS | - | Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998). | Possible (marginal habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Gallinago hardwickii* | Latham's snipe | MI | MI | Soft, wet ground or shallow water with tussocks and other green or dead growth, wet parts of paddocks, seepage below dams, irrigated areas, scrub or open woodlandfrom sea level to alpine bogs over 2000 m, samphire on saltmarshes and mangrove fringes. Rare visitor to Western Australia. | Possible (potential habitat present) |
| *Gallinago megala* | Swinhoe's snipe | MI | MI | Wet, grassy ground; edges of reedy swamps (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Gallinago stenura* | Pin-tailed snipe | MI | MI | Boggy edges of vegetated wetlands; sewage and other ponds; stubbles, grasslands with shrubs, pastures (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Gelochelidon nilotica* | Gull-billed tern | MI | MI | Beaches, mudflats; fresh, brackish wetlands, including far inland; grasslands, crops, ploughed fields, airfields (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Haliaeetus leucogaster* | White-bellied sea-eagle | - | MA | Coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs (Pizzey & Knight 2012). | Unlikely (no suitable habitat) |
| *Heteroscelus brevipes* | Grey-tailed tattler | P4 (M | MI | Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Himantopus himantopus* | Black-winged stilt | - | MA | Freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers (Birdlife Australia 2019). | Possible (potential habitat present) |
| *Hydroprogne caspia* | Caspian tern | MI | MI | Mainly sheltered areas, estuaries (when not laden with silt) and tidal creeks; occasionally near-coastal saltlakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh waters. | Unlikely (no suitable habitat) |
| *Ixobrychus dubius* | Australian little bittern | P4 | - | Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of Typha spp., Baumea spp. and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998). | Possible (marginal habitat present) |
| *Leipoa ocellata* | Mallefowl | VU | VU | Scrubs and thickets of Eucalyptus spp., Melaleuca lanceolata and Acacia linophylla; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998). | Unlikely (locally extinct, no suitable habitat) |
| *Limosa lapponica* | Bar-tailed godwit | MI (& | MI | Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Limosa lapponica baueri* | Bar-tailed godwit | VU | VU | Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Limosa lapponica menzbieri* | Bar-tailed godwit | CR | CR | Mainly coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins and Davies 1996). | Unlikely (no suitable habitat) |
| *Limosa limosa* | Black-tailed godwit | MI | MI | Tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures, airfields (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Macronectes giganteus* | Southern giant-petrel | MI | EN (MI) | Breeds on southern subantarctic and antarctic islands. May visit Western Australian waters from February to December (mostly June to September) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Macronectes halli* | Northern giant petrel | MI | VU (MI) | Breeds on subantarctic islands. May visit Western Australian water from February to September (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Merops ornatus* | Rainbow bee-eater | - | MA | Open woodlands with sandy, loamy soil; sandridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands and golf courses (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Motacilla cinerea* | Grey wagtail | MI | MI | Mainly banks and rocks in fast-running fresh water habitats: rivers, creeks, streams and around waterfalls, both in forest and open country. | Unlikely (no suitable habitat) |
| *Numenius madagascariensis* | Eastern curlew | CR | CR (MI) | Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Numenius minutus* | Little curlew | MI | MI | Dry grasslands, floodplains, margins of drying swamps; tidal mudflats, airfields, playing fields, crops, commercial saltfields, sewage ponds (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Numenius phaeopus* | Whimbrel | MI | MI | Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds and lawns. | Possible (potential habitat present) |
| *Oxyura australis* | Blue-billed duck | P4 | - | Mainly deeper freshwater swamps and lakes; occasionally saltlakes and estuaries freshened by flood waters (Johnstone and Storr 1998a). | Possible (marginal habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Pachyptila turtur subantarctica* | Fairy prion | - | VU | Breeds on subantarctic islands and is presumed to frequent subtropical waters during non-breeding period (TSSC 2015). | Unlikely (no suitable habitat) |
| *Pandion cristatus* | Osprey | MI | MI | Coasts, estuaries, bays, inlets, islands, and surrounding waters; coral atolls, reefs, lagoons, rock cliffs, stacks (Pizzey & Knight 2012). | Unlikely (no suitable habitat) |
| *Phaethon rubricauda* | Red-tailed tropicbird | P4 (M | MI | Spend most of their lives at sea and rarely venture near land. This bird is normally found in tropical and subtropical seas around northern Australia. Though rarely seen in colder areas, a few pairs breed on Sugarloaf Rock, south of Cape Naturaliste (DPAW 2017b). | Unlikely (no suitable habitat) |
| *Phalaropus lobatus* | Red-necked phalarope | MI | MI | Shallow pools in commercial saltfields, tidal mudflats, beaches, saltmarshes, freshwater wetlands. | Possible (marginal habitat present) |
| *Philomachus pugnax* | Ruff | MI | MI | Fresh, brackish and saline wetlands; tidal mudflats, saltfields, sewage ponds (Pizzey & Knight 2012). | Possible (marginal habitat present) |
| *Plegadis falcinellus* | Glossy Ibis | MI | MI | Shallow and adjacent flats of freshwater lakes and swamps, also river pools, flooded samphire and sewage ponds. | Possible (marginal habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Pluvialis fulva* | Pacific golden plover | MI | MI | Estuaries, mudflats, saltmarshes, mangroves; rocky reefs and stranded seaweed on ocean shores; margins of shallow open inland swamps; sewage ponds, short-grass paddocks, sportsgrounds, airfields, ploughed land (Pizzey & Knight 2012). | Possible (potential habitat present) |
| *Pluvialis squatarola* | Grey Plover | MI | MI | Mudflats, saltmarsh, tidal reefs and estuaries, rarely inland (Pizzey and Knight 2012). | Unlikely (no suitable habitat) |
| *Puffinus carneipes* | Flesh-footed shearwater | MI | MI | Marine species that breeds on islands off south coast from near Cape Leeuwin (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Recurvirostra novaehollandiae* | Red-necked avocet | - | MA | Estuaries, tidal mudflats; fresh, brackish and salt swamps and lakes; claypans, commercial saltfields and sewage ponds (Pizzey & Knight 2012). | Possible (marginal habitat present) |
| *Rostratula australis* | Australian painted snipe | EN | EN | Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993). | Possible (marginal habitat present) |
| *Rostratula benghalensis* | Painted snipe | - | EN | Well vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea tree scrub, open timber. Requires dense low cover (Morcombe 2004). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Sterna dougallii* | Roseate tern | MI | MI | Offshore waters, islands, coral reefs, sand cays, beaches, tidal inlets (Pizzey & Knight 2012). | Unlikely (no suitable habitat) |
| *Sterna hirundo hirundo* | n/a | MI | MI | Offshore waters, beaches, reefs, bays, estuaries, sandflats, saltfields, sewage ponds, freshwater wetlands. | Unlikely (no suitable habitat) |
| *Sternula nereis nereis* | Australian fairy tern | VU | VU | Sheltered blue-water seas close to land, estuaries (when free of silt) and near-coastal lakes (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Thalassarche cauta cauta* | Shy albatross | VU | VU (MI) | Scarce visitor (late May to mid-October) to southwestern and western seas. Breeds on islands off Tasmania and south New Zealand (Johnstone and Storr 1998). | Possible (marginal habitat present) |
| *Thalassarche cauta steadi* | White-capped albatross | VU | VU (MI) | Scarce visitor (late May to mid-October) to southwestern and western seas. Breeds on islands off Tasmania and south New Zealand (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |
| *Thalassarche impavida* | Campbell albatross | VU | VU (MI) | Scarce visitor to south western and western seas. Breeds on Campbell island. | Unlikely (no suitable habitat) |
| *Thalassarche melanophris* | Black-browed albatross | EN | VU (MI) | Seas of south and west coasts. Visitor to Western Australian mainland from January to early November (mostly May to September). Breeds on southern subantarctic and antarctic islands (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Thalassarche steadi* | White-capped albatross | VU | VU (MI) | Marine species that occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). The species has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore (Marchant 1977) and enters harbours and bays (Jehl 1973). Birds gather to scavenge at commercial fishing grounds. | Unlikely (no suitable habitat) |
| *Thalasseus bergii* | Crested tern | MI | MI | Mainly blue-water seas (especially within 3 km of land), including southern estuaries in summer and autumn (when free of silt); also tidal creeks in north, but not penetrating far into larger estuaries. | Unlikely (no suitable habitat) |
| *Thinornis rubricollis* | Hooded plover | P4 | VU | Margins and shallows of saltlakes, sandy and seaweedy beaches and estuaries; also dams (Johnstone & Storr 1998). | Possible (marginal habitat present) |
| *Tringa brevipes* | Grey-tailed tattler | P4 (M | MI | Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Tringa glareola* | Wood sandpiper | MI | MI | Mainly shallow fresh waters (lagoons, swamps, claypans, river pools, dams, bore overflows and sewage ponds); occasionally brackish swamps, rarely saltlakes and estuaries. | Possible (potential habitat present) |
| *Tringa nebularia* | Common greenshank | MI | MI | Shallow fresh waters (claypans, lagoons, swamps, river pools, dams and sewage ponds) and salt waters (estuaries, mangrove creeks, lakes, samphire flats, reef flats and saltwork ponds). | Possible (potential habitat present) |
| *Tringa stagnatilis* | Marsh sandpiper | MI | MI | Mainly shallow fresh or brackish waters: swamps, lakes, river pools, soaks, sewage ponds and bore overflows. Occasionally estuaries and salt ponds, and rarely coasts. | Possible (potential habitat present) |
| *Tringa totanus* | Common redshank | MI | MI | Sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). Also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). | Possible (marginal habitat present) |
| *Tyto novaehollandiae novaehollandiae* | Australian masked owl | P3 | - | Forests, open woodlands, farmlands with large trees. E.g. river red gums, adjacent cleared country, timbered watercourses, paperbark woodlands and caves (Pizzey & Knight 2012). | Possible (marginal habitat present) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Xenus cinereus* | Terek sandpiper | MI | MI | Tidal mudflats, estuaries; shores and reefs of islands; coastal swamps, commercial saltfields (Pizzey & Knight 2012). | Unlikely (no suitable habitat) |
| **Invertebrates** | | | | | |
| *Idiosoma sigillatum* | Swan Coastal Plain shield-backed trapdoor spider | P3 | - | Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003). | Possible (suitable habitat present. multiple records nearby.) |
| *Synemon gratiosa* | Graceful sunmoth | P4 | - | Coastal heathland on Quindalup dunes where it is restricted to secondary sand dunes due to the abundance of the preferred host plant Lomandra maritima. Banksia woodland on Spearwood and Bassendean dunes, where the second known host plant L. hermaphrodita is widespread (DEC 2011). | Possible (hostplant recorded) |
| *Throscodectes xiphos* | Stylet bush cricket | P1 | - | Species poorly understood and documented. Known from Jandacot area, where it was originally collected in the axial leaf bases of grass trees (*Xanthorrhoea preissei* ) (Invertebrate Solutions 2019). | Possible (suitable habitat present, single record narby, poor knowledge of species exists.) |
| *Leioproctus contrarius* | a short-tongued bee | P3 | - | Life history and habits are poorly documented/ unknown. It has been recorded only on flowers of Goodeniaceae and possibly Lechenaultia stenosepala (Bamford 2003). | Unlikely (hostplants not recorded, one record in the wider area) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Westralunio carteri* | Carter's freshwater mussel | VU | VU | Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Salinity tolerance quite low (Morgan et al. 2011). | Unlikely (no suitable habitat) |
| *Neopasiphae simplicior* | a short-tongued bee | EN | CR | This species of native bee has been collected on flowers of Goodenia filiformis, Lobelia tenuior, Angianthus preissianus and Velleia sp. (Houston 2000). | Unlikely (hostplants not recorded. one record in the wider area) |
| **Mammals** | | | | | |
| *Hydromys chrysogaster* | Rakali | P4 | - | Areas with permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen et al. 1985). | Possible (marginal habitat present) |
| *Isoodon fusciventer* | Quenda | P4 | - | Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012a) | **Recorded** (potential habitat present) |
| *Falsistrellus mackenziei* | Western false pipistrelle | P4 | - | High rainfall forests dominated by jarrah, karri, marri, and tuart. Occupies hollow logs for breeding and resting (Van Dyck and Strahan 2008). Also known to utilise Banksia woodland on the Swan Coastal Plain (Hosken and O'Shea 1995). | Unlikely (no suitable habitat) |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Notamacropus eugenii derbianus* | Tammar wallaby | P4 | - | Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983). | Unlikely (no suitable habitat) |
| *Notamacropus irma* | Western brush wallaby | P4 | - | Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983). | Unlikely (no suitable habitat) |
| *Dasyurus geoffroii* | Chuditch | VU | VU | Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along road sides in the wheatbelt (DEC 2012b). | Unlikely (no suitable habitat, now mostly restircted to darling scarp) |
| *Myrmecobius fasciatus* | Numbat | EN | EN | Generally dominated by Eucalyptus spp. that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008). | Unlikely (no suitable habitat, locally extinct) |
| *Pseudocheirus occidentalis* | Western ringtail possum | CR | CR | On the Swan Coastal Plain in Agonis flexuosa woodlands and Agonis flexuosa/ Eucalyptus gomphocephala forests. Also Eucalyptus marginata forests (DBCA 2017). | Unlikely (locally extinct, no suitable habitat) |
| *Setonix brachyurus* | Quokka | VU | VU | On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007). | Unlikely (locally extinct, no suitable habitat) |
| **Reptiles** | | | | | |

| Species name | Common name | Level of significance | | Habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| | | WA | EPBC Act | | |
| *Lerista lineata* | Perth slider | P3 | - | Sandy coastal heath and low scrubland. Banksia spp. woodland, Eucalyptus gomphocephala open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2017). | Possible (potential habitat present) |
| *Neelaps calonotos* | Black-striped snake | P3 | - | Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002). | Possible (potential habitat present) |

Note: CE=critically endangered, EN=endangered, VU=vulnerable, CD=conservation dependent, MI=migratory, OS=other specially protected, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4. Species recorded or considered to potentially occur within the site are shaded green.

# Appendix D

Species List

# Fauna List
## Former Glen Iris Golf Course

| Category | Status | Species name | Common name | Record type |
|---|---|---|---|---|
| **Birds** | | | | |
| | | *Anthochaera carunculata* | Red wattlebird | Sight |
| | EN | *Calyptorhynchus latirostris* | Carnaby's cockatoo | Sight |
| | | *Chenonetta jubata* | Australian wood duck | Sight |
| | | *Corvus coronoides* | Australian raven | Sight |
| | | *Cracticus tibicen* | Australian magpie | Sight |
| | | *Fulica atra* | Eurasian coot | Sight |
| | | *Grallina cyanoleuca* | Magpie-lark | Call |
| | | *Phaps chalcoptera* | Common bronzewing | Sight |
| | | *Phylidonyris novaehollandiae* | New Holland honeyeater | Sight |
| | | *Rhipidura leucophrys* | Willie wagtail | Sight |
| | | *Threskiornis spinicollis* | Straw-necked ibis | Sight |
| | | *Trichoglossus haematodus* | Rainbow lorikeet | Call |
| | | *Zosterops lateralis* | Grey-breasted white-eye | Call |
| **Crustacean** | | | | |
| | * | *Cherax destructor* | Yabby | Shell |
| **Fish** | | | | |
| | * | *Cyprinus rubrofuscus* | Koi fish | Sight |
| **Mammals** | | | | |
| | P4 | *Isoodon fusciventer* | Quenda | Diggings |
| | *DP | *Oryctolagus cuniculus* | Rabbit | Scat, diggings |
| **Reptiles** | | | | |
| | | *Chelodina colliei* | Snake-necked turtle | Sight |

Note: * denotes introduced fauna species, DP=declared pest under the BAM Act, EN=Endangered under the EPBC Act, P4=Priority 4 in WA

# Appendix C

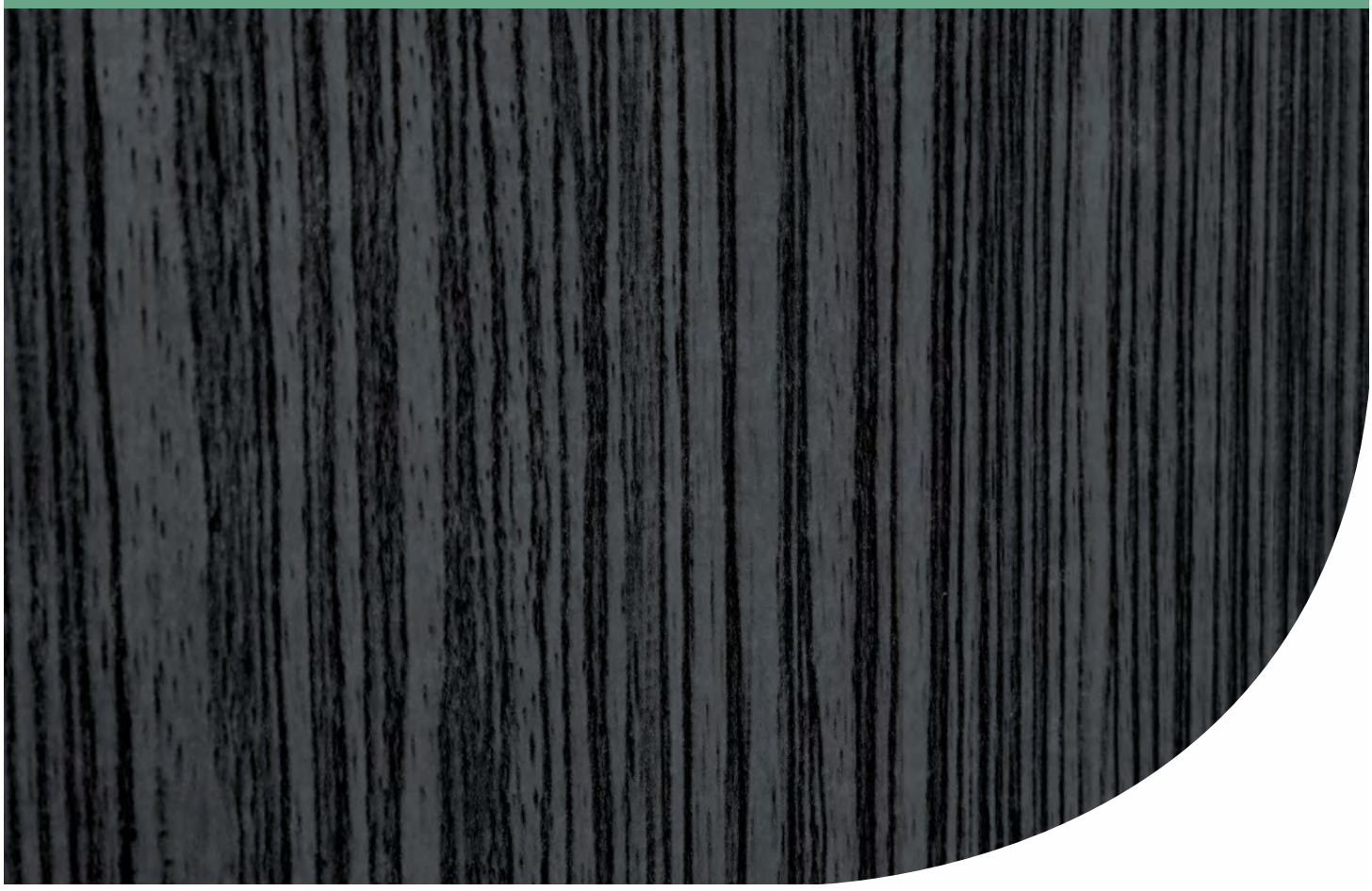
Targeted Black Cockatoo Assessment

# Targeted Black Cockatoo Assessment

## Former Glen Iris Golf Course

Project No: EP20-009(13)

**Prepared for ECP Acquisitions 6 Pty Ltd**
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# Executive Summary

ECP Acquisitions 6 Pty Ltd engaged Emerge Associates (Emerge) to conduct a 'targeted' threatened black cockatoo assessment in the former Glen Iris Golf Course which comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court in Jandakot (referred to herein as the 'site').

As part of the assessment a desktop assessment of relevant background information was completed and a field survey was undertaken across the site on 11 March and 12 November 2020. During the field survey an assessment of habitat for threatened black cockatoo species was completed.

Outcomes of the survey include the following:

- The site occurs within the modelled distribution of Carnaby's cockatoo and forest red-tailed black cockatoo, but outside of the modelled distribution of Baudin's cockatoo. The site is also within the breeding range of forest red-tailed black cockatoo. Therefore, the habitat in the site is most relevant to Carnaby's cockatoo and forest red-tailed black cockatoo.
- Carnaby's cockatoo were recorded in the site. Both Carnaby's cockatoo and forest red-tailed black cockatoo are likely to occur within the site.
- Forest red-tailed black cockatoo nests have been recorded within 6 km of the site at Bibra Lake and Murdoch, with the most recent breeding record occurring in spring 2020 (BirdLife Australia 2021). The site contains 11 habitat trees of which none contain hollows suitable for use by black cockatoos for breeding. Therefore, the site does not currently provide breeding habitat for forest red-tailed black cockatoo black cockatoo.
- White-tailed black cockatoo (likely Carnaby's cockatoo) and forest red-tailed black cockatoo roosts have been recorded at 42 locations within 12 km of the site (BirdLife Australia 2021). No roosts or evidence of roosting by any species of black cockatoo was recorded within the site. Tall native and non-native trees within the site represent suitable roosting habitat.
- Extensive areas of native and non-native vegetation that provides foraging habitat for Carnaby's cockatoo and forest red-tailed black cockatoo occurs immediately adjacent to the site and in the wider area. A total of 4.76 ha of foraging habitat for Carnaby's cockatoo was mapped within the site of which 0.96 ha (20%) provides a high value resource, 0.16 ha (14%) provides a moderate value resource and 3.13 ha (66%) provides a low value resource. A total of 4.88 ha of foraging habitat for forest red-tailed black cockatoo was mapped in the site of which 0.59 ha (12%) provides a high value resource, 0.39 ha (8%) provides a moderate value resource and 3.90 ha (80%) provides a low value resource.
- Overall habitat quality was scored at three out of ten (low quality) for Carnaby's cockatoo with foraging habitat being the highest scoring component. Overall black cockatoo habitat quality was scored at five out of ten (moderate quality) for forest red-tailed black cockatoo with foraging habitat being the highest scoring component.

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Additional Information

**Appendix B**

Black Cockatoo Foraging Plants

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Black Cockatoo Habitat Quality Assessment (Emerge 2021)

**Appendix D**

Black Cockatoo Habitat Tree Data

**Appendix E**

Overall Habitat Quality Assessment

# Abbreviation Tables

*Table A1: Abbreviations – Organisations*

| Organisations | |
|---|---|
| EPA | Environmental Protection Authority |
| DBCA | Department of Biodiversity, Conservation and Attractions |
| DPaW | Department of Parks and Wildlife (now DBCA) |
| DAWE | Department of Agriculture, Water and the Environment |
| WA Museum | Western Australian Museum |

*Table A2: Abbreviations – General terms*

| General terms | |
|---|---|
| EN | Endangered |
| VU | Vulnerable |

*Table A3: Abbreviations – Legislation*

| Legislation | |
|---|---|
| BC Act | *Biodiversity Conservation Act 2016* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |

*Table A4: Abbreviations – units of measurement*

| Units of measurement | |
|---|---|
| DBH | Diameter at breast height |
| cm | Centimetre |
| ha | Hectare |
| km | Kilometre |
| m | Metre |

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# 1 Introduction

## 1.1 Project background

Emerge Associates (Emerge) were engaged by ECP Acquisitions 6 Pty Ltd to characterise the black cockatoo habitat values within the former Glen Iris Golf Course which comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court in Jandakot (referred to herein as the 'site'). These lots are located approximately 6 kilometres (km) south of the Perth Central Business District within the City of Cockburn.

The site is approximately 53.7 hectares (ha) in size and is surrounded by residential subdivision, with a railway to the north and Kwinana Freeway to the west. The site comprises two areas separated by Berrigan Drive. The location and extent of the site is shown in **Figure 1**.

## 1.2 Purpose and scope of work

The scope of work was specifically to conduct a terrestrial vertebrate fauna assessment to the standard required of a 'targeted' black cockatoo survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020) and the *Environment Protection and Biodiversity Conservation Act* black cockatoo referral guidelines (DSEWPaC 2012b).

As part of this scope of work, the following tasks were undertaken:

- Desktop assessment of relevant background information pertaining to the site and surrounds, including database and literature searches for black cockatoos.
- Field survey to identify potential habitat for species of black cockatoo.
- An assessment of the quality of black cockatoo habitat within the site.
- Mapping of black cockatoo habitat.
- Documentation of the desktop assessment, survey methodology and results into a report.

# 2 Background

## 2.1 Environmental Context

Landform and soils influence fauna habitat and species at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area.

The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side has formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side is comprised of three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Soil mapping by Gozzard (2011) places the site in the Bassendean dunes which are 'old, low hills of quartz sand with numerous interdunal swamps and lakes'.

Vegetation mapping by Heddle *et al.* (1980) indicates the site lies within the 'Bassendean complex - central and south' which is described as supporting 'woodland of *Eucalyptus marginata - Allocasuarina fraseriana - Banksia* spp. to low woodland of *Melaleuca* spp. and sedgelands on the moister sites' (Beard 1990).

## 2.2 Threatened fauna

Certain fauna taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, fauna taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia fauna species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Threatened fauna species listed under the EPBC Act and/or BC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Further information on threatened species and their categories is provided in **Appendix A**.

## 2.3 Black cockatoos

Three threatened species of black cockatoo occur in the south-west of WA (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories:

- Black cockatoos nest in hollows that form in trees which are usually more than ~200 years old. 'Breeding habitat' comprises 'habitat trees' which are trees of a species known to support black cockatoo breeding and which either have a suitably large enough nest hollow or have a large enough diameter at breast height (DBH) to indicate that a suitable nest hollow could develop in time (DSEWPaC 2012a). A minimum DBH for a habitat tree is defined as ≥50 centimetres (cm) for most tree species used by black cockatoos and ≥30 cm for *Eucalyptus wandoo* (wandoo) and *Eucalyptus salmonophloia* (salmon gum) (DSEWPaC 2012a). Breeding habitat is also generally expected to be located within 7 km of food and water resources (Saunders 1990).
- During the day and most often overnight black cockatoos congregate in a tree or group of trees to rest. 'Roosting habitat' consists of groups or individual tall trees used for roosting. Roosts generally comprise the tallest trees in an area and can include native and non-native trees (DSEWPaC 2012a). They are often located within 6 km of water and food resources, with additional foraging ranges within 12 km (Shah 2006; DSEWPaC 2012a; Le Roux 2017). The use of a particular roost may vary depending on availability of food and water resources.
- Black cockatoos feed on the fruit and seeds of a range of native and non-native plants species. 'Foraging habitat' is vegetation that contains plant species known to be foraged on by black cockatoos.

Each black cockatoo species has a defined breeding season, with Baudin's cockatoo breeding from August/September to February/March and Carnaby's cockatoo breeding from July/August to January/February (DSEWPaC 2012a). Forest red-tailed black cockatoo breeds in October/November but may breed in March/April if there is good autumn rainfall (DSEWPaC 2012a). There is also evidence that forest red-tail black cockatoos breed throughout the year, with peaks in April – June and August – October (Johnstone *et al.* 2013).

## 2.4 Previous surveys

No previous black cockatoo surveys are known to have been undertaken within the site.

Emerge have previously completed a Level 1 fauna assessment within the site (Emerge Associates 2020a).

# 3 Methods

## 3.1 Desktop assessment

A search was conducted for records of black cockatoos and potential black cockatoo habitat mapping occurring within 10 km of the site using a range of publicly available regional studies and datasets. Detailed information on each dataset considered as part of the desktop review is provided in **Appendix A**.

## 3.2 Field survey

A zoologist and an ecologist from Emerge visited the site on 11 March and 12 November 2020 during the day to conduct the field survey.

Transects were traversed across the site and potential black cockatoo breeding, night roosting and foraging habitat was recorded. If observed, the presence of black cockatoos within or near the site was noted. Active searches for secondary evidence of breeding, roosting and foraging activity such as chew marks, branch clippings, droppings, moulted feathers and chewed fruit were conducted.

### 3.2.1 Breeding habitat

A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥50 cm or DBH ≥30 cm for wandoo or salmon gum. As any tree that has a suitable hollow may provide breeding habitat for black cockatoos, other tree species were also considered to be habitat trees if they contained a suitable hollow.

To be suitable for use as breeding habitat by black cockatoos it was considered a hollow must:

- have an entrance opening of at least 10 cm but preferably 20-30 cm (Saunders *et al.* 1982; Groom 2010; Johnstone *et al.* 2013).
- be located at least 3 m from the ground (Saunders 1979b; Johnstone and Storr 1998; Groom 2010; Saunders 2014).
- be located in a trunk or branch that is generally large enough to contain a hollow that has a floor diameter of at least 40 cm and depth of 50-200 cm such that it could house an adult black cockatoo and nestlings (Saunders 1979a; Johnstone and Storr 1998; Saunders 2014; DPaW 2015).
- have vertical or near vertical orientation (Johnstone and Kirkby 2008; Johnstone *et al.* 2013).

Occasionally, native eucalypts were encountered that met DBH requirements but did not contain a trunk/branch of a sufficient size to support a hollow suitable for use by black cockatoos. For example, the tree may have been less than 3 m tall or had a trunk that forked between 1.3 m and 3 m in height and after the fork no limbs had a diameter such that they could contain a suitable hollow. These trees were not recorded as habitat trees as the likelihood they would ever form a suitable hollow was low.

Habitat trees were individually identified, and the attributes outlined in **Table 1** were recorded for each tree.

*Table 1: Attributes recorded for each habitat tree in the site*

| Attribute | Description |
|---|---|
| Tag | Unique identifier on a metal tag was nailed to tree |
| Image | Trees were individually photographed |
| GPS location | The location was recorded using a handheld GPS unit |
| Tree species | Species and common name were identified |
| Diameter at breast height (DBH) (cm) | DBH was measured at breast height (1.3 metres) using a diameter tape |
| Hollows potentially suitable for breeding by a black cockatoo | Number of hollows potentially suitable for breeding by a black cockatoo recorded (assessed from ground level only) |

Hollows that appeared potentially suitable for use by a black cockatoo from the ground were further inspected using a drone and/or a pole-mounted camera. During the hollow inspection the internal dimensions of the hollow were confirmed, if possible, and an assessment was made for signs of use such as chew marks around the hollow entrance, nesting material, feathers or the presence of birds within the hollow.

All recorded habitat trees were assigned to a category listed in **Table 2**.

*Table 2: Habitat tree categories*

| Category | Specifications |
|---|---|
| Nest | The tree contains a hollow used by black cockatoos for breeding as confirmed by records of black cockatoos, their eggs or fledglings or other evidence of recent nesting activity by black cockatoos |
| Potential nest | The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^ and evidence of use by an unidentified bird such as feathers, chew marks or nest material has been recorded within a hollow |
| Suitable hollow(s) | The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^ |
| Potentially suitable hollow(s) | The tree contains or is suspected to contain one or more hollows that have the potential to be suitable for use by black cockatoos when either viewed from the ground or following an internal hollow inspection that was inconclusive^ |
| No suitable hollow(s) | The tree does not contain hollow(s) that have the potential to be suitable for use by black cockatoos when viewed from the ground or contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection^ |

^Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above in **Section 3.2.1.**

### 3.2.2 Roosting habitat

The site was assessed for the presence of active or historical roosts and its potential to provide roosting habitat for black cockatoos.

During the field survey the site was searched for secondary evidence of roosting activity, such as branch clippings, droppings or moulted feathers. No dusk roost survey was undertaken as no signs indicative of roosting were recorded (refer **Section 4.5**). Groups of tall native and non-native trees, if present, were assumed to provide potential roosting habitat.

### 3.2.3 Foraging habitat

Foraging habitat was identified by comparing the vegetation within the site to literature on plant species known to provide food consumed by black cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DSEWPaC 2012a).

Foraging habitat was classified as providing a 'high', 'moderate' or 'low' value resource based on the proportion of 'primary' or 'secondary' food plants. Primary food plants were defined as those with historical and contemporary records of regular consumption by a black cockatoo species. Secondary food plants were defined as plants that black cockatoo species have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. Each patch of foraging habitat was assigned a percentage cover of primary and secondary food plants based on the preferences of each black cockatoo species. As it is not always possible to separate out food plants from non-food plants, mapped foraging habitat may also include vegetation comprising non-food plants. Classification of foraging habitat was completed such that the proportion of non-food plants was minimised as far as practicable. A list of plant species classified as primary or secondary food plants is provided as **Appendix B.**

Evidence of black cockatoo foraging, such as chewed fruits, was searched for within the site and allocated to a species where possible. The locations of black cockatoo foraging evidence within the site were recorded using a hand-held GPS unit.

## 3.3 Data analysis, presentation and mapping

Habitat trees were classified according to the scheme outlined in **Table 2** and mapped on aerial imagery. A complete summary of the recorded attributes of habitat trees was compiled in a tabular format.

Foraging habitat was described according to the dominant flora species or vegetation type present and mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field. The value of each patch of foraging habitat was mapped for each species of black cockatoo likely to occur in the site. The proportions of high, moderate and low value foraging habitat mapped within the site are reported in **Section 4.6**.

### 3.3.1 Overall black cockatoo habitat quality

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of back cockatoo habitat (DAWE 2020). DAWE does not provide a methodology for scoring 'overall black cockatoo habitat quality' but instead specifies that an assessment of quality should be undertaken by an experienced technical expert (DSEWPaC 2012b).

Emerge have developed a method to provide a systematic assessment of overall black cockatoo habitat quality. The method assesses and scores the condition, context and stocking rate of breeding, roosting and foraging habitat separately and then provides an overall quality score out of ten based on the highest score determined for these categories of habitat. The assessment methodology is detailed in **Appendix C.**

## 3.4 Nomenclature and sources of information

Taxonomy and nomenclature of scientific and common names for fauna species follow the *Western Australian Museum* (WAM) *Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020). Where common names were not provided by the Western Australian Museum (2019); (WAM 2020), these have been derived from other sources. Literature listed in **Appendix A** represent the main publications used to identify fauna species and habitats within the site.

## 3.5 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA's document *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) is provided in **Table 3**.

*Table 3: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| Level of survey | No limitation | A targeted black cockatoo habitat survey was undertaken. The level of survey and survey effort are considered adequate to assess the black cockatoo habitat values within the site. |
| Scope | No limitation | The survey focused on black cockatoo habitat within the site. |
| Proportion of fauna identified, recorded and/or collected. | No limitation | The survey focused on identifying habitat for species of black cockatoo rather. One of the two species of black cockatoo known to occur in the vicinity of the site was recorded during the survey. Habitat was reviewed across the entire site. All habitat trees and all potentially suitable hollows were assessed. The extent of foraging habitat was resolved such that the proportion of non-food plants within mapped habitat was less than 25%. |
| Sources of information e.g. previously available information (whether historic or recent) as distinct from new data. | No limitation | Adequate information was available from database searches and previous surveys to place habitat in context. |
| The proportion of the task achieved and further work which might be needed. | No limitation | The targeted black cockatoo assessment was achieved in its entirety. |
| Experience level of personnel | No limitation | The field survey was led by and the report authored by a qualified zoologist with over three years' experience. Technical review was undertaken by an ecologist with over ten years' experience in in environmental science in Western Australia. |

*Table 3: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020) (continued)*

| Constraint | Degree of limitation | Details |
|---|---|---|
| Suitability of timing, weather and season | No limitation | Survey timing is not of great importance for a black cockatoo habitat assessment (with exception of detecting active nests). Nevertheless, the survey was undertaken within the main breeding season for all three species of black cockatoo (refer to **Section 2.3**). |
| Completeness | No limitation | The desktop assessment, field survey and targeted black cockatoo habitat assessment was completed comprehensively. |
| Spatial coverage and access | No limitation | Site coverage was comprehensive (track logged). |
| | No limitation | All parts of the site could be accessed as required. |
| Survey intensity | No limitation | The intensity of the survey was adequate given the size of the site. |
| Influence of disturbance | No limitation | The western portion of the site is modified due to historical disturbance associated with quarrying activities. However, no recent disturbance was noted that may have affected outcomes of the survey. |
| Adequacy of resources | No limitation | All resources required to perform the survey were available.<br>The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is limited and relies heavily on technical experts preparing their own methodology. In response this assessment applies an internally developed methodology that is considered to provide a systematic and balanced characterisation of black cockatoo habitat. |

# 4 Results

## 4.1 Desktop assessment

The results of the desktop assessment are summarised in **Table 4**, **Table 5** and **Table 6**, and shown in **Figure 2.** Detailed information on each dataset considered as part of the desktop review is provided in **Appendix A**.

*Table 4: Summary of black cockatoo background review*

| Category | | Site context | Source |
|---|---|---|---|
| Species distribution | | • Site is not within the modelled distribution of Baudin's cockatoo.<br>• Site is within the modelled distribution of Carnaby's cockatoo but not within its breeding range.<br>• Site is within the modelled distribution of forest red-tailed black cockatoo and within its known breeding range. | (DoEE 2016a, c, b) |
| Breeding sites | | • No nesting records occur within the site.<br>• Breeding of forest red-tailed black cockatoo has been recorded within 6 km of the site in Bibra Lake and Murdoch, with the most recent breeding in spring 2020. | BirdLife Australia database search (2021) |
| Carnaby's cockatoo breeding areas (12 km radius surrounding breeding sites) | | • No confirmed or possible breeding areas intersect the site. | (Glossop *et al.* 2011) |
| Important bird areas for Carnaby's cockatoo | | • None within the site.<br>• None within 12 km of the site | (DPaW 2013) |
| Roost site | | • None within the site.<br>• 42 roost sites within 12 km of the site (see **Table 5** and **Table 6**):<br>o 18 associated with white-tailed^ black cockatoos only<br>o 11 associated with forest red-tailed black cockatoos only<br>o 13 associated with white^ and red-tailed black cockatoos | BirdLife Australia database search (2021), Peck *et al.* (2019) |
| Foraging habitat | White-tailed black cockatoo^ | • No native foraging habitat mapped within the site.<br>• Multiple parcels of potential native foraging habitat are mapped within the wider local area of the site. Extensive areas of potential native foraging habitat are mapped on the Darling Scarp approximately 16 km east of the site. | (Emerge Associates 2020b) |
| | White-tailed black cockatoo^ | • No pine plantations are mapped within 12 km of the site | (Forest Products Commission 2020) |
| | Forest red-tailed black cockatoo | • No native foraging habitat mapped within the site.<br>• Multiple parcels of potential native foraging habitat are mapped within the wider local area of the site. Extensive areas of potential native foraging habitat are mapped on the Darling Scarp approximately 16 km east of the site. | (Emerge Associates 2020c) |

^Carnaby's and/or Baudin's cockatoo

*Table 5: White-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia (2021); (Peck et al. 2019)*

| Roost ID | Year and number of individuals | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| ARMCHAR001 | NS | NS | NS | NS | NS | NS | NS | 0 | 3 | 0 |
| ARMFORR001 | NS | NS | NS | 0 | 0 | 18 | 0 | 0 | NS | 0 |
| ARMHARR001 | NS | 0 | 0 | NS | 0 | 1 | 3 | 0 | 0 | 0 |
| CANFERR001 | NS | NS | NS | 5 | 0 | 0 | 0 | 0 | 0 | NS |
| CANWILR001 | 0 | 0 | 0 | 0 | 68 | 0 | 0 | 0 | 0 | 0 |
| COCBANR001 | NS | NS | NS | NS | NS | 45 | NS | 0 | 20 | 0 |
| COCBANR002 | NS | NS | NS | NS | 53 | NS | 0 | 0 | 0 | 0 |
| COCBANR003 | NS | NS | NS | NS | NS | NS | NS | 6 | 16 | 0 |
| COCCOOR005 | NS | NS | NS | NS | NS | NS | NS | 38 | 0 | 0 |
| COCHAMR001 | 0 | 169 | 215 | 0 | 168 | 68 | 101 | 0 | 0 | 0 |
| COCHAMR002 | NS | NS | NS | NS | NS | 263 | 194 | 0 | 369 | 506 |
| COCMUNR003 | NS | NS | NS | NS | NS | NS | 0 | 0 | 0 | 3 |
| COCSPER001 | 0 | 2 | NS | 323 | NS | 0 | 0 | 40 | 0 | NS |
| COCSPER002 | NS | 5 | 0 | NS | NS | 0 | 24 | 0 | NS | NS |
| GOSCNVR001 | 0 | 19 | NS | NS | 0 | 0 | 0 | 0 | NS | 80 |
| GOSCNVR002 | NS | NS | 26 | 52 | 0 | 0 | 151 | 0 | 0 | 0 |
| GOSSOUR002 | NS | NS | NS | NS | NS | NS | 50 | 0 | 0 | 0 |
| KWIWANR001 | 63 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | NS |
| KWIWANR002 | NS | NS | NS | 0 | 0 | 0 | 0 | 5 | 0 | 0 |
| KWIWANR004 | NS | NS | NS | NS | NS | NS | NS | 73 | 0 | 0 |
| MELBATR001 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MELKARR002 | 0 | 0 | 0 | NS | 0 | 55 | 0 | 0 | 0 | 0 |
| MELLEER001 | 0 | 0 | 12 | 0 | 70 | 0 | 0 | 0 | 15 | 2 |
| MELMURR001 | 700 | 60 | 142 | 127 | 234 | 24 | 78 | 0 | 227 | 249 |
| MELWINR001 | NS | 56 | 81 | 70 | 41 | 0 | 21 | 0 | 0 | 12 |
| MELWINR003 | 117 | 130 | NS | NS | NS | 0 | 7 | 54 | 64 | 108 |

*Table 5: White-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia (2021); (Peck et al. 2019) (continued)*

| Roost ID | Year and number of individuals | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| MELWINR004 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | NS |
| SEROAKR004 | 45 | 3 | 0 | 0 | 50 | 0 | 26 | 2 | 33 | NS |
| SEROAKR007 | NS | NS | NS | NS | NS | NS | NS | 2 | 0 | NS |
| SOUCOMR001 | 408 | 645 | 558 | 301 | 402 | 460 | 242 | 289 | 470 | 563 |
| SOUSALR001 | 12 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 2 | 0 |

NS = not surveyed

*Table 6: Forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia (2021); (Peck et al. 2019)*

| Roost ID | Year and number of individuals | | | | | |
|---|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| ARMCHAR001 | NS | NS | NS | 11 | 16 | 0 |
| CANRIVR001 | NS | NS | 6 | 11 | 7 | 16 |
| CANROSR001 | NS | NS | 0 | 0 | 14 | 2 |
| CANWILR001 | 4 | 7 | 7 | 5 | 16 | 82 |
| COCBANR001 | NS | 0 | NS | 6 | 17 | 0 |
| COCBANR002 | 3 | NS | 32 | 24 | 109 | 15 |
| COCCOCR001 | NS | NS | NS | NS | 15 | 102 |
| COCCOOR001 | NS | 13 | 0 | 0 | 8 | 0 |
| COCCOOR003 | NS | NS | 57 | 6 | 71 | 33 |
| COCMUNR001 | 92 | NS | 73 | 0 | 365 | 259 |
| COCMUNR003 | NS | NS | 38 | 0 | 108 | 0 |
| COCSPER003 | NS | NS | NS | 35 | 12 | 0 |
| FREWHIR001 | 0 | NS | 0 | 38 | 29 | 28 |
| GOSCNVR001 | 2 | 0 | 0 | 0 | NS | 0 |
| GOSCNVR002 | 0 | 4 | 0 | 0 | 0 | 0 |
| GOSGOSR004 | 19 | NS | 31 | 32 | 79 | 0 |

*Table 6: Forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia (2021); (Peck et al. 2019) (continued)*

| Roost ID | Year and number of individuals | | | | | |
|---|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| GOSSOUR002 | NS | NS | 0 | 36 | 208 | 15 |
| MELLEER001 | 0 | 0 | 11 | 25 | 5 | 0 |
| MELMURR001 | 199 | 33 | 125 | 209 | 441 | 214 |
| MELWINR003 | NS | 0 | 0 | 0 | 1 | 0 |
| MOSMOSR001 | 0 | 0 | 0 | 0 | 0 | 3 |
| SOUCOMR001 | 0 | 0 | 0 | 0 | 0 | 1 |
| SOUSALR001 | 2 | 0 | 0 | 0 | 8 | 0 |
| VICWATR002 | NS | NS | 0 | 45 | 85 | 51 |

NS = not surveyed

## 4.2 General site conditions

The site is gently undulating and comprises sandy white-grey soils. Seven artificial lakes occur within the site that were sustained by irrigation at the time of the first survey day. During the second survey, only the southernmost lake contained water.

The site has been highly modified for use as a golf course and is dominated by non-native vegetation and unvegetated areas, with native vegetation present as individuals or small scattered patches. The artificial lakes are surrounded by either turf, riparian vegetation or planted trees and shrubs.

## 4.3 Species inventory

Approximately 20 Carnaby's cockatoo individuals were observed perching and foraging within trees in the central portion of the site during the day on 11 March 2020.

## 4.4 Breeding habitat

A total of 11 black cockatoo habitat trees were recorded within the site as shown in **Figure 3**.

All of the habitat trees were *Eucalyptus marginata* (jarrah). Two habitat trees were initially assessed to potentially contain suitable hollows based on the initial inspection from ground level. An internal hollow inspection determined that these hollows were not suitable for use by black cockatoos for breeding.

A summary of the habitat trees recorded within the site is provided in **Table 7** and an inventory in **Appendix D.**

*Table 7: Habitat trees recorded within the site*

| Category | No. trees | No. suitable hollows |
|---|---|---|
| Confirmed nest | 0 | - |
| Potential nest | 0 | - |
| Suitable hollow(s) | 0 | - |
| Potentially suitable hollow(s) | 0 | - |
| No suitable hollow(s) | 11 | 0 |
| **Total** | **11** | **0** |

## 4.5 Roosting habitat

No roosts or secondary evidence of roosting were observed within the site during the survey. Native and non-native trees within the site have the potential to provide roosting habitat for black cockatoos.

## 4.6 Foraging habitat

A total of 4.76 ha of foraging habitat was mapped within the site for Carnaby's cockatoo and 4.88 ha for forest red-tailed black cockatoo as detailed in **Table 9** and shown in **Figure 4** and **Figure 5**. The foraging habitat occurs as scattered native trees and generally linear patches of native and non-native trees. The extent of foraging habitat by value category is detailed in **Table 9**.

*Table 8: Foraging habitat quality*

| Foraging value | Black cockatoo species and foraging habitat area (ha)^ | |
|---|---|---|
| | Carnaby's | Forest red-tailed |
| High | 0.96 (20%) | 0.59 (12%) |
| Moderate | 0.67 (14%) | 0.39 (8%) |
| Low | 3.13 (66%) | 3.90 (80%) |
| **Total** | **4.76** | **4.88** |

^As the site is located outside of the range of Baudin's cockatoo foraging value for this species was not reported.

Primary food plants include *Banksia attenuata* (candlestick banksia), *Banksia menziesii* (firewood banksia) and **Tipuana tipu* (tipuana) whose fruits are consumed by Carnaby's cockatoo, jarrah and marri whose fruits are consumed by both Carnaby's cockatoo and forest red-tailed black cockatoo and **Melia azedarach* (Cape lilac) whose fruits are consumed by forest red-tailed black cockatoo. Secondary food plants include a range of species including *Allocasuarina fraseriana* (sheoak), *Casuarina obesa* (swamp sheoak), *Xanthorrhoea preissii* (grass tree), but predominantly comprise non-native eucalypt trees (**Eucalyptus* spp.).

A summary of dominant food plants within foraging habitat within the site is provided in **Table 8**.

*Table 9: Dominant primary and secondary black cockatoo foraging plants recorded within the site*

| Common name | Black cockatoo species and foraging habitat category | |
|---|---|---|
| | Carnaby's | Forest red-tailed |
| Candlestick banksia | Primary | Non-food |
| *Cape lilac | Secondary | Primary |
| **Eucalyptus* spp. | Secondary | Secondary |
| Firewood banksia | Primary | Non-food |
| Grass tree | Secondary | Non-food |
| Jarrah | Primary | Primary |
| Marri | Primary | Primary |
| Sheoak | Non-food | Secondary |
| Swan River blackbutt | Primary | Primary |
| *Swamp sheoak | Secondary | Non-food |
| *Tipuana | Primary | Non-food |

*Denotes non-native species.

## 4.7 Overall quality

Overall habitat quality for Carnaby's cockatoo within the site scored three out of ten (low quality). The overall habitat quality for forest red-tailed black cockatoo scored five out of ten (moderate quality).

The outcome of the overall black cockatoo habitat quality assessment is provided in **Table 10** and summarised in **Table 11**. The full results of the quality assessment are provided in **Appendix E**.

*Table 10: Overall habitat quality assessment scores*

| Habitat category | Black cockatoo species and score | |
|---|---|---|
| | Carnaby's | Forest red-tailed |
| Breeding | N/A[#] | 3 |
| Roosting | 1 | 1 |
| Foraging | 3 | 5 |
| **Overall Score** | **3** | **5** |

[#]No breeding habitat score was assigned as the site is located outside of the species breeding range. No habitat score was assigned for Baudin's cockatoo as the site is located outside of the species distribution range.

*Table 11: Summary of attributes contributing to black cockatoo habitat quality scores*

| Habitat category | Quality component category | Black cockatoo species and attributes | |
|---|---|---|---|
| | | Carnaby's | Forest red-tailed |
| Breeding | Site condition | N/A – site is located outside of its breeding range | The site supports habitat trees without suitable hollows. |
| | Site context | | Three confirmed forest red-tailed black cockatoo nests occur within 6 km of the site and 2,236 ha of potential forest red-tailed foraging habitat is mapped within 6 km of the site. |
| | Species stocking rate | | N/A – no evidence of breeding was recorded within the site. |
| Roosting | Site condition | The site supports potential roosting habitat. | The site supports potential roosting habitat. |
| | Site context | The site is located more than 1 km from a large white-tailed black cockatoo roost and more than 500 m from a small white-tailed black cockatoo roost. | The site is located more than 1 km from a large roost and more than 500 m from a small roost. |
| | Species stocking rate | N/A - no evidence of roosting was recorded within the site. | N/A - no evidence of roosting was recorded within the site. |
| Foraging | Site condition | The site supports foraging habitat that comprises 66% low value, 14% moderate value and 20% high value. | The site supports foraging habitat that comprises 80% low value, 8% moderate value and 12% high value. |
| | Site context | The site is located more than 6 km from a white-tailed black cockatoo nest. | Confirmed forest red-tailed black cockatoo nest sites occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the breeding sites. |
| | Species stocking rate | Limited evidence of Carnaby's cockatoo foraging was recorded. Nevertheless, it is likely that the species would forage in the site. | No evidence of foraging by forest red-tailed black cockatoos was recorded. Nevertheless, it is likely that the species would forage in the site. |

# 5 Discussion

Carnaby's cockatoo was observed foraging in trees within the site. A record for Carnaby's cockatoo was not surprising as this species is routinely sighted across the Swan Coastal Plain and foraging habitat occurs within the site and local area.

No record of forest red-tailed black cockatoo was made during the two site visits. It is likely that forest red-tailed black cockatoo would also occur in the site as this species is similarly common within its range. Chance observation of highly mobile species like black cockatoos could require frequent surveillance. Given foraging evidence or other signs of presence may not persist in the environment for particular long periods, or necessarily be noted by surveyors on a given day, the lack of records for forest red-tailed black cockatoo should not be taken of indication that the species would not occur.

## 5.1 Breeding habitat

As the 11 habitat trees recorded in the site do not contain hollows suitable for use by black cockatoos for breeding, the site does not currently provide breeding habitat for any of the three species of black cockatoo. The habitat trees and other large trees within the site have the potential to form suitable hollows in the future. However, it will likely take many tens of years for hollows to form that are large enough to be suitable for use by black cockatoos for breeding.

As the site is located outside of the expected breeding distribution of Carnaby's cockatoo and Baudin's cockatoo, the potential for the future formation of breeding habitat is most relevant to forest red-tailed black cockatoo.

## 5.2 Roosting habitat

No signs of roosting were observed during the field survey and the BirdLife Australia dataset does not include any roost records in the site. Therefore, there is no reason to suspect that roosting currently occurs in the site. Nevertheless, the site contains tall trees and a water source that, in combination, comprise roosting habitat which could be used by black cockatoos.

## 5.3 Foraging habitat

The foraging habitat within the site was predominantly classified as providing low value to Carnaby's cockatoo and forest tailed black cockatoo. This is due to the high cover of secondary food plants, in particularly non-native eucalypts. While there are records of the consumption of non-native eucalypts by Carnaby's cockatoo and forest tailed black cockatoo (Groom 2011; DoEE 2017), these plants are arguably not as important food sources compared to primary food plants.

White-tailed black cockatoo (likely Carnaby's cockatoo) roosts occur within 6 km of the site and forest red-tailed black cockatoo roosts and nest sites occur within 6 km of the site. The foraging habitat within the site may be used by birds utilising the roosts and nesting in the local area. However, extensive areas of native and non-native vegetation that are dominated by primary food

plants for Carnaby's cockatoo and forest red-tailed black cockatoo occur immediately adjacent to the site and in the wider area and would provide a larger and higher value foraging resource.

## 5.4 Overall quality

Developing an objective scoring system for relative and to some extent subjective concept like quality can be challenging. An ecological concept like habitat may have multiple attributes, which may be independent, interdependent or contrasting with other attributes and which vary in relevance in response to the changing species requirements or environmental conditions. Consequently, overall 'quality' must be assessed holistically to be properly understood.

The three conventional categories of black cockatoo habitat are intrinsically linked in that breeding and roosting activity is directly related to the availability of foraging and watering resources surrounding nests or roosts (Saunders 1990; Shah 2006; Le Roux 2017). Black cockatoos can also move over large distances within their range to access breeding and foraging habitat and will not necessarily return to the same locations within a year or across years (Saunders 1980; Johnstone and Kirkby 2008; Johnstone *et al.* 2017; Peck *et al.* 2019). Therefore, evaluating the overall quality of black cockatoo habitat requires acknowledgement of the interrelationships between the three habitat categories and the potential for use more than one category of habitat to be relevant to a site.

The method used in the assessment of overall quality selects the highest score of the three habitat categories to represent overall habitat quality (refer **Appendix C**). Adopting the highest score from a habitat category within a site avoids over or under estimating habitat quality because the most important value always drives, or is reflected in, the overall score.

Foraging habitat was the highest scoring category of habitat within the site for both Carnaby's cockatoo and forest red-tailed black cockatoos as the site does not currently provide breeding habitat and while roost habitat is present, roosting is not suspected to occur.

The foraging habitat within the site was further dominated by lower value secondary food plants. As there were no significant contextual factors to increase quality for Carnaby's cockatoo, a score of three (low quality) was applied. However, forest red-tailed black cockatoo nests are recorded within 6 km of the site. A nearby nest is considered to increase the quality of foraging habitat (from an impact assessment perspective) as it indicates foraging resource is within range of a nest such that it could contribute to support breeding activity. Accordingly, the overall quality of forest red-tailed black cockatoo foraging was scored five out of ten (moderate quality).

# 6 Conclusions

The site occurs within the modelled distribution of Carnaby's cockatoo and forest red-tailed black cockatoo, but outside of the modelled distribution of Baudin's cockatoo. The site is also within the breeding range of forest red-tailed black cockatoo. Therefore, the habitat in the site is most relevant to Carnaby's cockatoo and forest red-tailed black cockatoo.

Carnaby's cockatoo were recorded in the site. Both Carnaby's cockatoo and forest red-tailed black cockatoo are likely to occur within the site.

Forest red-tailed black cockatoo nests have been recorded within 6 km of the site at Bibra Lake and Murdoch, with the most recent breeding record occurring in spring 2020 (BirdLife Australia 2021). The site contains 11 habitat trees of which none contain hollows suitable for use by black cockatoos for breeding. Therefore, the site does not currently provide breeding habitat for forest red-tailed black cockatoo black cockatoo.

White-tailed black cockatoo (likely Carnaby's cockatoo) and forest red-tailed black cockatoo roosts have been recorded at 42 locations within 12 km of the site (BirdLife Australia 2021). No roosts or evidence of roosting by any species of black cockatoo was recorded within the site. Tall native and non-native trees within the site represent suitable roosting habitat.

Extensive areas of native and non-native vegetation that provide foraging habitat for Carnaby's cockatoo and forest red-tailed black cockatoo occurs immediately adjacent to the site and in the wider area.

A total of 4.76 ha of foraging habitat for Carnaby's cockatoo was mapped within the site of which 0.96 ha (20%) provides a high value resource, 0.67 ha (14%) provides a moderate value resource and 3.13 ha (66%) provides a low value resource.

A total of 4.88 ha of foraging habitat for forest red-tailed black cockatoo was mapped in the site of which 0.59 ha (12%) provides a high value resource, 0.39 ha (8%) provides a moderate value resource and 3.90 ha (80%) provides a low value resource.

Overall habitat quality was scored at three out of ten (low) for Carnaby's cockatoo with foraging habitat being the highest scoring component.

Overall black cockatoo habitat quality was scored at five out of ten (moderate) for forest red-tailed black cockatoo foraging habitat being the highest scoring component.

# References

## 7.1 General references

Beard, J. S. 1990, *Plant Life of Western Australia*, Kangaroo Press Pty Ltd., Kenthurst, N.S.W.

Davies, S. J. J. F. 1966, *The movements of the White-tailed Black Cockatoo (Calyptorhynchus baudinii) in south-western Australia*, Western Australian Naturalist 10: 33-42.

Department of Environment and Energy (DoEE) 2016a, *Modelled distribution for Baudin's Cockatoo (Calyptorhynchus baudinii)*, Canberra.

Department of the Environment and Energy (DoEE) 2016b, *Modelled distribution for Carnaby's Cockatoo (Calyptorhynchus latirostris)*, Canberra.

Department of Environment and Energy (DoEE) 2016c, *Modelled distribution for Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)*, Canberra.

Department of Environment and Energy (DoEE) 2017, *Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) Calyptorhynchus latirostris, Baudin's Cockatoo (Vulnerable) Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo (Vulnerable) Calyptorhynchus banksii naso*, Canberra, Australia.

Department of Parks and Wildlife (DPaW) 2013, *Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan*, Perth, Western Australia.

Department of Parks and Wildlife (DPaW) 2015, *How to design and place artificial hollows for Carnaby's cockatoo*, Perth.

Department of Sustainability Environment Water Populations and Communities (DSEWPaC) 2012a, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii and Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*, Commonwealth of Australia, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012b, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*, Commonwealth of Australia, Canberra.

Emerge Associates 2020a, *Level 1 Fauna Assessment - Former Glen Iris Golf Course*, EP20-009(04)--004 RAW, Version 1.

Emerge Associates 2020b, *Potential foraging habitat (Swan Coastal Plain) for the Carnaby's black cockatoo (Calyptorhynchus latirostris) - spatial dataset*, Version dated 13 February 2020.

Emerge Associates 2020c, *Potential foraging habitat (Swan Coastal Plain) for the forest red-tailed black cockatoo (Calyptorhynchus banksii naso) - spatial dataset*, Version dated 13 February 2020.

Environmental Protection Authority (EPA) 2020, *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment*, Joondalup, Western Australia.

Forest Products Commission 2020, *Forest Products Commission Plantations (FPC-001)*.

Glossop, B., Clarke, K., Mitchell, D. and Barrett, G. 2011, *Methods for mapping Carnaby's cockatoo habitat*, Department of Environment and Conservation, Perth.

Gozzard, J. 2011, *Sea to scarp - geology, landscape, and land use planning in the southern Swan Coastal Plain*, Geological Survey of Western Australia.

Groom, C. 2010, *Artificial Hollows for Carnaby's Black Cockatoo: An investigation of the placement, use, monitoring and maintenance requirements of artificial hollows for Carnaby's black cockatoo*, Department of Environment and Conservation, Perth.

Groom, C. 2011, *Plants Used by Carnaby's Black Cockatoo*, Department of Environment and Conservation, Perth.

Heddle, E. M., Loneragan, O. W. and Havel, J. J. 1980, *'Vegetation Complexes of the Darling System Western Australia'*, in Department of Conservation and Environment (ed.), *Atlas of Natural Resources Darling System Western Australia*, Perth.

Johnstone, R., Kirby, T. and Sarti, K. 2013, *The breeding biology of the forest red-tailed black cockatoo Calyptorhynchus banksii naso Gould in south-western Australia. I. Characteristics of nest trees and nest hollows*, Pacific Conservation Biology, 19(2): 121-142.

Johnstone, R. E., Johnstone, C. and Kirkby, T. 2011, *Black Cockatoos on the Swan Coastal Plain: Carnaby's Cockatoo (Calyptorhynchus latirostris), Baudin's Cockatoo (Calyptorhynchus baudinii) and the Forest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso) on the Swan Coastal Plain (Lancelin–Dunsborough), Western Australia. Studies on distribution, status, breeding, food, movements and historical changes.*, Department of Planning, Western Australia.

Johnstone, R. E. and Kirkby, T. 1999, *Food of the Red-tailed Forest Black Cockatoo Calyptorhynchus banksii naso in Western Australia*, Western Australian Naturalist, 22: 167-178.

Johnstone, R. E. and Kirkby, T. 2008, *Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (Calyptorhynchus baudinii) in South-west Western Australia*, Records of the Western Australian Museum, 25: 107-118.

Johnstone, R. E. and Storr, G. M. 1998, *Handbook of Western Australian Birds. Volume 1 - Non-Passerines (Emu to Dollarbird)*, Western Australian Museum, Perth.

Kendrick, G. W., Wyrwoll, K. H. and Szabo, B. J. 1991, *Pliocene-Pleistocene coastal events and history along the western margin of Australia*, Quaternary Science Reviews, 10: 419-439.

Le Roux, C. 2017, *Nocturnal roost tree, roost site and landscape characteristics of Carnaby's Black-Cockatoo (Calyptorynchus latirostris) on the Swan Coastal Plain*, Edith Cowan University Research Online.

Peck, A., Barret, G. and Williams, M. 2019, *The 2019 Great Cocky Count: a community-based survey for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris), Baudin's Black-Cockatoo (Calyptorhynchus baudinii) and Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso).* , Birdlife Australia, Floreat, Western Australia.

Saunders, D. A. 1979a, *The Availability of Tree Hollows for Use as Nest Sites by White-tailed Black Cockatoos*, Australian Wildlife Research, 6: 205-216.

Saunders, D. A. 1979b, *Distribution and taxonomy of the white-tailed and yellow-tailed Black-Cockatoos Calyptorhynchus spp.*, Emu, 79(215-227).

Saunders, D. A. 1980, *Food and Movements of the Short-billed Form of the White-tailed Black Cockatoo*, Australian Wildlife Research, 7: 257-269.

Saunders, D. A. 1990, *Problems of Survival in an Extentively Cultivated Landscape: the case of Carnaby's Cockatoo Calyptorhynchus funereus latirostris*, Biological Conservation, 54: 277-290.

Saunders, D. A., Mawson, P.R., Dawson, R. 2014, Use of tree hollows by Carnaby's Cockatoo and the fate of large hollow-bearing trees at Coomallo Creek, Western Australia 1969-2013., Biological Conservation, 177: 185-193.

Saunders, D. A., Smith, G. T. and Rowley, I. 1982, The availability and dimensions of Tree Hollows that Provide Nest Sites for Cockatoos (Psittaciformes) in Western Australia, Australian Wildlife Research, 9: 541-556.

Seddon, G. 2004, A Sense of Place: a response to an environment, the Swan Coastal Plain Western Australia, Blooming Books, Melbourne.

Shah, B. 2006, Conservation of Carnaby's Black Cockatoo on the Swan Coastal Plain, Western Australia, Birds Australia, Perth.

Western Australian Museum (WAM) 2020, WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia, Perth, Western Australia.

Western Australian Museum 2019, WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia, Perth, Western Australia.

## 7.2 Online references

Bureau of Meteorology (BoM) 2021, *Climate Averages,* viewed 15 February 2021, <http://www.bom.gov.au/climate/data/>.

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# Figures

*Figure 1: Site Location*

*Figure 2: Black Cockatoo Habitat Context*

*Figure 3: Black Cockatoo Habitat Trees*

*Figure 4: Carnaby's Cockatoo Foraging Habitat*

*Figure 5: Forest Red-tailed Black Cockatoo Foraging Habitat*




**Figure 1: Site Location**

**Project:** Targeted Black Cockatoo Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(13)--F14

| | |
|---|---|
| Drawn: | GAR |
| Date: | 03/03/2021 |
| Checked: | MS |
| Approved: | RAW |
| Date: | 18/03/2021 |

N

0 100 200 300
Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

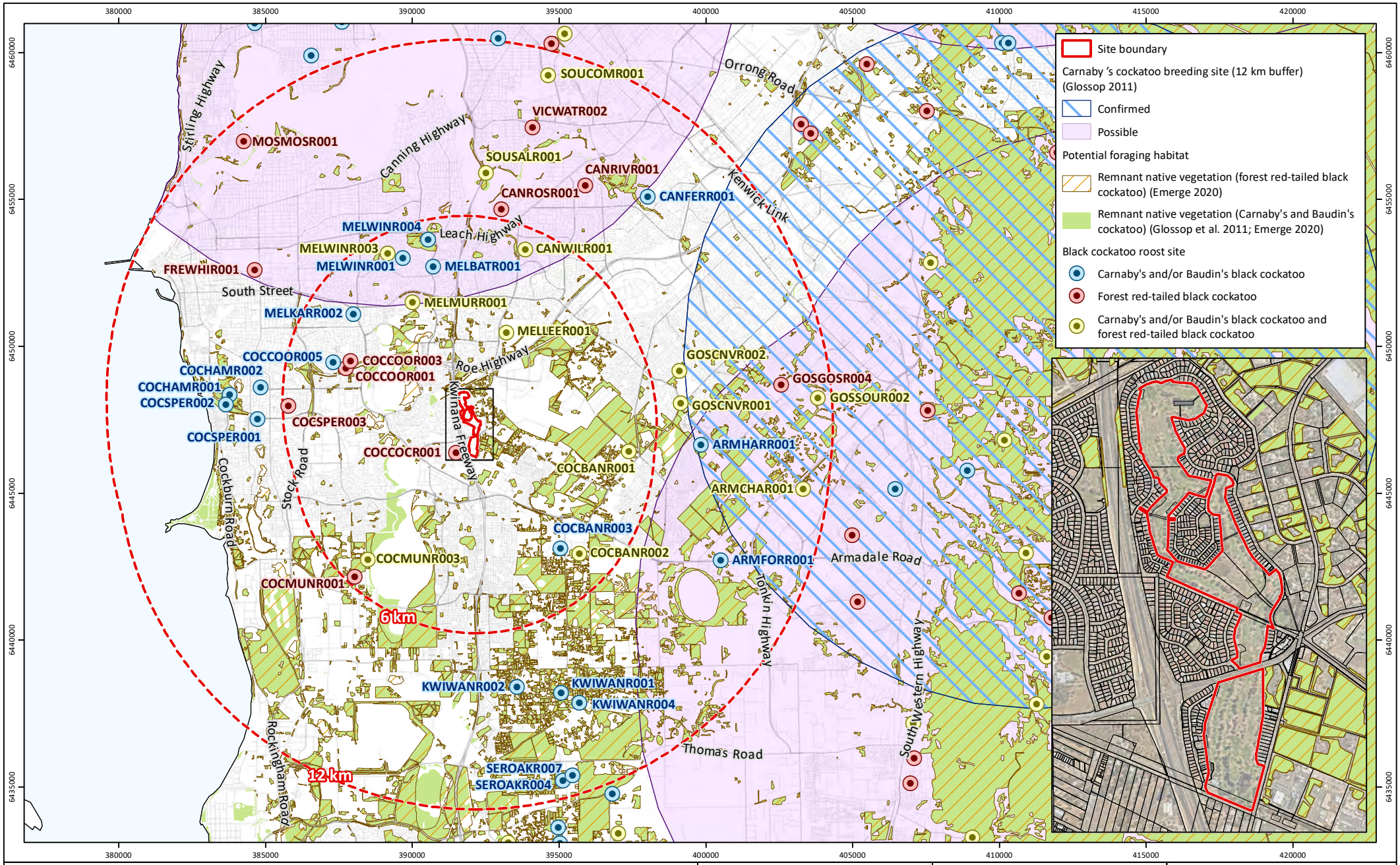



**Figure 2:** **Black Cockatoo Habitat Context**

| | |
|---|---|
| **Project:** | Targeted Black Cockatoo Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(13)--F15**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 03/03/2021 |
| Checked: | MS |
| Approved: | RAW |
| Date: | 18/03/2021 |

N

0 2 4 6
Kilometers

Scale: 1:170,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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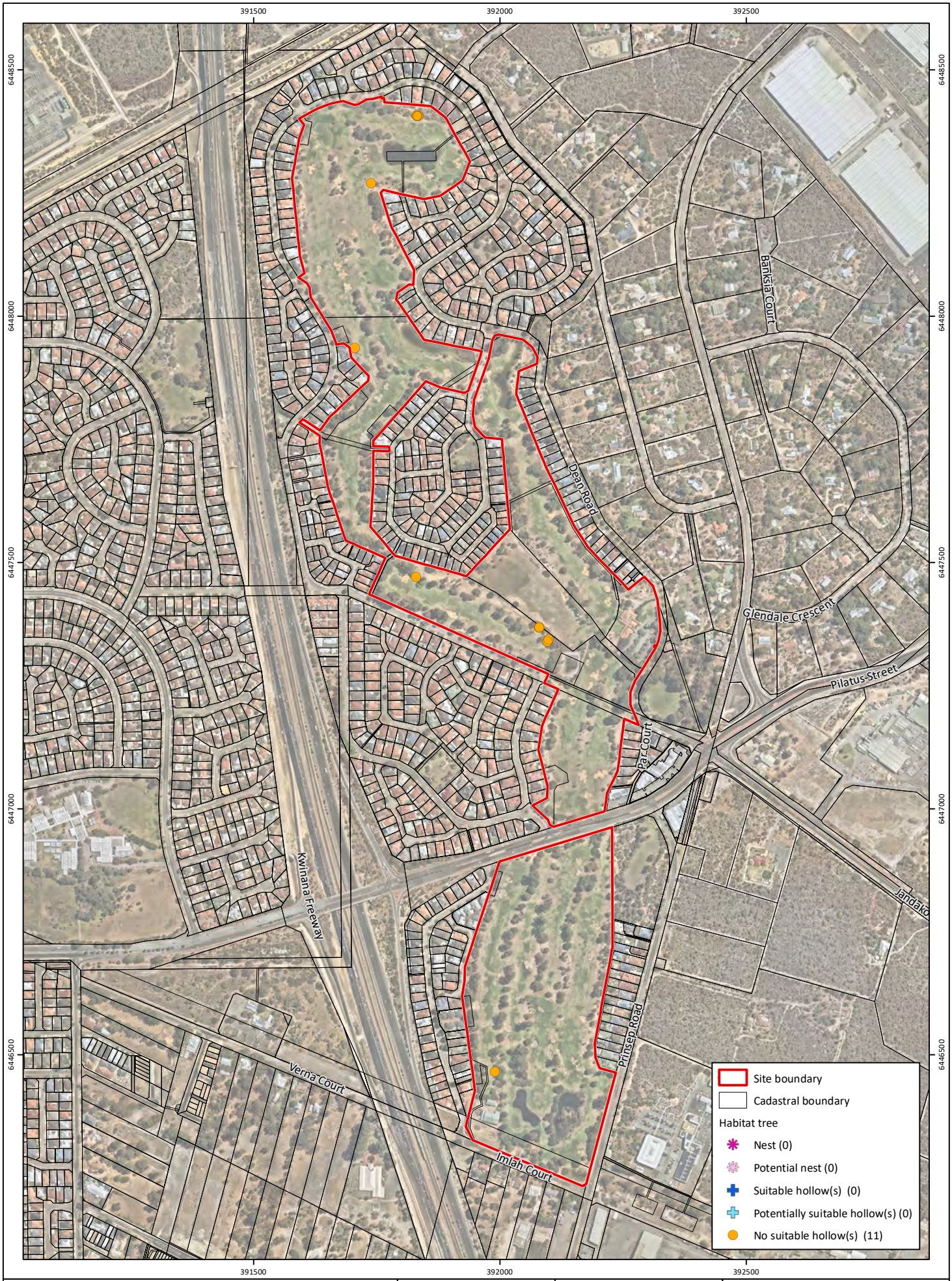



**Figure 3: Black Cockatoo Habitat Trees**

**Project:** Targeted Black Cockatoo Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(13)--F16**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 03/03/2021 |
| Checked: | MS |
| Approved: | RAW |
| Date: | 18/03/2021 |

N

0 100 200 300
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

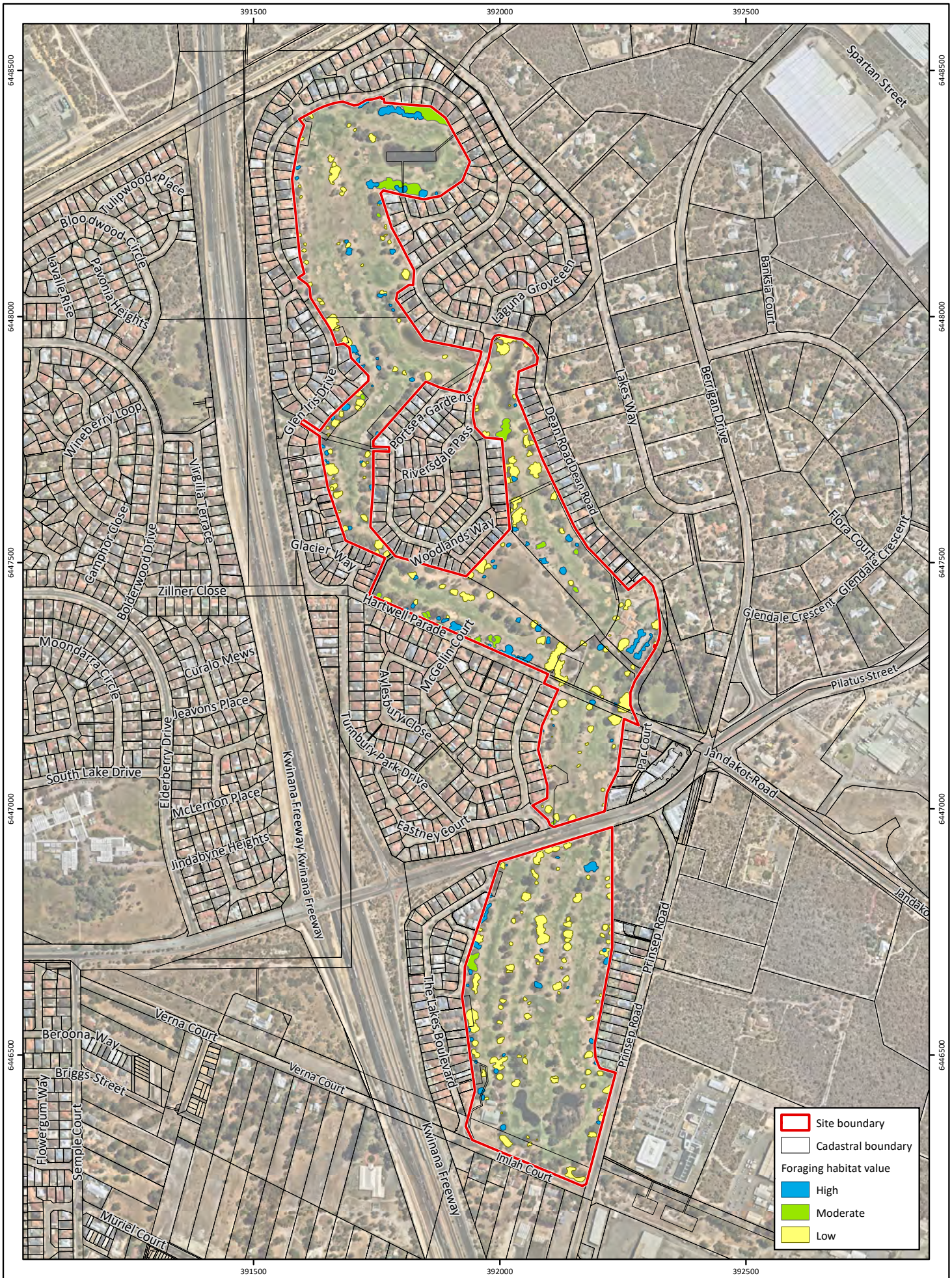



**Figure 4: Carnaby's Cockatoo Foraging Habitat**

**Project:** Targeted Black Cockatoo Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(13)--F17a

| | |
|---|---|
| Drawn: | RAW |
| Date: | 21/06/2021 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 21/06/2021 |

N

0 100 200 300
Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

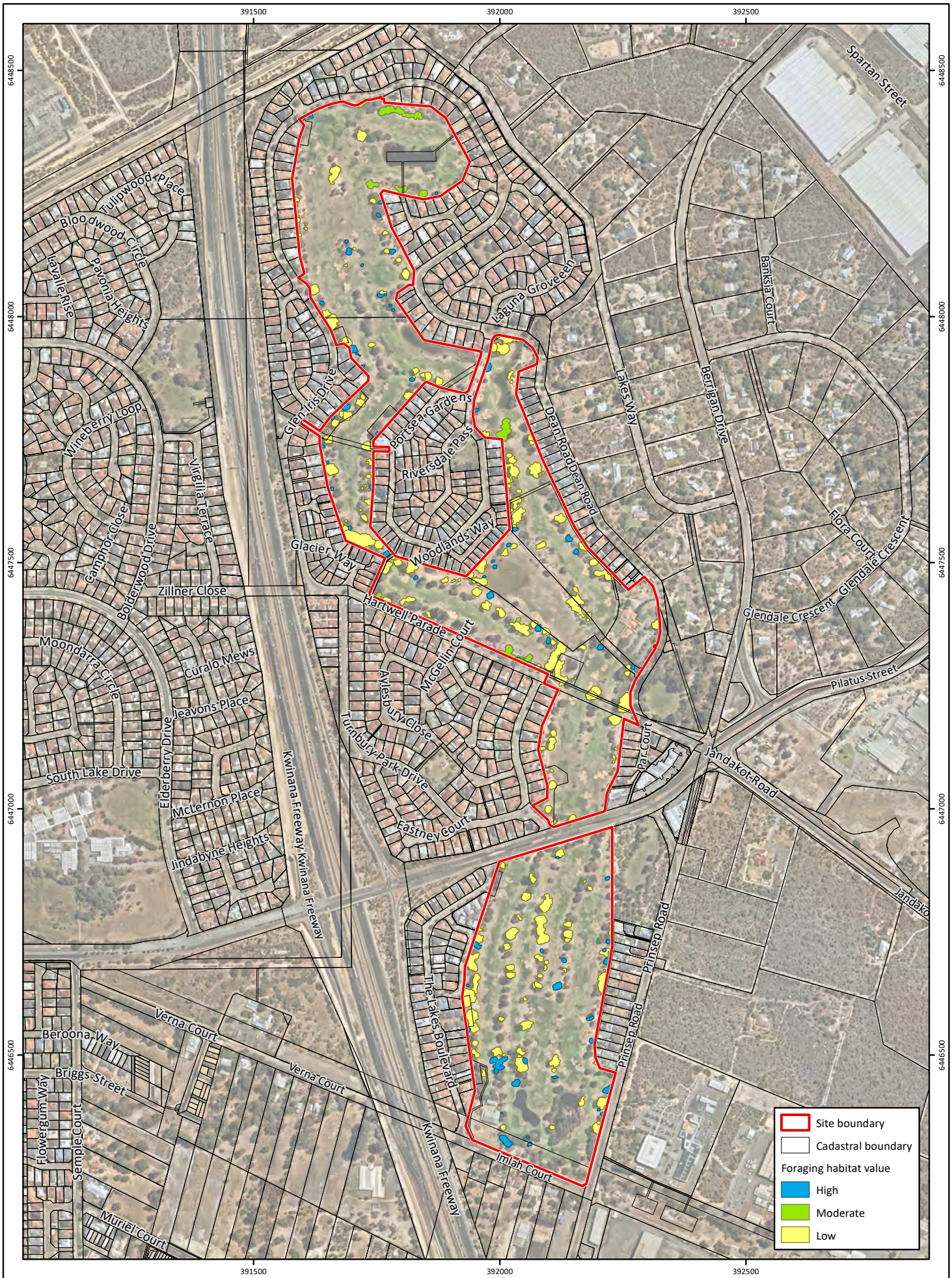



**Figure 5:** **Forest Red-tailed Black Cockatoo Foraging Habitat**

**Project:** Targeted Black Cockatoo Assessment
Former Glen Iris Golf Course

**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:** EP20-009(13)--F18a

| | |
|---|---|
| Drawn: | RAW |
| Date: | 21/06/2021 |
| Checked: | RAW |
| Approved: | TAA |
| Date: | 21/06/2021 |

N

0 100 200 300
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

# Appendix A

Additional Information

# Conservation Significant Fauna

## Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as 'threatened', 'migratory' or 'marine' as described in **Table 1**.

Migratory species comprise birds recognised under international treaties including:

- *Japan Australia Migratory Bird Agreement 1981* (JAMBA)
- *China Australia Migratory Bird Agreement 1998* (CAMBA)
- *Republic of Korea-Australia Migratory Bird Agreement 2007* (ROKAMBA)
- *Bonn Convention 1979* (The Convention on the Conservation of Migratory Species of Wild Animals).

Fauna species listed as threatened and migratory are protected in Australia as 'matters of national environmental significance' (MNES) under the EPBC Act.

*Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act*

| Conservation Code | Category |
|---|---|
| X | Threatened Fauna –Extinct<br>There is no reasonable doubt that the last member of the species has died. |
| EW# | Threatened Fauna –Extinct in the Wild<br>Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys. |
| CR# | Threatened Fauna – Critically Endangered<br>Taxa which are considered to be facing an extremely high risk of extinction in the wild. |
| EN# | Threatened Fauna – Endangered<br>Taxa which are considered to be facing a very high risk of extinction in the wild. |
| VU# | Threatened Fauna – Vulnerable<br>Taxa which are considered to be facing a high risk of extinction in the wild. |
| Migratory# | Migratory Fauna<br>All migratory species that are:<br>(i) native species; and<br>(ii) from time to time included in the appendices to the Bonn Convention; and<br>(b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and<br>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. |
| Ma | Marine Fauna<br>Species in the list established under s248 of the EPBC Act |

#matters of national environmental significance (MNES) under the EPBC Act

In Western Australia, fauna taxa may be classed as 'threatened', 'extinct', or 'specially protected' under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019a). The definitions of these categories are provided in **Table 2**.

*Table 2: Definitions of specially protected fauna schedules under the BC Act (DBCA 2019a)*

| Category | Conservation Code | Definition |
|---|---|---|
| Threatened | CR | Critically endangered<br>Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future. |
| | EN | Endangered<br>Threatened species considered to be facing a very high risk of extinction in the wild in the near future. |
| | VU | Vulnerable<br>Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future. |
| Extinct | EX | Extinct<br>Species where there is no reasonable doubt that the last member of the species has died. |
| | EW | Extinct in the wild<br>Species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form.<br>Note that no species are currently listed as EW. |
| Specially protected | MI | Migratory species<br>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth<br><br>Includes birds that 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. |
| | CD | Species of special conservation interest (conservation dependent fauna)<br>Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. |
| | OS | Other specially protected species<br>Fauna otherwise in need of special protection to ensure their conservation. |

Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those 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 (DBCA 2019a).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019a).

*Table 3: Definitions of priority fauna categories on DBCA's Priority Fauna List (DBCA 2019a)*

| Conservation Code | Category |
|---|---|
| P1 | Priority 1 – Poorly known<br>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 | Priority 2 – Poorly known<br>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. |
| P3 | Priority 3 – Poorly known<br>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) Priority 4 – Rare species<br>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.<br>(b) Priority 4 – Near Threatened<br>Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.<br>(c) Priority 4 – Other<br>Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy. |

## Black cockatoos

Three threatened species of black cockatoo occur on the Swan Coastal Plain (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

There are a range of regional studies and spatial datasets available which provide information on black cockatoo records and potential habitat mapping. These are detailed below.

### Species distribution and breeding range

Broad-scale maps are available for the modelled distribution of Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo (DSEWPaC 2011; DoEE 2016a, b).

The modelled distribution maps also include 'known breeding areas' and 'predicted breeding range' for Baudin's cockatoo and 'breeding range' and 'non-breeding range' for Carnaby's cockatoo.

No breeding range modelling is available for forest red-tailed black cockatoo but the species is known to breed mainly in the jarrah forest region (DBCA 2017) and in small populations on the Swan Coastal Plain within the Baldivis, Stake Hill, Lake McLarty and Capel area and increasingly in the Perth metropolitan area (DAWE 2020).

### Breeding habitat

Department of Environment and Conservation (DEC, now Department of Biodiversity, Conservation and Attractions (DBCA)) and fauna experts, have identified and mapped Carnaby's cockatoo habitat on the Swan Coastal Plain and Jarrah Forest regions (Glossop *et al.* 2011). This dataset includes mapping of Carnaby's cockatoo breeding sites based on point records of breeding from a range of sources. Breeding sites were classified as 'confirmed' where eggs or chicks were recorded and 'possible' where observations relating to Carnaby's cockatoo breeding that did not include actual records of eggs or chicks (e.g. chewed hollows or records of breeding or nesting behaviour by an expert observer).

A 12 km buffer applies to each site to 'reflect the flexible use of these areas by cockatoos and to indicate the important zone for access to potential feeding habitat' (Glossop *et al.* 2011). Glossop *et al.* (2011) state that the areas mapped in the dataset are not a comprehensive record of Carnaby's cockatoo breeding and that many nesting sites are not known.

While this dataset only applies to Carnaby's cockatoo, the information it contains is also applicable for Baudin's cockatoo and forest red-tailed black cockatoo as they have similar breeding habitat requirements. That is, breeding sites that are suitable for Carnaby's cockatoo may also be suitable for

Baudin's cockatoo and forest red-tailed black cockatoo, if located within their distribution/breeding ranges.

BirdLife Australia also maintain a database of confirmed black cockatoo breeding sites which is accessible via a paid search system. BirdLife Australia have advised that their database is comprised of data collected during surveys by staff and volunteers of which most (>99%) surveys are of Carnaby's cockatoo. They have also advised that the dataset is not comprehensive and that an absence of known nests does not necessarily indicate a lack of breeding activity.

The Carnaby's cockatoo recovery plan also identifies 13 'important bird areas' for Carnaby's cockatoo, which are identified as 'sites of global bird conservation importance' (DPaW 2013). These 'important bird areas' comprise sites supporting at least 20 breeding pairs or 1% of the population regularly utilising an area in the non-breeding part of the range.

### Confirmed roost sites

BirdLife Australia undertakes annual monitoring of black cockatoo overnight roost sites as part of the annual 'Great Cocky Count' community-based survey. Information gathered from these monitoring events provides roost locations and recorded black cockatoo numbers (Peck *et al.* 2019).

### Native foraging habitat

Glossop et al. (2011) also mapped 'areas requiring investigation as Carnaby's cockatoo feeding habitat' for the Swan Coastal Plain and Jarrah Forest regions, based on regional vegetation mapping that may contain plant species known to be foraged upon by Carnaby's cockatoo. Note that this dataset does not include observations or point records of Carnaby's cockatoo feeding. This dataset represents areas of vegetation that may potentially provide foraging habitat for Carnaby's cockatoo.

Given this dataset was created in 2011 and in order to account for clearing of native vegetation that has occurred since this time, Emerge have updated this dataset using the current native vegetation extent as provided by DPIRD (2019a) to only show potential foraging habitat that currently exists (Emerge Associates 2020a).

Pine plantations also provide an important food source for Carnaby's cockatoo, but were not included in the Glossop et al. (2011) dataset. Mapping of pine plantations is available from the Forest Products Commission (Forest Products Commission 2020).

The Glossop et al. (2011) dataset is broadly applicable to other black cockatoos as many plant species that are foraged upon by Carnaby's cockatoo are also consumed by Baudins' cockatoo (e.g. fruit of *Banksia* spp., *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah)) and forest red-tailed black cockatoo (e.g. jarrah and marri fruit). However, using the Glossop et al. (2011) potential foraging habitat dataset for forest red-tailed cockatoos likely overestimates available foraging habitat as it includes multiple plant species that are not consumed by this species (e.g. *Banksia* spp.), and to a lesser extent the foraging value is also over-estimated for Baudin's cockatoo.

Emerge Associates (2020b) have used a similar methodology to Glossop et al. (2011) to define potential foraging habitat for forest-red tailed cockatoos. Specifically, DBCA (2019b) regional vegetation complex mapping has been used to determine which areas of remnant vegetation

support plant species known to be foraged upon by forest red-tailed cockatoos, including *Allocasuarina fraseriana* (sheoak), *Corymbia calophylla* (marri), *Eucalyptus gomphocephala* (tuart) and *Eucalyptus marginata* (jarrah). Where these vegetation complexes intersect remnant vegetation mapped by DPIRD (2019b) they were considered to represent potential foraging habitat for forest red-tailed cockatoos.

# References

## General references

department of biodiversity Conservation and Attractions (DBCA) 2017, *Fauna Profile - Forest red-tailed black cockatoo Calyptorhynchus banksii naso*, Perth, Western Australia.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Threatened and Priority Fauna List 15 February 2018*, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2019a, *Conservation Codes for Western Australian Flora and Fauna - last updated 3 January 2019*.

Department of Biodiversity Conservation and Attractions (DBCA) 2019b, *Vegetation Complexes - South West forest region of Western Australia (DBCA-047)*, Kensington.

Department of Environment and Energy (DoEE) 2016a, *Modelled distribution for Baudin's Cockatoo (Calyptorhynchus baudinii)*, Canberra.

Department of Environment and Energy (DoEE) 2016b, *Modelled distribution for Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)*, Canberra.

Department of Parks and Wildlife (DPaW) 2013, *Carnaby's Cockatoo (Calyptorphynchus latirostris) Recovery Plan*.

Department of Primary Industries and Regional Development (DPIRD) 2019a, *Current Extent of Native Vegetation - Western Australia*, Perth, Western Australia.

Department of Primary Industries and Regional Development (DPIRD) 2019b, *Native Vegetation Extent Dataset (DPIRD-005)*, Perth.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011, *Modelled distribution of Carnaby's black cockatoo (Calyptorhynchus latirostris)*, Commonwealth of Australia, Canberra, Australian Capital Territory.

Emerge Associates 2020a, *Potential foraging habitat (Swan Coastal Plain) for the Carnaby's black cockatoo (Calyptorhynchus latirostris) - spatial dataset*, Version dated 13 February 2020.

Emerge Associates 2020b, *Potential foraging habitat (Swan Coastal Plain) for the forest red-tailed black cockatoo (Calyptorhynchus banksii naso) - spatial dataset*, Version dated 13 February 2020.

Forest Products Commission 2020, *Forest Products Commission Plantations (FPC-001)*.

Glossop, B., Clarke, K., Mitchell, D. and Barrett, G. 2011, *Methods for mapping Carnaby's cockatoo habitat*, Department of Environment and Conservation, Perth.

Peck, A., Barret, G. and Williams, M. 2019, *The 2019 Great Cocky Count: a community-based survey for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris), Baudin's Black-Cockatoo (Calyptorhynchus baudinii) and Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso).* , Birdlife Australia, Floreat, Western Australia.

# Appendix B

Black Cockatoo Foraging Plants

| | | Foraging category as assigned by Emerge | | | |
|---|---|---|---|---|---|
| **Species name** | **Common name** | **CBC** | **BBC** | **FRTBC** | **Literature references** |
| *Acacia baileyana* | Cootamundra wattle | Secondary | | | Groom 2011 |
| *Acacia pentadenia* | Karri wattle | Secondary | | | Groom 2011 |
| *Acacia saligna* | Orange wattle | Secondary | | | Groom 2011 |
| *Agonis flexuosa* | Peppermint tree | Secondary | | | Groom 2011 |
| *Allocasuarina fraseriana* | Sheoak | | Secondary | Secondary | Johnstone & Storr 1998; Johnstone et al. 2010; Johnstone 2017; DoEE 2017 |
| *Allocasuarina spp.* | | Secondary | | Secondary | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017 |
| *Anigozanthos flavidus* | Tall kangaroo paw | | Secondary | | Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017 |
| *Araucaria heterophylla* | Norfolk island pine | Secondary | | | Groom 2011; DoEE 2017 |
| *Banksia ashbyi* | Ashby's banksia | Primary | Secondary | | Saunders 1980; Groom 2011; DoEE 2017 |
| *Banksia attenuata* | Slender banksia | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia baxteri* | Baxter's banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia carlinoides* | Pink dryandra | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia coccinea* | Scarlet banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia dallanneyi* | Couch honeypot dryandra | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia ericifolia* | Heath-leaved banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia fraseri* | | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia gardneri* | Prostrate banksia | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia grandis* | Bull banksia | Primary | Secondary | | Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia hookeriana* | Hooker's banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia ilicifolia* | Holly banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; Johnstone & Storr 1998; DoEE 2017 |
| *Banksia kippistiana* | | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia leptophylla* | | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia lindleyana* | Porcupine banksia | Primary | Secondary | | Johnstone et al. 2010; DoEE 2017 |

| | | Foraging category as assigned by Emerge | | | |
|---|---|---|---|---|---|
| **Species name** | **Common name** | **CBC** | **BBC** | **FRTBC** | **Literature references** |
| *Banksia littoralis* | Swamp banksia | Primary | Secondary | | Saunders 1980; Groom 2011Johnstone & Storr 1998; Johnstone et al. 2010; DoEE 2017 |
| *Banksia menziesii* | Firewood banksia | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia mucronulata* | Swordfish dryandra | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia nivea* | Honeypot dryandra | Primary | Secondary | | Saunders 1980; Groom 2011; DoEE 2017 |
| *Banksia nobilis* | Golden dryandra | Primary | Secondary | | Saunders 1980; Groom 2011; DoEE 2017 |
| *Banksia praemorsa* | Cut-leaf banksia | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia prionotes* | Acorn banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia prolata* | | Primary | Secondary | | Johnstone et al. 2010; DoEE 2017 |
| *Banksia quercifolia* | Oak-leaved banksia | Primary | Secondary | | Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia sessilis* | Parrot bush | Primary | Secondary | | Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia speciosa* | Showy banksia | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia spp.* | | Primary | Secondary | | Saunders 1979; DSEWPaC 2012; DoEE 2017 |
| *Banksia squarrosa* | Pingle | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Banksia tricuspis* | Pine banksia | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia undata* | Urchin dryandra | Primary | Secondary | | Groom 2011; DoEE 2017 |
| *Banksia verticillata* | Granite banksia | Primary | Secondary | | Saunders 1980; Groom 2011; DoEE 2017 |
| *Brassica campestris* | Canola | Secondary | | | Groom 2011; DoEE 2017 |
| *Callistemon spp.* | | Secondary | Secondary | | Johnstone et al. 2010; DoEE 2017 |
| *Callistemon viminalis* | Captain cook bottlebrush | Secondary | | | Groom 2011 |
| *Callitris sp.* | | Secondary | | | Johnstone et al. 2010; Groom 2011 |
| *Carya illnoinensis* | Pecan | Primary | Secondary | | Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017 |
| *Casuarina cunninghamiana* | River sheoak | Secondary | | | Groom 2011 |
| *Citrullus lanatus* | Pie or afghan melon | Secondary | | | Johnstone et al. 2010; Groom 2011 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Corymbia calophylla* | Marri | Primary | Primary | Primary | Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Saunders 1979; Johnstone & Kirkby 2008 |
| *Corymbia citriodora* | Lemon scented gum | Secondary | Secondary | Secondary | Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017 |
| *Corymbia ficifolia* | Red flowering gum | Secondary | | | Groom 2011 |
| *Corymbia haematoxylon* | Mountain marri | Secondary | | Secondary | Groom 2011; DoEE 2012; DoEE 2017 |
| *Corymbia maculata* | Spotted gum | - | - | - | - |
| *Darwinia citriodora* | Lemon-scented darwinia | Secondary | Secondary | | Groom 2011; Johnstone et al. 2010 |
| *Diospryros sp.* | Sweet persimmon | Secondary | Secondary | | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017 |
| *Eremophila glabra* | Tarbush | Secondary | | | Groom 2011 |
| *Erodium aureum* | | Secondary | | | Groom 2011 |
| *Erodium botrys* | Long storksbill | Secondary | Secondary | | Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010 |
| *Erodium spp.* | | Secondary | Secondary | | Johnstone et al. 2010; DoEE 2017 |
| *Eucalyptus accedens* | Powderbark | - | - | - | - |
| *Eucalyptus caesia* | Silver princess | Secondary | | Secondary | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017 |
| *Eucalyptus camaldulensis* | River red gum | | | Secondary | DoEE 2012; DoEE 2017 |
| *Eucalyptus decipiens* | Red heart/moit | | | Secondary | Johnstone 2017 |
| *Eucalyptus diversicolor* | Karri | | | Primary | Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998 |
| *Eucalyptus erythrocorys* | Illyarrie | Secondary | | Secondary | DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010 |
| *Eucalyptus globulus* | Tasmanian blue gum | - | - | - | - |
| *Eucalyptus gomphocephala* | Tuart | Secondary | | Secondary | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017 |
| *Eucalyptus grandis* | Flooded gum, rose gum | | | Secondary | DoEE 2012; DoEE 2017 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Eucalyptus lehmannii* | Bushy yate | | | Secondary | Johnstone 2017 |
| *Eucalyptus leucoxylon* | Yellow gum | Secondary | | | Groom 2014 |
| *Eucalyptus longicornis* | Red morrell | - | - | - | - |
| *Eucalyptus loxophleba* | York gum | Secondary | | | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017 |
| *Eucalyptus marginata* | Jarrah | Primary | Secondary | Primary | Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017 |
| *Eucalyptus megacarpa* | Bullich | - | - | - | - |
| *Eucalyptus occidentalis* | Swamp yate | - | - | - | - |
| *Eucalyptus patens* | Blackbutt | Primary | | Primary | Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011 |
| *Eucalyptus pleurocarpa* | Tallerack | Secondary | | | Groom 2011 |
| *Eucalyptus preissiana* | Bell-fruited mallee | Secondary | | | Groom 2011 |
| *Eucalyptus robusta* | Swamp mahogany | Secondary | | | Johnstone et al. 2010; Groom 2011 |
| *Eucalyptus rudis* | Flooded gum | - | - | - | - |
| *Eucalyptus salmonophloia* | Salmon gum | Primary | | | Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017 |
| *Eucalyptus salubris* | Gimlet | - | - | - | - |
| *Eucalyptus staeri* | Albany blackbutt | | | Secondary | Johnstone & Storr 1998 |
| *Eucalyptus todtiana* | Coastal blackbutt | Secondary | | | Saunders 1980; Johnstone et al. 2010; Groom 2011; Johnstone & Kirkby 2008 |
| *Eucalyptus wandoo* | Wandoo | Primary | Secondary | Primary | Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017 |
| *Ficus sp.* | Fig | Secondary | | | Groom 2011 |
| *Grevillea armigera* | Prickly toothbrushes | Primary | | | Groom 2011 |
| *Grevillea bipinnatifida* | Fuschia grevillea | Primary | | | Groom 2011 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Grevillea hookeriana* | Red toothbrushes | Primary | | | Groom 2011 |
| *Grevillea hookeriana subsp. apic* | Black toothbrushes | Primary | | | Groom 2011 |
| *Grevillea paniculata* | Kerosene bush | Primary | | | Groom 2011 |
| *Grevillea paradoxa* | Bottlebrush grevillea | Primary | | | Groom 2011 |
| *Grevillea petrophiloides* | Pink poker | Primary | | | Groom 2011 |
| *Grevillea robusta* | Silky oak | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Grevillea spp.* | | Primary | | | Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017 |
| *Grevillea wilsonii* | Native fuchsia | | Secondary | | Johnstone et al. 2010 |
| *Hakea auriculata* | | Primary | | | Saunders 1980; Groom 2011 |
| *Hakea candolleana* | | Primary | | | Groom 2011 |
| *Hakea circumalata* | Coastal hakea | Primary | | | Groom 2011 |
| *Hakea commutata* | | Primary | | | Groom 2011 |
| *Hakea conchifolia* | Shell-leaved hakea | Primary | | | Groom 2011 |
| *Hakea costata* | Ribbed hakea | Primary | | | Groom 2011 |
| *Hakea cristata* | Snail hakea | Primary | Secondary | | Groom 2011; Johnstone et al. 2010 |
| *Hakea cucullata* | Snail hakea | Primary | | | Groom 2011 |
| *Hakea cyclocarpa* | Ramshorn | Primary | | | Saunders 1980; Groom 2011 |
| *Hakea eneabba* | | Primary | | | Groom 2011 |
| *Hakea erinacea* | Hedgehog hakea | Primary | Secondary | | Johnstone et al. 2010; Groom 2011 |
| *Hakea falcata* | Sickle hakea | Primary | | | Groom 2011 |
| *Hakea flabellifolia* | Fan-leaved hakea | Primary | | | Groom 2011 |
| *Hakea gilbertii* | | Primary | | | Saunders 1980; Groom 2011 |
| *Hakea incrassata* | Golfball or marble hakea | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Hakea lasiantha* | Woolly flowered hakea | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Hakea lasianthoides* | | Primary | Secondary | | Johnstone et al. 2010; Groom 2011 |
| *Hakea laurina* | Pin-cushion hakea | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Hakea lissocarpha* | Honeybush | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011 |
| *Hakea marginata* | | | Secondary | | Johnstone et al. 2010 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Hakea megalosperma* | Lesueur hakea | Primary | | | Groom 2011 |
| *Hakea multilineata* | Grass leaf hakea | Primary | | | Groom 2011 |
| *Hakea neospathulata* | | Primary | | | Groom 2011 |
| *Hakea obliqua* | Needles and corks | Primary | | | Saunders 1980; Groom 2011 |
| *Hakea oleifolia* | Dungyn | Primary | | | Groom 2011 |
| *Hakea pandanicarpa subsp. crassifolia* | Thick-leaved hakea | Primary | | | Groom 2011 |
| *Hakea petiolaris* | Sea urchin hakea | Primary | | | Groom 2011 |
| *Hakea polyanthema* | | Primary | | | Groom 2011 |
| *Hakea preissii* | Needle tree | Primary | | | Groom 2011 |
| *Hakea prostrata* | Harsh hakea | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011 |
| *Hakea psilorrhyncha* | | Primary | | | Groom 2011 |
| *Hakea ruscifolia* | Candle hakea | Primary | Secondary | | Saunders 1980; Groom 2011; Johnstone et al. 2010 |
| *Hakea scoparia* | Kangaroo bush | Primary | | | Groom 2011 |
| *Hakea smilacifolia* | | Primary | | | Groom 2011 |
| *Hakea spp.* | | Primary | Secondary | | Saunders 1979; DSEWPaC 2012; DoEE 2017 |
| *Hakea stenocarpa* | Narrow-fruited hakea | Primary | Secondary | | Johnstone et al. 2010; Groom 2011 |
| *Hakea sulcata* | Furrowed hakea | Primary | | | Groom 2011 |
| *Hakea trifurcata* | Two-leaved hakea | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011 |
| *Hakea undulata* | Wavy-leaved hakea | Primary | Secondary | | Saunders 1980; Johnstone et al. 2010; Groom 2011 |
| *Hakea varia* | Variable-leaved hakea | Primary | Secondary | | Saunders 1980; Groom 2011 |
| *Harpephyllum caffrum* | Kaffir plum | | | Secondary | Johnstone 2017 |
| *Helianthus annuus* | Sunflower | Secondary | | | Johnstone et al. 2010; Groom 2011 |
| *Hibiscus sp.* | Hibiscus | Secondary | | | Groom 2011 |
| *Isopogon scabriusculus* | | Secondary | | | Groom 2011 |
| *Jacaranda mimosifolia* | Jacaranda | Secondary | Secondary | | Johnstone et al. 2010; Groom 2011 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Jacksonia furcellata* | Grey stinkwood | Secondary | | | Groom 2011 |
| *Kingia australis* | Kingia | | Secondary | | Johnstone et al. 2010 |
| *Lambertia inermis* | Chittick | Secondary | | | Johnstone & Storr 1998; Groom 2011 |
| *Lambertia multiflora* | Many-flowered honeysuckle | Secondary | | | Saunders 1980; Groom 2011 |
| *Liquidamber styraciflua* | Liquid amber | Primary | | Secondary | Johnstone et al. 2010; Groom 2011; Groom 2014; Personal observation |
| *Lupinus sp.* | Lupin | Secondary | | | Saunders 1980; Groom 2011 |
| *Macadamia integrifolia* | Macadamia | Primary | Secondary | | Johnstone et al. 2010; Grooms 2011; Groom 2014 |
| *Malus domestica* | Apple | Secondary | Secondary | | Johnstone et al. 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011 |
| *Melaleuca leuropoma* | | Secondary | | | Saunders 1980; Groom 2011 |
| *Melia azedarach* | Cape lilac or white cedar | Secondary | | Primary | Johnstone et al. 2010; Groom 2011 |
| *Mesomeleana spp.* | | Secondary | | | Johnstone et al. 2010; Groom 2011 |
| *Olea europea* | Olive | | | Secondary | Johnstone 2017 |
| *Persoonia longifolia* | Snottygobble | | | Secondary | Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017 |
| *Pinus canariensis* | Canary island pine | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Pinus caribea* | Caribbean pine | Primary | | | Johnstone et al. 2010; Groom 2011 |
| *Pinus pinaster* | Pinaster or maritime pine | Primary | | | Groom 2011 |
| *Pinus radiata* | Radiata pine | Primary | Secondary | | Johnstone et al. 2010; Groom 2011 |
| *Pinus spp.* | | Primary | Secondary | | Johnstone & Storr 1998; Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017 |
| *Protea 'Pink Ice'* | | Secondary | | | Groom 2011 |
| *Protea repens* | | Secondary | | | Groom 2011 |
| *Protea spp.* | | Secondary | | | Johnstone et al. 2010 |

| Species name | Common name | Foraging category as assigned by Emerge | | | Literature references |
|---|---|---|---|---|---|
| | | CBC | BBC | FRTBC | |
| *Prunus amygdalus* | Almond tree | Secondary | | | Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017 |
| *Pyrus communis* | European pear | | Secondary | | Johnstone & Storr 1998; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017 |
| *Quercus spp.* | Oak | | Secondary | | Johnstone et al. 2010 |
| *Raphanus raphanistrum* | Wild radish | Secondary | | | Groom 2011; DoEE 2017 |
| *Reedia spathacea* | | | Secondary | | Johnstone et al. 2010 |
| *Rumex hypogaeus* | Doublegee | Secondary | | | Saunders 1980 |
| *Stenocarpus sinuatus* | | Secondary | | | Johnstone et al. 2010 |
| *Syzygium smithii* | Lilly pilly | Secondary | | | Groom 2014 |
| *Tipuana tipu* | Tipu or rosewood tree | Primary | | | Groom 2011, Groom 2014 |
| *Xanthorrhoea preissii* | Grass tree | Secondary | Secondary | | Groom 2011; Johnstone et al. 2010 |
| *Xylomelum occidentale* | Woody pear | Secondary | | | Groom 2014 |

CBC=Carnaby's cockatoo, BBC=Baudin's cockatoo and FRTBC=Forest red-tailed black cockatoo

**References**

Department of the Environment and Energy (DoEE) 2017, 'Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo, Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, EPBC Act referral guidelines for three threatened black cockatoo species, Australian Government, Canberra.

Groom, C. 2011, Plants Used by Carnaby's Black Cockatoo, Department of Environment and Conservation, Perth.

Groom C. J , Mawson P. R , Roberts J. D. and Mitchell N. J. 2014, Meeting an expanding human population's needs whilst conserving a threatened parrot species in an urban environment, WIT Transactions on Ecology and The Environment, 191: 1199-1212.Johnstone, R. E. and Storr, G. M. 1998, *Handbook of Western Australian Birds. Volume 1 - Non-Passerines (Emu to Dollarbird)*, Western Australian Museum, Perth.

Johnstone, R. E. and Kirkby, T. 1999, Food of the Red-tailed Forest Black Cockatoo Calyptorhynchus banksii naso in Western Australia, Western Australian Naturalist, 22: 167-178.

Johnstone, R. E. and Kirkby, T. 2008, Distribution, status, social organisation, movements and conservation of Baudin's cockatoo (Calyptorhynchus baudinii) in South-west Western Australia, Records of the Western Australian Museum, 25: 107-118.

Johnstone, R. E. and Storr, G. M. 1998, Handbook of Western Australian Birds. Volume 1 - Non-Passerines (Emu to Dollarbird), Western Australian Museum, Perth.

Johnstone, R. E., Johnstone, C. and Kirkby, T. 2010, Black Cockatoos on the Swan Coastal Plain: Carnaby's Cockatoo (Calyptorhynchus latirostris), Baudin's Cockatoo (Calyptorhynchus baudinii) and the Forest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso) on the Swan Coastal Plain (Lancelin–Dunsborough), Western Australia. Studies on distribution, status, breeding, food, movements and historical changes., Department of Planning, Western Australia.

Johnstone, R. E., Kirkby, T. and Sarti, K. 2017, The distribution, status movements and diet of the forest red-tailed black cockatoo in the south-west with emphasis on the greater Perth region, Western Australia, The West Australian Naturalist, 30(4): 193-219.

Saunders, D. A. 1979, Distribution and taxonomy of the white-tailed and yellow-tailed Black-Cockatoos Calyptorhynchus spp., Emu, 79(215-227).

# Appendix C

Black Cockatoo Habitat Quality Assessment (Emerge 2021)

# Introduction

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of back cockatoo habitat within a site (DAWE 2020). DAWE does not provide a methodology for scoring habitat quality, specifying instead that an assessment of quality should be undertaken by an experienced technical expert (DSEWPaC 2012).

Emerge Associates (Emerge) have developed this method to provide a systematic assessment of overall black cockatoo habitat quality. Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories. Our method assesses and scores the quality of breeding, roosting and foraging habitat separately and then provides an overall quality score (out of ten) based on the highest score determined for the respective habitat categories.

# Methodology

The International Organization for Standardization defines 'quality' as the "*degree to which a set of inherent characteristics fulfils requirements*" (ISO 9000 2020). Developing an objective scoring system for quality is therefore challenging, as quality is both relative and, to some extent, subjective. An ecological value like habitat may also have a wide range of characteristics, with varying relevance to the requirements of a species and that may be independent, interdependent or contrasting with other characteristics, such that habitat quality must be assessed holistically to be properly understood.

The three categories of black cockatoo habitat are intrinsically linked in that breeding and roosting activity is directly related to the availability of foraging and watering resources surrounding nests or roosts (Saunders 1990; Shah 2006; Le Roux 2017). Black cockatoos can also move over large distances within their range to access breeding and foraging habitat and will not necessarily return to the same locations within a year or across years (Saunders 1980; Johnstone and Kirkby 2008; Johnstone *et al.* 2017; Peck *et al.* 2019). Therefore, evaluating the overall quality of black cockatoo habitat requires acknowledgement of the relationships between the different habitat categories and the potential for use of all habitats within a site, given the condition of each habitat, the sites' location and the history of use of habitat within a site by black cockatoos.

While breeding, roosting and foraging habitat are interrelated, we suggest that the different habitat categories should not be scored cumulatively as this can overestimate quality. That is, if a site contains multiple categories of habitat it does not necessarily contain greater quality habitat. For example, a site that contains a roost is not necessarily of higher overall quality if it also contains breeding habitat.

Alternatively, averaging the scores from all three habitat categories can act to underestimate habitat, since certain types of habitat are recorded less frequently than others and therefore their absence would act to devalue quality. For example, the likelihood of recording a roost is generally low compared to recording foraging or breeding habitat but a site that lacks a roost is not necessarily of lower overall quality.

Hence, our scoring system selects the highest habitat category score to represent overall habitat quality. Adopting the highest score from any habitat category within a site avoids over or under estimating habitat quality because the most important value always drives, or is reflected in, the overall score.

To provide a score for each habitat category, the following three 'quality components' are considered as recommended by DAWE (DAWE 2020):

- Site condition which is the "*condition of a site in relation to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features".*
- Site context which is the "*relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community. This includes considerations such as movement patterns of the species, the proximity of the site in relation to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species or community*".
- Species stocking rate which is the "*usage and/or density of a species at a particular site...It includes considerations such as survey data for a site in regards to a particular species population or, in the case of a threatened ecological community this may be a number of different populations. It also includes consideration of the role of the site population in regards to the overall species population viability or community extent*".

A habitat quality assessment should aim to combine current information on the status of black cockatoos and habitat characteristics within a site with the best available information regarding the status of black cockatoo populations and black cockatoo habitat within areas surrounding a site. Black cockatoo habitat assessments for a given site don't typically allow scope for physical survey of areas surrounding a site and so the ability to obtain new information is usually limited to that which can be obtained within a site. Therefore, we considered that, when assessing the above components, site condition is best defined from a current survey, site context is best defined from literature and relevant databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019) and information on species stocking rate is best obtained from a combination of current survey, previous survey or databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019).

# Method

The *Habitat Scoring Tool* provided as **Plate 1** is an *Excel* spreadsheet document that is used to determine a quality score for each habitat category component by answering queries about habitat within and surrounding the site. The *Habitat Scoring Tool* shows the attributes measured within each habitat category and quality component. An overall score from one to ten is assigned for each species, with 1-3 being low, 4-6 being moderate, 7 being moderate – high and 8-10 being high.

The highest score of 10 is reserved for habitat that has an active nest(s) as it provides the best confirmation that the site and/or surrounding area provides sufficient resources and is therefore worthy of a higher quality score. Foraging habitat scores a maximum total of eight as it is an essential

requirement for black cockatoos, particularly to support breeding. Roosting habitat scores a maximum total of seven as it is more transient than the other habitat components.

A quality score is calculated for each habitat category by summing maximum scores for each query. Because maximum scores are selected, multiple answers may be provided for any query where appropriate without exaggerating the quality score. For key confirmed habitat such as roosts or nests, the scoring tool ensures that relevant, higher scores are achieved irrespective of whether all preceding queries have been answered positively (for example a roost always scores 8 irrespective of whether other quality criteria have been met).

The highest score from any of the three habitat categories is then adopted as the overall score for black cockatoo habitat quality within the site.

## Black Cockatoo Habitat Quality Assessment - Scoring Tool (Baudin's cockatoo)
<insert site name>

| | | Query | | Answer | Weighting | Site score | Sum |
|---|---|---|---|---|---|---|---|
| Breeding habitat | Site condition | 1.1 | The site contains habitat trees with either: | | | | |
| | | | no suitable hollow(s) | y | 1.0 | 1.0 | 1.0 |
| | | | suitable hollow(s) | n | 4.0 | 0.0 | |
| | | | suitable hollow(s) that have signs of use by black cockatoos | n | 5.0 | 0.0 | |
| | Site context | 1.2 | The site contains habitat trees and is located within 6 km of a black cockatoo nest(s) (active, historical or potential) | y | 1.0 | 1.0 | 2.0 |
| | | 1.3 | The site contains habitat trees and is located within 6 km of either: | | | | |
| | | | >2,000 ha of native vegetation that provides foraging habitat | y | 1.0 | 1.0 | |
| | | | >10,000 ha of native vegetation that provides foraging habitat | n | 2.0 | 0.0 | |
| | Species stocking rate | 1.4 | The site contains habitat tree(s) that support(s) an active nest(s) | n | Maximum score (10) | 0.0 | 0.0 |
| | | | | | Score out of a maximum of 10 | | 3 |
| Roosting habitat | Site condition | 2.1 | The site contains trees suitable for roosting and a water source or a water source exists nearby | y | 1.0 | 1.0 | 1.0 |
| | Site context | 2.2 | The site is located within 1 km of a large roost (≥150 individuals) or 500 m of a small roost (< 150 individuals)(used within last 5 years) | n | 3.0 | 0.0 | 0.0 |
| | Species stocking rate | 2.3 | The site contains a roost (used within last 5 years) | n | 7.0 | 0.0 | 0.0 |
| | | | | | Score out of a maximum of 7 | | 1 |
| Foraging habitat | Site condition | 3.1 | Within the site the proportion of foraging habitat that is: | | | | |
| | | | low value | 90% | 1.0 | 0.9 | 1.4 |
| | | | moderate value | 1% | 3.0 | 0.0 | |
| | | | high value | 10% | 5.0 | 0.5 | |
| | Site context | 3.2 | The site is located within 6 km of a nest(s) (active, historical or potential) | y | 2.0 | 2.0 | 2.0 |
| | Species stocking rate | 3.4 | The site is likely to support foraging by the species | y | 1.0 | 1.0 | 1.0 |
| | | | | | Score out of a maximum of 8 | | 4 |

| SUMMARY | | |
|---|---|---|
| **Habitat category** | **Score** | **Habitat quality** |
| Breeding | 3 | Low |
| Roosting | 1 | Low |
| Foraging | 4 | Moderate |
| **Overall habitat quality score** | **4** | Moderate |

Note:
1. Within the breeding category, a score of 10 applies if an active nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a roost occurs within the site, regardless of the answer to other queries in this category.
3. The overall habitat quality score consists of the highest score from each habitat category.

*Plate 1: Black Cockatoo Habitat Scoring Tool (Baudin's cockatoo example)*

# References

## General references

Department of Environment and Energy (DoEE) 2016a, *Modelled distribution for Baudin's Cockatoo (Calyptorhynchus baudinii)*, Canberra.

Department of the Environment and Energy (DoEE) 2016b, *Modelled distribution for Carnaby's Cockatoo (Calyptorhynchus latirostris)*, Canberra.

Department of Environment and Energy (DoEE) 2016c, *Modelled distribution for Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)*, Canberra.

Department of Parks and Wildlife (DPaW) 2013, *Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan*, Perth, Western Australia.

Department of Sustainability Environment Water Populations and Communities (DSEWPaC) 2012, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii and Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*, Commonwealth of Australia, Canberra.

Glossop, B., Clarke, K., Mitchell, D. and Barrett, G. 2011, *Methods for mapping Carnaby's cockatoo habitat*, Department of Environment and Conservation, Perth.

Johnstone, R. E. and Kirkby, T. 2008, *Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (Calyptorhynchus baudinii) in South-west Western Australia*, Records of the Western Australian Museum, 25: 107-118.

Johnstone, R. E., Kirkby, T. and Sarti, K. 2017, *The distribution, status movements and diet of the forest red-tailed black cockatoo in the south-west with emphasis on the greater Perth region, Western Australia*, The West Australian Naturalist, 30(4): 193-219.

Le Roux, C. 2017, *Nocturnal roost tree, roost site and landscape characteristics of Carnaby 's Black-Cockatoo (Calyptorynchus latirostris) on the Swan Coastal Plain*, Edith Cowan University Research Online.

Peck, A., Barret, G. and Williams, M. 2019, *The 2019 Great Cocky Count: a community-based survey for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris), Baudin's Black-Cockatoo (Calyptorhynchus baudinii) and Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso).* , Birdlife Australia, Floreat, Western Australia.

Saunders, D. A. 1980, *Food and Movements of the Short-billed Form of the White-tailed Black Cockatoo*, Australian Wildlife Research, 7: 257-269.

Saunders, D. A. 1990, *Problems of Survival in an Extentively Cultivated Landscape: the case of Carnaby's Cockatoo Calyptorhynchus funereus latirostris*, Biological Conservation, 54: 277-290.

Shah, B. 2006, *Conservation of Carnaby's Black Cockatoo on the Swan Coastal Plain, Western Australia*, Birds Australia, Perth.

Department of Environment and Energy (DoEE) 2016a, *Modelled distribution for Baudin's Cockatoo (Calyptorhynchus baudinii)*, Canberra.

## Online references

Department of Agriculture, Water and the Environment (DAWE) 2020*, How to use the Offsets assessment* guide, viewed 9 June 2020, < https://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy>.

ISO 9000:2015, *Quality management systems — Fundamentals and vocabulary, International Organization for Standardization*, Geneva, viewed 30 June 2020, <https://www.iso.org/obp/ui/#iso:std:iso:9000:ed-4:v1:en, 2020.06.30>.

# Appendix D

Black Cockatoo Habitat Tree Data

# Black Cockatoo Habitat Tree Inventory
## Former Glen Iris Golf Course



| Tag No. | Easting | Northing | DBH (cm) | Species | Category | Notes |
|---|---|---|---|---|---|---|
| 1 | 391990 | 6446466 | 75 | Eucalyptus marginata | No suitable hollow(s) | |
| 2 | 392097 | 6447344 | 67 | Eucalyptus marginata | No suitable hollow(s) | |
| 3 | 392099 | 6447344 | 61 | Eucalyptus marginata | No suitable hollow(s) | |
| 4 | 391830 | 6447470 | 68 | Eucalyptus marginata | No suitable hollow(s) | |
| 5 | 392080 | 6447370 | 89 | Eucalyptus marginata | No suitable hollow(s) | |
| 6 | 392079 | 6447368 | 86 | Eucalyptus marginata | No suitable hollow(s) | |
| 7 | 391737 | 6448274 | 105 | Eucalyptus marginata | No suitable hollow(s) | Internal hollow inspection undertaken but hollow(s) not suitable for black cockatoos |
| 8 | 391836 | 6448409 | 81 | Eucalyptus marginata | No suitable hollow(s) | |
| 9 | 391835 | 6448406 | 58 | Eucalyptus marginata | No suitable hollow(s) | |
| 10 | 391831 | 6448405 | 87 | Eucalyptus marginata | No suitable hollow(s) | Internal hollow inspection undertaken but hollow(s) not suitable for black cockatoos |
| 11 | 391705 | 6447935 | 93 | Eucalyptus marginata | No suitable hollow(s) | |

# Appendix E

Overall Habitat Quality Assessment

# Black Cockatoo Habitat Quality Assessment - Scoring Tool (Carnaby's cockatoo)
## Former Glen Iris Golf Course

| | | Query | | Answer | Weighting | Site score | Sum |
|---|---|---|---|---|---|---|---|
| Breeding habitat | **Site condition** | 1.1 | The site contains habitat trees with either: | | | | |
| | | | no suitable hollow(s) | N/A | 1.0 | 0.0 | 0.0 |
| | | | suitable hollow(s) | N/A | 4.0 | 0.0 | |
| | | | suitable hollow(s) that have signs of use by black cockatoos | N/A | 5.0 | 0.0 | |
| | **Site context** | 1.2 | The site contains habitat trees and is located within 6 km of a black cockatoo nest(s) (active, historical or potential) | N/A | 1.0 | 0.0 | 0.0 |
| | | 1.3 | The site contains habitat trees and is located within 6 km of either: | | | | |
| | | | >2,000 ha of native vegetation that provides foraging habitat | N/A | 1.0 | 0.0 | |
| | | | >10,000 ha of native vegetation that provides foraging habitat | N/A | 2.0 | 0.0 | |
| | **Species stocking rate** | 1.4 | The site contains habitat tree(s) that support(s) an active nest(s) | N/A | Maximum score (10) | 0.0 | 0.0 |
| | | | | | | **Score out of a maximum of 10** | **0** |
| Roosting habitat | **Site condition** | 2.1 | The site contains trees suitable for roosting and a water source or a water source exists nearby | y | 1.0 | 1.0 | 1.0 |
| | **Site context** | 2.2 | The site is located within 1 km of a large roost (≥150 individuals) or 500 m of a small roost (< 150 individuals)(used within last 5 years) | n | 3.0 | 0.0 | 0.0 |
| | **Species stocking rate** | 2.3 | The site contains a roost (used within last 5 years) | n | 7.0 | 0.0 | 0.0 |
| | | | | | | **Score out of a maximum of 7** | **1** |
| Foraging habitat | **Site condition** | 3.1 | Within the site the proportion of foraging habitat that is: | | | | |
| | | | low value | 66% | 1.0 | 0.7 | 2.1 |
| | | | moderate value | 14% | 3.0 | 0.4 | |
| | | | high value | 20% | 5.0 | 1.0 | |
| | **Site context** | 3.2 | The site is located within 6 km of a nest(s) (active, historical or potential) | n | 2.0 | 0.0 | 0.0 |
| | **Species stocking rate** | 3.4 | The site is likely to support foraging by the species | y | 1.0 | 1.0 | 1.0 |
| | | | | | | **Score out of a maximum of 8** | **3** |

| SUMMARY | | |
|---|---|---|
| **Habitat category** | **Score** | **Habitat quality** |
| Breeding | N/A | N/A |
| Roosting | 1 | Low |
| Foraging | 3 | Moderate |

| | | |
|---|---|---|
| **Overall habitat quality score** | **3** | Moderate |

Note:

1. Within the breeding category, a score of 10 applies if an active nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a roost occurs within the site, regardless of the answer to other queries in this category.
3. The overall habitat quality score consists of the highest score from each habitat category.

# Black Cockatoo Habitat Quality Assessment - Scoring Tool (forest red-tailed black cockatoo)
## Former Glen Iris Golf Course

| | | Query | | Answer | Weighting | Site score | Sum |
|---|---|---|---|---|---|---|---|
| Breeding habitat | **Site condition** | 1.1 | The site contains habitat trees with either: | | | | |
| | | | no suitable hollow(s) | y | 1.0 | 1.0 | 1.0 |
| | | | suitable hollow(s) | n | 4.0 | 0.0 | |
| | | | suitable hollow(s) that have signs of use by black cockatoos | n | 5.0 | 0.0 | |
| | **Site context** | 1.2 | The site contains habitat trees and is located within 6 km of a black cockatoo nest(s) (active, historical or potential) | y | 1.0 | 1.0 | 2.0 |
| | | 1.3 | The site contains habitat trees and is located within 6 km of either: | | | | |
| | | | >2,000 ha of native vegetation that provides foraging habitat | y | 1.0 | 1.0 | |
| | | | >10,000 ha of native vegetation that provides foraging habitat | n | 2.0 | 0.0 | |
| | **Species stocking rate** | 1.4 | The site contains habitat tree(s) that support(s) an active nest(s) | n | Maximum score (10) | 0.0 | 0.0 |
| | | | | | | **Score out of a maximum of 10** | **3** |
| Roosting habitat | **Site condition** | 2.1 | The site contains trees suitable for roosting and a water source or a water source exists nearby | y | 1.0 | 1.0 | 1.0 |
| | **Site context** | 2.2 | The site is located within 1 km of a large roost (≥150 individuals) or 500 m of a small roost (< 150 individuals)(used within last 5 years) | n | 3.0 | 0.0 | 0.0 |
| | **Species stocking rate** | 2.3 | The site contains a roost (used within last 5 years) | n | 7.0 | 0.0 | 0.0 |
| | | | | | | **Score out of a maximum of 7** | **1** |
| Foraging habitat | **Site condition** | 3.1 | Within the site the proportion of foraging habitat that is: | | | | |
| | | | low value | 80% | 1.0 | 0.8 | 1.6 |
| | | | moderate value | 8% | 3.0 | 0.2 | |
| | | | high value | 12% | 5.0 | 0.6 | |
| | **Site context** | 3.2 | The site is located within 6 km of a nest(s) (active, historical or potential) | y | 2.0 | 2.0 | 2.0 |
| | **Species stocking rate** | 3.4 | The site is likely to support foraging by the species | y | 1.0 | 1.0 | 1.0 |
| | | | | | | **Score out of a maximum of 8** | **5** |

| SUMMARY | | |
|---|---|---|
| **Habitat category** | **Score** | **Habitat quality** |
| Breeding | 3 | Low |
| Roosting | 1 | Low |
| Foraging | 5 | Moderate |
| **Overall habitat quality score** | **5** | Moderate |

Note:

1. Within the breeding category, a score of 10 applies if an active nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a roost occurs within the site, regardless of the answer to other queries in this category.
3. The overall habitat quality score consists of the highest score from each habitat category.

# Appendix D

Arboricultural Assessment

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Emerge Environmental Services Pty Ltd ABN 57144772510 trading as Emerge Associates

Document Reference: EP20-009(12)--011B TAA

Emerge contact: Tom Atkinson

17 September 2021

ECP Acquisitions 6 Pty Ltd
Attention: Jarrod Rendell
C/- Acumen Development Solutions
18 Lyall Street
SOUTH PERTH WA 6151

*Delivered by email to: jarrod@acumends.com.au*

Dear Jarrod

# ARBORICULTURAL ASSESSMENT – FORMER GLEN IRIS GOLF COURSE

## 1 INTRODUCTION

Acumen Development Solutions, on behalf of ECP Acquisitions 6 Pty Ltd, engaged Emerge Associates (Emerge) to conduct an arboricultural assessment within the former Glen Iris Golf Course, which comprises Lots 6 and 7 Glen Iris Drive, Lots 3, 509 and 512 Dean Road and Lot 139 Imlah Court, Jandakot (referred to herein as the 'site').

A separate assessment was previously undertaken to map black cockatoo habitat trees[1] (Emerge Associates 2021). The purpose of this arboricultural assessment was to provide information on attributes of all large trees within the site to inform tree retention.

The location of the site is shown in **Figure 1**.

## 2 METHODS

### 2.1 Field survey

The field survey was completed by subcontracted qualified arborist from Arborite[2].

The survey was completed by the arborist over multiple dates in January and February 2021. During the survey the site was traversed on foot. The arborist recorded the attributes outlined in **Table 1** for all trees with a trunk diameter at breast height (DBH) of 30 centimetres (cm) or greater , including habitat trees previously assessed by Emerge Associates (2021). In some instances, a single location was recorded for groups of similar juvenile or semi-mature trees (with DBH ≥30 cm).

[1] Native eucalypts with a trunk 'diameter at breast height' (DBH) of ≥50 centimetres (cm).
[2] David Cuddihy, Graduate Certificate Arboriculture (Australian Qualifications Framework (AQF) Level 8)

***Table 1: Attributes assessed for each tree***

| Attribute | Notes |
|---|---|
| Unique id | Aluminium tag number |
| Spatial location | XY coordinates using GPS receiver ± 5m^ |
| Image | Oblique digital photograph (12 megapixel or greater) |
| Species name | Using WA herbarium nomenclature |
| Common name | Using WA herbarium nomenclature |
| Height | 1-5 m, 1-10 m, 10-15 m, 15-20 m, 20-25 m, 25 +m |
| Canopy spread (width) | 1-5 m, 1-10 m, 10-15 m, 15-20 m |
| Trunk diameter | Diameter at breast height (DBH) (cm) |
| Health | Excellent, good, average, poor, dead |
| Age | Juvenile, semi-mature, mature |
| Useful life expectancy | 25+ years, 15-25 years, 5-15 years, <5 years |
| Retention value | Low, medium, high |
| Notes | Safety concerns, tree defects, pruning requirements, further ecologist/arborist assessment recommended etc. |

## 2.2 Health

Tree health was determined by the arborist according to scheme outlined in **Table 2**.

***Table 2: Tree health rating descriptions***

| Tree Health Rating | Description |
|---|---|
| Excellent | Tree with >90% of original canopy present. Less than 5% epicormic growth and deadwood. No history of failures or pruning wounds. Well-formed canopy. |
| Good | Tree with 75-90% of original canopy present. Epicormic growth less than 10% of remaining canopy. Some dead branchlets, minor limb failures and pruning wounds. Minor canopy imbalance. |
| Average | Tree with 50– 75% of original canopy present Some epicormic growth. Some major dead stems and major deadwood up to 30%. History of larger limb failure and canopy imbalance. |
| Poor | Major canopy die-back with major stems deceased. Structurally unsound, history of large limb failure. Hazardous tree. |
| Dead | Tree dead or transient. Less than 5 years useful life expectancy. |

## 2.3 Useful life expectancy

Useful life expectancy (ULE) is an estimate of the number of years a tree is expected to remain alive. ULE is a method of assessing the relative importance of individual trees and the amenity value that can be realised for the remaining duration of the trees' lifespan. In conjunction with landscape significance, ULE helps making informed decisions on the retention value of trees on site.

ULE was determined by the arborist who considered the age of the tree, the average life span of the species and any local environmental modifying factors that may influence life span.

## 2.4 Retention value

There is always a compromise between retaining trees on a development site and the economic imperatives of land development. Establishing priorities for the retention of trees is an important part of the planning process if amenity is to be sustained in the long term.

Retention value was classified 'high', 'medium', 'low' and 'very low' by the arborist. Arborite's method for classifying retention value contrasts ULE with landscape significance, as outlined in **Table 3.** Landscape significance of trees was determined by the arborist using the criteria outlined in **Table 4.**

***Table 3: Tree retention matrix***

| **Useful life expectancy (ULE)** | **Landscape significance** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Long - Greater than 25 years | High | | | | | | |
| Medium - 15 to 25 years | | | Medium | | | | |
| Short - 5 to 15 years | | | | Low | | | |
| Transient - Less than 5 years | | | | | Very low | | |
| Dead or potentially hazardous | | | | | | | |

***Table 4: Criteria for rating landscape significance of trees***

| **Significance rating** | **Criteria** |
|---|---|
| 1 - Significant | • The subject tree is listed as a heritage Item with a local, state or national level of significance.<br>• The subject tree forms part of the curtilage of a Heritage Item and has a known or documented association with that item.<br>• The subject tree is a commemorative planting having been planted by an important historical person (s) or to commemorate an important historical event.<br>• The subject tree is scheduled as a threatened species.<br>• The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species.<br>• The subject tree is a remnant tree, being a tree in existence prior to development of the area.<br>• The subject tree has a very large live crown size exceeding 300 m² with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity.<br>• The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance. |
| 2 - Very high | • The tree has a strong historical association with a heritage item. (building/structure/artifact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.<br>• The subject tree is listed on a local Significant Tree Register.<br>• The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined biodiversity corridor or has known wildlife habitat value.<br>• The subject tree has a very large live crown size exceeding 200 m²; a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area. |
| 3- High | • The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence.<br>• The tree is a locally-indigenous species and representative of the original vegetation of the area.<br>• The subject tree has a large live crown size exceeding 100 m².<br>• The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal).<br>• The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area. |
| 4 - Moderate | • The subject tree has a medium live crown size exceeding 40 m².<br>• The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% Crown Cover (thinning to normal).<br>• The tree makes a fair contribution to the visual character and amenity of the area. |

***Table 4: Criteria for rating landscape significance of trees (continued)***

| Significance rating | Criteria |
|---|---|
| 4 - Moderate | • The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms.<br>• The tree has no known or suspected historical association. |
| 5- Low | • The subject tree has a small live crown size of less than 40 m² and can be replaced within the short term with new tree planting.<br>• The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse).<br>• The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. |
| 6 - Very low | • The subject tree is listed as an environment weed in the relevant Local Government Area, being invasive, or a nuisance species.<br>• The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's due to its species, nuisance or position relative to buildings or other structures. |
| 7 - Insignificant | • The tree is a declared pest or environmental weed. |

### 2.5 Spatial location

Following the survey, the spatial location of high and medium retention value trees was updated using data supplied by project surveyors MNG.

## 3 RESULTS

A total of 1,215 trees were recorded within the site, comprising 80 species and 26 unidentified trees. (including one 'unknown' category which was not assigned species). Nine species are native to the local area and 72 species are non-native[3]. The unidentified trees are also non-native. The locations of native and non-native trees within the site are shown in **Figure 2**.

A summary of the ten most common species in the site is provided in **Table 5**.

***Table 5: Ten most common tree species in the site***

| Species name | Common name | No. individuals |
|---|---|---|
| **Eucalyptus camaldulensis* | River red-gum | 158 |
| **Corymbia maculata* | Spotted gum | 106 |
| **Eucalyptus grandis* | Rose gum | 102 |
| **Eucalyptus leucoxylon* | Yellow gum | 72 |
| **Eucalyptus* sp. | Gum | 59 |
| **Eucalyptus cladocalyx* | Sugar gum | 56 |
| **Eucalyptus citriodora* | Lemon-scented gum | 42 |
| *Banksia attenuata* | Slender banksia | 41 |
| **Acacia* sp. | Wattle | 36 |
| **Ficus microcarpa* | Chinese banyan | 36 |

Ninety-seven (97) trees were classified as having 'high' retention value, 375 were classified as having 'medium' retention value and the remaining 743 trees were classified as having 'low' retention value. The

[3] Non-native species denoted by an asterisk ('*') in text and raw data.

retention value of each tree is shown in **Figure 3**. Note only three of the retention value categories outlined in **Section 2.4** were applied (that is no trees were classified as having a very low retention value).

The data recorded for each tree is provided as **Attachment 1**.

## Summary and closing

We trust that this letter provides sufficient details on the trees within the site. Should you have any questions regarding the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely
Emerge Associates



**Tom Atkinson**
PRINCIPAL ENVIRONMENTAL CONSULTANT

cc: nil

Encl: Figure 1: Site Location
Figure 2: Tree Species
Figure 3: Retention Value
Attachment 1: Tree Inventory Data and Photos

## References

Emerge Associates 2021, *Targeted Black Cockatoo Assessment - Former Glen Iris Golf Course*, EP20-009(13)--009A MS, Version A.

# Figures

*Figure 1: Site Location*

*Figure 2: Tree Species*

*Figure 3: Retention Value*




**Figure 1: Site Location**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F21**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 100 200 300
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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Site boundary
Cadastral boundary
Native tree
Non-native tree

**Figure 2a: Trees**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F24**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

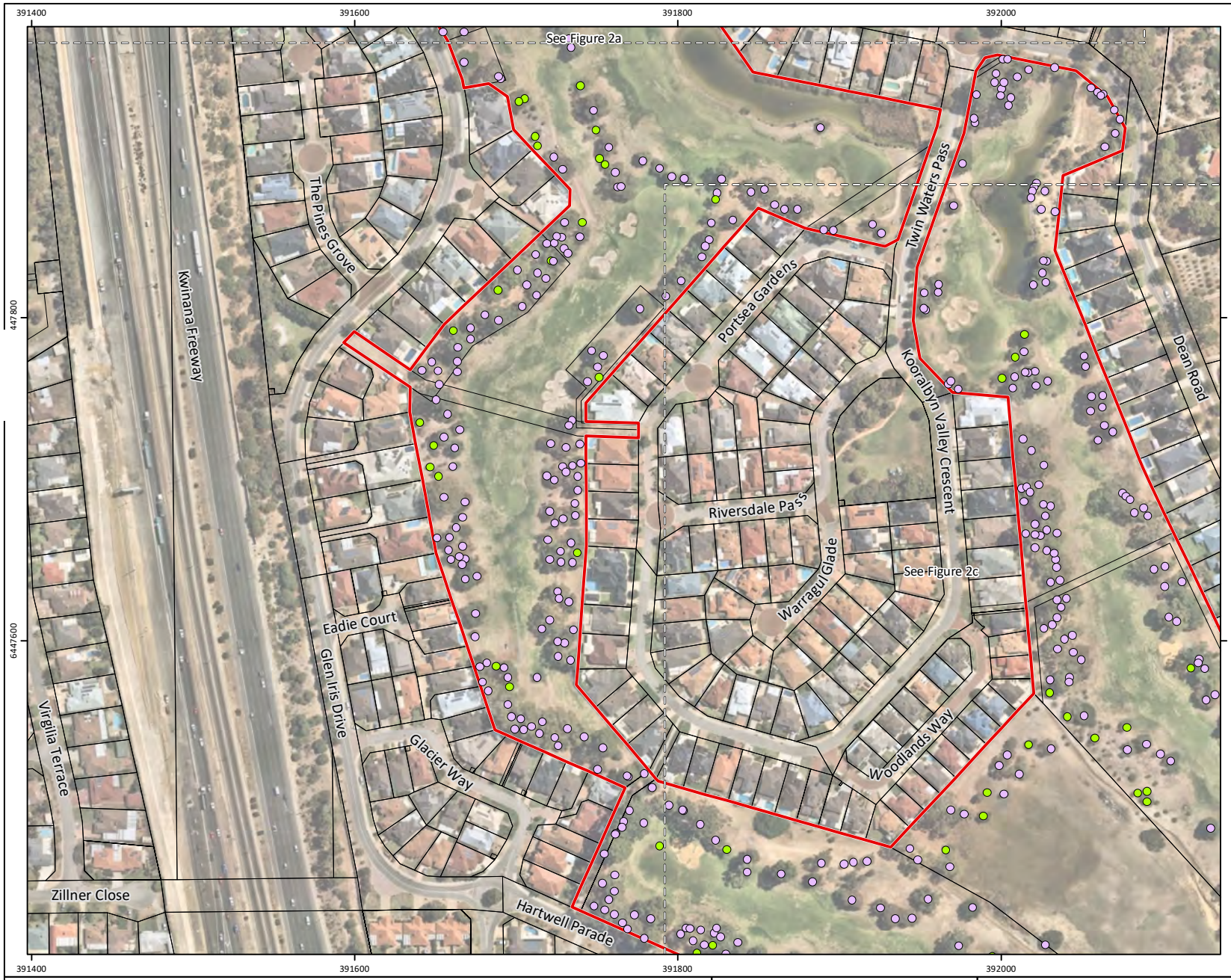
0 50 100 150
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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Site boundary
Cadastral boundary
Native tree
Non-native tree

**Figure 2b: Trees**

**Project:** Arboricultural Assessment
Former Glen Iris Golf Course
**Client:** ECP Acquisitions 6 Pty Ltd

**Plan Number:**
**EP20-009(12)--F24**
Drawn: GAR
Date: 07/04/2021
Checked: RAW
Approved: ALB
Date: 03/06/2021

N

0 50 100 150
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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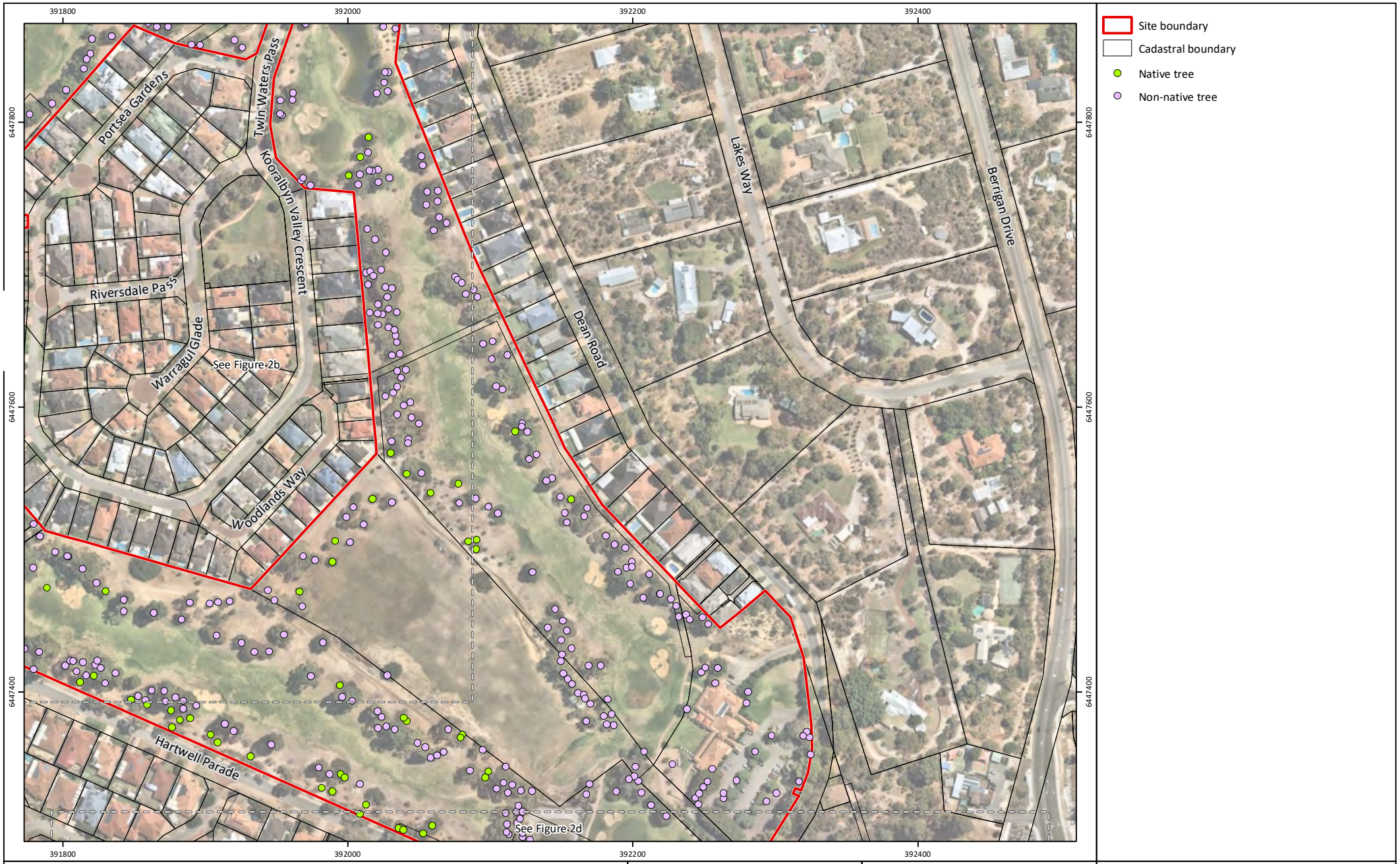



**Figure 2c: Trees**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F24**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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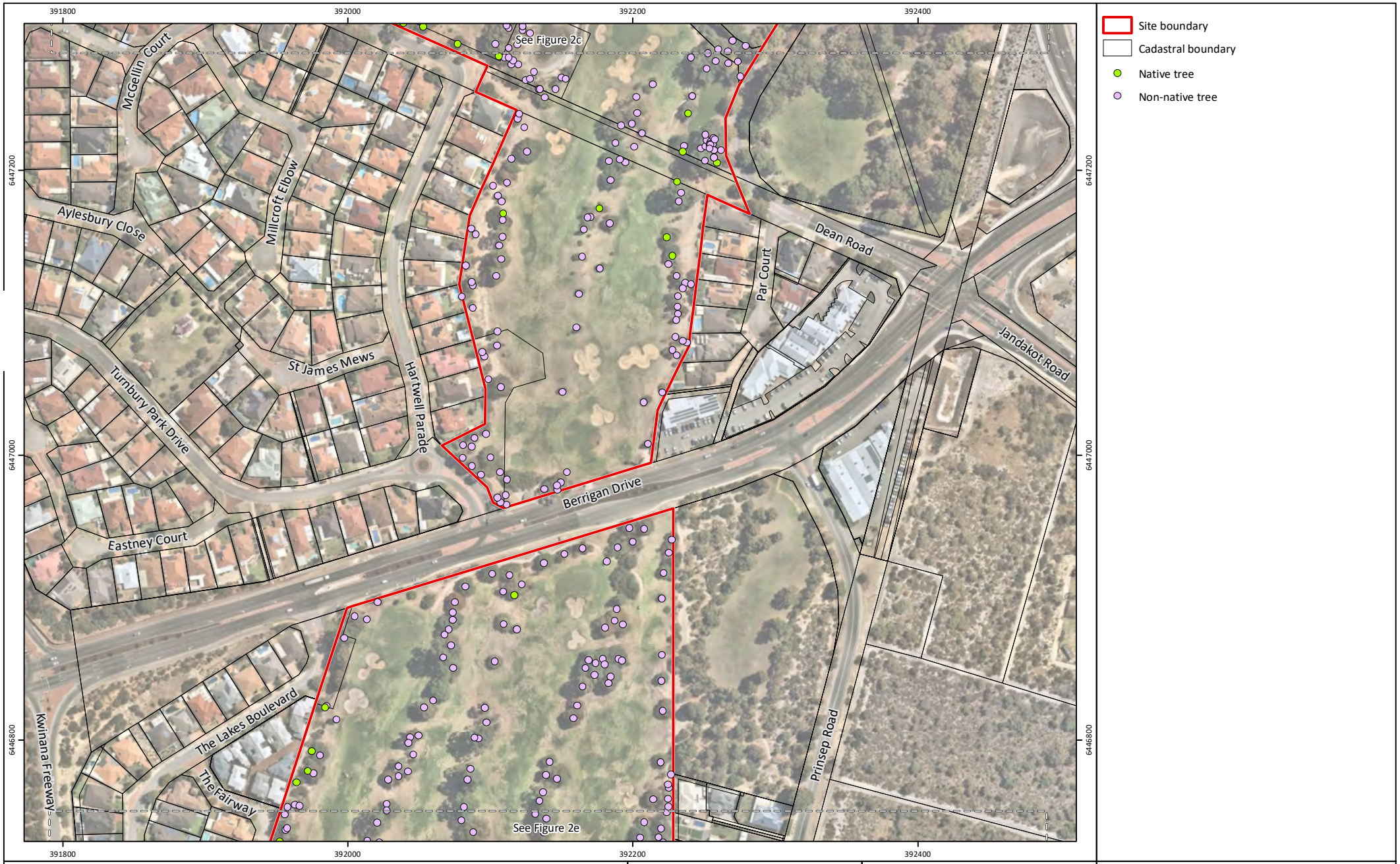



**Figure 2d: Trees**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F24**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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**Figure 2e: Trees**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F24**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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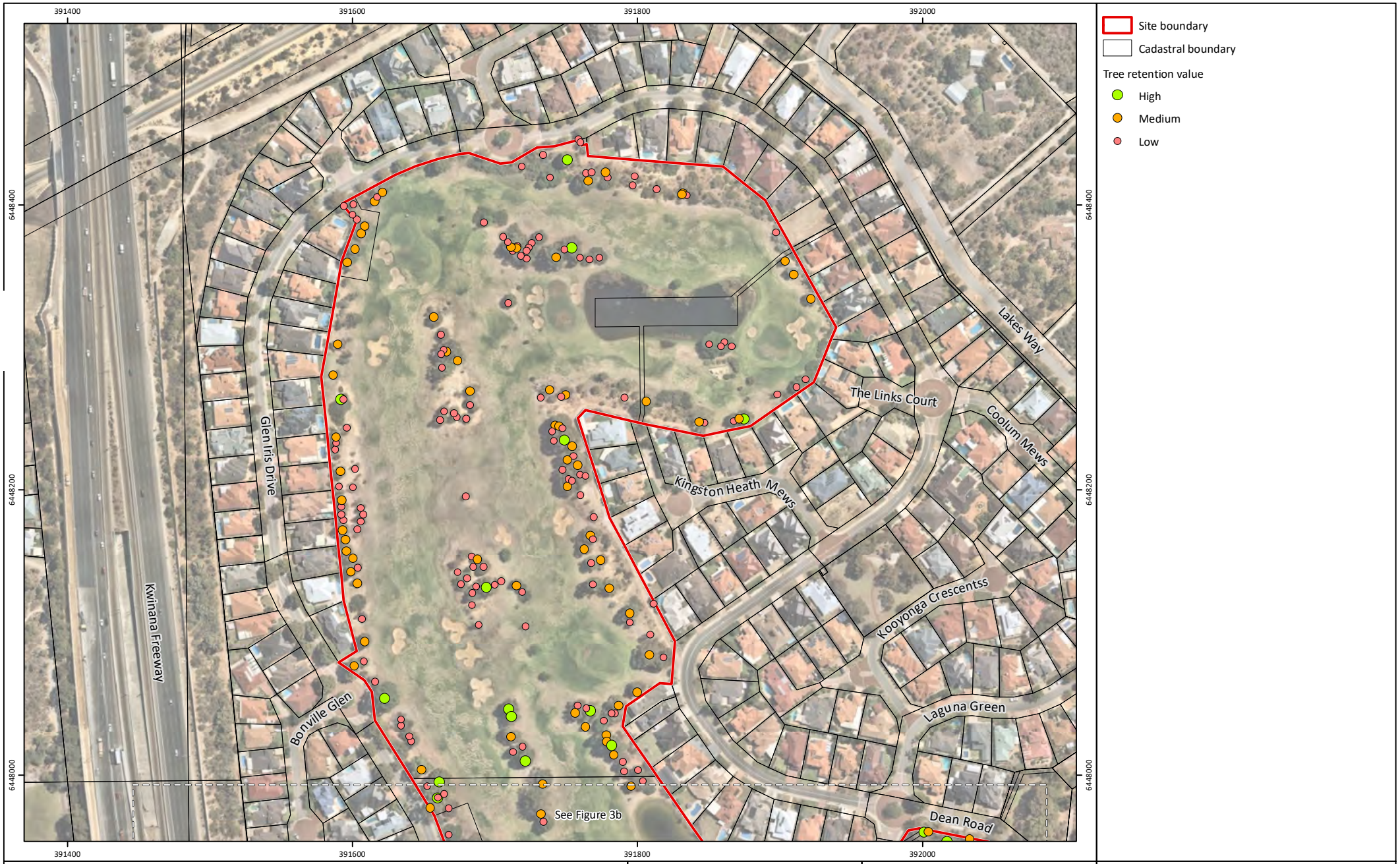



**Figure 3a: Tree Retention Value**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F23**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

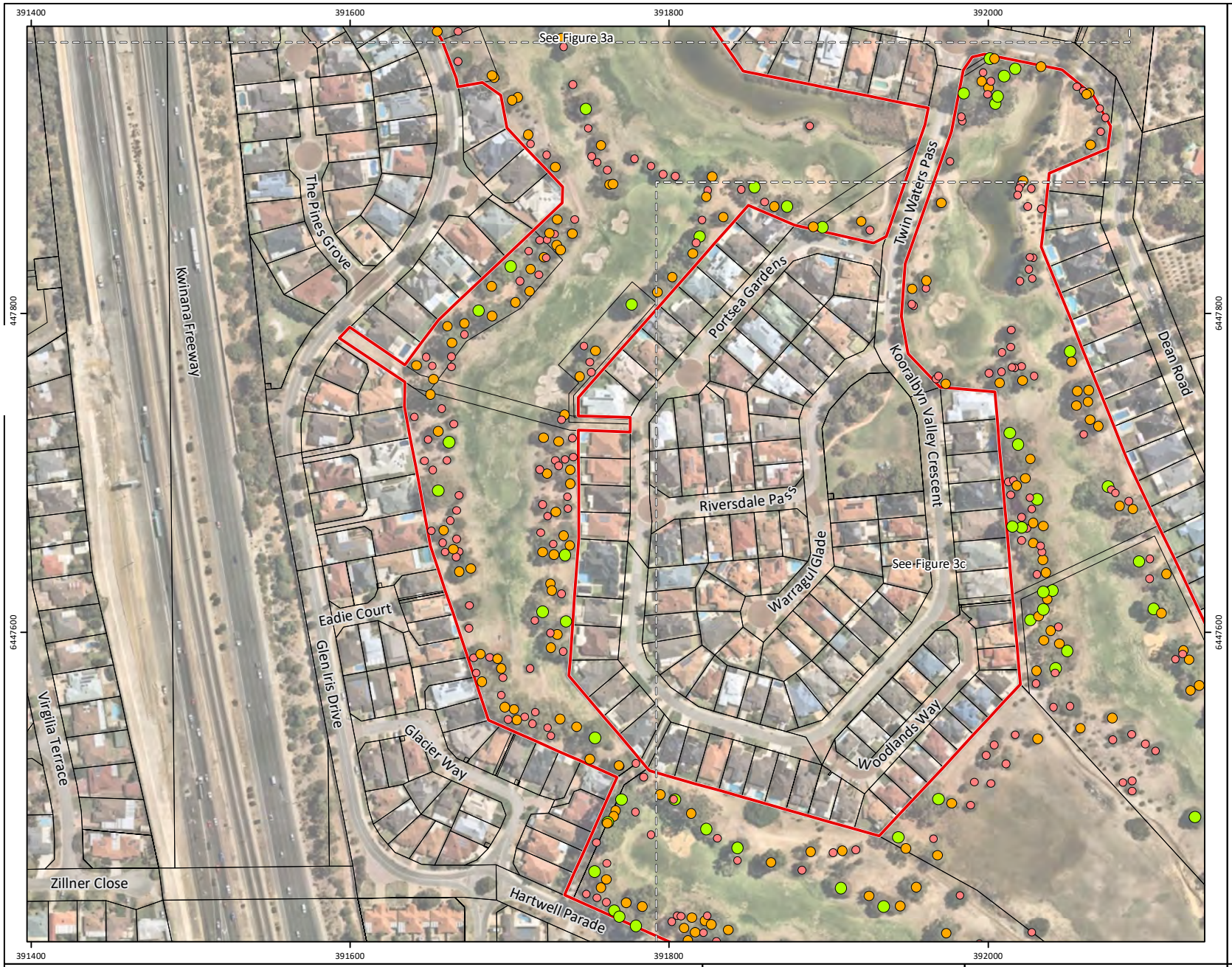
0 50 100 150
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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Site boundary

Cadastral boundary

Tree retention value

- High
- Medium
- Low

**Figure 3b: Tree Retention Value**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F23**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150

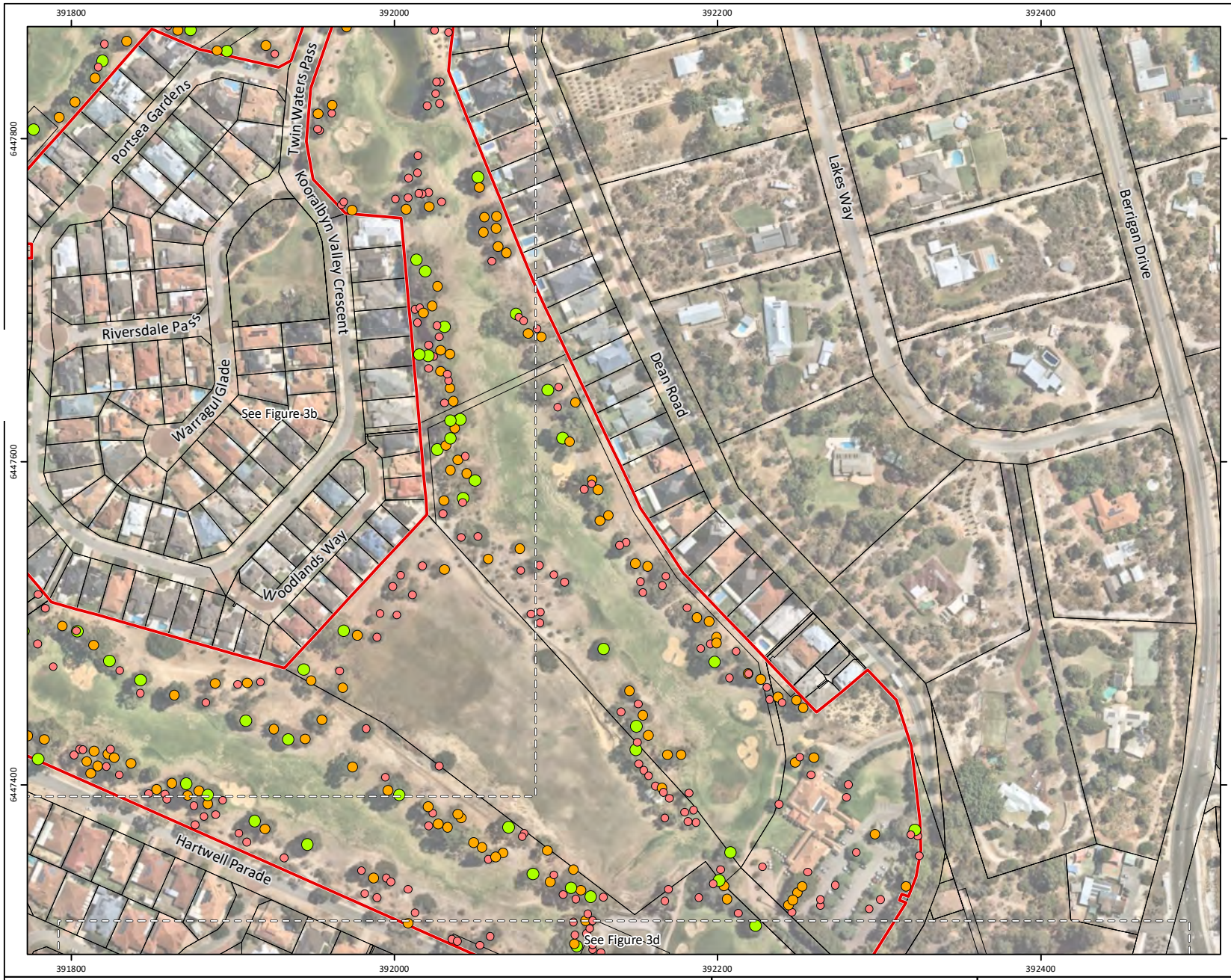
Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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Site boundary

Cadastral boundary

Tree retention value

- High
- Medium
- Low

**Figure 3c: Tree Retention Value**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F23**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150

Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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Site boundary

Cadastral boundary

Tree retention value

- High
- Medium
- Low

**Figure 3d: Tree Retention Value**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

**Plan Number:**
**EP20-009(12)--F23**

| | |
|---|---|
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150

Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used
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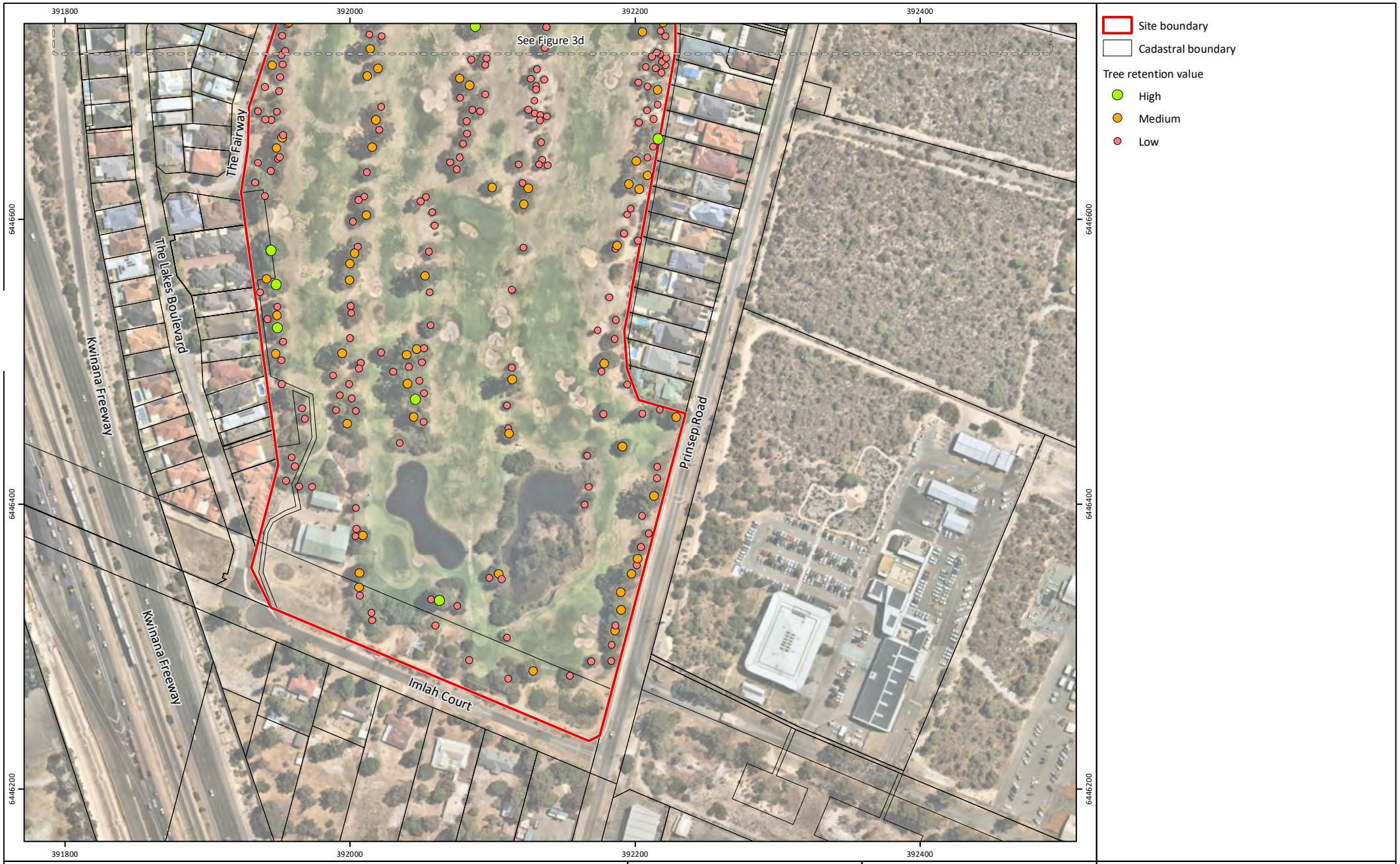



**Figure 3e: Tree Retention Value**

| | |
|---|---|
| **Project:** | Arboricultural Assessment<br>Former Glen Iris Golf Course |
| **Client:** | ECP Acquisitions 6 Pty Ltd |

| | |
|---|---|
| **Plan Number:** | **EP20-009(12)--F23** |
| Drawn: | GAR |
| Date: | 07/04/2021 |
| Checked: | RAW |
| Approved: | ALB |
| Date: | 03/06/2021 |

N

0 50 100 150

Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used
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# Attachment A

Tree Inventory Data and Photos

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.75 | Yes |
| 2 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Poor | Mature | 15-25 | Medium | 0.67 | Yes |
| 3 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Mature | 15-25 | Low | 0.61 | Yes |
| 4 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.68 | Yes |
| 5 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.89 | Yes |
| 6 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.86 | Yes |
| 7 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Poor | Mature | 5-15 | Medium | 1.05 | Yes |
| 8 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Medium | 0.81 | Yes |
| 9 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Mature | 15-25 | Low | 0.58 | Yes |
| 10 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Medium | 0.87 | Yes |
| 11 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Excellent | Mature | 25+ | Medium | 0.93 | Yes |
| N/A | *Melaleuca sp.* | 1 | 5-10 | 10-15 | Good | Mature | 25+ | High | 0.2 | No |
| 12 | *Melaleuca rhaphiophylla* | 1 | 1-5 | 1-5 | Poor | Mature | 0-5 | Low | 0.6 | No |
| 13 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | High | 1 | No |
| 14 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 15 | *Eucalyptus camaldulensis* | 1 | 5-10 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 16 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.55 | No |
| 17 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.15 | No |
| 18 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.55 | No |
| 22 | *Eucalyptus robusta* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 23 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.5 | No |
| 24 | *Eucalyptus grandis* | 1 | 10-15 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 25 | *Eucalyptus robusta* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 26 | *Eucalyptus grandis* | 1 | 15-20 | 1-5 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 27 | *Eucalyptus grandis* | 1 | 15-20 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.45 | No |
| 28 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.25 | No |
| 29 | *Eucalyptus grandis* | 1 | 5-10 |  | Average | Juvenile | 25+ | Low | 0.25 | No |
| 30 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Average | Mature | 15-25 | Medium | 0.75 | No |
| 31 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 32 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 25+ | Low | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 33 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 34 | *Eucalyptus grandis* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 38 | *Erythrina sykseii* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.75 | No |
| 39 | *Platanus x acerifolia* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.5 | No |
| 40 | *Melaleuca quinquenervia* | 15 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 41 | *Melaleuca quinquenervia* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.75 | No |
| 42 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Average | Semi-mature | 25+ | Low | 0.55 | No |
| 43 | *Melia azaderach* | 1 | 10-15 | 5-10 | Average | Semi-mature | 25+ | Low | 0.45 | No |
| 44 | *Erythrina sykseii* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.7 | No |
| 58 | *Morus alba* | 1 | 1-5 | 1-5 | Average | Mature | 15-25 | Low | 0.25 | No |
| 59 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 60 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 61 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.55 | No |
| 62 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.75 | No |
| 63 | *Robinia pseudoacacia 'umbraculifera'* | 6 | 1-5 | 1-5 | Poor | Semi-mature | | Low | 0.2 | No |
| 64 | *Tipuana tipu* | 2 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.25 | No |
| 65 | *Ulmus parvifolia* | 1 | 5-10 | 1-5 | Dead | Juvenile | 0-5 | Low | 0.25 | No |
| 66 | *Tipuana tipu* | 5 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.25 | No |
| 67 | *Tipuana tipu* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.35 | No |
| 68 | *Pheonix canariensis* | 1 | 5-10 | 1-5 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 69 | *Schefflera actinophylla* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |
| 70 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Average | Mature | 5-15 | High | 0.75 | No |
| 71 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.55 | No |
| 72 | *Hibiscus tiliaceus* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Low | 0.65 | No |
| 73 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.55 | No |
| 74 | *Lagunaria patersonia* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 75 | *Tipuana tipu* | 4 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 76 | *Robinia pseudoacacia 'umbraculifera'* | 5 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 77 | *Robinia pseudoacacia 'umbraculifera'* | 8 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 78 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.45 | No |
| 80 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.35 | No |
| 81 | *Schinus molle* | 1 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.25 | No |
| 82 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 83 | *Ficus microcarpa* | 3 | 1-5 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 84 | *Allocasuarina sp.* | 8 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.65 | No |
| 85 | *Pheonix canariensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 25+ | Low | 0.8 | No |
| 86 | *Eucalyptus camaldulensis* | 1 | 20-25 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.5 | No |
| 87 | *Agonis flexuosa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 88 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 89 | *Syagrus romanzoffiana* | 1 | 1-5 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 90 | *Syagrus romanzoffiana* | 1 | 5-10 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.35 | No |
| 91 | *Melaleuca rhaphiophylla* | 1 | 5-10 | 10-15 | Average | Mature | 15-25 | High | 0.8 | No |
| 92 | *Unknown* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Medium | 0.5 | No |
| 93 | *Banksia sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 94 | *Melaleuca rhaphiophylla* | 4 | 1-5 | 1-5 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 95 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | High | 1.2 | No |
| 96 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 97 | *Acacia saligna* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 98 | *Schinus terebinthifolia* | 1 | 1-5 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 99 | *Acacia sp.* | 1 | 1-5 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 100 | *Banksia attenuata* | 1 | 1-5 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.45 | No |
| 101 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.45 | No |
| 102 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 25+ | Low | 0.45 | No |
| 103 | *Acacia sp.* | 1 | 1-5 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.25 | No |
| 104 | *Aruacaria columnaris* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.2 | No |
| 105 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 106 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.3 | No |
| 107 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 108 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Medium | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 109 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 110 | *Tipuana tipu* | 1 | 1-5 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 111 | *Eucalyptus platypus* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Low | 0.15 | No |
| 112 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Medium | 0.25 | No |
| 113 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 114 | *Olea europaea* | 1 | 1-5 | 1-5 | Good | Semi-mature | 15-25 | Low | 0.25 | No |
| 115 | *Ficus microcarpa* | 1 | 1-5 | 1-5 | Average | Juvenile | 25+ | Low | 0.35 | No |
| 116 | *Aruacaria heterophylla* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Medium | 0.4 | No |
| 117 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Average | Semi-mature | 25+ | Low | 0.35 | No |
| 118 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | High | 0.5 | No |
| 119 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.35 | No |
| 120 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | High | 0.5 | No |
| 121 | *Ficus microcarpa* | 1 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.25 | No |
| 122 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Low | 0 | No |
| 123 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Average | Juvenile | 25+ | Medium | 0.3 | No |
| 124 | *Eucalyptus citriodora* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Medium | 0.2 | No |
| 125 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.3 | No |
| 126 | *Tipuana tipu* | 1 | 1-5 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 127 | *Ulmus parvifolia* | 8 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 128 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.45 | No |
| 129 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 130 | *Corymbia maculata* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.45 | No |
| 131 | *Olea europaea* | 1 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.2 | No |
| 132 | *Jacaranda mimosifolia* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.2 | No |
| 133 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.3 | No |
| 134 | *Cupressus sp.* | 3 | 1-5 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.35 | No |
| 135 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.5 | No |
| 136 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 25+ | Medium | 0.8 | No |
| 137 | *Eucalyptus sp.* | 1 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.1 | No |
| 138 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.15 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 25+ | Medium | 0.3 | No |
| 140 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 141 | *Ficus microcarpa* | 1 | 1-5 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 142 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 143 | *Cupressus sp.* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 144 | *Acacia sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.2 | No |
| 145 | *Cupressus sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 146 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 147 | *Cupressus sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 148 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 25+ | Medium | 0.75 | No |
| 149 | *Ficus microcarpa* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Medium | 0.2 | No |
| 150 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 151 | *Acacia sp.* | 1 | 1-5 | 10-15 | Average | Mature | 5-15 | Low | 0.4 | No |
| 152 | *Cupressus sp.* | 1 | 1-5 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.2 | No |
| 153 | *Grevillea robusta* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Medium | 0.2 | No |
| 154 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Medium | 0.45 | No |
| 155 | *Acacia sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.25 | No |
| 156 | *Aruacaria heterophylla* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Medium | 0.25 | No |
| 157 | *Cupressus sp.* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 158 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.55 | No |
| 159 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.6 | No |
| 160 | *Ficus microcarpa* | 1 | 5-10 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 161 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 25+ | Medium | 0.25 | No |
| 162 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.45 | No |
| 163 | *Eucalyptus platypus* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Low | 0.15 | No |
| 164 | *Ulmus parvifolia* | 1 | 5-10 | 10-15 | Good | Mature | 15-25 | Medium | 0.35 | No |
| 165 | *Syagrus romanzoffiana* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 166 | *Eucalyptus camaldulensis* | 1 | 5-10 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.75 | No |
| 167 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.35 | No |
| 168 | *Ulmus parvifolia* | 4 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 169 | *Eucalyptus sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.15 | No |
| 170 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Poor | Semi-mature | 5-15 | Low | 0.5 | No |
| 171 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.35 | No |
| 172 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.5 | No |
| 176 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 177 | *Eucalyptus camaldulensis* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Low | 0.1 | No |
| 178 | *Eucalyptus camaldulensis* | 3 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 179 | *Fraxinus ornus* | 1 | 1-5 | 1-5 | Average | Juvenile | | Low | 0.1 | No |
| 180 | *Callistemon sp.* | 1 | 1-5 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.1 | No |
| 181 | *Eucalyptus camaldulensis* | 6 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 182 | *Melaleuca rhaphiophylla* | 1 | 1-5 | 1-5 | Average | Mature | 5-15 | Low | 0.6 | No |
| 183 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 184 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.65 | No |
| 185 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Average | Mature | 15-25 | Low | 0.55 | No |
| 186 | *Eucalyptus camaldulensis* | 1 | 5-10 | 10-15 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 187 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.75 | No |
| 188 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.75 | No |
| 189 | *Platanus x acerifolia* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 190 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 191 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 192 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 193 | *Eucalyptus camaldulensis* | 1 | 20-25 | 10-15 | Average | Mature | 15-25 | Medium | 0.65 | No |
| 194 | *Eucalyptus camaldulensis* | 1 | 1-5 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 195 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 196 | *Ficus carica* | 1 | 1-5 | 1-5 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 197 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 25+ | Low | 0.25 | No |
| 198 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 25+ | Low | 0.35 | No |
| 199 | *Platanus x acerifolia* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 200 | *Syzygium smithii* | 1 | 10-15 | 5-10 | Excellent | Mature | 25+ | Low | 0.4 | No |
| 201 | *Eucalyptus patens* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Medium | 0.5 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 202 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 5-15 | Medium | 0.5 | No |
| 203 | *Eucalyptus globulus* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 1.2 | No |
| 204 | *Archontophoenix cunninghamiana* | 1 | 5-10 | 1-5 | Excellent | Semi-mature | 25+ | Low | 0.2 | No |
| 205 | *Lagerstroemia indica* | 1 | 1-5 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 206 | *Fraxinus sp.* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.3 | No |
| 207 | *Ulmus parvifolia* | 1 | 1-5 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 208 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 209 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Good | Mature | 25+ | High | 1.2 | No |
| 210 | *Syagrus romanzoffiana* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 211 | *Eucalyptus citriodora* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 212 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.2 | No |
| 213 | *Syagrus romanzoffiana* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.25 | No |
| 214 | *Tipuana tipu* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Low | 0.4 | No |
| 215 | *Ulmus parvifolia* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.4 | No |
| 216 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.6 | No |
| 217 | *Ficus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 218 | *Cinnamomum camphora* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 219 | *Melaleuca rhaphiophylla* | 1 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 220 | *Agonis flexuosa* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | High | 0.8 | No |
| 221 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 222 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 223 | *Poplar lombardi* | 1 | 10-15 | 1-5 | Excellent | Semi-mature | 15-25 | Low | 0.4 | No |
| 224 | *Cinnamomum camphora* | 1 | 1-5 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 225 | *Ficus microcarpa* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Low | 0.35 | No |
| 226 | *Jacaranda mimosifolia* | 1 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 227 | *Araucaria heterophylla* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 228 | *Cinnamomum camphora* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 229 | *Unknown* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 230 | *Syagrus romanzoffiana* | 1 | 5-10 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.2 | No |
| 231 | *Syagrus romanzoffiana* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 232 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.6 | No |
| 233 | *Eucalyptus sp.* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.3 | No |
| 234 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 235 | *Eucalyptus cladocalyx* | 1 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.6 | No |
| 236 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.5 | No |
| 237 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 238 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 25+ | Low | 0.5 | No |
| 239 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.8 | No |
| 240 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.4 | No |
| 241 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 242 | *Eucalyptus cladocalyx* | 1 | 15-20 | 10-15 | Average | Mature | 5-15 | Low | 0.9 | No |
| 243 | *Liquidambar styraciflua* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.25 | No |
| 244 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.6 | No |
| 245 | *Pinus radiata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 1.2 | No |
| 246 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 247 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 248 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 249 | *Acacia sp.* | 1 | 5-10 | 10-15 | Poor | Mature | 5-15 | Low | 0.7 | No |
| 250 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.5 | No |
| 251 | *Tipuana tipu* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.4 | No |
| 252 | *Eucalyptus grandis* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.5 | No |
| 253 | *Melaleuca rhaphiophylla* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.4 | No |
| 254 | *Banksia attenuata* | 1 | 5-10 | 1-5 | Average | Semi-mature | 15-25 | Medium | 0.3 | No |
| 255 | *Melaleuca rhaphiophylla* | 1 | 5-10 | 5-10 | Average | Mature | 15-25 | Low | 0.6 | No |
| 256 | *Acacia sp.* | 1 | 5-10 | 10-15 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 257 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.5 | No |
| 258 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | High | 0.6 | No |
| 259 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 260 | *Eucalyptus sp.* | 1 | 1-5 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.3 | No |
| 261 | *Eucalyptus leucoxylon* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | High | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 262 | *Eucalyptus cladocalyx* | 1 | 15-20 | 5-10 | Average | Mature | 15-25 | Medium | 0.8 | No |
| 263 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 264 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 265 | *Eucalyptus grandis* | 1 | 15-20 | 5-10 | Average | Semi-mature | 25+ | Low | 0.4 | No |
| 266 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.4 | No |
| 267 | *Eucalyptus camaldulensis* | 1 | 20-25 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 268 | *Eucalyptus citriodora* | 1 | 20-25 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 269 | *Eucalyptus cladocalyx* | 1 | 15-20 | 10-15 | Average | Mature | 25+ | Medium | 0.6 | No |
| 270 | *Eucalyptus citriodora* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | High | 1 | No |
| 271 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.7 | No |
| 272 | *Eucalyptus botryoides* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 273 | *Ulmus parvifolia* | 1 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.1 | No |
| 274 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Average | Mature | 15-25 | Medium | 0.9 | No |
| 275 | *Unknown* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Medium | 0.5 | No |
| 276 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Semi-mature | 5-15 | Low | 0.6 | No |
| 277 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.5 | No |
| 278 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 279 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.45 | No |
| 280 | *Eucalyptus citriodora* | 1 | 20-25 | 5-10 | Good | Semi-mature | 25+ | High | 0.5 | No |
| 281 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 282 | *Agonis flexuosa* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 283 | *Grevillea robusta* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Medium | 0.2 | No |
| 284 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 285 | *Agonis flexuosa* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 286 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.7 | No |
| 287 | *Agonis flexuosa* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 288 | *Ficus microcarpa* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 289 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 290 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 291 | *Eucalyptus botryoides* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 292 | *Corymbia ficifolia* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Medium | 0.4 | No |
| 293 | *Eucalyptus citriodora* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | Medium | 1 | No |
| 294 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | High | 1 | No |
| 295 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | High | 0.45 | No |
| 296 | *Allocasuarina sp.* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 297 | *Eucalyptus botryoides* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 298 | *Eucalyptus botryoides* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 299 | *Allocasuarina sp.* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 300 | *Allocasuarina sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 301 | *Allocasuarina sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 302 | *Allocasuarina sp.* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 303 | *Eucalyptus marginata* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 304 | *Allocasuarina fraseriana* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 305 | *Eucalyptus patens* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.8 | No |
| 306 | *Allocasuarina fraseriana* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.5 | No |
| 307 | *Allocasuarina sp.* | 1 | 15-20 | 5-10 | Good | Mature | 15-25 | Medium | 0.8 | No |
| 308 | *Allocasuarina sp.* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 309 | *Allocasuarina sp.* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 310 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.5 | No |
| 311 | *Melia azaderach* | 1 | 5-10 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.4 | No |
| 312 | *Corymbia ficifolia* | 1 | 1-5 | 1-5 | Good | Juvenile | 15-25 | Medium | 0.3 | No |
| 313 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Low | 0.5 | No |
| 314 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 315 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 316 | *Melia azaderach* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | Low | 0.6 | No |
| 317 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 318 | *Cupressus sp.* | 1 | 1-5 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 319 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Excellent | Mature | 25+ | High | 0.9 | No |
| 320 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 321 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 322 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |
| 323 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |
| 324 | *Eucalyptus citriodora* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 325 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 326 | *Eucalyptus cladocalyx* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 327 | *Eucalyptus citriodora* | 1 | 15-20 | 15-20 | Good | Mature | 25+ | High | 0.9 | No |
| 328 | *Eucalyptus citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 329 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 330 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |
| 331 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Average | Mature | 15-25 | Medium | 0.8 | No |
| 332 | *Melia azaderach* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.4 | No |
| 333 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 334 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.3 | No |
| 335 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Medium | 0.3 | No |
| 336 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 337 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.3 | No |
| 338 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.3 | No |
| 339 | *Melaleuca quinquenervia* | 10 | 5-10 | 1-5 | Good | Semi-mature | 25+ | Medium | 0.35 | No |
| 340 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Medium | 0.3 | No |
| 341 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 342 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 343 | *Eucalyptus platypus* | 1 | 1-5 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 344 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 345 | *Olea europaea* | 1 | 1-5 | 1-5 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 346 | *Syagrus romanzoffiana* | 4 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 347 | *Eucalyptus robusta* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.45 | No |
| 348 | *Melaleuca quinquenervia* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 349 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Low | 0.5 | No |
| 350 | *Tipuana tipu* | 1 | 5-10 | 1-5 | Average | Juvenile | 25+ | Low | 0.2 | No |
| 351 | *Eucalyptus robusta* | 4 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 352 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.7 | No |
| 353 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 354 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.8 | No |
| 355 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 356 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.6 | No |
| 357 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.55 | No |
| 358 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.4 | No |
| 359 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 360 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 361 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 362 | *Corymbia ficifolia* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 363 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 364 | *Eucalyptus globulus* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.7 | No |
| 365 | *Eucalyptus camaldulensis* | 1 | 5-10 | 10-15 | Average | Mature | 15-25 | Low | 0.5 | No |
| 366 | *Eucalyptus cladocalyx* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.9 | No |
| 367 | *Eucalyptus globulus* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | High | 1.5 | No |
| 368 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 369 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.5 | No |
| 370 | *Eucalyptus robusta* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 371 | *Eucalyptus nicholii* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | High | 0.9 | No |
| 372 | *Eucalyptus cladocalyx* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 373 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.9 | No |
| 374 | *Eucalyptus grandis* | 1 | 15-20 | 5-10 | Average | Mature | 5-15 | Low | 1 | No |
| 375 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 376 | *Melaleuca rhaphiophylla* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.4 | No |
| 377 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 378 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 379 | *Eucalyptus patens* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 380 | *Eucalyptus patens* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 381 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 382 | *Eucalyptus patens* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 383 | *Banksia sp.* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Medium | 0.5 | No |
| 384 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.7 | No |
| 385 | *Eucalyptus sp.* | 1 | 5-10 | 10-15 | Poor | Mature | 5-15 | Low | 0.9 | No |
| 386 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 387 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 388 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.3 | No |
| 389 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 390 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 391 | *Eucalyptus botryoides* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 392 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 393 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 394 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.3 | No |
| 395 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 396 | *Acacia sp.* | 1 | 5-10 | 10-15 | Poor | Mature | 5-15 | Low | 0.4 | No |
| 397 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 398 | *Eucalyptus grandis* | 1 | 5-10 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 399 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.3 | No |
| 400 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 401 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 402 | *Eucalyptus sp.* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 403 | *Eucalyptus sp.* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 404 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Average | Mature | 25+ | Medium | 0.6 | No |
| 405 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | Medium | 0.6 | No |
| 406 | *Eucalyptus robusta* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 407 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 408 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.7 | No |
| 409 | *Brachychiton populneus* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Medium | 0.3 | No |
| 410 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Semi-mature | 25+ | Medium | 0.6 | No |
| 411 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 412 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 413 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 414 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.9 | No |
| 415 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.8 | No |
| 416 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |
| 417 | *Corymbia calophylla* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 418 | *Corymbia citriodora* | 1 | 25+ | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 419 | *Eucalyptus robusta* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.7 | No |
| 420 | *Corymbia calophylla* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 421 | *Corymbia calophylla* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.35 | No |
| 422 | *Eucalyptus sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 423 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |
| 424 | *Eucalyptus cladocalyx* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 425 | *Agonis flexuosa* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 426 | *Corymbia calophylla* | 1 | 1-5 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 427 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.4 | No |
| 428 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 429 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 430 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 431 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 432 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 433 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 434 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 435 | *Ulmus parvifolia* | 1 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 436 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | High | 0.7 | No |
| 437 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 438 | *Corymbia maculata* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 439 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.6 | No |
| 440 | *Robinia sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 441 | *Eucalyptus robusta* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | High | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 442 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.2 | No |
| 443 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 444 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 445 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 446 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 447 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.6 | No |
| 448 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.5 | No |
| 449 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Good | Juvenile | 25+ | Medium | 0.2 | No |
| 450 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 451 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.5 | No |
| 452 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 453 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 454 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 455 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 456 | *Allocasuarina fraseriana* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 457 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 458 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.6 | No |
| 459 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 460 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 461 | *Ficus microcarpa* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.4 | No |
| 462 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 463 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 464 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Medium | 0.4 | No |
| 465 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 466 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 467 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Low | 0.3 | No |
| 468 | *Eucalyptus botryoides* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.75 | No |
| 469 | *Eucalyptus cladocalyx* | 1 | 10-15 | 10-15 | Poor | Mature | 5-15 | Low | 0.6 | No |
| 470 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.45 | No |
| 471 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 472 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Average | Mature | 15-25 | Medium | 1 | No |
| 473 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.4 | No |
| 474 | *Eucalyptus cladocalyx* | 1 | 10-15 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.45 | No |
| 475 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 476 | *Olea europaea* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 15-25 | Low | 0.3 | No |
| 477 | *Olea europaea* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 15-25 | Low | 0.3 | No |
| 478 | *Lophostemon confertus* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 479 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.5 | No |
| 480 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 481 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 25+ | Medium | 1 | No |
| 482 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 15-25 | Medium | 0.7 | No |
| 483 | *Eucalyptus cladocalyx* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.75 | No |
| 484 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 15-25 | Medium | 0.7 | No |
| 485 | *Unknown* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 486 | *Eucalyptus spathulata* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 487 | *Araucaria columnaris* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.4 | No |
| 488 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 489 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 490 | *Eucalyptus cladocalyx* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 491 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Average | Mature | 5-15 | Low | 0.65 | No |
| 492 | *Lophostemon confertus* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 493 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Good | Semi-mature | 25+ | High | 0.6 | No |
| 494 | *Eucalyptus citriodora* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 495 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 496 | *Eucalyptus sp.* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | Medium | 0.7 | No |
| 497 | *Corymbia maculata* | 1 | 20-25 | 15-20 | Excellent | Mature | 25+ | High | 0.9 | No |
| 498 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 499 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 500 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 501 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 502 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.3 | No |
| 503 | *Banksia attenuata* | 1 | 1-5 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 504 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 505 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 506 | *Eucalyptus robusta* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.8 | No |
| 507 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.5 | No |
| 508 | *Banksia attenuata* | 2 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 509 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 510 | *Angophora costada* | 1 | 10-15 | 1-5 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 511 | *Eucalyptus gomphocephala* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 512 | *Banksia attenuata* | 2 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 513 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.3 | No |
| 514 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 515 | *Banksia attenuata* | 2 | 5-10 | 5-10 | Average | Mature | 0-5 | Low | 0.5 | No |
| 516 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 517 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 518 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 519 | *Banksia sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 520 | *Banksia attenuata* | 2 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 521 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |
| 522 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.6 | No |
| 523 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 524 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.5 | No |
| 525 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 526 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.2 | No |
| 527 | *Banksia attenuata* | 2 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 528 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.5 | No |
| 529 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 530 | *Banksia attenuata* | 10 | 1-5 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.2 | No |
| 531 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 532 | *Callistemon sp.* | 1 | 1-5 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 533 | *Banksia attenuata* | 3 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 534 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Medium | 0.4 | No |
| 535 | *Banksia sp.* | 1 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 536 | *Eucalyptus marginata* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 537 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 538 | *Unknown* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 539 | *Banksia sp.* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.4 | No |
| 540 | *Banksia attenuata* | 4 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 541 | *Allocasuarina fraseriana* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 542 | *Banksia attenuata* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 543 | *Allocasuarina fraseriana* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.6 | No |
| 544 | *Allocasuarina fraseriana* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.8 | No |
| 545 | *Allocasuarina fraseriana* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.7 | No |
| 546 | *Melia azaderach* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 547 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.5 | No |
| 548 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 15-25 | Medium | 0.5 | No |
| 549 | *Eucalyptus citriodora* | 1 | 20-25 | 15-20 | Excellent | Mature | 25+ | High | 0.8 | No |
| 550 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Good | Mature | 15-25 | Medium | 0.85 | No |
| 551 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.7 | No |
| 552 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 553 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 554 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 555 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.7 | No |
| 556 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 5-15 | Low | 0.6 | No |
| 557 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Average | Mature | 15-25 | Medium | 0.5 | No |
| 558 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Low | 0.5 | No |
| 559 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 560 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 1.1 | No |
| 561 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Average | Mature | 5-15 | Low | 0.7 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 562 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 563 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 564 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 565 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 566 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.6 | No |
| 567 | *Allocasuarina fraseriana* | 1 | 10-15 | 5-10 | Poor | Mature | 0-5 | Low | 0.5 | No |
| 568 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 569 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 570 | *Agonis flexuosa* | 1 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 571 | *Schinus molle* | 1 | 5-10 | 10-15 | Good | Mature | 15-25 | Low | 0.7 | No |
| 572 | *Ficus microcarpa* | 1 | 5-10 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.6 | No |
| 573 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 574 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 575 | *Ulmus parvifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 576 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.45 | No |
| 577 | *Melia azaderach* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 578 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 579 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 580 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 581 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 582 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 583 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 584 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 585 | *Eucalyptus citriodora* | 1 | 20-25 | 15-20 | Excellent | Mature | 25+ | High | 1 | No |
| 586 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 587 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 588 | *Robinia sp.* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.1 | No |
| 589 | *Quercus robur* | 1 | 10-15 | 10-15 | Excellent | Juvenile | 25+ | High | 0.4 | No |
| 590 | *Banksia ilicifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 591 | *Eucalyptus robusta* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 592 | *Corymbia calophylla* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 593 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 594 | *Ulmus parvifolia* | 1 | 5-10 | 10-15 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 595 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Average | Mature | 15-25 | Medium | 0.8 | No |
| 596 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 597 | *Angophora costada* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 598 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 599 | *Callistemon sp.* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 600 | *Eucalyptus spathulata* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 601 | *Eucalyptus spathulata* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 602 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 603 | *Corymbia calophylla* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 604 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 605 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 606 | *Corymbia citriodora* | 1 | 15-20 | 5-10 | Excellent | Mature | 25+ | High | 0.6 | No |
| 607 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | Medium | 1 | No |
| 608 | *Corymbia calophylla* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 609 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 610 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 611 | *Corymbia maculata* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 612 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 613 | *Eucalyptus robusta* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Medium | 1 | No |
| 614 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.35 | No |
| 615 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.6 | No |
| 616 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.3 | No |
| 617 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Semi-mature | 5-15 | Low | 0.6 | No |
| 618 | *Eucalyptus robusta* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 619 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.5 | No |
| 620 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.65 | No |
| 621 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 622 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 623 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 624 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 625 | *Banksia ilicifolia* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 626 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | Medium | 0.5 | No |
| 627 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 628 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 629 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 15-25 | Medium | 0.6 | No |
| 630 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 631 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Low | 0.3 | No |
| 632 | *Corymbia calophylla* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 633 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.8 | No |
| 634 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.75 | No |
| 635 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 636 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 637 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 638 | *Eucalyptus nicholii* | 1 | 10-15 | 5-10 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 639 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 640 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 641 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 642 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 643 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 644 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 645 | *Grevillea robusta* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 646 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 647 | *Eucalyptus sp.* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 648 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Low | 0.5 | No |
| 649 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 650 | *Lophostemon confertus* | 1 | 10-15 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.4 | No |
| 651 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 652 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Low | 0.45 | No |
| 653 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 654 | *Corymbia calophylla* | 1 | 5-10 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.55 | No |
| 655 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.5 | No |
| 656 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 657 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Low | 0.4 | No |
| 658 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 659 | *Brachychiton populneus* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Medium | 0.2 | No |
| 660 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 661 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Low | 0.5 | No |
| 662 | *Eucalyptus cladocalyx* | 1 | 15-20 | 15-20 | Good | Mature | 25+ | High | 0.7 | No |
| 663 | *Eucalyptus camaldulensis* | 1 | 15-20 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 664 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.7 | No |
| 665 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.45 | No |
| 666 | *Araucaria columnaris* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 667 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 668 | *Lophostemon confertus* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | Low | 0.6 | No |
| 669 | *Robinia sp.* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.2 | No |
| 670 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Average | Mature | 25+ | Medium | 1 | No |
| 671 | *Eucalyptus patens* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.5 | No |
| 672 | *Banksia attenuata* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.35 | No |
| 673 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.3 | No |
| 674 | *Eucalyptus marginata* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 675 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 676 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 677 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Low | 0.6 | No |
| 678 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Low | 0.55 | No |
| 679 | *Corymbia citriodora* | 1 | 20-25 | 10-15 | Excellent | Mature | 25+ | High | 0.9 | No |
| 680 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 681 | *Corymbia citriodora* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 682 | *Corymbia citriodora* | 1 | 15-20 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.45 | No |
| 683 | *Corymbia citriodora* | 1 | 10-15 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 684 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 685 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 25+ | Medium | 0.6 | No |
| 686 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 687 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 688 | *Eucalyptus nicholii* | 1 | 5-10 | 10-15 | Average | Mature | 25+ | Medium | 0.6 | No |
| 689 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 690 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Poor | Semi-mature | 5-15 | Low | 0.4 | No |
| 691 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 692 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 694 | *Eucalyptus nicholii* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 695 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 696 | *Allocasuarina fraseriana* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 697 | *Eucalyptus nicholii* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | High | 1.3 | No |
| 698 | *Banksia attenuata* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 699 | *Eucalyptus nicholii* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | Medium | 0.7 | No |
| 700 | *Banksia ilicifolia* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 701 | *Banksia attenuata* | 2 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 702 | *Leptospermum laevigatum* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.3 | No |
| 703 | *Eucalyptus nicholii* | 1 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.7 | No |
| 704 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 705 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 706 | *Callistemon sp.* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.4 | No |
| 707 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |
| 708 | *Callistemon sp.* | 1 | 1-5 | 5-10 | Average | Mature | 5-15 | Low | 0.4 | No |
| 709 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 710 | *Melia azaderach* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 711 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 712 | *Unknown* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.7 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 713 | *Eucalyptus grandis* | 1 | 15-20 | 15-20 | Excellent | Mature | 25+ | High | 0.8 | No |
| 714 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 715 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 716 | *Unknown* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 717 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 718 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 719 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.2 | No |
| 720 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 721 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.35 | No |
| 722 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 723 | *Eucalyptus nicholii* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 724 | *Eucalyptus citriodora* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.2 | No |
| 725 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 726 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 727 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 728 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Low | 0.3 | No |
| 729 | *Unknown* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.5 | No |
| 730 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 731 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 732 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 733 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 734 | *Eucalyptus camaldulensis* | 2 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 735 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 736 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 737 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 738 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 739 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 740 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 741 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 742 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 743 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.3 | No |
| 744 | *Banksia attenuata* | 15 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.3 | No |
| 745 | *Ficus microcarpa* | 7 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.3 | No |
| 746 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | Medium | 0.4 | No |
| 747 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 748 | *Melaleuca quinquenervia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 749 | *Unknown* | 2 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 750 | *Fraxinus ornus* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 751 | *Syzygium smithii* | 2 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 752 | *Melia azaderach* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Low | 0.7 | No |
| 753 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 754 | *Melia azaderach* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Low | 0.4 | No |
| 755 | *Eucalyptus sideroxylon* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 756 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 757 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 758 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 759 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 760 | *Eucalyptus botryoides* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 761 | *Eucalyptus sideroxylon* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 762 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 763 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 764 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.3 | No |
| 765 | *Callistemon sp.* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 766 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 767 | *Schinus molle* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 768 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 769 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 770 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 771 | *Eucalyptus leucoxylon* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 772 | *Corymbia calophylla* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Medium | 0.3 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 773 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 774 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 775 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 776 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 777 | *Schinus molle* | 1 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 778 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 779 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 780 | *Eucalyptus sideroxylon* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 781 | *Corymbia calophylla* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | High | 0.6 | No |
| 782 | *Eucalyptus sideroxylon* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 783 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.25 | No |
| 784 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.2 | No |
| 785 | *Fraxinus sp.* | 3 | 1-5 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.1 | No |
| 786 | *Melia azaderach* | 4 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 787 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 788 | *Allocasuarina fraseriana* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 789 | *Acacia sp.* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 790 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.5 | No |
| 791 | *Banksia attenuata* | 3 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 792 | *Eucalyptus sp.* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.3 | No |
| 793 | *Banksia attenuata* | 3 | 5-10 | 1-5 | Average | Mature | 5-15 | Low | 0.3 | No |
| 794 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 795 | *Banksia attenuata* | 1 | 1-5 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.2 | No |
| 796 | *Corymbia calophylla* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 797 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.3 | No |
| 798 | *Eucalyptus marginata* | 8 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Medium | 0.3 | No |
| 799 | *Banksia attenuata* | 8 | 1-5 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 800 | *Corymbia ficifolia* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 801 | *Corymbia ficifolia* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 802 | *Eucalyptus sp.* | 2 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 803 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 804 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 805 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 806 | *Schinus molle* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 807 | *Schinus molle* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 808 | *Unknown* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 809 | *Unknown* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.3 | No |
| 810 | *Erythrina sykseii* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Low | 0.6 | No |
| 811 | *Unknown* | 1 | 10-15 | 1-5 | Good | Semi-mature | 15-25 | Low | 0.2 | No |
| 812 | *Erythrina sykseii* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Low | 0.7 | No |
| 813 | *Melaleuca quinquenervia* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.9 | No |
| 814 | *Lophostemon confertus* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 815 | *Lophostemon confertus* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 816 | *Eucalyptus marginata* | 1 | 10-15 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.75 | No |
| 817 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.5 | No |
| 818 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.6 | No |
| 819 | *Banksia attenuata* | 10 | 5-10 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.2 | No |
| 820 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 821 | *Banksia attenuata* | 2 | 1-5 | 1-5 | Poor | Semi-mature | 5-15 | Low | 0.2 | No |
| 822 | *Eucalyptus marginata* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 823 | *Melaleuca preissiana* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.4 | No |
| 824 | *Schinus molle* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 825 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 826 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 827 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 828 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 829 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 830 | *Eucalyptus grandis* | 1 | 10-15 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 831 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 832 | *Acacia sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 833 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 834 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 835 | *Eucalyptus grandis* | 1 | 10-15 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 836 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.3 | No |
| 837 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 838 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 839 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 840 | *Corymbia ficifolia* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 841 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 842 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 843 | *Eucalyptus sp.* | 1 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 844 | *Eucalyptus sp.* | 1 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 845 | *Eucalyptus sp.* | 1 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 846 | *Eucalyptus sp.* | 1 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 847 | *Eucalyptus sp.* | 1 | 15-20 | 15-20 | Excellent | Mature | 25+ | High | 0.7 | No |
| 848 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Low | 0.3 | No |
| 849 | *Corymbia calophylla* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 850 | *Jacaranda mimosifolia* | 1 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 851 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 852 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 853 | *Eucalyptus sp.* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 854 | *Eucalyptus sp.* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 855 | *Callistemon sp.* | 1 | 1-5 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 856 | *Corymbia calophylla* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 857 | *Eucalyptus sp.* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 858 | *Angophora costada* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 859 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 860 | *Corymbia ficifolia* | 1 | 1-5 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 861 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Excellent | Juvenile | 25+ | Medium | 0.4 | No |
| 862 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.2 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 863 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 864 | *Eucalyptus nicholii* | 1 | 10-15 | 5-10 | Poor | Mature | 5-15 | Low | 0.6 | No |
| 865 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.3 | No |
| 866 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 867 | *Corymbia calophylla* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 15-25 | Medium | 0.5 | No |
| 868 | *Eucalyptus grandis* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 869 | *Cupressus sp.* | 2 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 870 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 871 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 872 | *Corymbia citriodora* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 873 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.8 | No |
| 874 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.7 | No |
| 875 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 876 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 877 | *Acacia sp.* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 878 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 879 | *Corymbia calophylla* | 1 | 10-15 | 5-10 | Excellent | Semi-mature | 25+ | High | 0.4 | No |
| 880 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 881 | *Quercus robur* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 25+ | Medium | 0.1 | No |
| 882 | *Corymbia calophylla* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 883 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 884 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 885 | *Corymbia calophylla* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 886 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.7 | No |
| 887 | *Corymbia calophylla* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.3 | No |
| 888 | *Eucalyptus cladocalyx* | 1 | 10-15 | 1-5 | Good | Juvenile | 25+ | Low | 0.2 | No |
| 889 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 890 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 891 | *Unknown* | 1 | 5-10 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 892 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 893 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 894 | *Eucalyptus utilis* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 895 | *Eucalyptus sideroxylon* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Medium | 0.3 | No |
| 896 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 897 | *Eucalyptus sideroxylon* | 1 | 10-15 | 5-10 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 898 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | High | 0.6 | No |
| 899 | *Eucalyptus sideroxylon* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 900 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.1 | No |
| 901 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.5 | No |
| 902 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |
| 903 | *Eucalyptus camaldulensis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 0.7 | No |
| 904 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Excellent | Juvenile | 15-25 | Low | 0.1 | No |
| 905 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 906 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.4 | No |
| 907 | *Eucalyptus globulus* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.9 | No |
| 908 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 909 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 910 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 911 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | Medium | 0.5 | No |
| 912 | *Ulmus parvifolia* | 1 | 5-10 | 10-15 | Average | Mature | 15-25 | Low | 0.5 | No |
| 913 | *Platanus acerifolia* | 1 | 10-15 | 10-15 | Excellent | Mature | 25+ | Medium | 0.5 | No |
| 914 | *Acacia sp.* | 8 | 5-10 | 10-15 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 915 | *Schinus terebinthifolia* | 1 | 5-10 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 916 | *Melia azaderach* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Low | 0.4 | No |
| 917 | *Melia azaderach* | 3 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 918 | *Ficus microcarpa* | 3 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 919 | *Melia azaderach* | 3 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 920 | *Unknown* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 921 | *Liquidambar styraciflua* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.4 | No |
| 922 | *Toona australis* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 923 | *Ulmus parvifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 924 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 925 | *Lagenaria patersonia* | 1 | 10-15 | 5-10 | Good | Mature | 15-25 | Low | 0.5 | No |
| 926 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 927 | *Tipuana tipu* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 928 | *Ulmus parvifolia* | 1 | 5-10 | 5-10 | Excellent | Juvenile | 25+ | Low | 0.2 | No |
| 929 | *Tipuana tipu* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 930 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.4 | No |
| 931 | *Agonis flexuosa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 932 | *Allocasuarina fraseriana* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 933 | *Banksia attenuata* | 1 | 1-5 | 5-10 | Average | Mature | 5-15 | Low | 0.3 | No |
| 934 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.55 | No |
| 935 | *Eucalyptus citriodora* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 936 | *Platanus acerifolia* | 1 | 10-15 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 937 | *Eucalyptus citriodora* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | High | 0.5 | No |
| 938 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.4 | No |
| 939 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.5 | No |
| 940 | *Eucalyptus cladocalyx* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.6 | No |
| 941 | *Eucalyptus marginata* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.6 | No |
| 942 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.6 | No |
| 943 | *Corymbia citriodora* | 1 | 15-20 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 944 | *Eucalyptus grandis* | 1 | 25+ | 10-15 | Good | Mature | 25+ | High | 1.3 | No |
| 945 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.8 | No |
| 946 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.7 | No |
| 947 | *Corymbia citriodora* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 948 | *Eucalyptus marginata* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 949 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 950 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.45 | No |
| 951 | *Corymbia citriodora* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 952 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 953 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Good | Semi-mature | 15-25 | Low | 0.7 | No |
| 954 | *Eucalyptus cladocalyx* | 4 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 955 | *Banksia attenuata* | 2 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 956 | *Corymbia citriodora* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 957 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 958 | *Eucalyptus camaldulensis* | 4 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 959 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 960 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 961 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Medium | 0.4 | No |
| 962 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 963 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 964 | *Eucalyptus marginata* | 1 | 1-5 | 5-10 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 965 | *Eucalyptus marginata* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 966 | *Corymbia citriodora* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 967 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 968 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 969 | *Eucalyptus camaldulensis* | 2 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 970 | *Corymbia citriodora* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 971 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 972 | *Banksia attenuata* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 973 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 974 | *Banksia attenuata* | 2 | 1-5 | 1-5 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 975 | *Acacia sp.* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 976 | *Banksia attenuata* | 2 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 977 | *Platanus acerifolia* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 978 | *Corymbia maculata* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 979 | *Banksia attenuata* | 1 | 5-10 | 1-5 | Average | Mature | 15-25 | Medium | 0.3 | No |
| 980 | *Eucalyptus nicholii* | 1 | 5-10 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 981 | *Corymbia citriodora* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 982 | *Liquidambar styraciflua* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.1 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 983 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 984 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 985 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 986 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 987 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.6 | No |
| 988 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 989 | *Acacia sp.* | 1 | 5-10 | 10-15 | Poor | Mature | 0-5 | Low | 0.8 | No |
| 990 | *Corymbia maculata* | 1 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 991 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 992 | *Araucaria heterophylla* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 993 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Medium | 1.3 | No |
| 994 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 995 | *Cinnamomum camphora* | 1 | 5-10 | 10-15 | Good | Semi-mature | 15-25 | Low | 0.6 | No |
| 996 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Average | Mature | 25+ | Low | 0.7 | No |
| 997 | *Eucalyptus cladocalyx* | 1 | 10-15 | 1-5 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 998 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.4 | No |
| 999 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1000 | *Corymbia ficifolia* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 1017 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1019 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 1020 | *Eucalyptus cladocalyx* | 1 | 10-15 | 1-5 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 1021 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 1022 | *Fraxinus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 1023 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 1024 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.5 | No |
| 1025 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 1026 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 1027 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Medium | 0.7 | No |
| 1028 | *Eucalyptus nicholii* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | Medium | 0.6 | No |
| 1029 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Medium | 0.35 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1030 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.7 | No |
| 1031 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 1032 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.6 | No |
| 1033 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | Medium | 0.55 | No |
| 1034 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1035 | *Platanus acerifolia* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1036 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1037 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | Medium | 0.5 | No |
| 1038 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1039 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1040 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 15-25 | Medium | 0.7 | No |
| 1041 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 1042 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.8 | No |
| 1043 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1044 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1045 | *Brachychiton acerifolius* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1046 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Average | Mature | 15-25 | Medium | 0.6 | No |
| 1047 | *Liquidambar styraciflua* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 1048 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1049 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1050 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 1051 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1052 | *Melia azaderach* | 1 | 5-10 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.3 | No |
| 1053 | *Unknown* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1054 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 15-25 | Medium | 0.6 | No |
| 1055 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 1056 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 1057 | *Araucaria heterophylla* | 1 | 10-15 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 1058 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1059 | *Acacia sp.* | 1 | 10-15 | 5-10 | Poor | Mature | 0-5 | Low | 0.6 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1060 | *Corymbia maculata* | 1 | 15-20 | 5-10 | Good | Mature | 25+ | Medium | 0.5 | No |
| 1061 | *Eucalyptus camaldulensis* | 1 | 15-20 | 15-20 | Good | Mature | 25+ | High | 0.8 | No |
| 1063 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 1064 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | Medium | 0.8 | No |
| 1065 | *Melia azaderach* | 2 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1066 | *Unknown* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 1067 | *Corymbia citriodora* | 1 | 15-20 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 1068 | *Eucalyptus leucoxylon* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1069 | *Platanus acerifolia* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1070 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 1071 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 25+ | Medium | 0.8 | No |
| 1072 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 1073 | *Unknown* | 1 | 5-10 | 10-15 | Good | Mature | 15-25 | Low | 0.5 | No |
| 1074 | *Tipuana tipu* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1075 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Good | Mature | 15-25 | Medium | 1 | No |
| 1076 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Average | Mature | 15-25 | Low | 0.55 | No |
| 1077 | *Brachychiton acerifolius* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1078 | *Callistemon sp.* | 1 | 5-10 | 1-5 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 1079 | *Corymbia citriodora* | 1 | 10-15 | 5-10 | Good | Juvenile | 25+ | Low | 0.5 | No |
| 1080 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 1081 | *Acacia sp.* | 3 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1082 | *Eucalyptus grandis* | 4 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1083 | *Liquidambar styraciflua* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1084 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1085 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 25+ | Low | 0.3 | No |
| 1086 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 1087 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1088 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 1089 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1090 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1091 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Medium | 0.3 | No |
| 1092 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 1093 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.2 | No |
| 1094 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1095 | *Eucalyptus patens* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1096 | *Eucalyptus camaldulensis* | 1 | 10-15 | 15-20 | Good | Mature | 25+ | High | 0.8 | No |
| 1097 | *Corymbia citriodora* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.3 | No |
| 1098 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 1099 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Average | Mature | 15-25 | Low | 0.8 | No |
| 1100 | *Lagenaria patersonia* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 1101 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 25+ | Medium | 0.9 | No |
| 1102 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.3 | No |
| 1103 | *Eucalyptus camaldulensis* | 3 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 1104 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1105 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.5 | No |
| 1106 | *Callistemon sp.* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1107 | *Ulmus parvifolia* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1108 | *Corymbia calophylla* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Medium | 0.3 | No |
| 1109 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 1110 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Medium | 0.7 | No |
| 1111 | *Ficus microcarpa* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 1112 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 1113 | *Eucalyptus cladocalyx* | 3 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 1114 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 1115 | *Eucalyptus nicholii* | 1 | 5-10 | 5-10 | Dead | Semi-mature | 0-5 | Low | 0.4 | No |
| 1116 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.3 | No |
| 1117 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Excellent | Mature | 25+ | Medium | 0.4 | No |
| 1118 | *Unknown* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.1 | No |
| 1119 | *Araucaria heterophylla* | 1 | 10-15 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 1120 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Medium | 0.7 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1121 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1122 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Medium | 0.6 | No |
| 1123 | *Acacia sp.* | 1 | 10-15 | 5-10 | Good | Semi-mature | 5-15 | Low | 0.5 | No |
| 1124 | *Ficus microcarpa* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 1125 | *Acacia sp.* | 1 | 10-15 | 5-10 | Average | Mature | 5-15 | Low | 0.7 | No |
| 1126 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1127 | *Eucalyptus sp.* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 1128 | *Acacia sp.* | 1 | 10-15 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 1129 | *Eucalyptus grandis* | 1 | 15-20 | 5-10 | Good | Juvenile | 15-25 | Low | 0.4 | No |
| 1130 | *Acacia sp.* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1131 | *Eucalyptus cladocalyx* | 3 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1132 | *Eucalyptus grandis* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1133 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 25+ | High | 0.8 | No |
| 1134 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |
| 1135 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 1136 | *Toona australis* | 1 | 5-10 | 5-10 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 1137 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.8 | No |
| 1138 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.4 | No |
| 1139 | *Corymbia citriodora* | 1 | 15-20 | 10-15 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1140 | *Cinnamomum camphora* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 1141 | *Eucalyptus leucoxylon* | 1 | 5-10 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1142 | *Eucalyptus grandis* | 1 | 15-20 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.5 | No |
| 1143 | *Corymbia citriodora* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 1145 | *Ficus microcarpa* | 1 | 5-10 | 10-15 | Good | Semi-mature | 15-25 | Low | 0.6 | No |
| 1146 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.25 | No |
| 1147 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1148 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.35 | No |
| 1149 | *Corymbia ficifolia* | 1 | 1-5 | 5-10 | Average | Juvenile | 15-25 | Low | 0.35 | No |
| 1150 | *Melia azaderach* | 1 | 1-5 | 5-10 | Poor | Juvenile | 5-15 | Low | 0.3 | No |
| 1151 | *Cupressus sempervirens* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.15 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1152 | *Araucaria heterophylla* | 1 | 10-15 | 5-10 | Average | Juvenile | 15-25 | Low | 0.35 | No |
| 1153 | *Eucalyptus grandis* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.25 | No |
| 1154 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.2 | No |
| 1155 | *Schinus molle* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.45 | No |
| 1156 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.3 | No |
| 1157 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.35 | No |
| 1158 | *Liquidambar styraciflua* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.15 | No |
| 1159 | *Eucalyptus platypus* | 1 | 1-5 | 5-10 | Good | Juvenile | 15-25 | Low | 0.3 | No |
| 1160 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.25 | No |
| 1161 | *Melia azaderach* | 1 | 10-15 | 10-15 | Average | Mature | 5-15 | Low | 0.5 | No |
| 1162 | *Eucalyptus leucoxylon* | 1 | 1-5 | 1-5 | Average | Juvenile | 5-15 | Low | 0.15 | No |
| 1163 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Excellent | Semi-mature | 25+ | Medium | 0.45 | No |
| 1164 | *Ulmus parvifolia* | 1 | 5-10 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.35 | No |
| 1165 | *Fraxinus sp.* | 1 | 5-10 | 10-15 | Average | Mature | 15-25 | Medium | 0.4 | No |
| 1166 | *Unknown* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.25 | No |
| 1167 | *Unknown* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.15 | No |
| 1168 | *Cupressus sp.* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.35 | No |
| 1169 | *Eucalyptus grandis* | 1 | 20-25 | 15-20 | Average | Mature | 15-25 | Medium | 0.65 | No |
| 1170 | *Olea europaea* | 1 | 5-10 | 5-10 | Excellent | Semi-mature | 25+ | Low | 0.3 | No |
| 1171 | *Melia azaderach* | 1 | 10-15 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.35 | No |
| 1172 | *Agonis flexuosa* | 1 | 5-10 | 10-15 | Good | Mature | 25+ | Medium | 0.7 | No |
| 1173 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1174 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Good | Semi-mature | 25+ | Medium | 0.4 | No |
| 1175 | *Eucalyptus cladocalyx* | 1 | 10-15 | 5-10 | Good | Juvenile | 15-25 | Low | 0.35 | No |
| 1176 | *Cupressus sp.* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.45 | No |
| 1177 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 1178 | *Eucalyptus grandis* | 1 | 5-10 | 1-5 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 1179 | *Agonis flexuosa* | 1 | 5-10 | 5-10 | Average | Mature | 15-25 | Low | 0.6 | No |
| 1180 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1181 | *Schinus terebinthifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.4 | No |

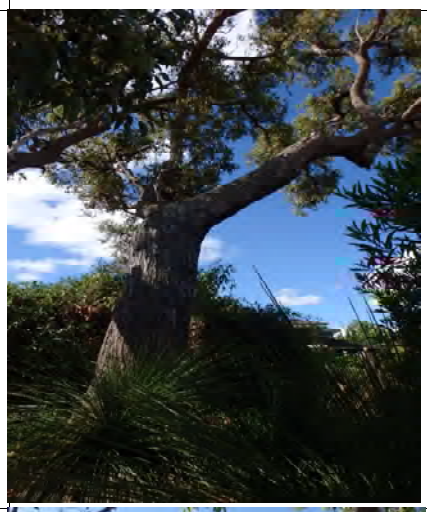
| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1182 | *Erythrina sykseii* | 1 | 10-15 | 10-15 | Excellent | Mature | 15-25 | Low | 0.65 | No |
| 1183 | *Eucalyptus nicholii* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 1184 | *Acacia sp.* | 1 | 10-15 | 5-10 | Poor | Mature | 0-5 | Low | 0.8 | No |
| 1185 | *Platanus acerifolia* | 1 | 10-15 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.5 | No |
| 1186 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.75 | No |
| 1187 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 25+ | Medium | 0.85 | No |
| 1188 | *Melia azaderach* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.25 | No |
| 1189 | *Liquidambar styraciflua* | 1 | 5-10 | 5-10 | Excellent | Juvenile | 15-25 | Medium | 0.3 | No |
| 1190 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Good | Mature | 15-25 | Low | 0.5 | No |
| 1191 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1192 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 1193 | *Eucalyptus grandis* | 1 | 20-25 | 10-15 | Good | Mature | 25+ | Medium | 1.35 | No |
| 1194 | *Brachychiton acerifolius* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 1195 | *Melia azaderach* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.45 | No |
| 1196 | *Fraxinus sp.* | 1 | 5-10 | 10-15 | Good | Semi-mature | 15-25 | Medium | 0.35 | No |
| 1197 | *Platanus acerifolia* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.6 | No |
| 1198 | *Unknown* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.35 | No |
| 1199 | *Araucaria heterophylla* | 1 | 10-15 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1200 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 5-15 | Low | 0.35 | No |
| 1201 | *Liquidambar styraciflua* | 1 | 5-10 | 1-5 | Good | Juvenile | 5-15 | Low | 0.25 | No |
| 1202 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Mature | 0-5 | Low | 0.6 | No |
| 1203 | *Ficus microcarpa* | 1 | 10-15 | 10-15 | Good | Mature | 15-25 | Medium | 0.5 | No |
| 1204 | *Corymbia maculata* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.45 | No |
| 1205 | *Washingtonia robusta* | 1 | 10-15 | 1-5 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 1206 | *Eucalyptus patens* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1207 | *Brachychiton acerifolius* | 1 | 5-10 | 1-5 | Poor | Juvenile | 0-5 | Low | 0.25 | No |
| 1208 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.45 | No |
| 1209 | *Corymbia maculata* | 1 | 10-15 | 5-10 | Good | Mature | 25+ | Medium | 0.45 | No |
| 1210 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.2 | No |
| 1211 | *Platanus acerifolia* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.25 | No |

| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1212 | *Eucalyptus sp.* | 1 | 10-15 | 1-5 | Excellent | Juvenile | 25+ | Low | 0.25 | No |
| 1213 | *Corymbia ficifolia* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1214 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Average | Semi-mature | 15-25 | Medium | 0.4 | No |
| 1215 | *Corymbia maculata* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.55 | No |
| 1216 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Good | Semi-mature | 25+ | Medium | 0.65 | No |
| 1217 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Semi-mature | 25+ | Medium | 0.5 | No |
| 1218 | *Eucalyptus camaldulensis* | 1 | 10-15 | 10-15 | Average | Semi-mature | 15-25 | Low | 0.5 | No |
| 1219 | *Eucalyptus camaldulensis* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 1220 | *Eucalyptus camaldulensis* | 1 | 10-15 | 15-20 | Good | Mature | 25+ | High | 1 | No |
| 1221 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.15 | No |
| 1222 | *Eucalyptus camaldulensis* | 1 | 10-15 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1223 | *Unknown* | 1 | 1-5 | 5-10 | Average | Juvenile | 5-15 | Low | 0.15 | No |
| 1224 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.3 | No |
| 1225 | *Corymbia calophylla* | 1 | 10-15 | 10-15 | Average | Mature | 15-25 | Medium | 0.55 | No |
| 1226 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.15 | No |
| 1227 | *Cinnamomum camphora* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.35 | No |
| 1228 | *Corymbia ficifolia* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.5 | No |
| 1229 | *Corymbia citriodora* | 1 | 5-10 | 5-10 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 1230 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.2 | No |
| 1231 | *Eucalyptus cladocalyx* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1232 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Juvenile | 5-15 | Low | 0.25 | No |
| 1233 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Average | Juvenile | 15-25 | Low | 0.25 | No |
| 1234 | *Eucalyptus camaldulensis* | 1 | 10-15 | 5-10 | Average | Semi-mature | 15-25 | Low | 0.4 | No |
| 1237 | *Eucalyptus cladocalyx* | 1 | 5-10 | 5-10 | Good | Juvenile | 15-25 | Low | 0.35 | No |
| 1238 | *Eucalyptus patens* | 1 | 5-10 | 5-10 | Average | Juvenile | 5-15 | Low | 0.4 | No |
| 1239 | *Unknown* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.65 | No |
| 1240 | *Melia azaderach* | 1 | 5-10 | 5-10 | Good | Semi-mature | 15-25 | Low | 0.5 | No |
| 1241 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.2 | No |
| 1242 | *Corymbia maculata* | 1 | 15-20 | 10-15 | Excellent | Mature | 15-25 | Medium | 0.5 | No |
| 1243 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Average | Mature | 5-15 | Low | 0.6 | No |

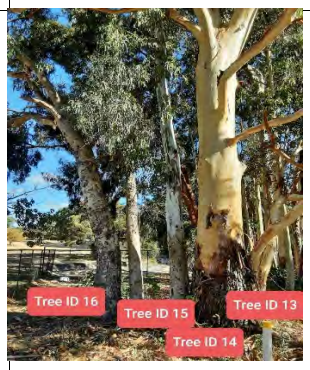
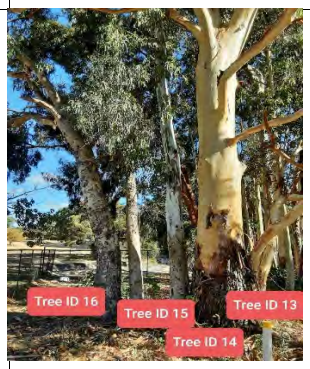
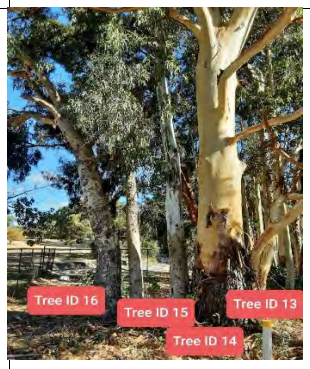
| Tag No. | Species name | No. Individuals | Height (m) | Width (m) | Health | Age | ULE | Retention Value | DBH (m) | Black cockatoo habitat tree |
|---|---|---|---|---|---|---|---|---|---|---|
| 1244 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.55 | No |
| 1245 | *Corymbia ficifolia* | 1 | 5-10 | 1-5 | Average | Juvenile | 5-15 | Low | 0.2 | No |
| 1246 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Poor | Semi-mature | 0-5 | Low | 0.45 | No |
| 1247 | *Eucalyptus leucoxylon* | 1 | 10-15 | 10-15 | Good | Mature | 25+ | Medium | 0.5 | No |
| 1248 | *Eucalyptus platypus* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.25 | No |
| 1249 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.25 | No |
| 1250 | *Eucalyptus camaldulensis* | 1 | 5-10 | 1-5 | Poor | Juvenile | 5-15 | Low | 0.25 | No |
| 1251 | *Erythrina sykseii* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.55 | No |
| 1252 | *Eucalyptus leucoxylon* | 1 | 5-10 | 5-10 | Poor | Semi-mature | 0-5 | Low | 0.4 | No |
| 1253 | *Jacaranda mimosifolia* | 1 | 5-10 | 5-10 | Good | Semi-mature | 5-15 | Low | 0.3 | No |
| 1254 | *Melia azaderach* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.5 | No |
| 1255 | *Lagenaria patersonia* | 1 | 5-10 | 1-5 | Good | Juvenile | 5-15 | Low | 0.2 | No |
| 1256 | *Unknown* | 1 | 5-10 | 5-10 | Average | Semi-mature | 5-15 | Low | 0.3 | No |
| 1257 | *Eucalyptus sp.* | 1 | 5-10 | 5-10 | Poor | Mature | 5-15 | Low | 0.6 | No |
| 1258 | *Acacia sp.* | 1 | 5-10 | 5-10 | Poor | Juvenile | 0-5 | Low | 0.25 | No |

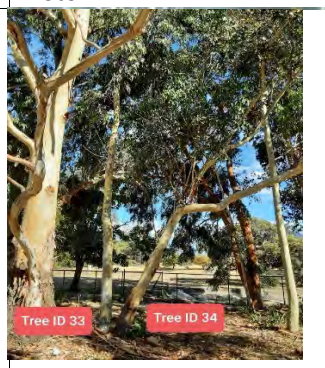
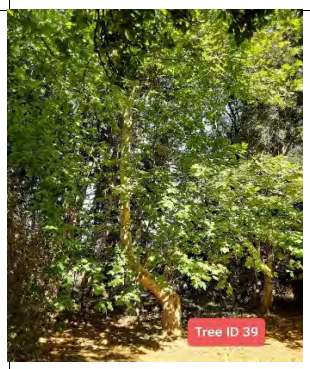
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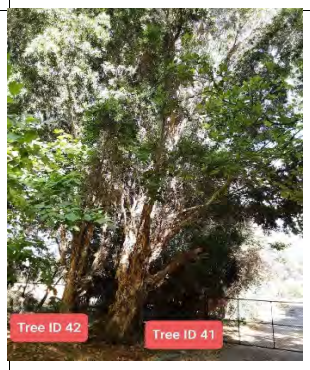
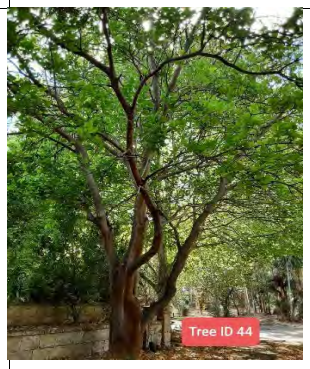
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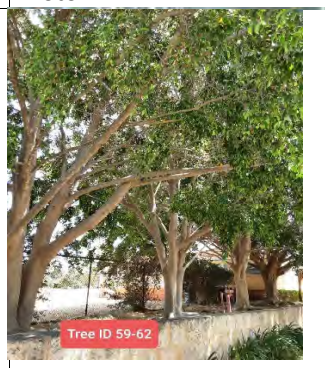
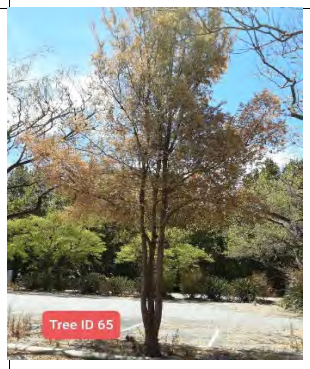
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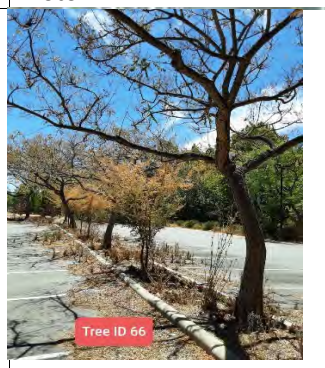
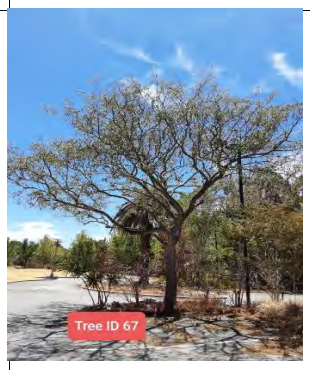
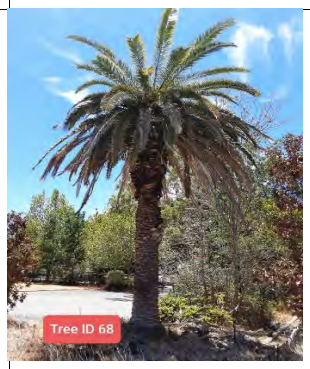
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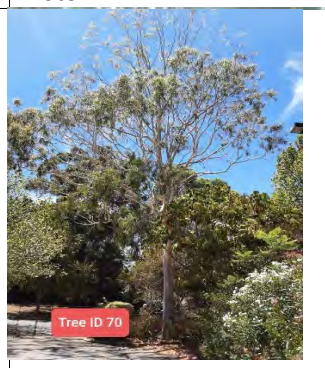
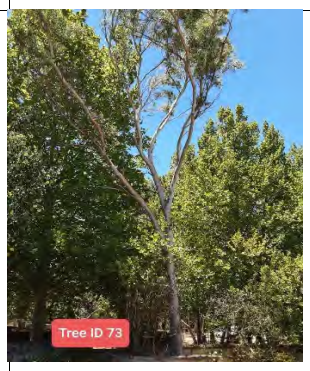
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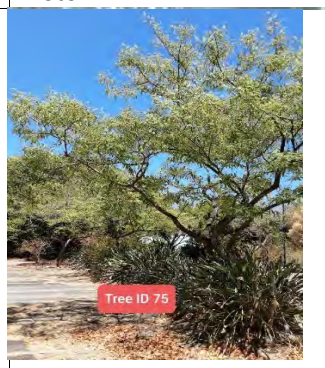
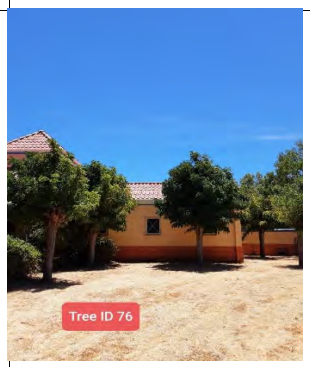
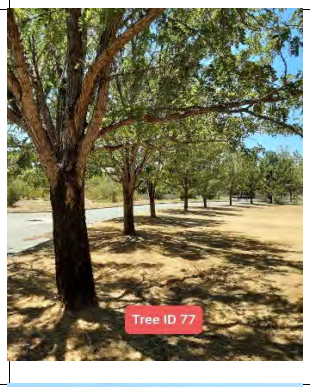
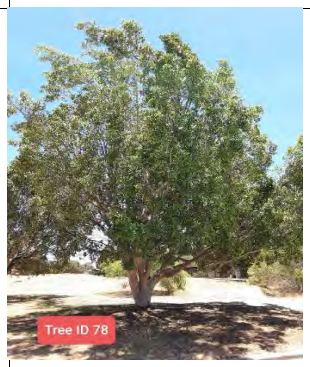
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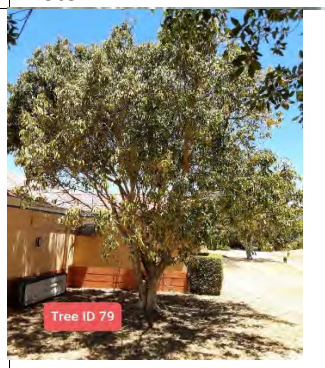
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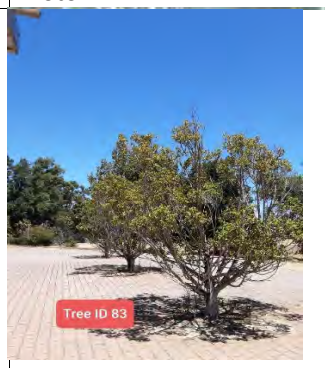
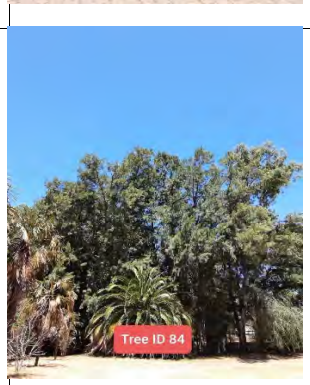
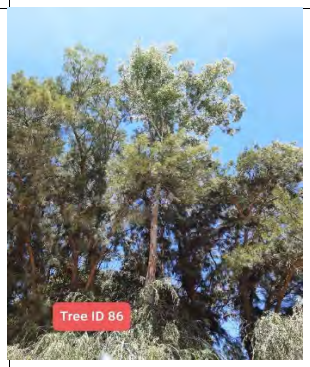
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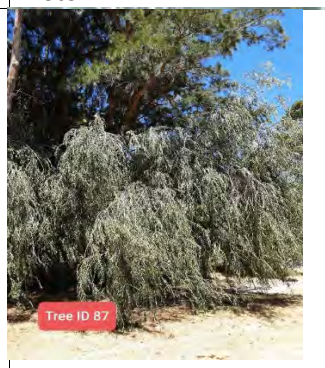
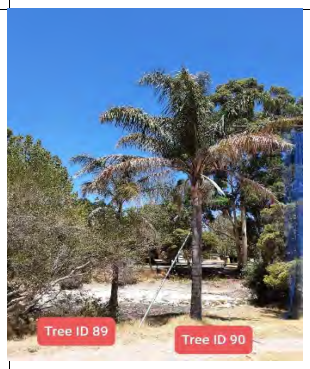
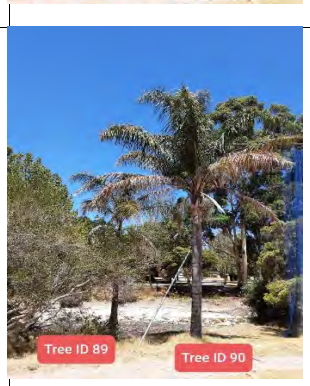
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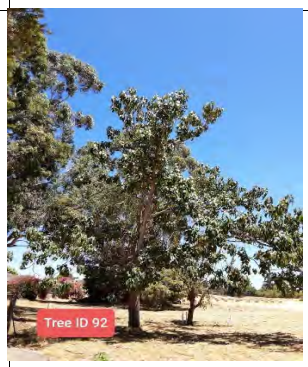
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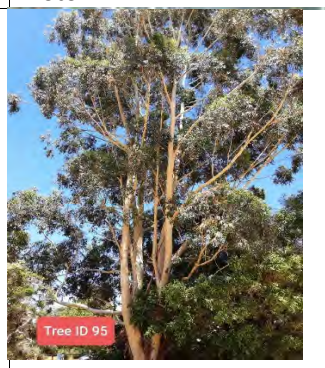
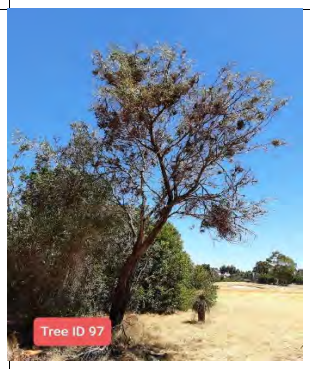
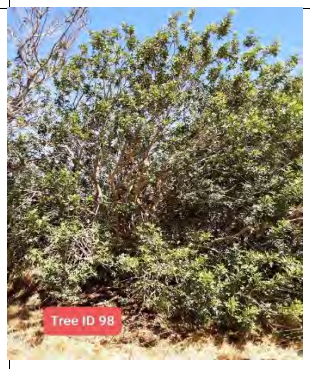
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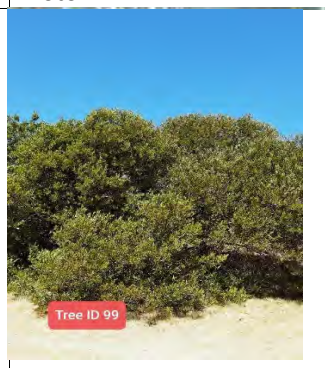
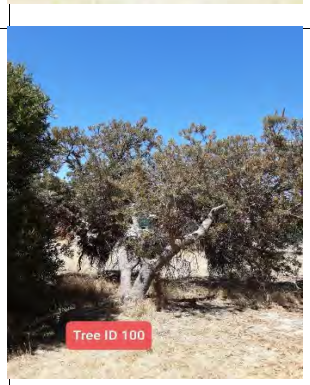
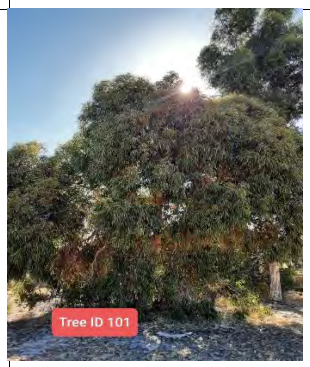
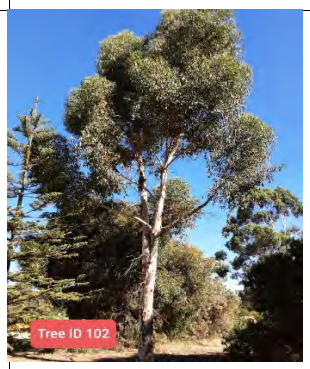
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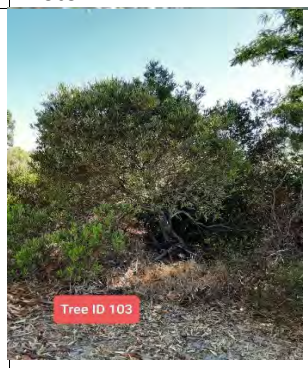
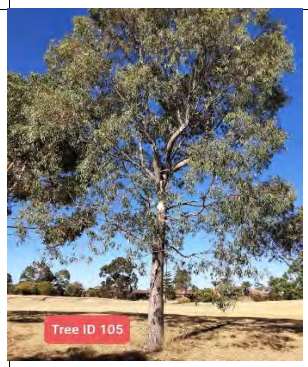
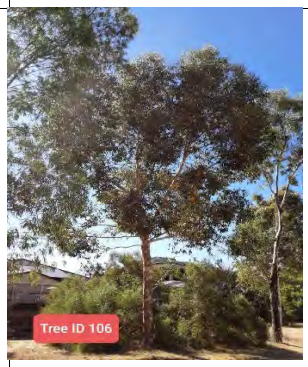
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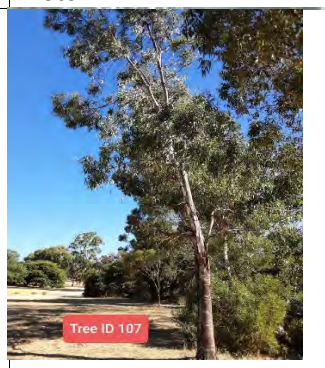
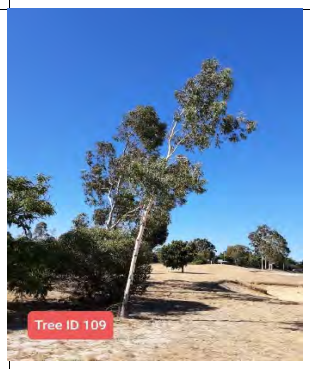
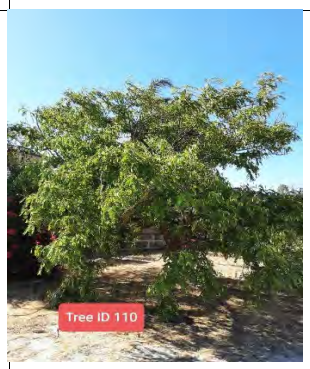
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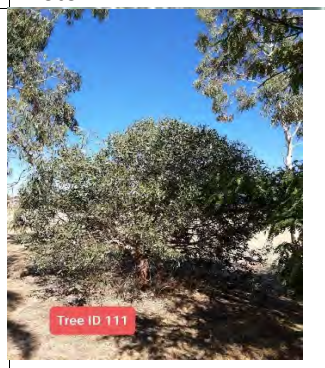
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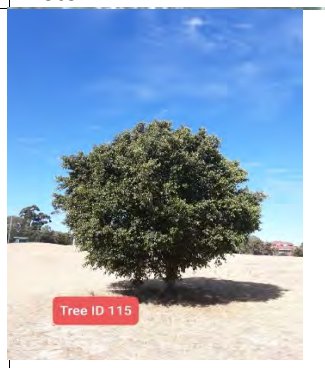
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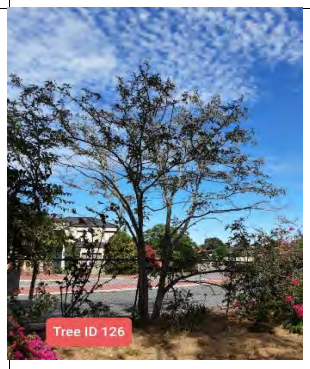
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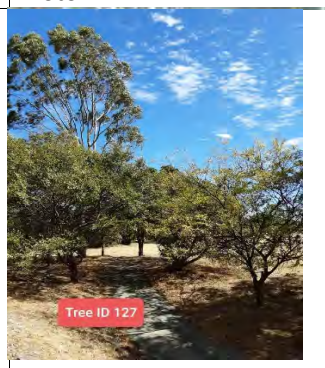
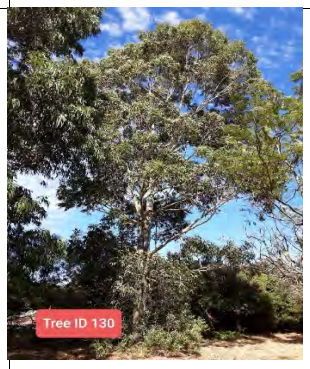
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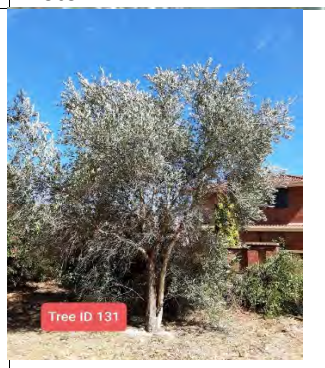
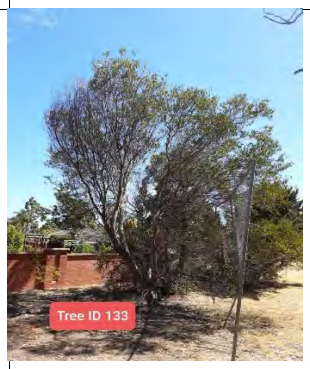
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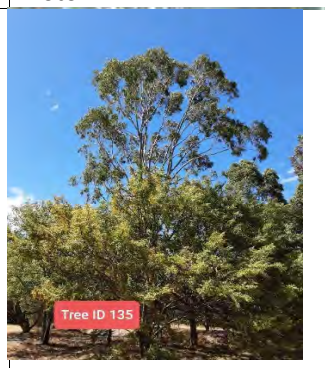
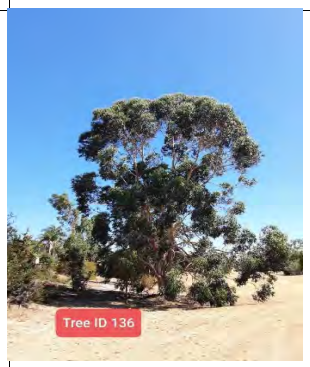
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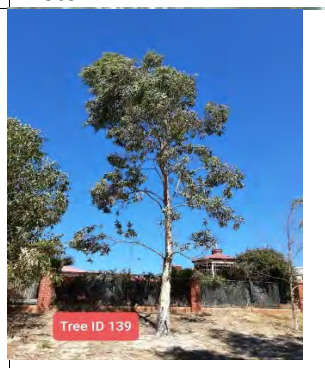
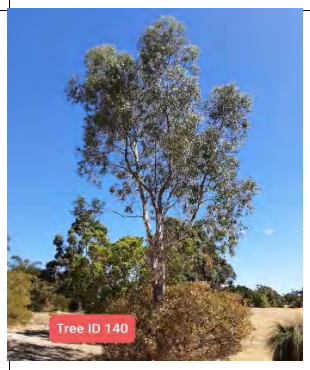
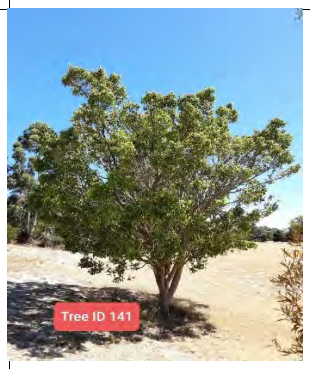
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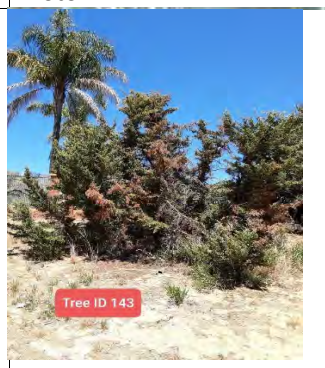
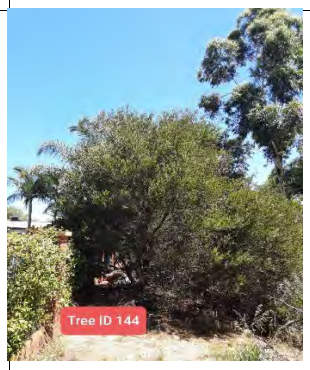
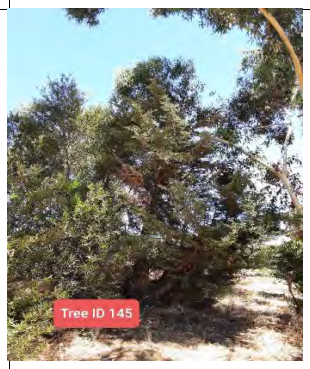
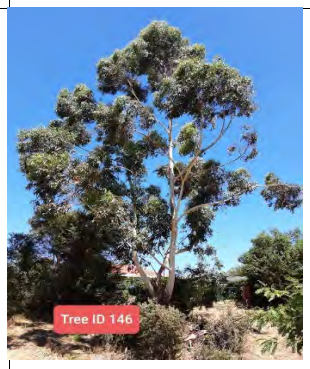
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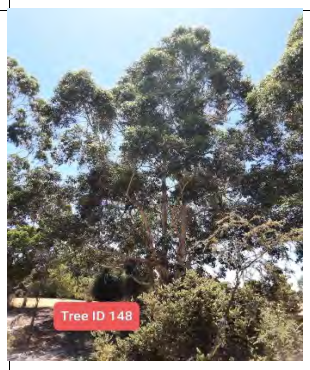
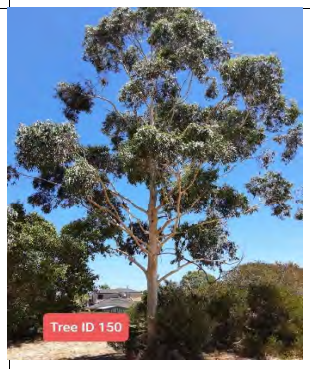
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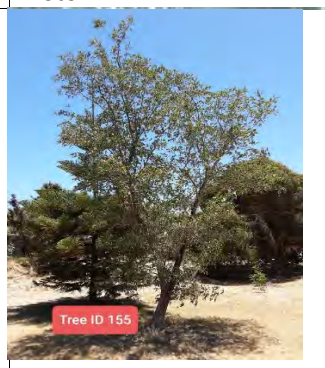
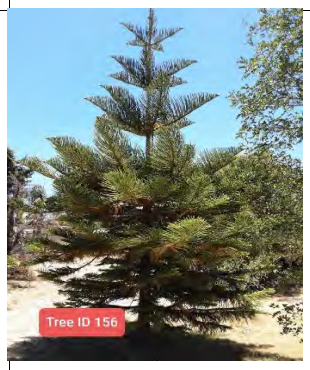
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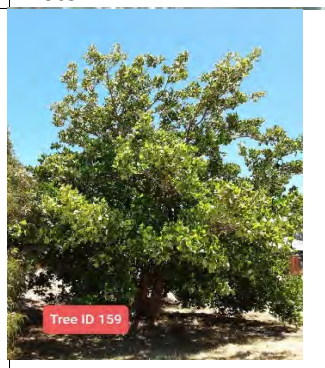
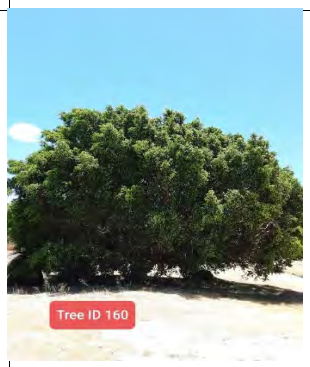
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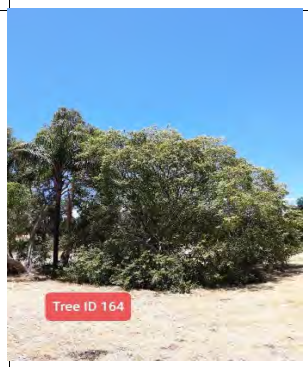
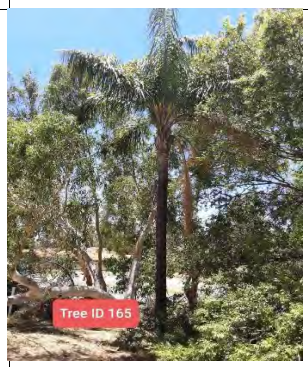
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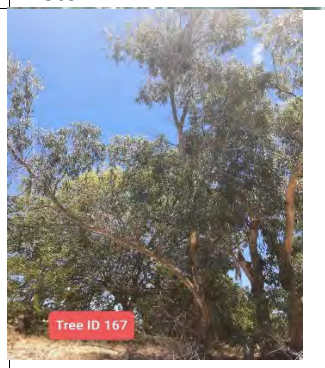
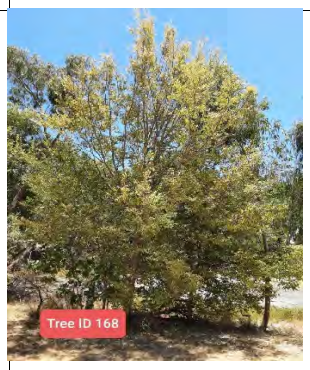
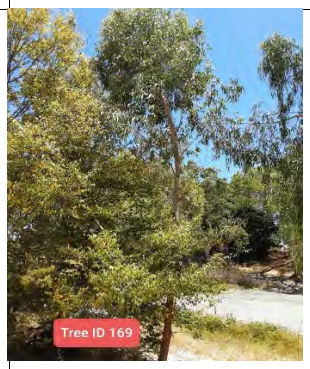
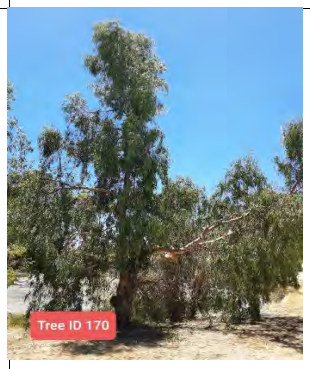
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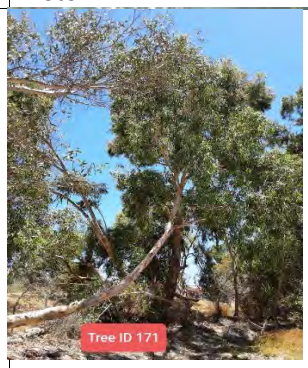
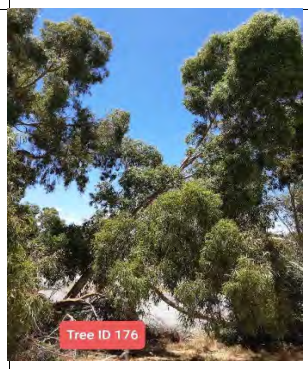
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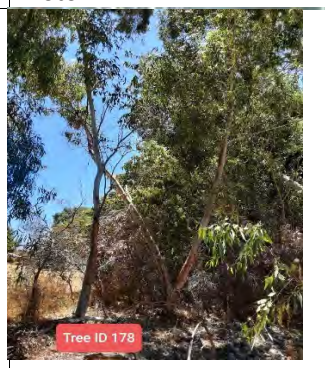
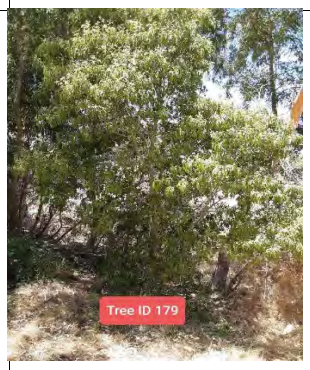
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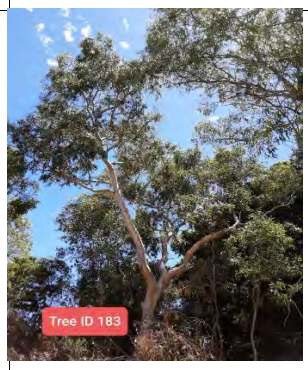
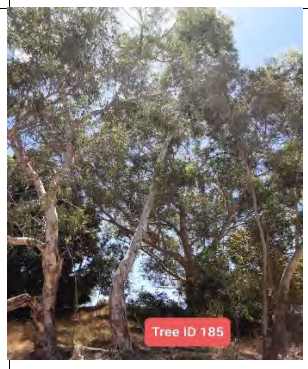
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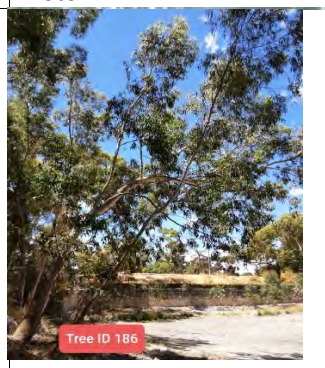
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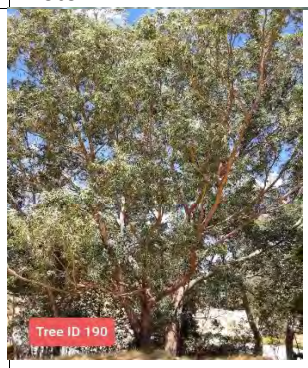
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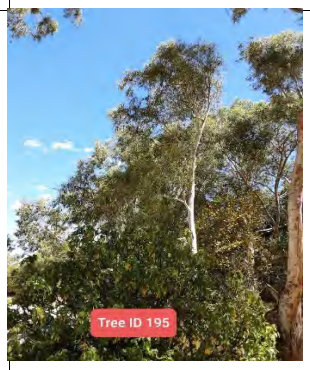
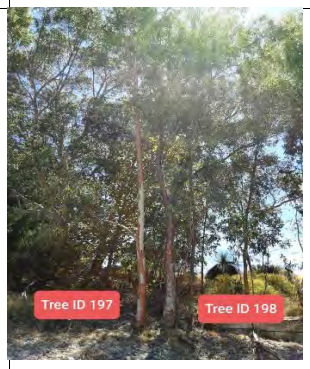
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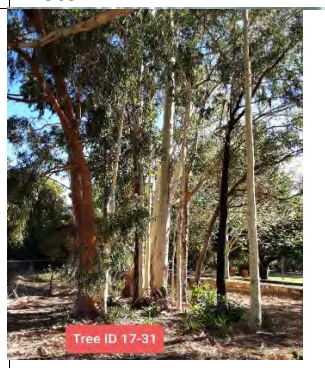
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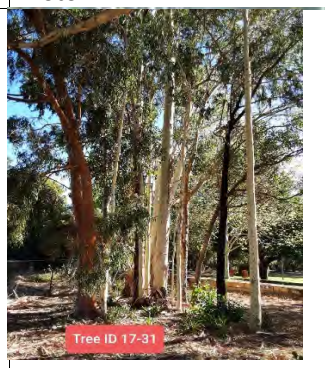
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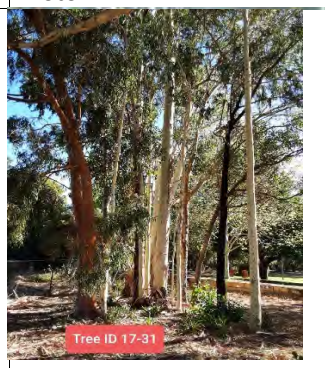
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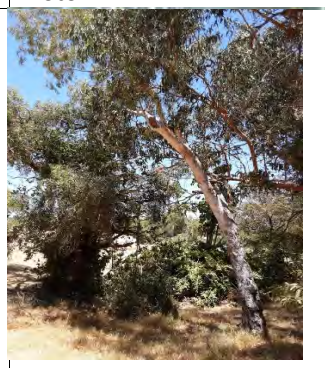
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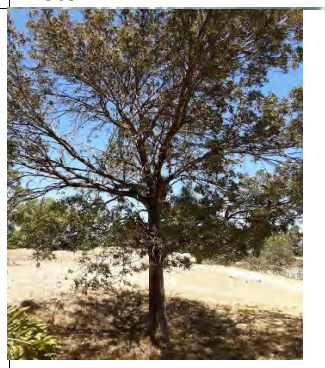
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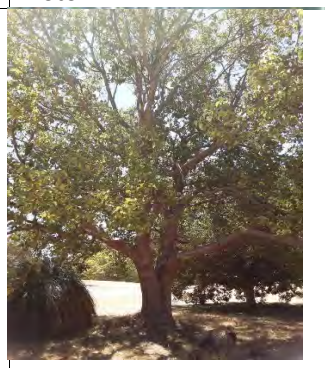
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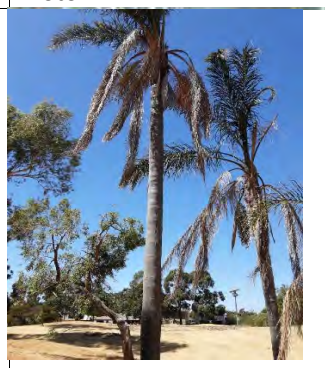
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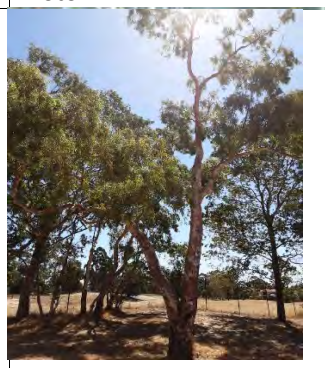
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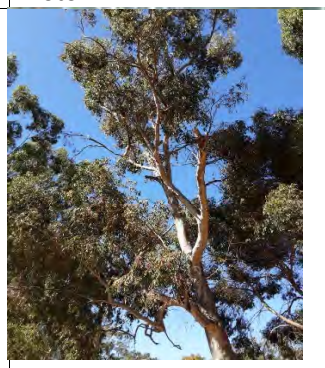
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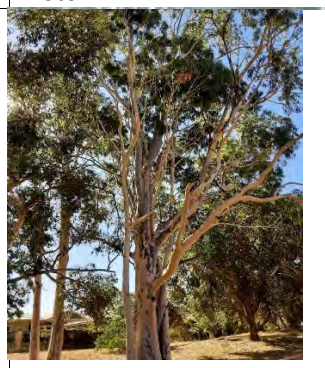
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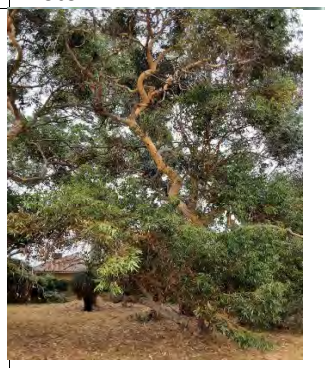
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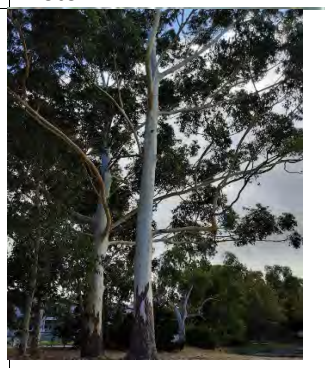
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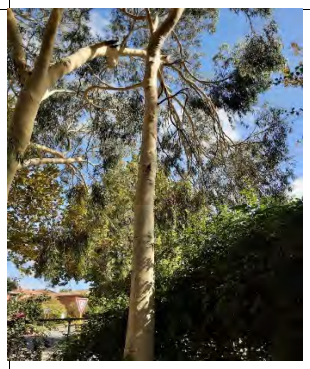
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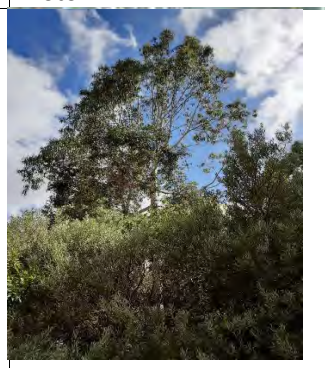
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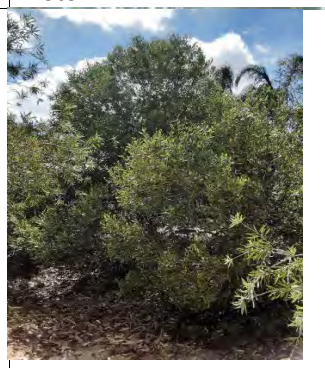
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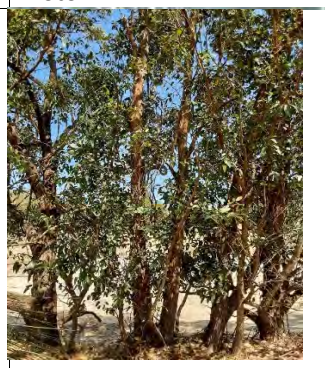
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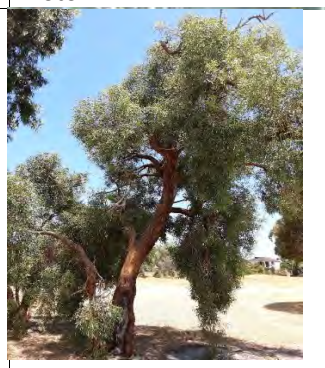
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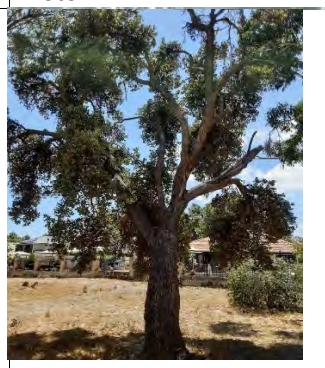
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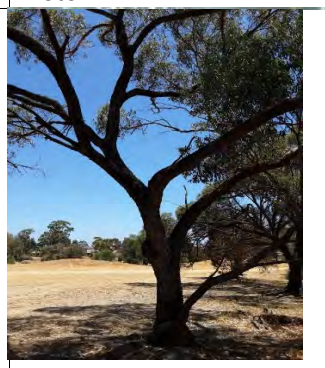
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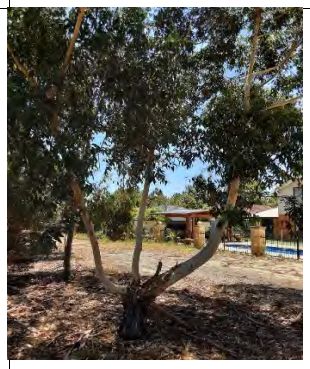
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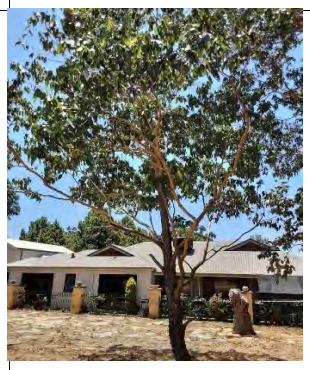
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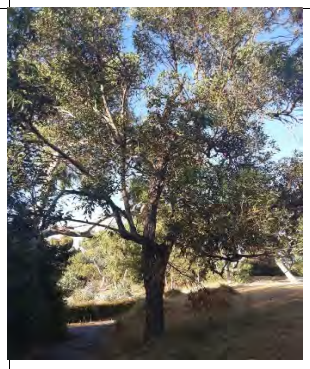
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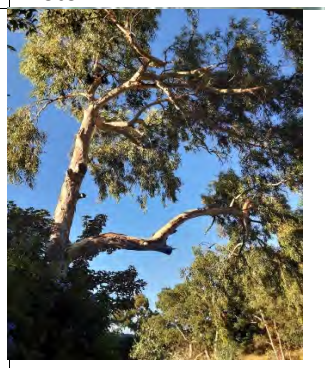
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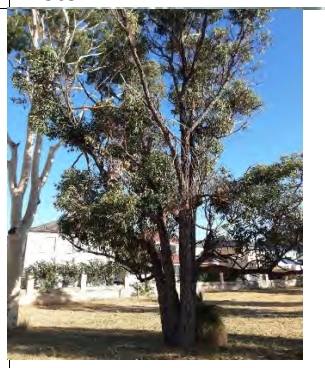
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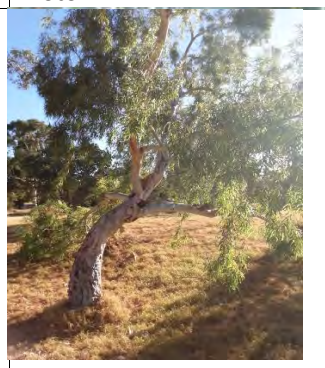
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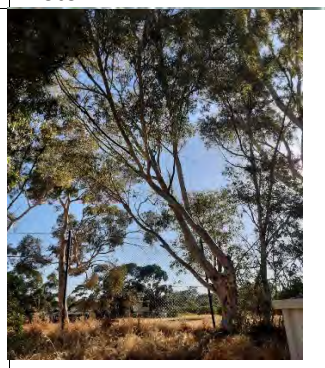
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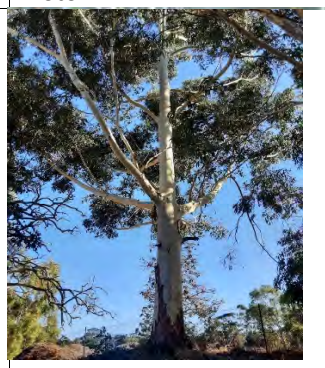
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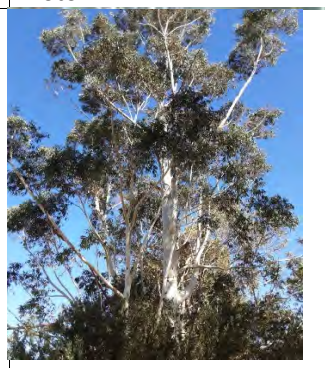
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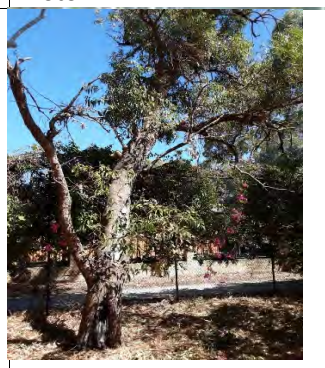
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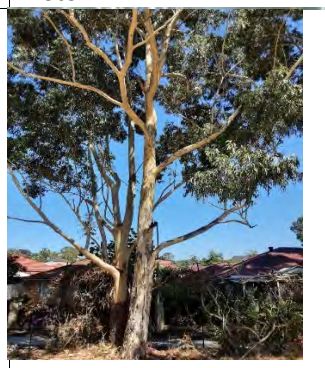
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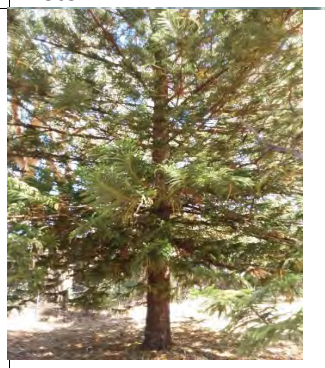
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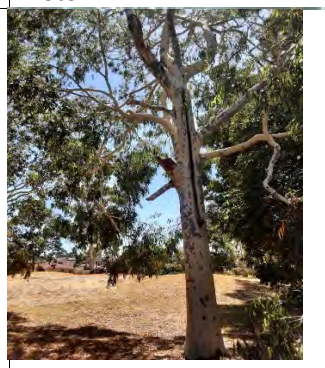
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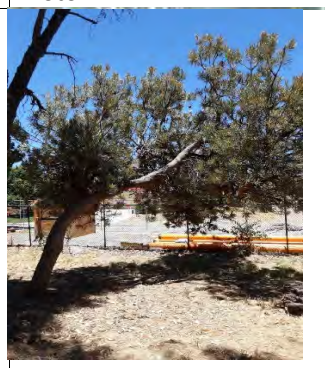
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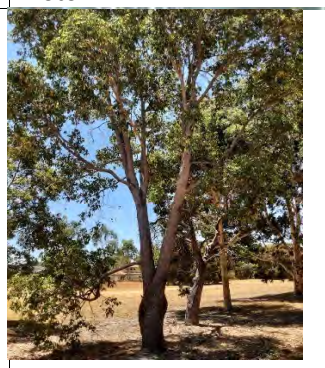
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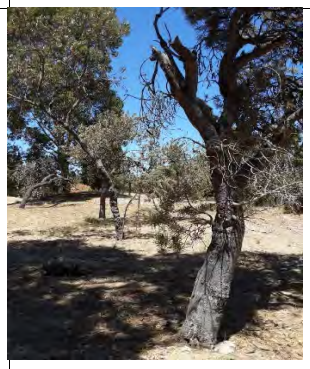
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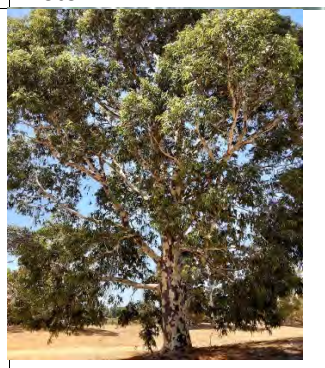
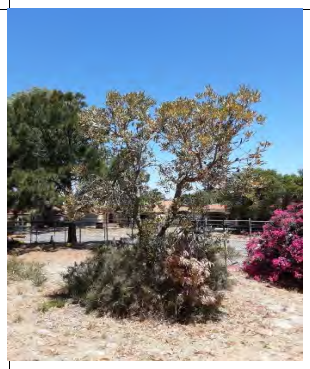
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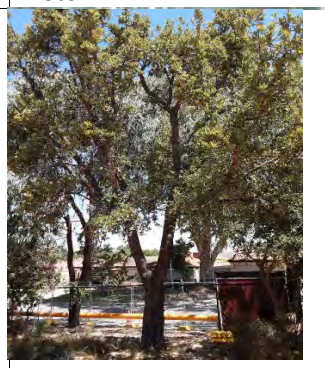
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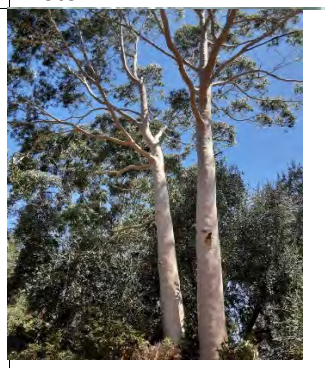
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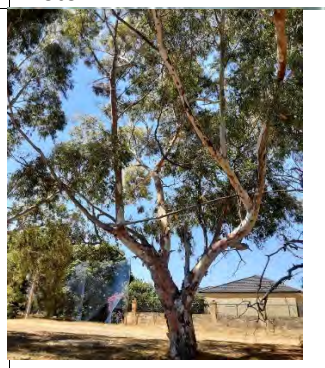
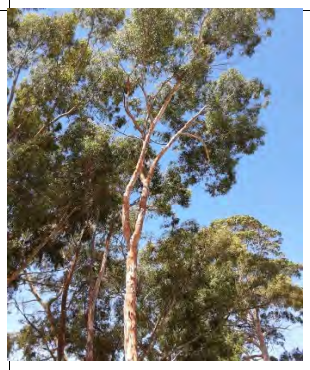
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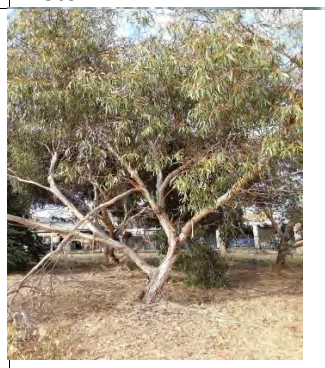
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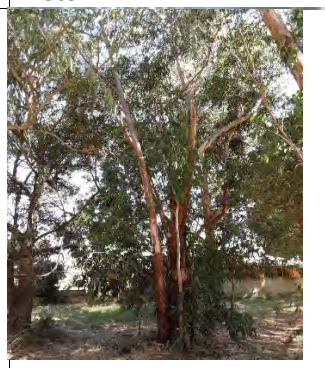
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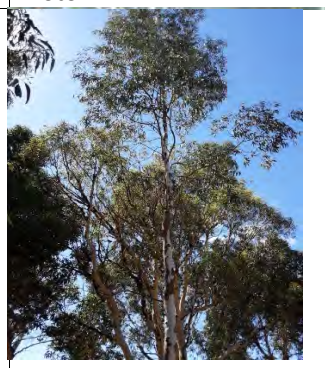
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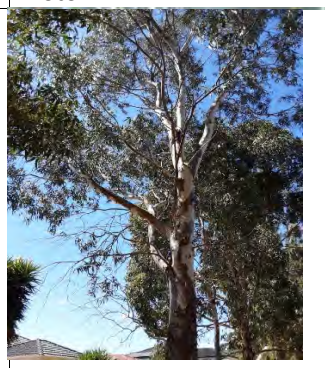
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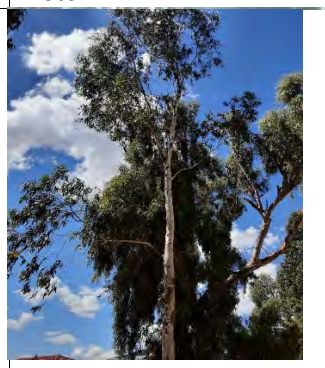
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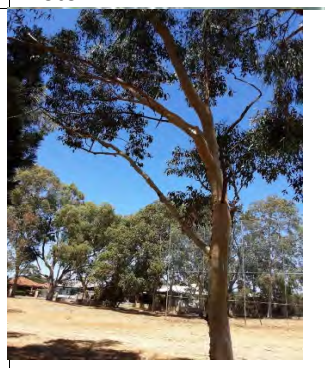
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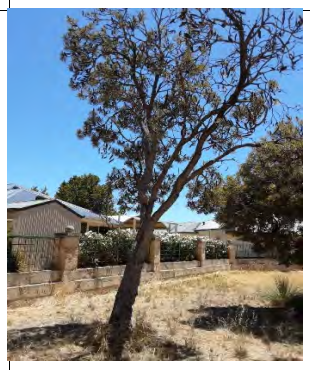
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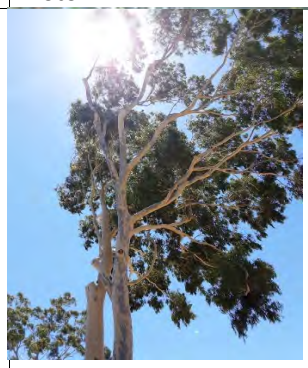
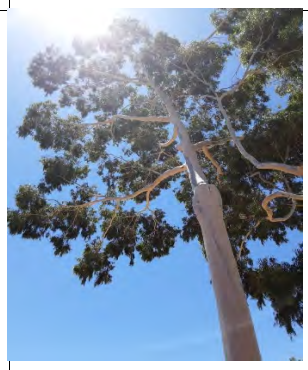
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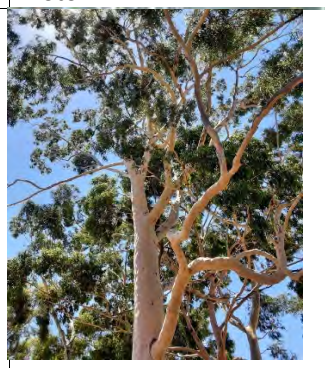
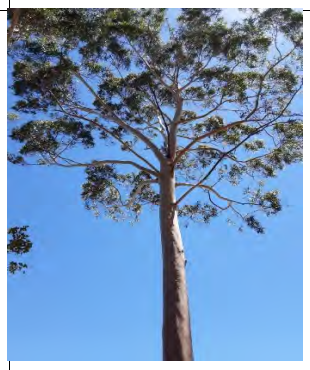
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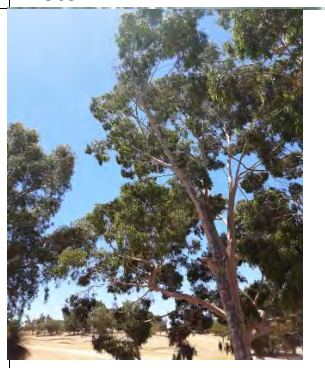
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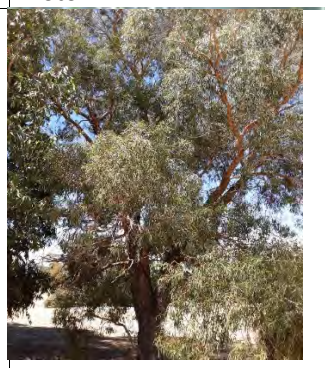
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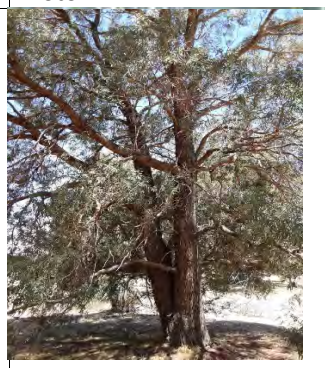
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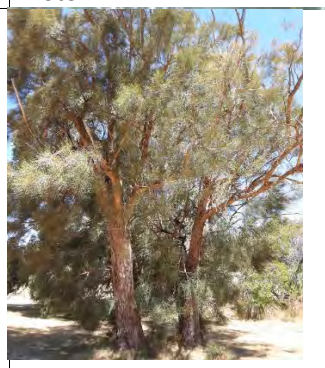
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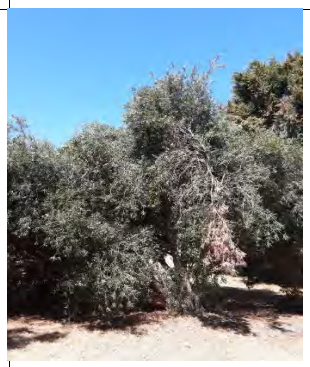
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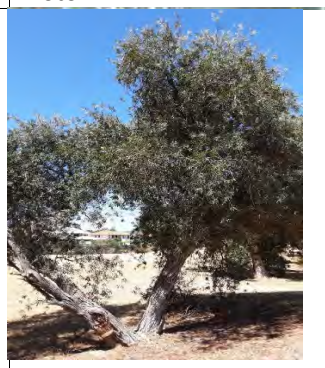
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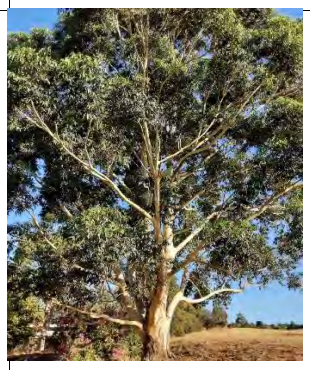
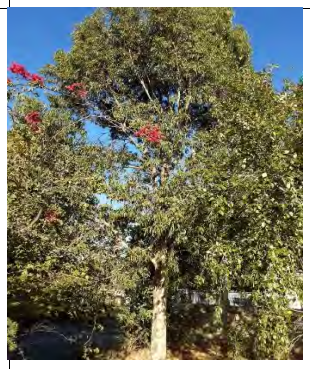
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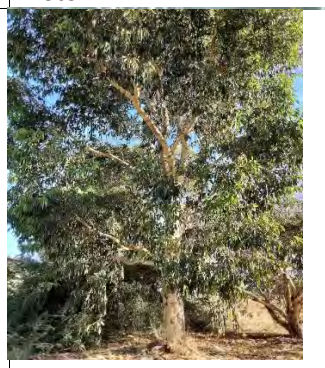
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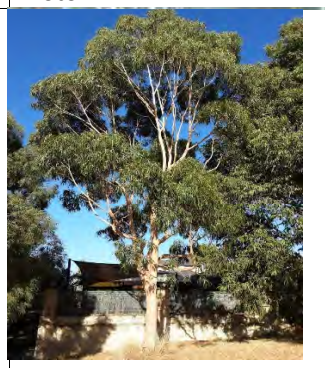
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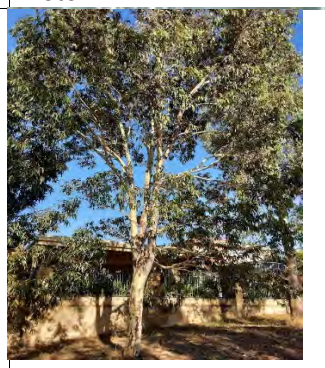
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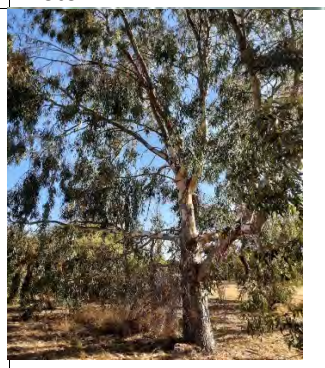
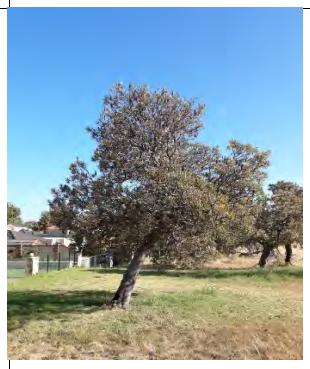
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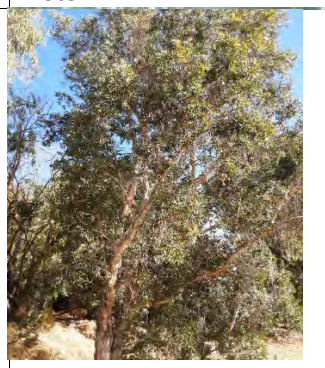
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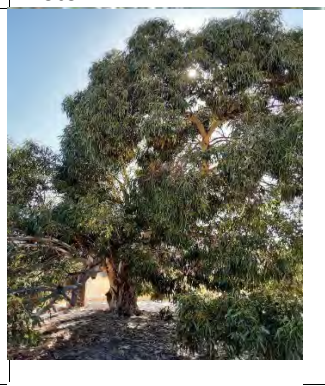
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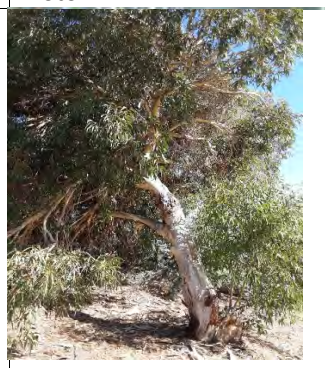
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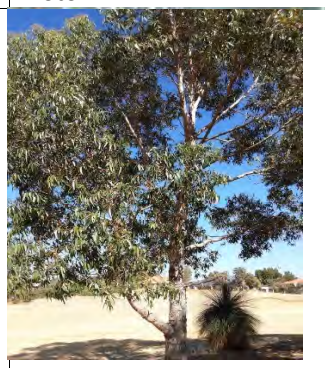
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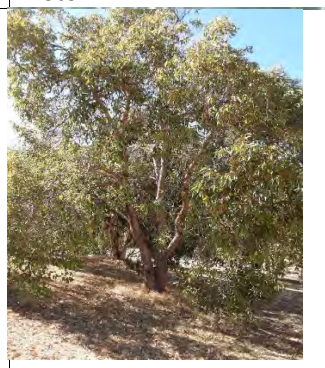
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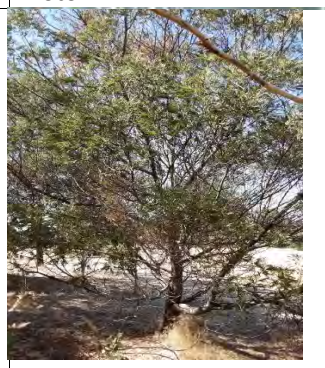
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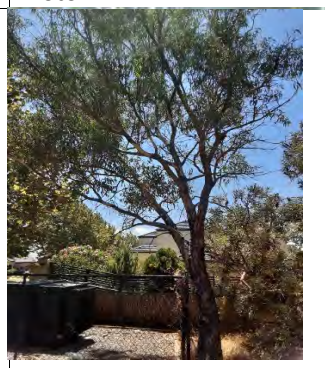
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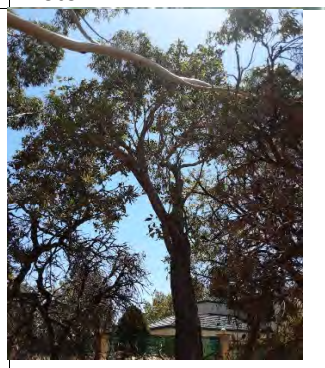
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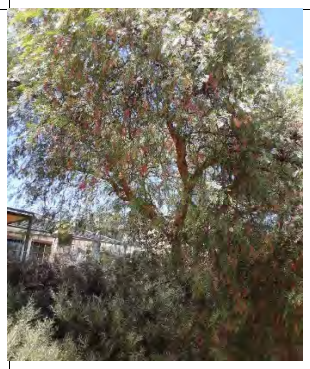
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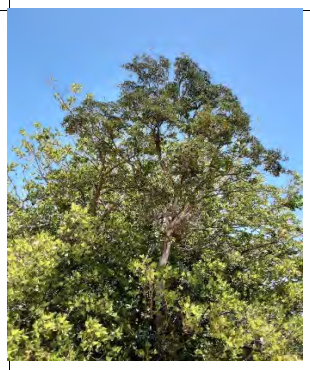
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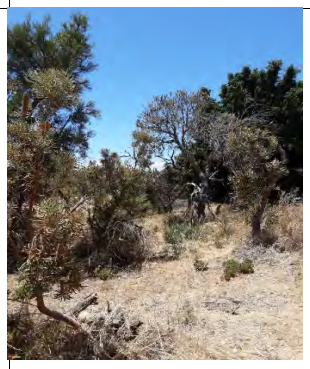
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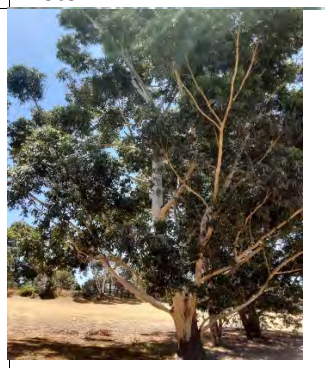
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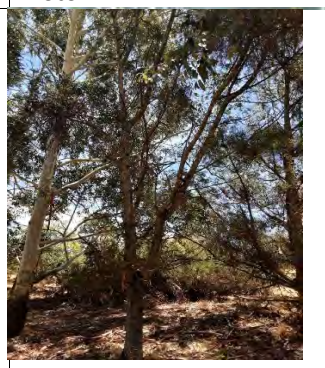
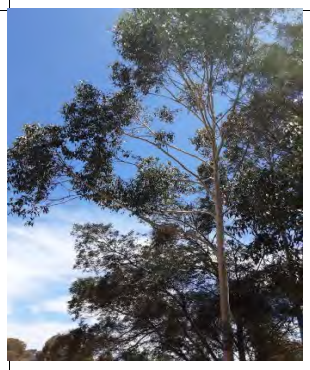
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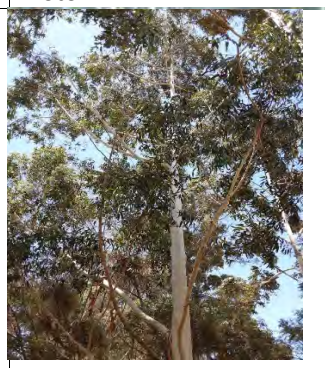
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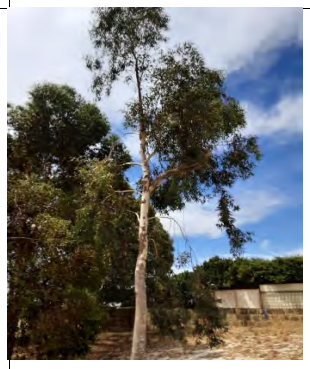
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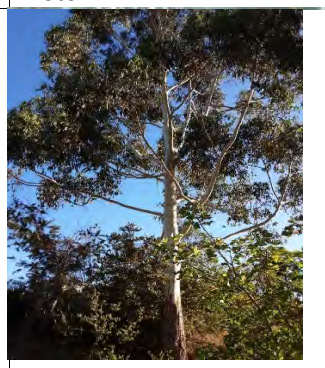
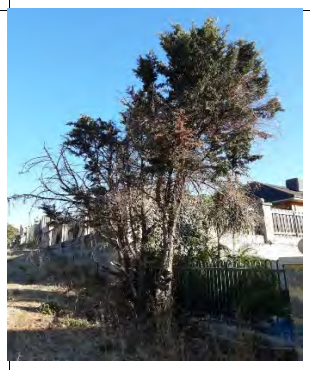
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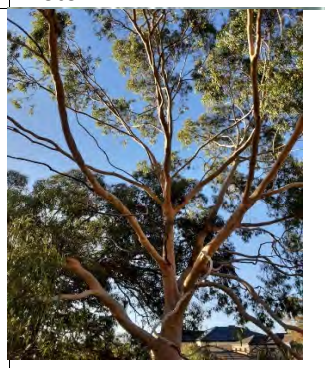
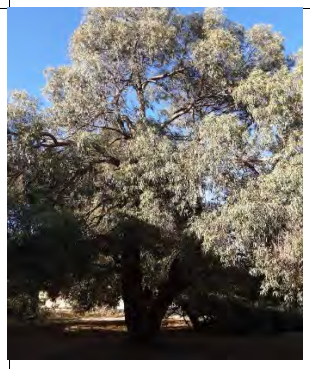
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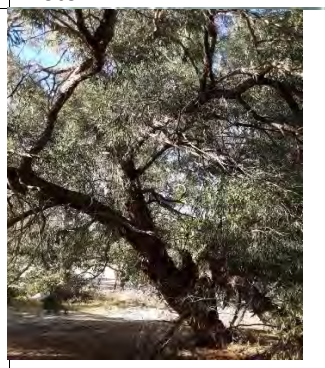
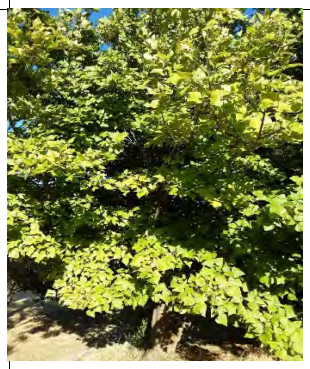
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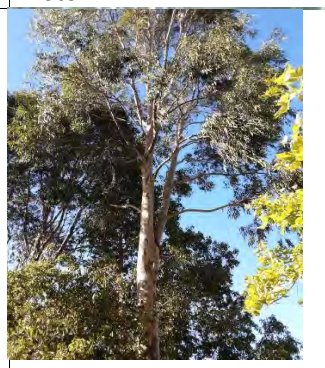
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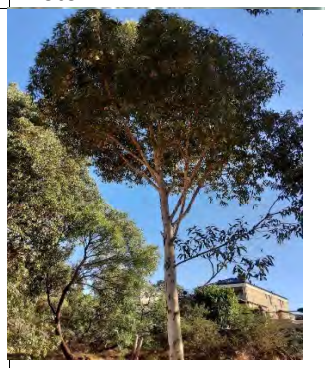
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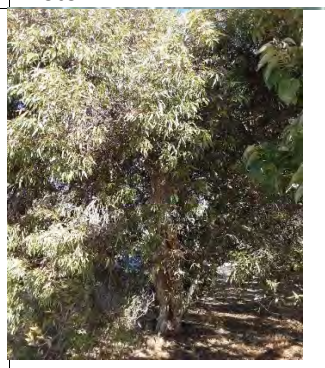
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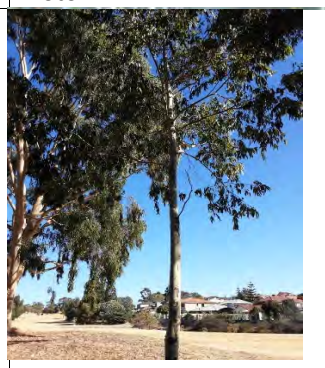
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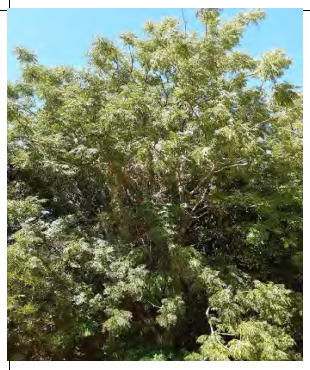
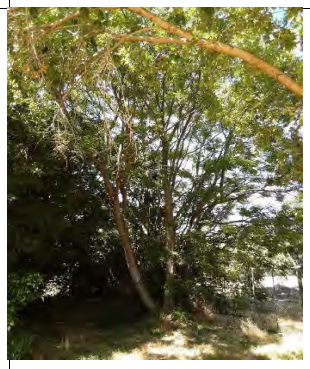
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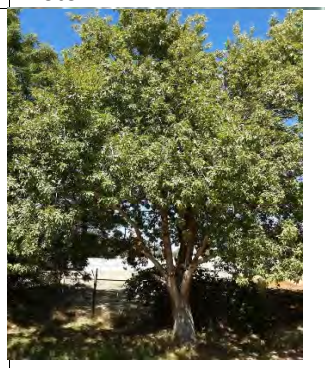
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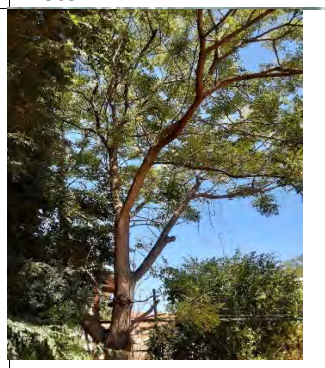
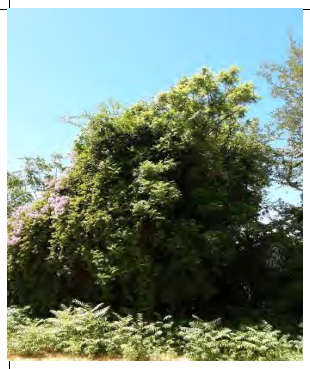
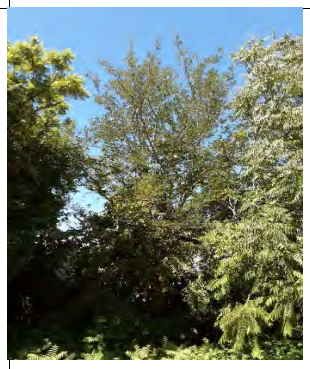
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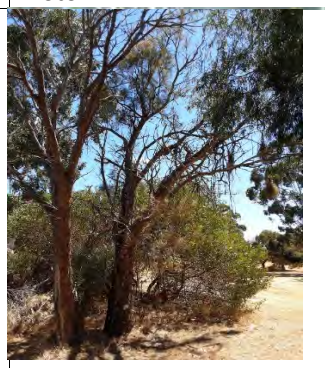
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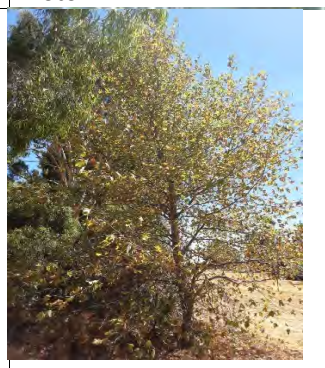
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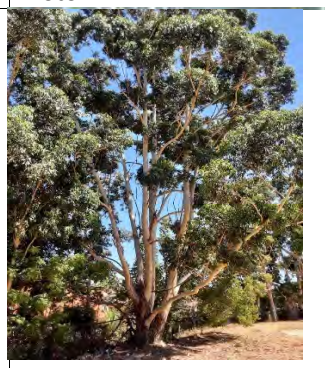
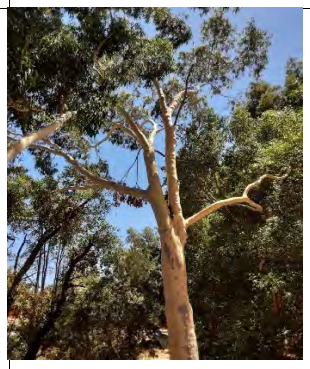
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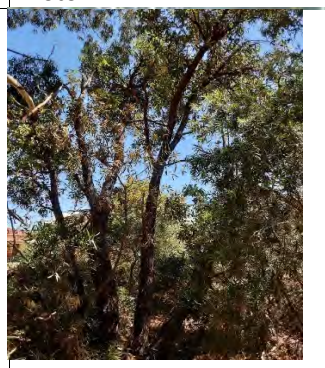
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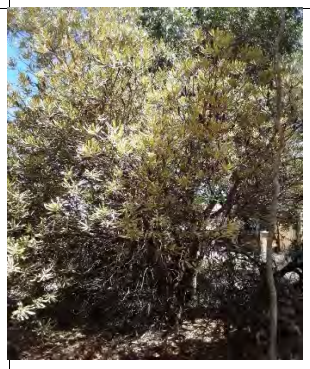
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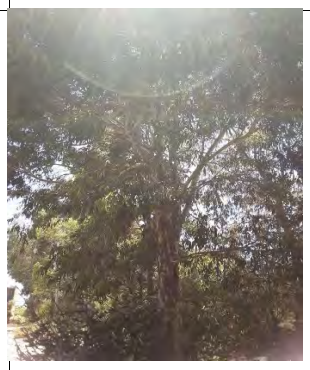
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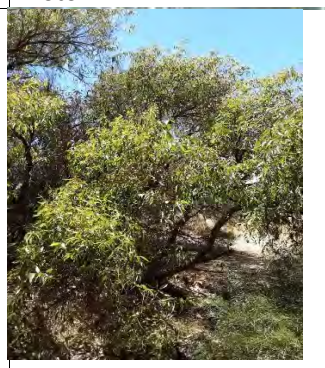
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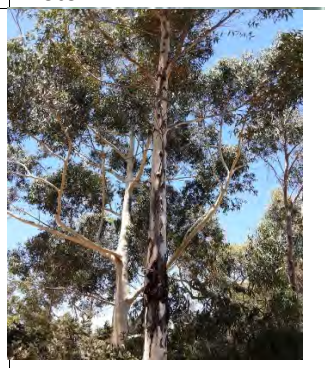
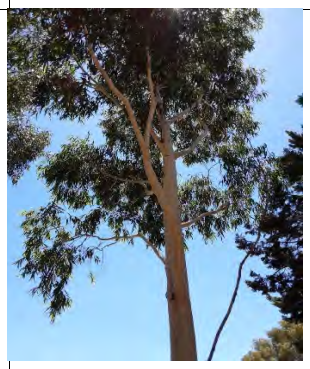
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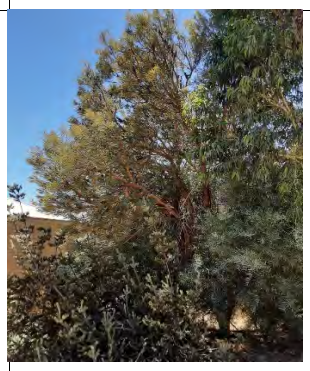
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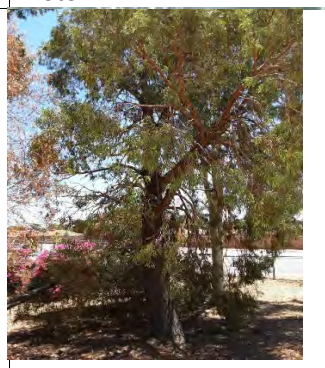
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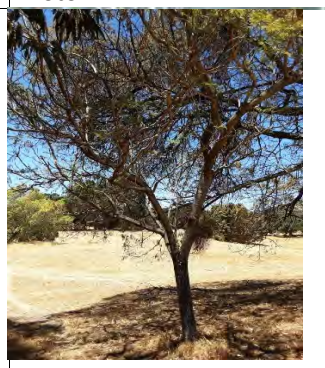
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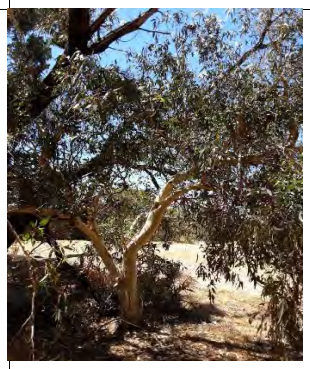
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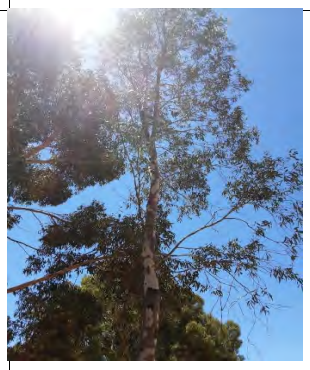
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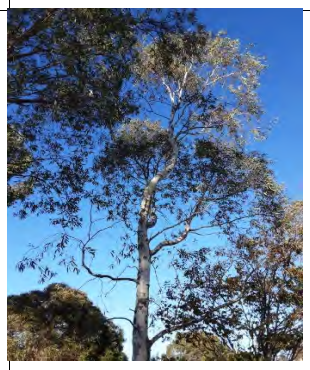
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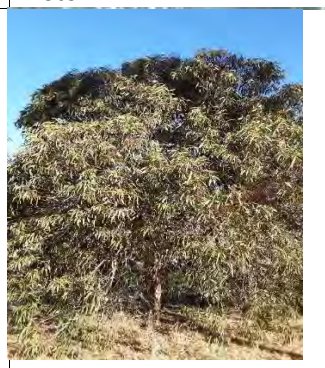
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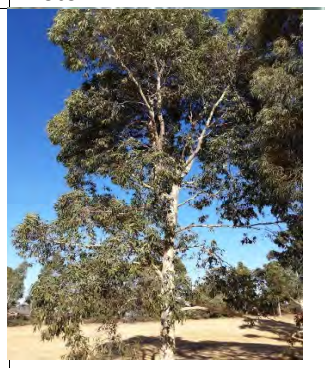
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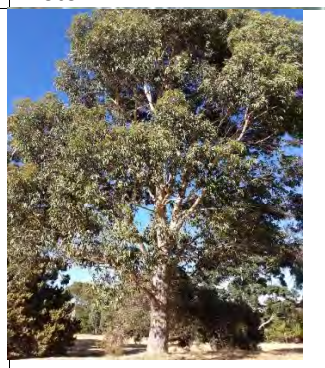
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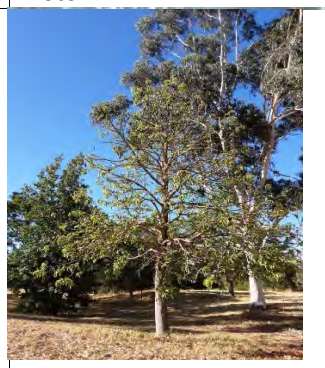
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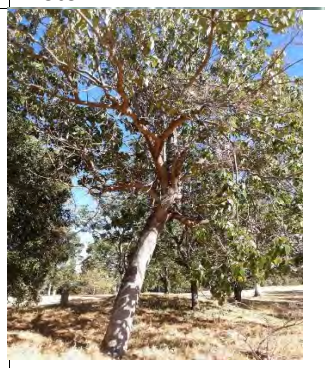
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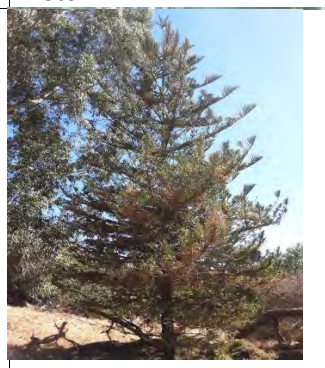
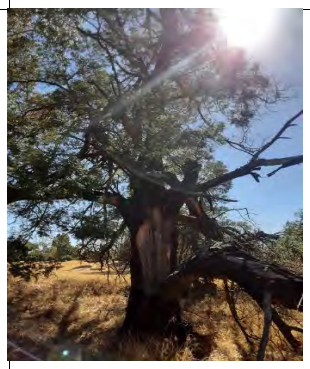
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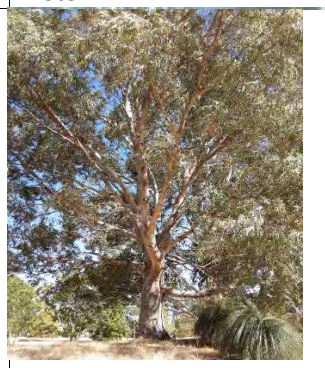
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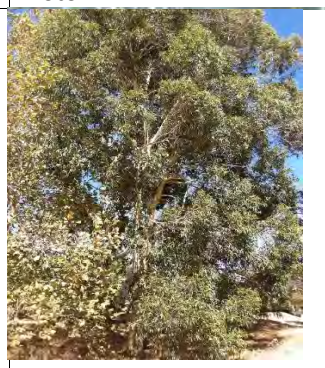
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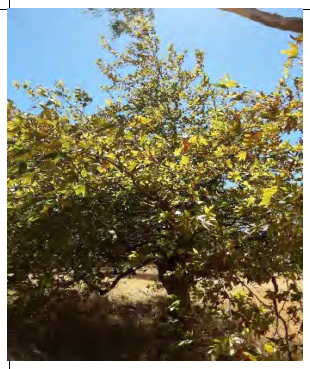
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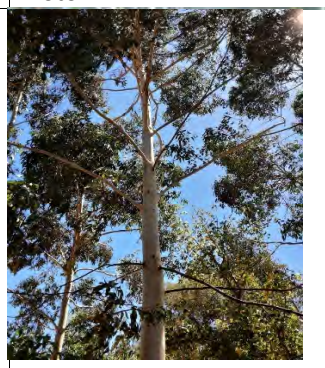
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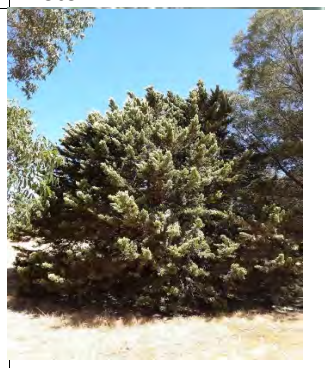
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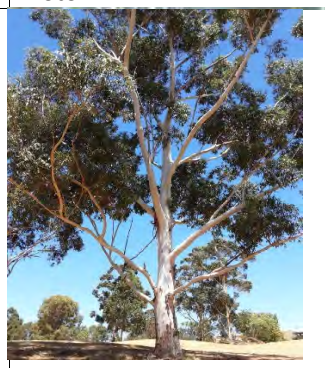
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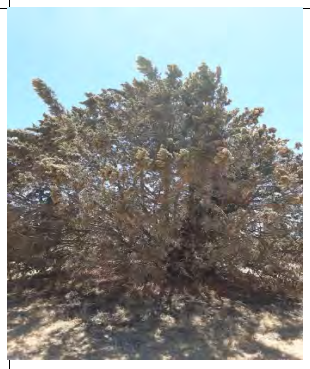
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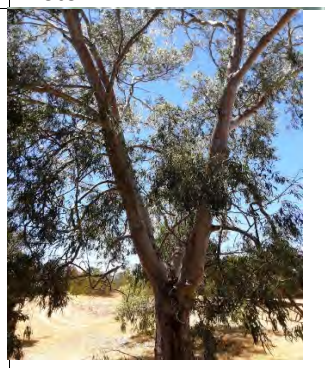
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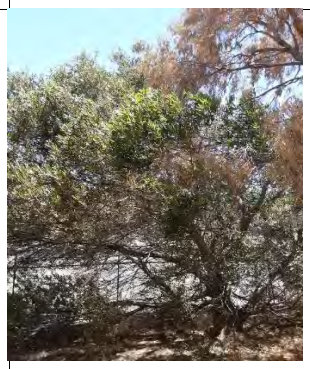
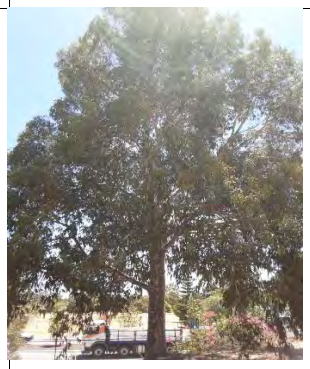
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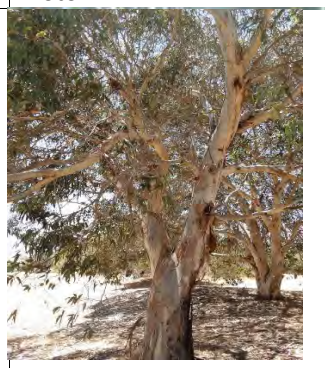
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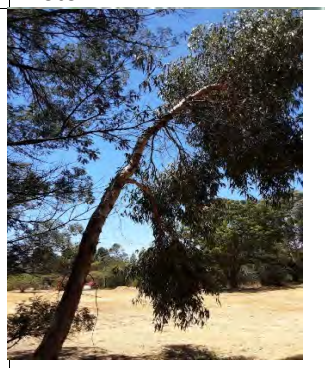
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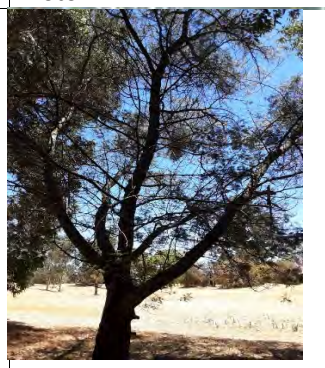
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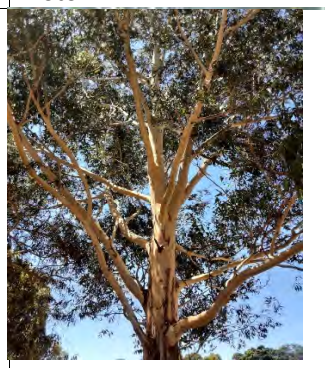
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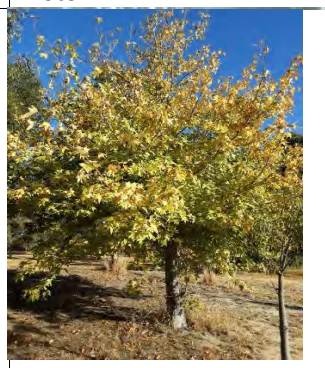
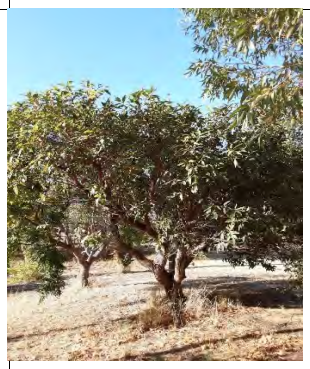
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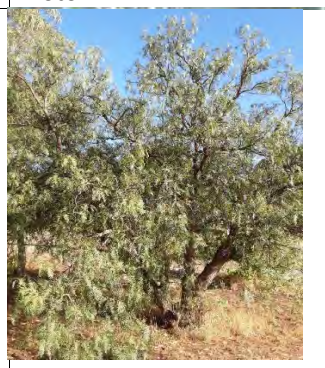
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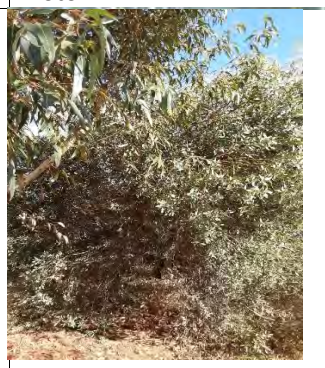
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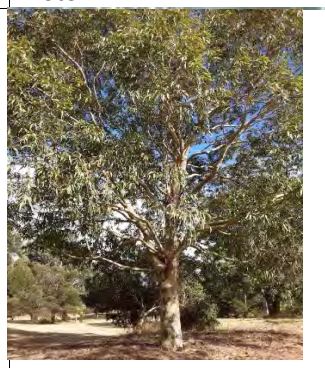
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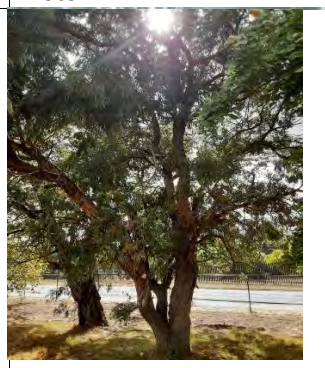
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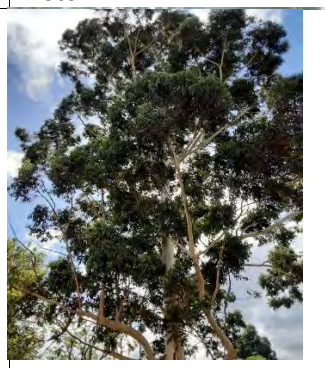
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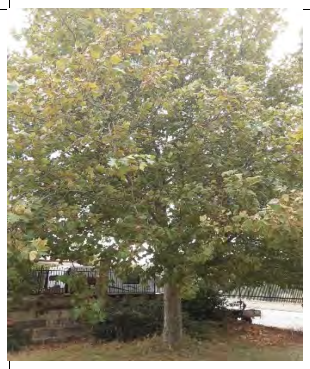
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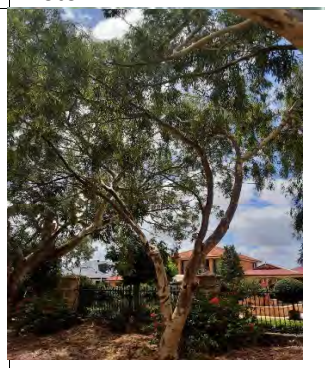
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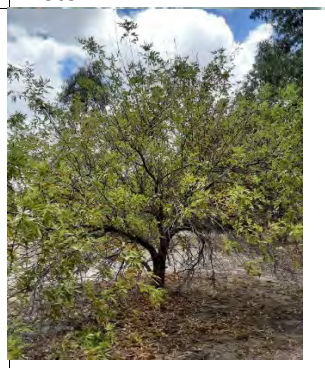
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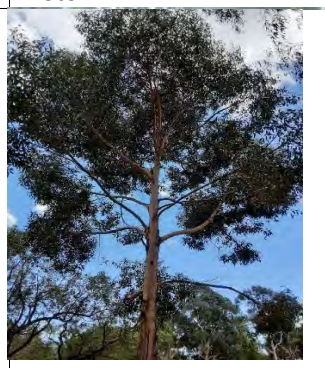
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# Appendix E

Acoustic Assessment

# GLEN IRIS GOLF COURSE REDEVELOPMENT

# DEAN RD, JANDAKOT

ACOUSTIC ASSESSMENT

SEPTEMBER 2021

OUR REFERENCE: 27789-2-20325

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
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DOCUMENT CONTROL PAGE

# ACOUSTIC ASSESSMENT
## GLEN IRIS GOLF COURSE

Job No: 20325

Document Reference: 27789-2-20325

| DOCUMENT INFORMATION | | | |
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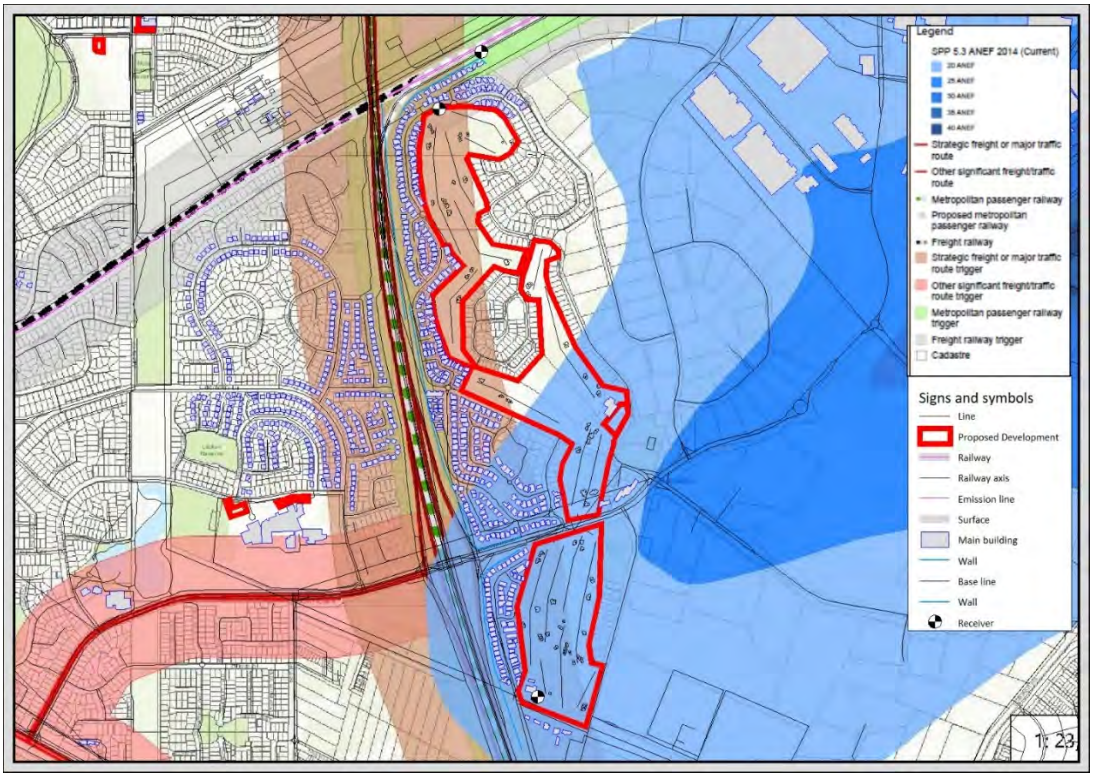

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# EXECUTIVE SUMMARY

Herring Storer Acoustics have been commissioned by Acumen Development Solutions to carry out an acoustical assessment of the proposed redevelopment of the Glen Iris Golf Course into residential land use.

The proposed residential estate is potentially impacted by noise from road traffic (Kwinana Freeway and Berigan Drive), rail traffic (Yangebup Freight Rail Line and future Thornlie to Cockburn Passenger Rail Line) and aircraft associated with Jandakot Airport with the figure below showing the PlanWA advice in regards to noise impacts. Consideration has also been given to the potential impact from noise related to existing industry to the south of the development on Prinsep Road.




Based on the above, the following criteria are proposed for this development:

## ROAD TRAFFIC AND RAIL NOISE

**External**

| | |
|---|---|
| Day | Maximum of 55 dB(A) $L_{Aeq}$ |
| Night | Maximum of 50 dB(A) $L_{Aeq}$ |
| Outdoor Living Areas* | Maximum of 50 dB(A) $L_{Aeq\ (night\ period)}$ |

*This is a suggested noise level; noise is to be reduced as far as practicably possible.

**Internal**

| | |
|---|---|
| Sleeping Areas | 35 dB(A) $L_{Aeq(night)}$ |
| Living Areas | 40 dB(A) $L_{Aeq(day)}$ |

## AIRCRAFT NOISE

**Internal**

| | |
|---|---|
| Sleeping areas | 50 dB(A) $L_{Amax}$ |
| Other habitable spaces | 55 dB(A) $L_{Amax}$ |

**ROAD NOISE**

Based on the development plan, it is proposed that areas are to be constructed for the purpose of residential with some commercial usage for the section to the north of Berrigan Drive. Noise levels for the future road traffic are such, that at some of the lot façades, the noise could exceed the 55 dB(A) noise Target. Therefore, amelioration in the form of Quiet House Design is required. These areas have been identified and general "deemed to satisfy packages" applied. Detailed design for these requirements can be applied at subdivision staging.

Given the noise levels, the lot façades would require Quiet House Design in the form of Package A. Appendix F contains the Quiet House Design requirements and an area plan outlining the effected Lots.

Additionally, as they are over the "Target" noise level, the lots in this area would require notification on titles of the Freeway and Berrigan Drive noise impact.

**RAIL NOISE**

For train noise associated with the Yangebup Freight Line, due to the topography (line being in a cutting) and the noise wall and residential housing between the rail line and the development, the noise levels for the worst case future scenario of one train per hour have been assessed as being below the night time noise Target criteria, hence there are no acoustic requirements.

Information was sought from the Metronet and the EPA as to the proposed design and impact of noise levels from the proposed future passenger rail and freight rail lines.

As there are existing residential premises located on the proposed rail line, development of the future rail line operations needs to consider these highly noise sensitive premises.

Review of the preliminary design noise levels, as provided in the *Thornnlie-Cockburn Link Noise and Vibration Assessment Report Number 675.10409.00100-R01* shows that noise levels to these existing residential premises will be designed such that the target noise levels (as per SPP 5.4) will be met.

As the Glen Iris development is set back behind these residential premises, noise levels would be less than those at the lot façades, hence compliance with the requirements of SPP 5.4 would be achieved. Therefore, noise modelling of the future proposed Freight / Passenger Rail would not be required for this development as the infrastructure provide will meet the requirements of SPP 5.4 for existing residential premises closer to the rail line.

It is noted that assessment of the freight rail has been undertaken and calibrated to existing noise levels. These noise levels have been increased for future rail freight movements of one per hour. This is based on the current built form, including the noise wall located along the existing residence boarding the rail line. If the proposed passenger rail development goes ahead, the noise mitigation requirements would incorporate the freight rail, hence noise levels would be less than those considered in this assessment. This provides as conservative acoustic assessment for the proposed development, where the future freight rail increases, and no further noise attenuation works are carried out.

**AIRCRAFT NOISE**

Based on guidance from SPP 5.3, the majority of the northern section of the proposed development site is acceptable for residential development, as indicated in Figure 5.3.

The blue area (ANEF 20 to 25) is also acceptable for residential development, although it requires conditions. These conditions are such that the internal noise level (for aircraft noise events) are to meet the criteria contained in AS2021. The affected lots within this development are those within the blue contour as noted in Figure 5.3.

Further to the criteria contained in SPP 5.3, the City of Cockburn LPP 1.12 contains advice as follows:

> *Consideration should be given to noise attenuation for noise sensitive premises within the Frame area corresponding to the requirements of Western Australian Planning Commission publication "Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport" 2004 (such as the installation of 6.38mm laminated glazing), in order to ensure that residential amenity is adequately protected within noise sensitive developments.*

Therefore, whilst at this stage of the development the lot configuration and layout are not known, a preliminary "deemed to satisfy construction" has been provided within this report. This can form the basis of future concept designs and can be refined at subdivision staging. This encompasses the Frame Area for which the entire development is located within the boundaries.

**INDUSTRY NOISE**

Based on the City of Cockburn Intramaps, there is industrial zoned land use to the south of the proposed residential development, as shown in Figure 5.4.

As there are existing residential premises located on Imlah Court, located at a closer distance to the industrial premises than the proposed development, expectations are that compliance with Regulatory criterial contained in the *Environmental Protection (Noise) Regulations 1997* would be achieved for the existing situation at these locations. However, consideration of the potential for noise impact from this area has been undertaken for the proposed residential development.

Three forms of noise amelioration have been considered for the future residence located on the southern end of the Glen Iris development, with these being as follows:

1. Noise Wall (Prinsep Road)
2. Upgrade Building Design (As per SPP 5.3)
3. Setback

Given the implementation of the above, noise levels can be managed, regardless of compliance with the regulatory criteria.

# 1.0 INTRODUCTION

Herring Storer Acoustics have been commissioned by Acumen Development Solutions to carry out an acoustical assessment of the proposed redevelopment of the Glen Iris Golf Course into residential land use.

The proposed residential estate is potentially impacted by noise from the following noise sources:

- Road Traffic Noise- Kwinana Freeway and Berrigan Drive.
- Rail Traffic Noise - Existing Yangebup Freight Rail Line and proposed Thornlie to Cockburn Passenger Rail Line.
- Aircraft Noise – Aircrafts associated with Jandakot Airport.
- Industrial Noise – Existing Industry located on Prinsep Road.

The objectives of the study were to:

- Measure existing noise levels at the proposed development from vehicles travelling on Kwinana Freeway and Berrigan Drive.
- Measure existing noise levels at the proposed development from trains travelling on the Yangebup Freight Rail Line.
- Determine by noise modelling the noise levels that would be received at residences within the development from vehicles travelling on the future Kwinana Freeway, Berrigan Drive and Yangebup freight Rail Line and proposed passenger rail.
- Assess the predicted noise levels received at residence for compliance with the requirements of the WAPC State Planning Policy 5.4 “Road and Rail Noise” (SPP 5.4).
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.
- Assess the predicted noise levels received at residence for compliance with the requirements of the WAPC State Planning Policy 5.3 “Land Use Planning in the Vicinity of Jandakot Airport” (SPP 5.3).
- Consider impacts of industrial noise associated with existing industry located on Prinsep Road, in accordance with the City of Cockburn’s Local Planning Policy 1.12 (LPP 1.12).

The work was commissioned to accompany the development application.

# 2.0 CRITERIA

## 2.1 NOISE INGRESS INTO DEVELOPMENT

The Western Australian Planning Commission (WAPC) released on 6th September 2019 State Planning Policy 5.4 *“Road and Rail Noise”.* The requirements of State Planning Policy 5.4 are outlined below.

*POLICY APPLICATION (Section 4)*

*When and where it applies (Section 4.1)*

*SPP 5.4 applies to the preparation and assessment of planning instruments, including region and local planning schemes; planning strategies, structure plans; subdivision and development proposals in Western Australia, where there is proposed:*

a) *noise-sensitive land-use within the policy's trigger distance of a transport corridor as specified in **Table 1**;*

b) *New or major upgrades of roads as specified in **Table 1** and maps **(Schedule 1,2 and 3);** or*

c) *New railways or major upgrades of railways as specified in maps (**Schedule 1, 2 and 3);** or any other works that increase capacity for rail vehicle storage or movement and will result in an increased level of noise.*

*Policy trigger distances (Section 4.1.2)*

***Table 1** identifies the State's transport corridors and the trigger distances to which the policy applies.*

*The designation of land within the trigger distances outlined in **Table 1** should not be interpreted to imply that land is affected by noise and/or that areas outside the trigger distances are un-affected by noise.*

*Where any part of the lot is within the specified trigger distance, an assessment against the policy is required to determine the likely level of transport noise and management/ mitigation required. An initial screening assessment (**guidelines: Table 2: noise exposure forecast**) will determine if the lot is affected and to what extent."*

***TABLE 1: TRANSPORT CORRIDOR CLASSIFICATION AND TRIGGER DISTANCES***

| ***Transport corridor classification*** | ***Trigger distance*** | ***Distance measured from*** |
|---|---|---|
| ***Roads*** | | |
| ***Strategic freight and major traffic routes***<br>*Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume* | *300 metres* | *Road carriageway edge* |
| ***Other significant freight/traffic routes***<br>*These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meet the criteria of either >=23,000 daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes)* | *200 metres* | *Road carriageway edge* |
| ***Passenger railways*** | | |
| | *100 metres* | *Centreline of the closest track* |
| ***Freight railways*** | | |
| | *200 metres* | *Centreline of the closest track* |

*Proponents are advised to consult with the decision making authority as site specific conditions (significant differences in ground levels, extreme noise levels) may influence the noise mitigation measures required, that may extend beyond the trigger distance.*

*POLICY MEASURES (Section 6)*

*The policy applies a performance-based approach to the management and mitigation of transport noise. The policy measures and resultant noise mitigation will be influenced by the function of the transport corridor and the type and intensity of the land-use proposed. Where there is risk of future land-use conflict in close proximity to strategic freight routes, a precautionary approach should be applied. Planning should also consider other broader planning policies. This is to ensure a balanced approach takes into consideration reasonable and practical considerations.*

*Noise Targets (Section 6.1)*

***Table 2** sets out noise targets that are to be achieved by proposals under which the policy applies. Where exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.*

*In the application of the noise targets the objective is to achieve:*

- *indoor noise levels as specified in **Table 2** in noise sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and child care centres the design of outdoor areas should take into consideration the noise target.*

*It is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.*

***TABLE 2: NOISE TARGETS***

| ***Proposals*** | ***New/Upgrade*** | ***Noise Targets*** | | |
|---|---|---|---|---|
| | | ***Outdoor*** | | ***Indoor*** |
| | | ***Day ($L_{Aeq}$(Day) dB) (6 am-10 pm)*** | ***Night ($L_{Aeq}$(Night)dB) (10 pm-6 am)*** | ***($L_{Aeq}$ dB)*** |
| *Noise-sensitive land-use and/or development* | *New noise sensitive land use and/or development within the trigger distance of an existing/proposed transport corridor* | *55* | *50* | *$L_{Aeq}$ (Day) 40(Living and work areas)*<br>*$L_{Aeq}$ (Night) 35 (bedrooms)* |
| *Roads* | *New* | *55* | *50* | *N/A* |
| | *Upgrade* | *60* | *55* | *N/A* |
| *Railways* | *New* | *55* | *50* | *N/A* |
| | *Upgrade* | *60* | *55* | *N/A* |

*Notes:*

- *The noise target is to be measured at one metre from the most exposed, habitable façade of the proposed building, which has the greatest exposure to the noise-source. A habitable room has the same meaning as defined in State Planning Policy 3.1 Residential Design Codes.*
- *For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.*
- *The 5dB difference in the criteria between new and upgrade infrastructure proposals acknowledges the challenges in achieving noise level reduction where existing infrastructure is surrounded by existing noise-sensitive development.*
- *Outdoor targets are to be met at all outdoor areas as far as is reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines. For example, it is likely unreasonable for a transport infrastructure provider to achieve the outdoor targets at more than 1 or 2 floors of an adjacent development with direct line of sight to the traffic.*

*Noise Exposure Forecast (Section 6.2)*

*When it is determined that SPP 5.4 applies to a planning proposal as outlined in Section 4, proponents and/or decision makers are required to undertake a preliminary assessment using **Table 2**: noise exposure forecast in the guidelines. This will provide an estimate of the potential noise impacts on noise-sensitive land-use and/ or development within the trigger distance of a specified transport corridor. The outcomes of the initial assessment will determine whether:*

- *no further measures is required;*
- *noise-sensitive land-use and/or development is acceptable subject to deemed-to-comply mitigation measures; or*
- *noise-sensitive land-use and/or development is not recommended. Any noise-sensitive land-use and/ or development is subject to mitigation measures outlined in a noise management plan."*

## 2.2 STATE PLANNING POLICY 5.3 LAND USE IN THE VICINITY OF JANDAKOT AIRPORT

AS2021: Acoustics – Aircraft Noise Intrusion-Building Siting and Construction, provides guidelines for determines the type of building construction necessary to provide a given noise reduction, given that external windows and doors are closed.

Additionally, guidance has been sought from *State Planning Policy 5.3 Land use in the vicinity of Jandakot airport.*

### 2.2.1 Building Site Acceptability

AS2021:2015 lists the building types compared to the acceptable ANEF contour in Table 2.1 of AS2021:2015. The applicable building types are reproduced in Table 1 below.

**TABLE 1 – ANEF ACCEPTABILITY FOR SITING AND CONSTRUCTION**

| Building Type | ANEF zone of Site | | |
|---|---|---|---|
| | Acceptable | Conditionally Acceptable | Unacceptable |

| | | | |
|---|---|---|---|
| House, home unit, flat, caravan park | Less than 20 ANEF | 20 to 25 ANEF | Greater than 25 ANEF |

AS2021:2015 *"Acoustics – Aircraft Noise Intrusion-Building Siting and Construction"* provides guidelines for determining the type of building construction necessary to provide a given noise reduction, given that external windows and doors are closed.

Indoor design sound levels for determination of aircraft noise reductions are given as follows:

| | | |
|---|---|---|
| Sleeping areas | - | 50 dB(A) |
| Other habitable spaces | - | 55 dB(A) |

For commercial buildings:

| | | |
|---|---|---|
| Private offices | - | 55 dB(A) |
| Open offices | - | 65 dB(A) |
| Shops, showrooms etc. | - | 75 dB(A) |
| Industrial | - | 75 dB(A) |

We note that the above noise levels are maximum noise levels.

## 2.3 CITY OF COCKBURN LOCAL PLANNING POLICY 1.12 – NOISE ATTENUATION

An Acoustic Report must accompany a Structure Plan, variations to a Structure Plan that materially alter the Plans intent or a Local Development Plan. The Acoustic Report shall be prepared in accordance with the attached City of Cockburn Noise Attenuation Guidelines where:

1. Noise sensitive development is proposed in the vicinity of an existing or future major road, rail infrastructure or a freight handling facility as required by SPP 5.4;
2. The land is located within either the Core Area or Frame Area for Jandakot Airport as identified by SPP 5.3; or
3. Noise sensitive development and commercial, industrial or light industry land uses or essential infrastructure are proposed in close proximity.

### 2.3.1 NOISE INTRUSION (NOISE SENSITIVE DEVELOPMENT)

1. Noise sensitive developments are to be designed to achieve the following sound levels:

   (a) Leq 35 dB(A) in sleeping areas (bedrooms); and
   (b) Leq 40 dB(A) in living/work areas and other habitable rooms.

   IMPORTANT NOTE:
   The Leq level should not be unduly biased toward the lower frequencies of the octave band spectrum. If lower frequencies are dominant in sound levels taken during the sampling phase of reporting (below 200Hz or a 15-20dB difference between LA and LC levels), the Acoustic Consultant shall discuss the findings with the City in developing appropriate solutions to ensure that low frequency noise is appropriately attenuated, prior to the submission of the final Acoustic Report.

2. For all other developments, noise intrusion is to be controlled to achieve the indoor design sound levels for buildings as set out in Australian Standard AS/NZS2107: "Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors".
3. For noise sensitive developments in close proximity to road and rail infrastructure, the report must address the requirements of SPP 5.4, including the requirement for a reasonable degree of acoustic amenity in at least one outdoor living area.
4. For noise sensitive developments in close proximity to freight rail infrastructure or other sources of vibration, the Acoustic Report should also address groundborne vibration levels to ensure that occupants of the development are not exposed to an unacceptable level of vibration. The report should make reference to:
   (a) Australian Standard 2670.2-1990 "Evaluation of human exposure to whole-body vibration; Part 2: Continuous and shock induced vibration in buildings (1 to 80 Hz)"
   (b) ISO 2631-2:2003 "Evaluation of human exposure to whole-body vibration Part 2: Vibration in buildings (1 Hz to 80 Hz)";
   (c) British Standard BS6472-2008: "Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)".
5. Residential developments are to be constructed to meet the requirements of the National Construction Code (as amended) and the Building Code of Australia Part F5 (as amended).

### 2.3.2 NOISE SOURCE IDENTIFICATION

Acoustic reports must identify all noise sources relevant to a development, including those which may require detailed assessment at a later stage. Ambient environmental noise sources that are relevant within the City of Cockburn include the following:

1. Noise from Road, Rail and Freight Infrastructure
2. Breakout and Street Noise
3. Mechanical Plant and Equipment
4. Co-existing Land Uses
5. Noise Sensitive Developments in Proximity to Jandakot Airport

## 2.4 APPROPRIATE CRITERIA

Based on the above, the following criteria are proposed for this development:

**ROAD TRAFFIC AND RAIL NOISE**

**External**

| | |
|---|---|
| Day | Maximum of 55 dB(A) $L_{Aeq}$ |
| Night | Maximum of 50 dB(A) $L_{Aeq}$ |
| Outdoor Living Areas* | Maximum of 50 dB(A) $L_{Aeq\ (night\ period)}$ |

*This is a suggested noise level; noise is to be reduced as far as practicably possible.

**Internal**

| | |
|---|---|
| Sleeping Areas | 35 dB(A) $L_{Aeq(night)}$ |
| Living Areas | 40 dB(A) $L_{Aeq(day)}$ |

**AIRCRAFT NOISE**

**Internal**

| | |
|---|---|
| Sleeping areas | 50 dB(A) $L_{Amax}$ |
| Other habitable spaces | 55 dB(A) $L_{Amax}$ |

## 3.0 NOISE MONITORING

Noise monitoring was undertaken as part of the study with the results used to calibrate the noise model.

In summary, the monitoring was undertaken over seven-day period commencing Monday 2nd December 2020. Monitoring was conducted at two locations, firstly at the northern end of the golf course, with the second location being in the south of the golf course

The results of this monitoring are summarised in Table 3.1.

**TABLE 3.1 : SUMMARY OF MEASURED ROAD TRAFFIC NOISE LEVELS (dB(A))**

| Date | Day of week | North Monitor | | South Monitor | |
|---|---|---|---|---|---|
| | | $L_{Aeq,day}$ (6am to 10pm) | $L_{Aeq,night}$ (10pm to 6am) | $L_{Aeq,day}$ (6am to 10pm) | $L_{Aeq,night}$ (10pm to 6am) |
| 2/12/2020 | Wednesday | - | - | 55.9 | 48.0 |
| 3/12/2020 | Thursday | 56.7 | 49.8 | 55.4 | 48.4 |
| 4/12/2020 | Friday | 57.4 | 48.0 | 57.3 | 48.6 |
| 5/12/2020 | Saturday | 56.8 | 49.1 | 55.2 | 49.3 |
| 6/12/2020 | Sunday | 55.1 | 50.2 | 53.6 | 47.4 |
| 7/12/2020 | Monday | 54.3 | 47.0 | 51.9 | 47.4 |
| 8/12/2020 | Tuesday | 54.6 | 48.1 | 52.5 | 45.7 |
| **Average (Weekdays)** | | **55.8** | **48.2** | **54.6** | **47.6** |

Note: Based on the results of the noise monitoring the difference between the $L_{Aeq}$ (Day) and $L_{Aeq}$ (Night) is greater than 5 dB(A). Hence, achieving compliance with the day period criteria would also result in compliance with the night period criteria. Thus, the day period has been used for the assessment.

A third measurement location was included to calibrate noise levels for Berrigan Drive. The measurement was conducted on 14th September 2021 for a short term during peak traffic times.

The summarised results are contained in table 3.2.

**TABLE 3.2 : SUMMARY OF MEASURED ROAD TRAFFIC NOISE LEVELS BERRIGAN DRIVE (dB(A))**

| Date | Day of week | $L_{Aeq}$ | $L_{A10}$ | $L_{A90}$ |
|---|---|---|---|---|
| 14/09/2021 | Tuesday | 68.8 | 72.5 | 56.7 |

For information, the results of the monitoring are shown graphically in Appendix E, with Figure 3.1 showing the location map, and Figure 3.2 showing the monitors in situ.

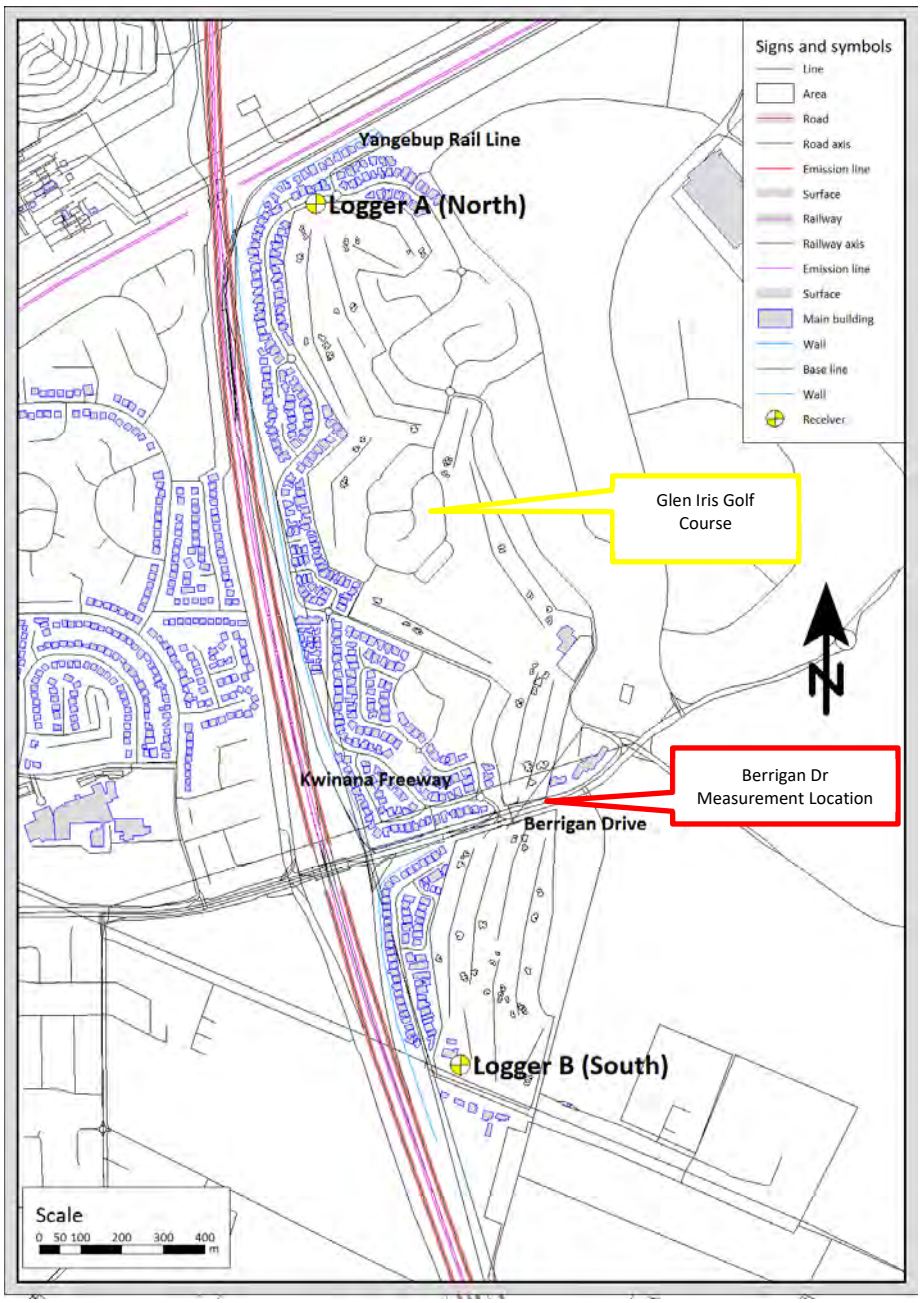



**FIGURE 3.1 - NOISE MONITOR LOCATION PLAN**



**FIGURE 3.2 - NOISE MONITOR IN SITU**

# 4.0 METHODOLOGY

## 4.1 ROAD TRAFFIC

The future road traffic volumes were based on information provided by the MRWA traffic modelling department. ROM24 2016 validation plots for 2016 and 2041 link volume plots were provided.

Predictive noise modelling has allowed for the following traffic data. It is noted that where available on the MRWA traffic maps site, current traffic counts were used to calibrate the measured noise levels.

Other information relevant to the calculations are shown below in Table 4.1.

**TABLE 4.1 - NOISE MODELLING INPUT DATA**

| Parameter | Traffic Flow VPD Current | Traffic Flow VPD Future (2041) | Traffic Speed km/hr | Road Surface |
|---|---|---|---|---|
| Traffic flows VPD Kwinana Freeway South Bound | *48,368 (13%) | 124,300 (11%) | 100 | Asphalt |
| Traffic flows VPD Kwinana Freeway North Bound | *55,082 (14%) | 118,000 (11%) | 100 | Asphalt |
| Kwinana Freeway (South Bound) Berrigan Drive Offramp | 9,000 (13%) | 20,900 (11%) | 60 | Asphalt |
| Berrigan Drive to Kwinana Freeway (South Bound) Onramp | 2,300 (17%) | 7,700 (11%) | 60 | Asphalt |
| Berrigan Drive East of Kwinana Freeway (East Bound) | *27,780 (11%)* | 20,000 (9%) | 70 | Asphalt |
| Berrigan Drive East of Kwinana Freeway (West Bound) | | 17,300 (11%) | 70 | Asphalt |

* Based on current traffic counts (2018 to 2021)

Other input data for the model included:

- Traffic data from MRWA ( https://mrapps.mainroads.wa.gov.au/TrafficMap/ )
- Noise source heights for the three road source strings (Passenger Vehicles, Heavy Vehicles Engine and Heavy Vehicle Exhausts) are +0.5, +1.5 and +3.6m, with a noise correction of -0.8 and -8.0 applied to the heavy vehicles engine and exhaust noise sources.
- Topographical data, with the ground level within the development based on natural ground levels as surveys conducted.
- A +2.5 dB adjustment to allow for façade reflection.
- Development receiver heights at 1.4m above ground level.
- Calculations based on CoRTN algorithms.
- Other parameter listed in SPP 5.4 as to guidance for modelling road traffic noise / assessment.

To determine the noise that would be received within the development from the surrounding road network, acoustic modelling was carried out using the computer program 'SoundPlan'.

The following scenario was modelled:

- Current Traffic flows, with existing walls and surrounding residential housing.
- Future traffic flows, with existing walls and surrounding residential housing

Based on the above, the noise contours plot for day period for the above modelling scenario is attached in Appendix B.

## 4.2 RAIL TRAFFIC

### 4.2.1 FREIGHT RAIL

To determine the requirements of noise associated with the Yangebup freight Line, acoustic modelling was carried out using the computer program 'SoundPlan'.

As the Freeway is the dominant noise source in the area, it is impacting the ability to measure current noise levels of train movements on the freight line and provide a basis for a statistical analysis. Additionally, the freight line is contained within a cutting for this section of track, as well as there being a noise wall and two storey residential buildings between the development and the rail line.

Reference was made to other monitoring conducted on the Cockburn freight line as to the validity of using an $L_{Aeq(1hour)}$ level for calibration of this assessment. Previous studies resulted in an $L_{Aeq(130seconds)}$ of 68.7 dB(A) for busier sections of the freight line. This was at a monitoring point 20m from the freight line. For information, calculating this noise level to the equivalent $L_{Aeq(1hour)}$ gives a resultant noise level of 54.3 dB(A).

Based on the calibrated freight rail line, the following scenarios were modelled:

1. Ultimate capacity volumes, i.e. 24 per 24 hours at 1 per hour, with existing walls and residential buildings between train line and proposed development.

Based on the above, the noise contours plots for day and night period for the above modelling scenarios are attached in Appendix C with the resultant level discussed further in the next section.

### 4.2.2 PROPOSED FUTURE FREIGHT / PASSENGER RAIL

Information was sought from the Metronet and the EPA as to the proposed design and impact of noise levels from the proposed future passenger rail and freight rail lines.

As there are existing residential premises located on the proposed rail line, development of the future rail line operations needs to consider these highly noise sensitive premises.

Review of the preliminary design noise levels, as provided in the *Thornnlie-Cockburn Link Noise and Vibration Assessment Report Number 675.10409.00100-R01* shows that noise levels to these existing residential premises will be designed such that the target noise levels (as per SPP 5.4) will be met.

As the Glen Iris development is set back behind these residential premises, noise levels would be less than those at the façade lots, hence compliance with the requirements of SPP 5.4 would be achieved. Therefore, noise modelling of the future proposed Freight / Passenger Rail would not be required for this development as the infrastructure provide will meet the requirements of SPP 5.4 for existing residential premises closer to the rail line.

It is noted that assessment of the freight rail has been undertaken and calibrated to existing noise levels. These noise levels have been increased for future rail freight movements of one per hour. This is based on the current built form, including the noise wall located along the existing residence boarding the rail line. If the proposed passenger rail development goes ahead, the noise mitigation requirements would incorporate the freight rail, hence noise levels would be less than those considered in this assessment. This provides as conservative acoustic assessment for the proposed development, where the future freight rail increases, and no further noise attenuation works are carried out.

# 5.0 RESULTS / ASSESSMENT

## 5.1 ROAD TRAFFIC

Under the WAPC State Planning Policy 5.4, for this development, the appropriate "Noise Targets" to be achieved under SPP 5.4, external to a residence are:

| **External** | |
|---|---|
| Day | Maximum of 55 dB(A) $L_{Aeq}$ |
| Night | Maximum of 50 dB(A) $L_{Aeq}$ |

The policy states that the "outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines". The Policy also states, under Section 6 – Policy Measures that "a reasonable degree of acoustic amenity for living areas on each residential lot". The policy recognises that "it may not be practicable to meet the outdoor noise targets".

The Policy states the following acceptable internal noise levels:

| **Internal** | |
|---|---|
| Living and Work Areas | $L_{Aeq(Day)}$ of 40 dB(A) |
| Bedrooms | $L_{Aeq(Night)}$ of 35 dB(A) |

For this development, compliance with the requirements of SPP 5.4, noise modelling and assessment are based on the day period.

The results of the acoustic assessment indicate that noise received at the proposed residential development would generally comply with the "Noise Targets" as outlined in SPP 5.4 with the exception of three main areas. These are identified below in Figure 5.1 and are discussed further below.

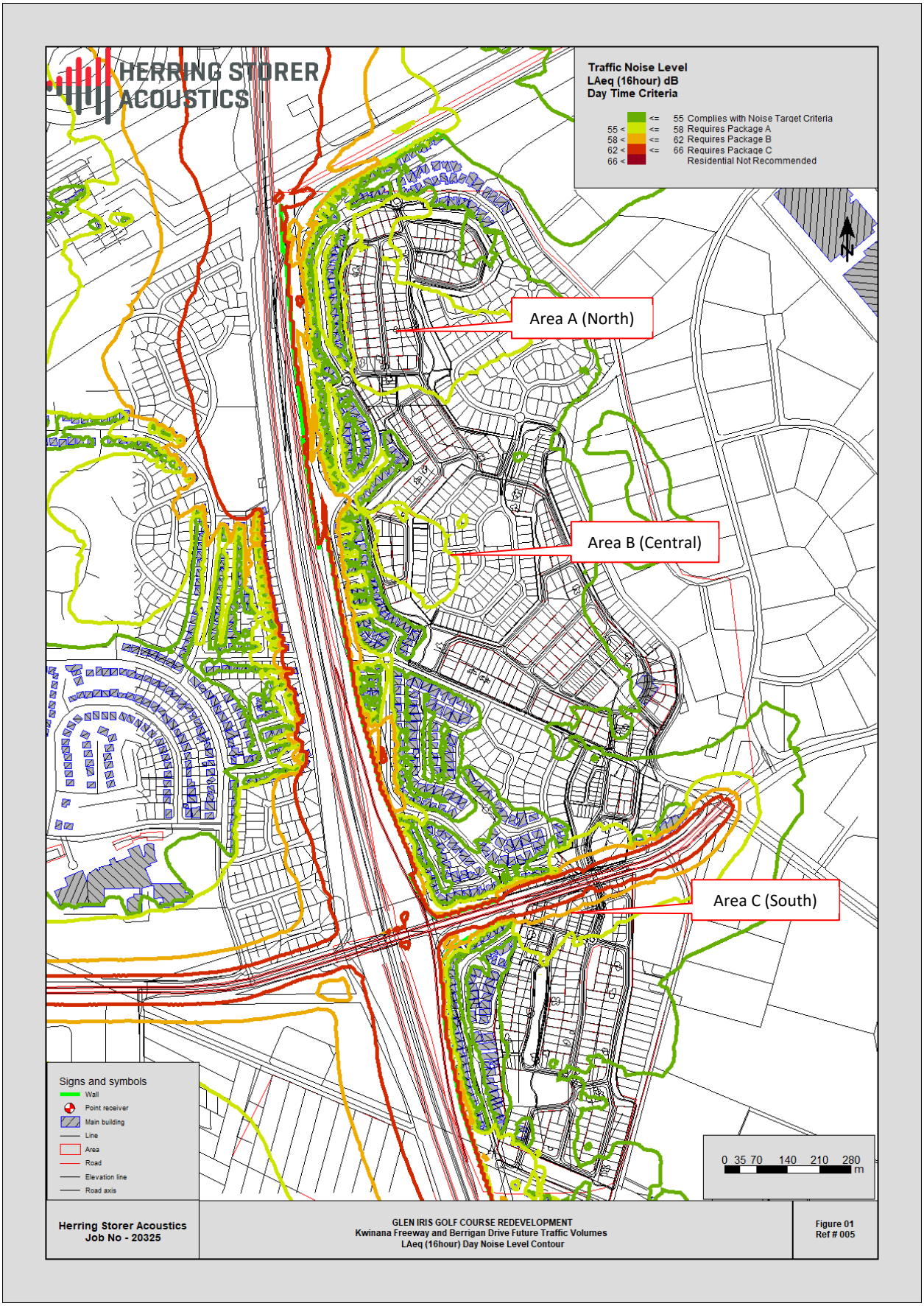



**FIGURE 5.1 – FUTURE ROAD TRAFFIC NOISE LEVELS**

### 5.1.1 AREA A - NORTH

Based on the development plan, it is proposed that areas are to be constructed for the purpose of residential. As per Figure 5.2 the areas exceed the 55 dB(A) noise Target, however only marginally and likely at only the façade Lots. This is shown by the spread of noise through the existing dwellings located between the development and the Freeway.

Given the noise levels, the façade lots would require quiet house design in the form of Package A. Appendix F contains the quiet house design requirements and an area plan outlining the effected Lots.

Additionally, as they are over the Target noise level, the lots in this area would require notification on titles of the Freeway noise impact.




**FIGURE 5.2 – FUTURE ROAD TRAFFIC NOISE LEVELS, AREA A - NORTH**

### 5.1.1 AREA B - CENTRAL

Based on the development plan, it is proposed that areas are to be constructed for the purpose of residential. As per Figure 5.3, the areas exceed the 55 dB(A) noise Target, however only marginally and likely at only the façade Lots. This is shown by the spread of noise through the existing dwellings located between the development and the Freeway.

Given the noise levels, the façade lots would require quiet house design in the form of Package A. Appendix F contains the quiet house design requirements and an area plan outlining the effected Lots.

Additionally, as they are over the Target noise level, the lots in this area would require notification on titles of the Freeway noise impact.




**FIGURE 5.3 – FUTURE ROAD TRAFFIC NOISE LEVELS, AREA B - CENTRAL**

### 5.1.1 AREA C – BERRIGAN DRIVE AND SOUTH

Based on the development plan, it is proposed that areas are to be constructed for the purpose of residential south of Berrigan Drive, and Commercial for the section to the north of Berrigan Drive. As per Figure 5.4 the areas exceed the 55 dB(A) noise Target, however only marginally and likely at only the façade Lots.

Given the noise levels, the façade lots would require quiet house design in the form of Package A. Appendix F contains the quiet house design requirements and an area plan outlining the effected Lots.

Additionally, as they are over the Target noise level, the lots in this area would require notification on titles of the Freeway and Berrigan Drive noise impact.

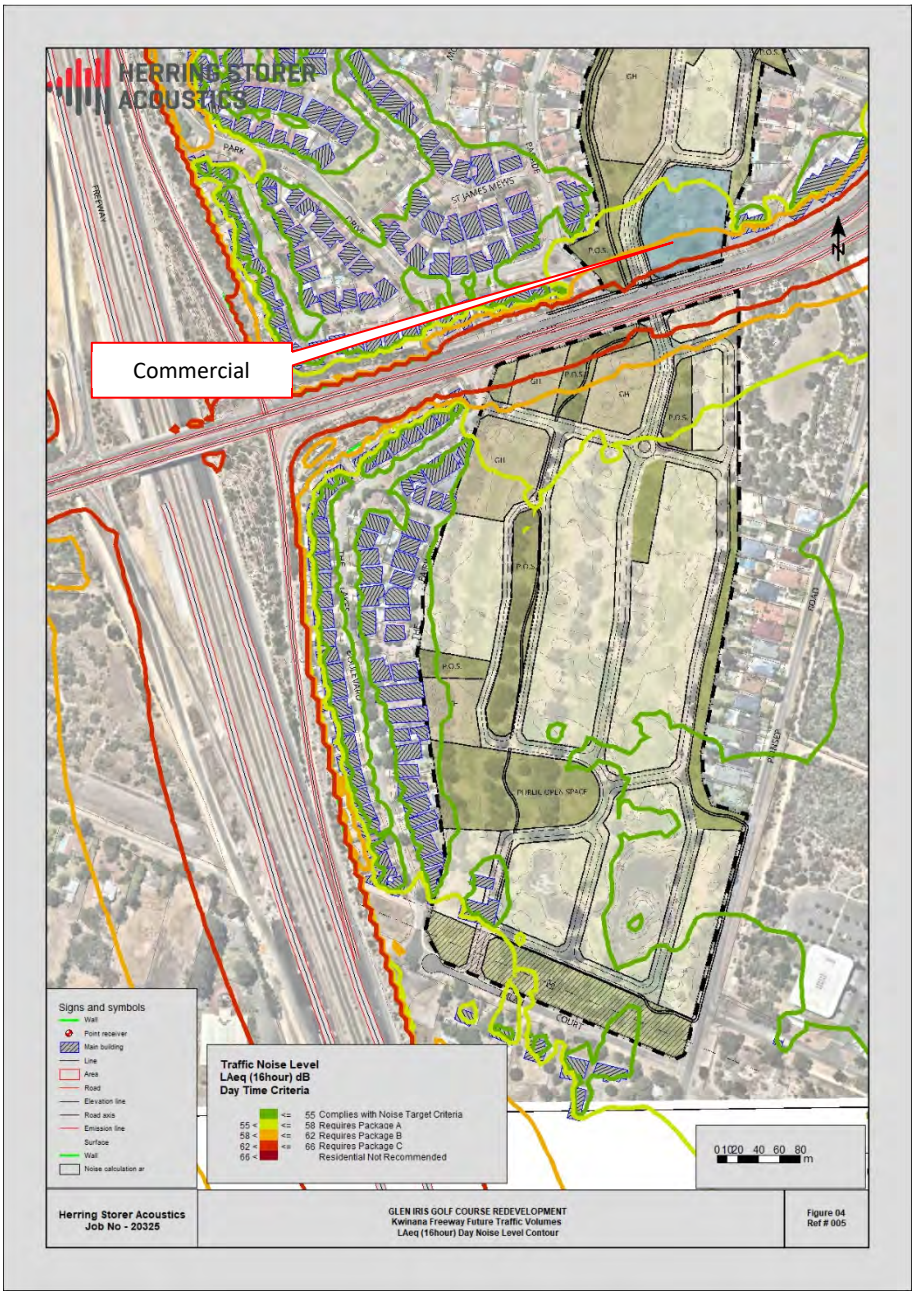



**FIGURE 5.4 – FUTURE ROAD TRAFFIC NOISE LEVELS, AREA C - SOUTH**

## 5.2 RAIL TRAFFIC

Under the WAPC State Planning Policy 5.4, for this development, the appropriate "Noise Targets" to be achieved under SPP 5.4, external to a residence are:

**External**

| | |
|---|---|
| Day | Maximum of 55 dB(A) $L_{Aeq}$ |
| Night | Maximum of 50 dB(A) $L_{Aeq}$ |

The policy states that the "outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines". The Policy also states, under Section 6 – Policy Measures that "a reasonable degree of acoustic amenity for living areas on each residential lot". The policy recognises that "it may not be practicable to meet the outdoor noise targets".
The Policy states the following acceptable internal noise levels:

**Internal**

| | |
|---|---|
| Living and Work Areas | $L_{Aeq(Day)}$ of 40 dB(A) |
| Bedrooms | $L_{Aeq(Night)}$ of 35 dB(A) |

For this development, compliance with the requirements of SPP 5.4, noise modelling and assessment are based on the night period.

The results of the acoustic assessment indicate that noise received at the proposed residential development would comply with the "Noise Targets" as outlined in SPP 5.4. The resultant noise level for the future night period, considering one train movement per hour is shown below in Figure 5.5.

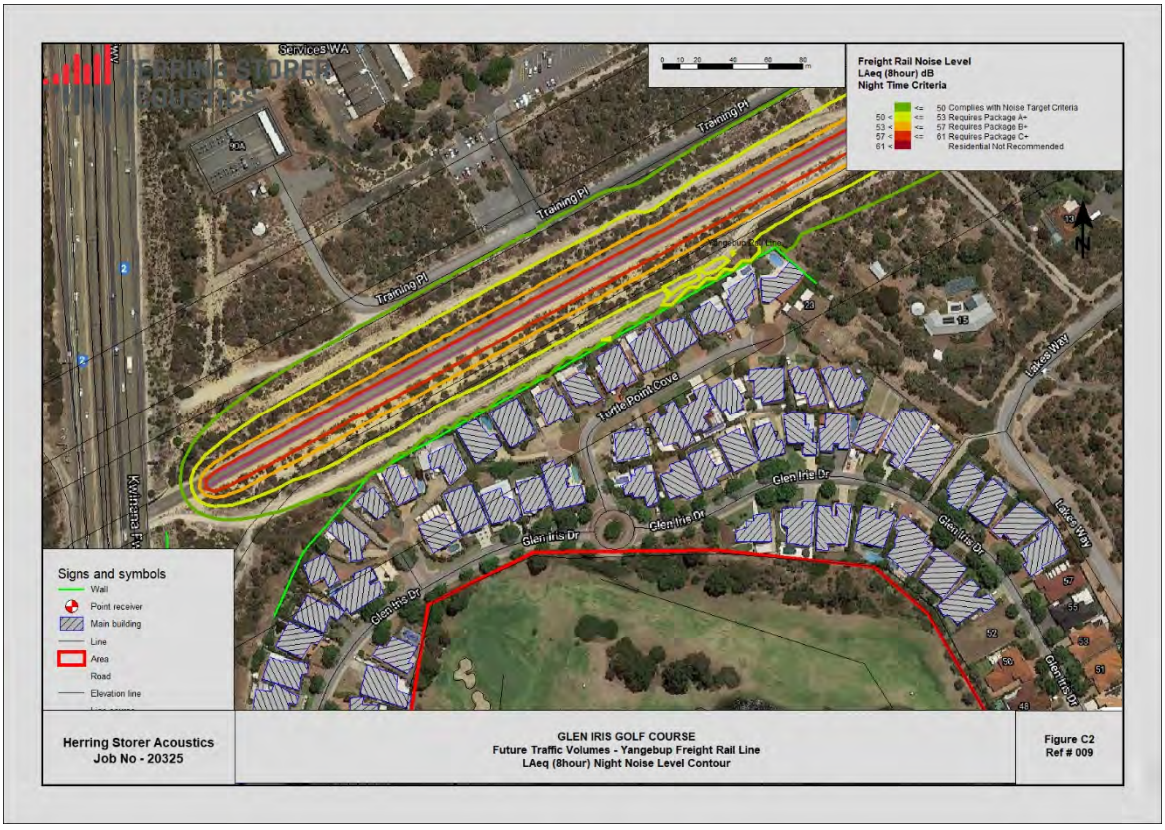



**FIGURE 5.5 – FUTURE FREIGHT RAIL NOISE LEVELS**

It is noted that the existing freight rail as per Section 4.2.1, has been undertaken and calibrated to existing noise levels. These noise levels have been increased for future rail freight movements of one per hour. This is based on the current built form, including the noise wall located along the existing residence boarding the rail line. If the proposed passenger rail development goes ahead, the noise mitigation requirements would incorporate the freight rail, hence noise levels would be less than those considered in this assessment. This provides as conservative acoustic assessment for the proposed development, where the future freight rail increases, and no further noise attenuation works are carried out.

## 5.3 AIRCRAFT NOISE

Based on guidance from SPP 5.3, the majority of the northern section of the proposed development site is acceptable for residential development, as indicated in Figure 5.6.

The blue area (ANEF 20 to 25) is also acceptable for residential development, although it requires conditions. These conditions are such that the internal noise level (for aircraft noise events) is to meet the criteria contained in AS2021. The affected lots within this development are those within the blue contour as noted in Figure 5.6.

Further to the criteria contained in SPP 5.3, the City of Cockburn LPP 1.12 contains advice as follows:

> *Consideration should be given to noise attenuation for noise sensitive premises within the Frame area corresponding to the requirements of Western Australian Planning Commission publication "Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport" 2004 (such as the installation of 6.38mm laminated glazing), in order to ensure that residential amenity is adequately protected within noise sensitive developments.*

Whilst at this stage of the development the lot configuration and layout are not known, a preliminary "deemed to satisfy construction" has been provided below. This can form the basis of future concept designs and can be refined at subdivision staging.

**Glazing**:

Bedrooms:

- Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10mm single or 6mm-12mm-10mm double insulated glazing ($R_w+C_{tr}$ 28 dB). Sealed awning or casement windows may use 6 mm glazing instead.
- Up to 60% floor area: as per above but must be sealed awning or casement type windows ($R_w+C_{tr}$ 31dB).

Indoor living and work areas:

- Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulated glazing ($R_w+C_{tr}$ 25dB).
- Up to 60% floor area: As per Bedrooms at up to 40% area ($R_w+C_{tr}$ 28 dB).
- Up to 80% floor area: As per Bedrooms at up to 60% area ($R_w+C_{tr}$ 31dB).

**Walls:**

Bedroom and indoor living and work areas to $R_w+C_{tr}$ 45dB:

- One row of 92mm studs at 600mm centres with:
  - Resilient steel channels fixed to the outside of the studs; and
  - 9.5mm hardboard or 9mm fibre cement sheeting or 11mm fibre cement weatherboards or one layer of 19mm board cladding fixed to the outside of the channels; and
  - 75mm glass wool (11kg/m3) or 75mm polyester (14kg/m3) insulation, positioned between the studs; and
  - Two layers of 16mm fire-protective grade plasterboard fixed to the inside face of the studs.
  - Single leaf of 150mm brick masonry with 13mm cement render on each face.
  - Double brick: two leaves of 90mm clay brick masonry with a 20mm cavity between leaves.

**Roof and Ceiling:**

Tiled or colorbond roof with sarking and 10mm plasterboard ceiling $R_w+C_{tr}$ 35.

Additional to the above there is a requirement where the lots within the ANEF 20 noise contour require notifications on titles for aircraft noise. The wording for the notification on title is as follows:

*Notification:*

*"This lot is situated in the vicinity of Jandakot Airport, and is currently affected, or may in the future, be affected by aircraft noise. Noise exposure levels are likely to increase in the future as a result of increases in numbers of aircraft using the airport, changes in aircraft type or other operational changes. Further information about aircraft noise, including development restrictions and noise insulation requirements for noise-affected properties, are available on request from the relevant local government offices."*

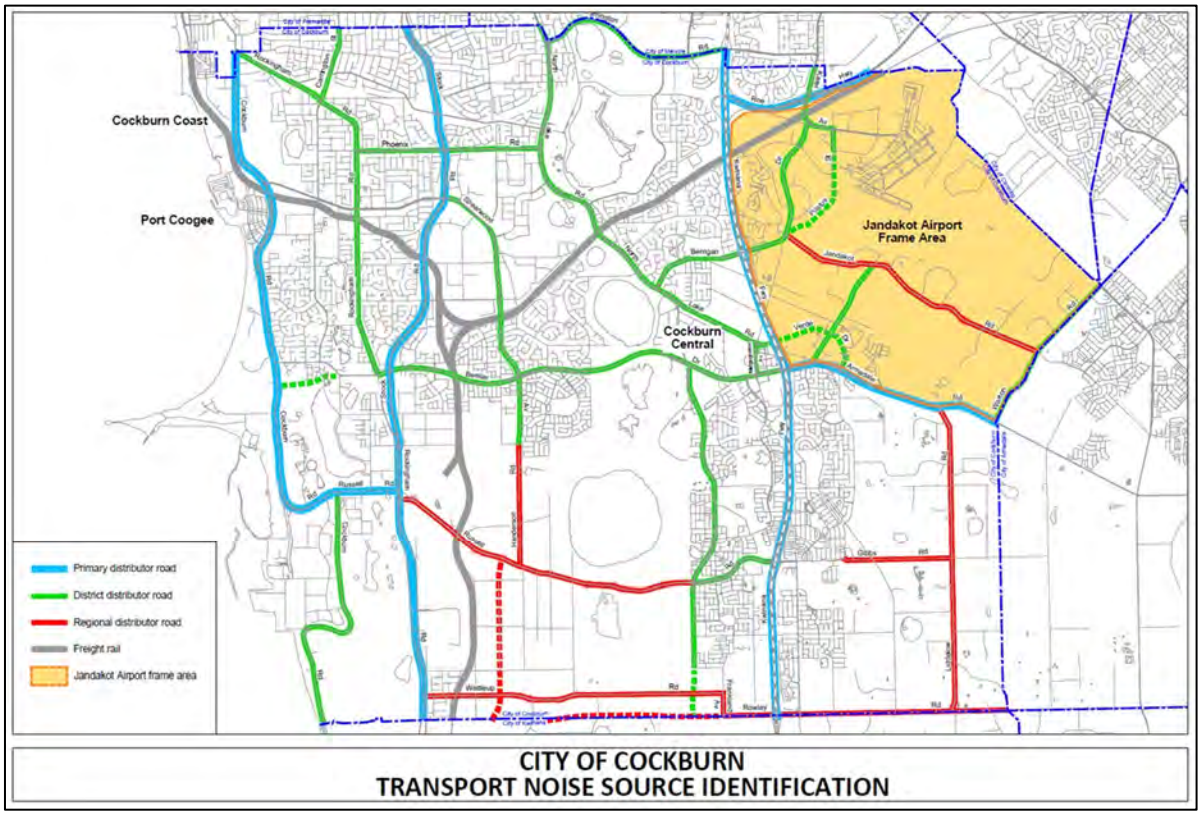



**FIGURE 5.6 – JANDAKOT AIRPORT FRAME AREA NOISE CONSIDERATIONS**

## 5.4 INDUSTRY NOISE

Based on the City of Cockburn Intramaps, there is industrial zoned land use to the south of the proposed residential development, as shown in Figure 5.7.

As there are existing residential premises located on Imlah Court, located at a closer distance to the industrial premises than the proposed development, expectations are that compliance with Regulatory criterial contained in the *Environmental Protection (Noise) Regulations 1997* would be achieved for the existing situation at these locations. However, consideration of the potential for noise impact from this area has been undertaken for the proposed residential development.

Three forms of noise amelioration have been considered for the future residence located on the southern end of the Glen Iris development, with these being as follows:

1. Noise Wall

   A solid, masonry barrier has been allowed for on the eastern boundary of the development, bounding Prinsep Road. The height of the wall has been set at 1.8m. As the proposed Lots are to back onto Prinsep Road, this will provide protection od outdoor living areas for noise associated with surrounding land use.

2. Upgrade Building Design

   As the proposed Lots for the southern section of the development lay within the Frame Area / ANEF 20/25 for Jandakot Airport, these residential dwellings will be required to meet the upgrade design as per SPP 5.4 / LPP 1.12. This will provide attenuation for other noise sources, such as industrial noise within the surrounding area.

3. Setback

As per the development plan attached in Appendix A, there is a 50m setback of lots from the southern boundary of the development. This will provide further amelioration in the form of distance attenuation.

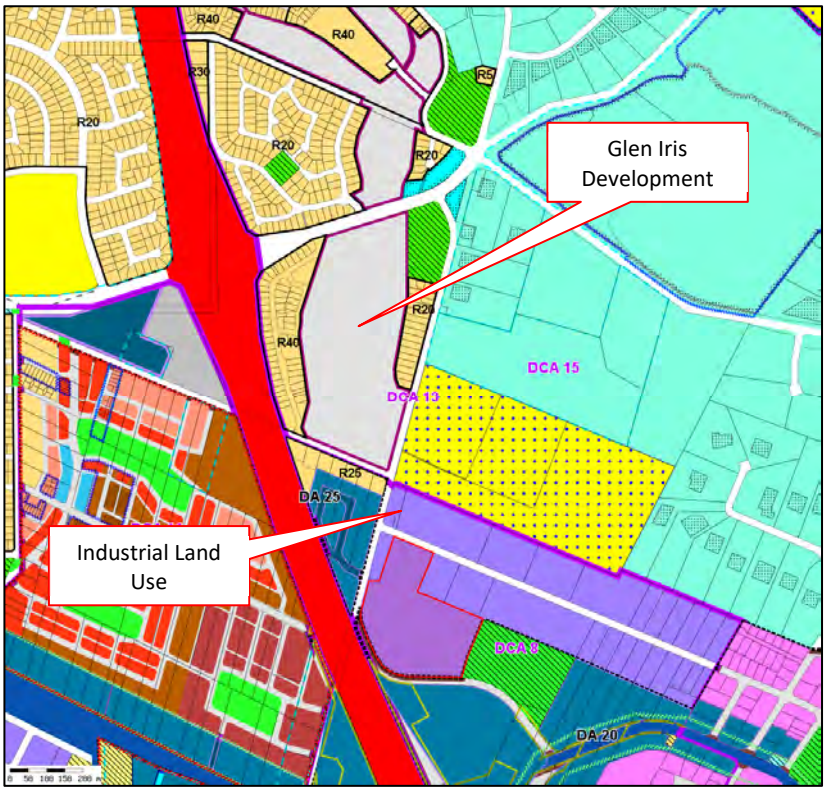



**FIGURE 5.7 – PLANNING LAND USE MAP**

# 6.0 CONCLUSION

**ROAD NOISE**

Based on the development plan, it is proposed that areas are to be constructed for the purpose of residential with some commercial usage for the section to the north of Berrigan Drive. Noise levels for the future road traffic are such, at some of the façade Lots, that noise can exceed the 55 dB(A) noise Target. Therefore, amelioration in the form of Quiet House Design is required. These areas have been identified and general “deemed to satisfy packages” applied. Detailed design for these requirements can be applied at subdivision staging.

Given the noise levels, the façade lots would require quiet house design in the form of Package A. Appendix F contains the quiet house design requirements and an area plan outlining the effected Lots.

Additionally, as they are over the Target noise level, the lots in this area would require notification on titles of the Freeway and Berrigan Drive noise impact.

**RAIL NOISE**

For train noise associated with the Yangebup Freight Line, due to the topography (line being in a cutting) and the noise wall and residential housing between the rail line and the development, the noise levels for the worst case future scenario of one train per hour have been assessed as being below the night time noise Target criteria, hence there are no acoustic requirements.

Information was sought from the Metronet and the EPA as to the proposed design and impact of noise levels from the proposed future passenger rail and freight rail lines.

As there are existing residential premises located on the proposed rail line, development of the future rail line operations needs to consider these highly noise sensitive premises.

Review of the preliminary design noise levels, as provided in the *Thornnlie-Cockburn Link Noise and Vibration Assessment Report Number 675.10409.00100-R01* shows that noise levels to these existing residential premises will be designed such that the target noise levels (as per SPP 5.4) will be met.

As the Glen Iris development is set back behind these residential premises, noise levels would be less than those at the façade lots, hence compliance with the requirements of SPP 5.4 would be achieved. Therefore, noise modelling of the future proposed Freight / Passenger Rail would not be required for this development as the infrastructure provide will meet the requirements of SPP 5.4 for existing residential premises closer to the rail line.

It is noted that assessment of the freight rail has been undertaken and calibrated to existing noise levels. These noise levels have been increased for future rail freight movements of one per hour. This is based on the current built form, including the noise wall located along the existing residence boarding the rail line. If the proposed passenger rail development goes ahead, the noise mitigation requirements would incorporate the freight rail, hence noise levels would be less than those considered in this assessment. This provides as conservative acoustic assessment for the proposed development, where the future freight rail increases, and no further noise attenuation works are carried out.

**AIRCRAFT NOISE**

Based on guidance from SPP 5.3, the majority of the northern section of the proposed development site is acceptable for residential development, as indicated in Figure 5.3.

The blue area (ANEF 20 to 25) is also acceptable for residential development, although it requires conditions. These conditions are such that the internal noise level (for aircraft noise events) are to meet the criteria contained in AS2021. The affected lots within this development are those within the blue contour as noted in Figure 5.3.

Further to the criteria contained in SPP 5.3, the City of Cockburn LPP 1.12 contains advice as follows:

> *Consideration should be given to noise attenuation for noise sensitive premises within the Frame area corresponding to the requirements of Western Australian Planning Commission publication "Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport" 2004 (such as the installation of 6.38mm laminated glazing), in order to ensure that residential amenity is adequately protected within noise sensitive developments.*

Therefore, whilst at this stage of the development the lot configuration and layout are not known, a preliminary "deemed to satisfy construction" has been provided within this report. This can form the basis of future concept designs and can be refined at subdivision staging. This encompasses the Frame Area for which the entire development is located within the boundaries.

**INDUSTRY NOISE**

Based on the City of Cockburn Intramaps, there is industrial zoned land use to the south of the proposed residential development, as shown in Figure 5.4.

As there are existing residential premises located on Imlah Court, located at a closer distance to the industrial premises than the proposed development, expectations are that compliance with Regulatory criterial contained in the *Environmental Protection (Noise) Regulations 1997* would be achieved for the existing situation at these locations. However, consideration of the potential for noise impact from this area has been undertaken for the proposed residential development.

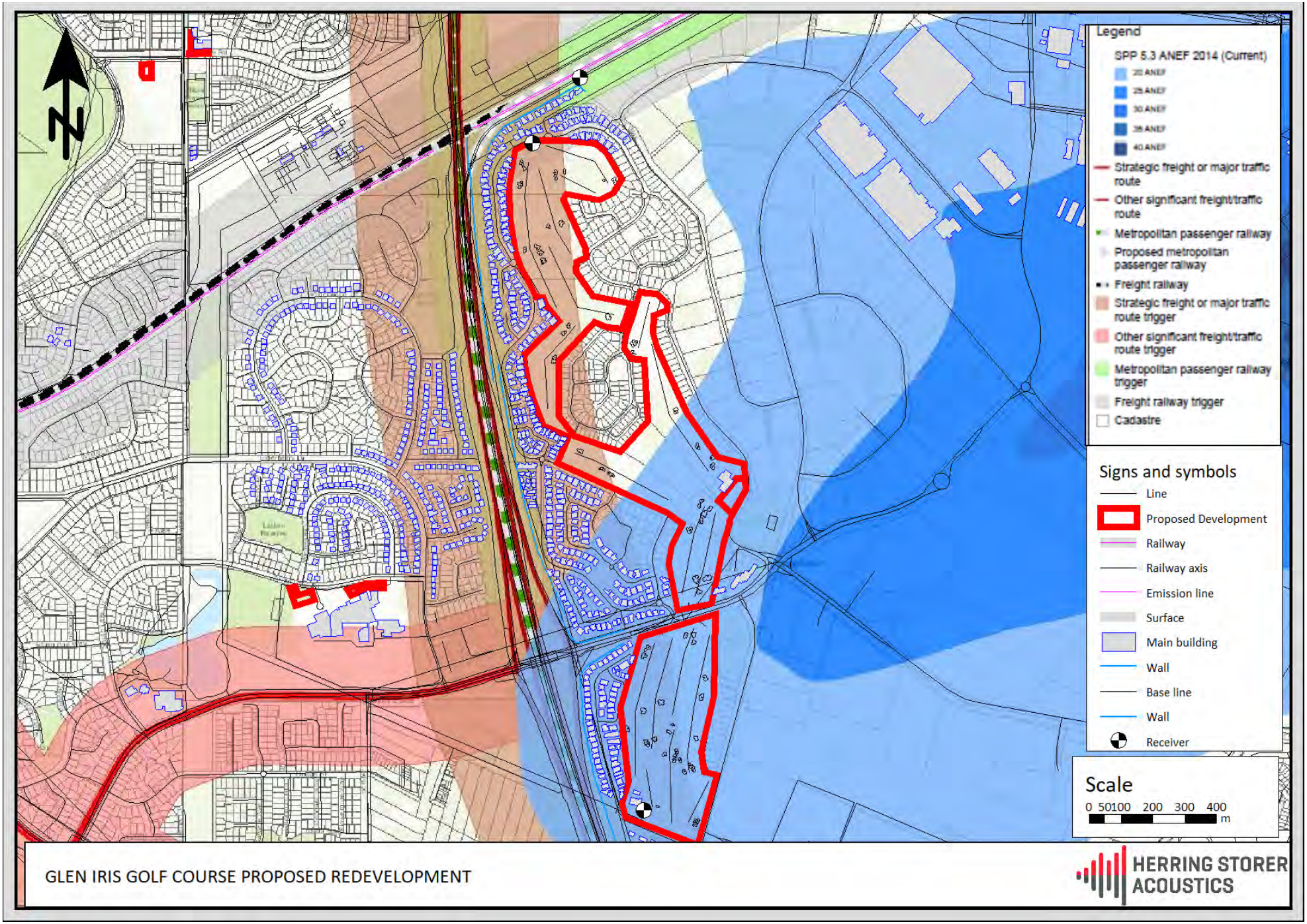
Three forms of noise amelioration have been considered for the future residence located on the southern end of the Glen Iris development, with these being as follows:

4. Noise Wall (Prinsep Road)
5. Upgrade Building Design (As per SPP 5.3)
6. Setback

Given the implementation of the above, noise levels can be managed, regardless of compliance with the regulatory criteria.

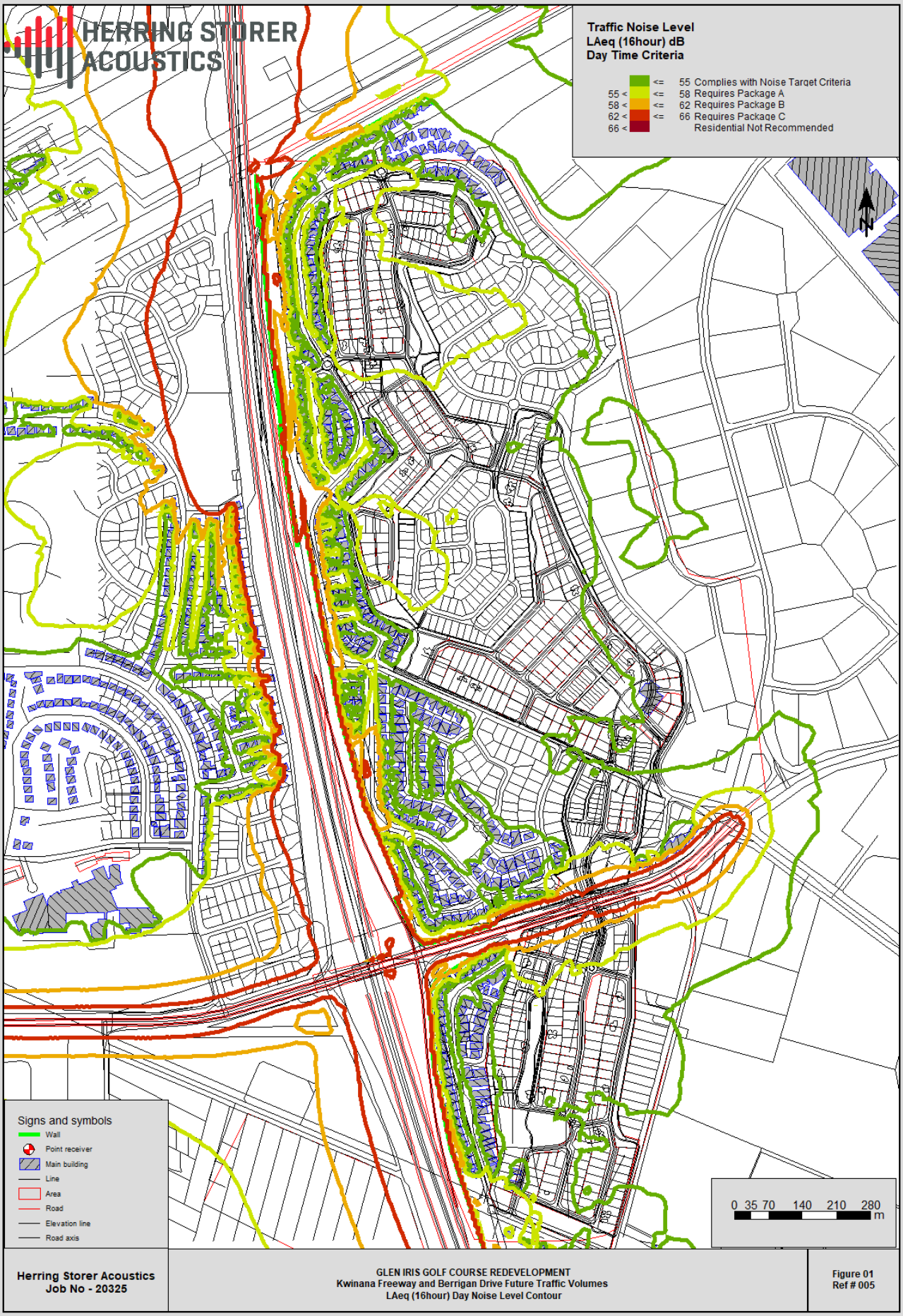
# APPENDIX A

Area Plan


N
Legend
SPP 5.3 ANEF 2014 (Current)
20 ANEF
25 ANEF
30 ANEF
35 ANEF
40 ANEF
Strategic freight or major traffic route
Other significant freight/traffic route
Metropolitan passenger railway
Proposed metropolitan passenger railway
Freight railway
Strategic freight or major traffic route trigger
Other significant freight/traffic route trigger
Metropolitan passenger railway trigger
Freight railway trigger
Cadastre
Signs and symbols
Line
Proposed Development
Railway
Railway axis
Emission line
Surface
Main building
Wall
Base line
Wall
Receiver
Scale
0 50100 200 300 400
m
GLEN IRIS GOLF COURSE PROPOSED REDEVELOPMENT
HERRING STORER ACOUSTICS

# APPENDIX B

$L_{Aeq(16hr)}$ DAY
NOISE CONTOURS FOR FUTURE KWINANA FREEWAY and BERRIGAN DRIVE


HERRING STORER ACOUSTICS
Traffic Noise Level
LAeq (16hour) dB
Day Time Criteria
<= 55 Complies with Noise Target Criteria
55 < <= 58 Requires Package A
58 < <= 62 Requires Package B
62 < <= 66 Requires Package C
66 < Residential Not Recommended
N
Signs and symbols
Wall
Point receiver
Main building
Line
Area
Road
Elevation line
Road axis
0 35 70 140 210 280
m
Herring Storer Acoustics
Job No - 20325
GLEN IRIS GOLF COURSE REDEVELOPMENT
Kwinana Freeway and Berrigan Drive Future Traffic Volumes
LAeq (16hour) Day Noise Level Contour
Figure 01
Ref # 005

# APPENDIX C

$L_{Aeq(8hr)}$ NIGHT
NOISE CONTOURS FOR FUTURE YANGEBUP FREIGHT LINE




**Herring Storer Acoustics**
**Job No - 20325**

**GLEN IRIS GOLF COURSE**
**Future Traffic Volumes - Yangebup Freight Rail Line**
**LAeq (8hour) Night Noise Level Contour**

**Figure C2**
**Ref # 009**

# APPENDIX D

TRAFFIC FLOW VOLUMES – KWINANA FREEWAY and BERRIGAN DRIVE

mainroads WESTERN AUSTRALIA

SITE 8450

# Hourly Volume

2017/18
Monday to Friday

## Kwinana Fwy (H015)

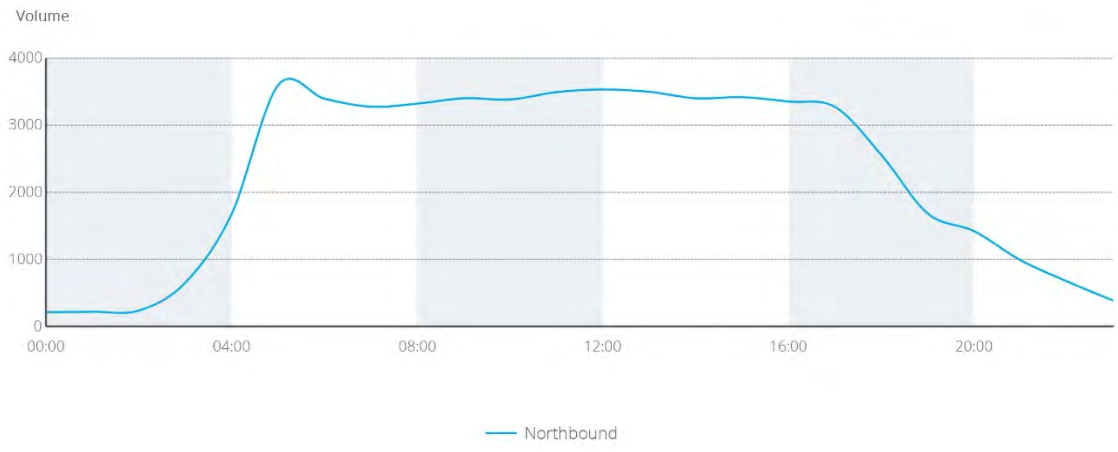
## NB At Bridge Under Berrigan Dr (SLK 16.89)

| | All Vehicles | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NB | | | | | | | |
| 00:00 | 214 | | | | | | | |
| 01:00 | 221 | | | | | | | |
| 02:00 | 239 | | | | | | | |
| 03:00 | 657 | | | | | | | |
| 04:00 | 1686 | | | | | | | |
| 05:00 | 3597 | | | | | | | |
| 06:00 | 3396 | | | | | | | |
| 07:00 | 3277 | | | | | | | |
| 08:00 | 3323 | | | | | | | |
| 09:00 | 3403 | | | | | | | |
| 10:00 | 3385 | | | | | | | |
| 11:00 | 3495 | | | | | | | |
| 12:00 | 3533 | | | | | | | |
| 13:00 | 3499 | | | | | | | |
| 14:00 | 3402 | | | | | | | |
| 15:00 | 3419 | | | | | | | |
| 16:00 | 3354 | | | | | | | |
| 17:00 | 3272 | | | | | | | |
| 18:00 | 2553 | | | | | | | |
| 19:00 | 1686 | | | | | | | |
| 20:00 | 1422 | | | | | | | |
| 21:00 | 989 | | | | | | | |
| 22:00 | 674 | | | | | | | |
| 23:00 | 386 | | | | | | | |
| TOTAL | 55082 | | | | | | | |

## Peak Statistics

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AM | TIME | 05:15 | | | | | | |
| | VOL | 3804 | | | | | | |
| PM | TIME | 12:15 | | | | | | |
| | VOL | 3550 | | | | | | |

Information Not Available



mainroads WESTERN AUSTRALIA

SITE 8437

# Hourly Volume

2017/18
Monday to Friday

## Kwinana Fwy (H015)

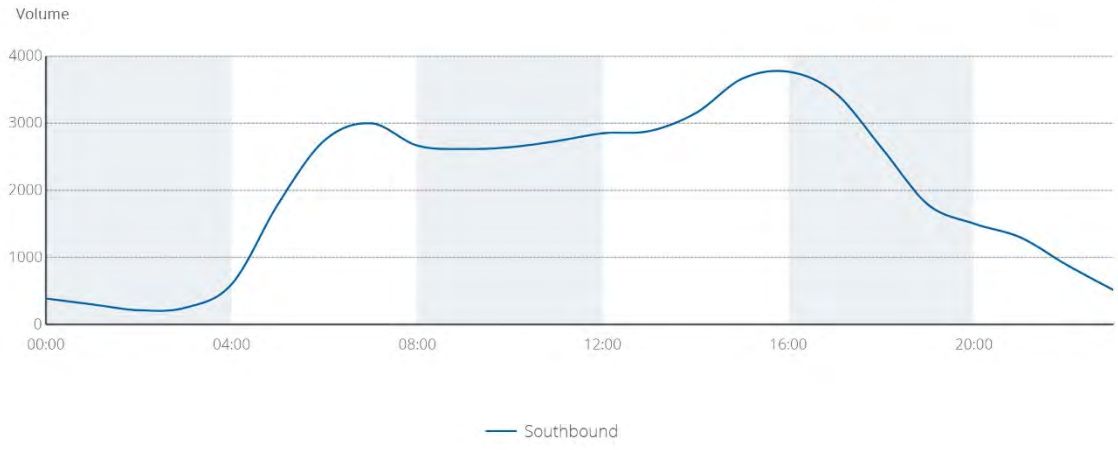
## SB At Bridge Under Berrigan Dr (SLK 16.90)

| | All Vehicles | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SB | | | | | | | |
| 00:00 | 388 | | | | | | | |
| 01:00 | 300 | | | | | | | |
| 02:00 | 213 | | | | | | | |
| 03:00 | 251 | | | | | | | |
| 04:00 | 605 | | | | | | | |
| 05:00 | 1807 | | | | | | | |
| 06:00 | 2746 | | | | | | | |
| 07:00 | 2999 | | | | | | | |
| 08:00 | 2666 | | | | | | | |
| 09:00 | 2614 | | | | | | | |
| 10:00 | 2643 | | | | | | | |
| 11:00 | 2734 | | | | | | | |
| 12:00 | 2851 | | | | | | | |
| 13:00 | 2883 | | | | | | | |
| 14:00 | 3152 | | | | | | | |
| 15:00 | 3665 | | | | | | | |
| 16:00 | 3768 | | | | | | | |
| 17:00 | 3456 | | | | | | | |
| 18:00 | 2635 | | | | | | | |
| 19:00 | 1792 | | | | | | | |
| 20:00 | 1504 | | | | | | | |
| 21:00 | 1299 | | | | | | | |
| 22:00 | 887 | | | | | | | |
| 23:00 | 516 | | | | | | | |
| TOTAL | 48368 | | | | | | | |

### Peak Statistics

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AM | TIME | 07:15 | | | | | | |
| | VOL | 3008 | | | | | | |
| PM | TIME | 15:45 | | | | | | |
| | VOL | 3795 | | | | | | |

Information Not Available



# 2016 ROM24 Scenario - Link Volume Plot for Berrigan Dr, Jandakot Noise Assessment
## All Day
## MLUFS Version 1.4 land use assumption with 20-Year Road Network Development Plan



# 2041 ROM24 Scenario - Link Volume Plot for Berrigan Dr, Jandakot Noise Assessment
## All Day
## MLUFS Version 1.4 land use assumption with 20-Year Road Network Development Plan

**MODEL ASSUMPTIONS**

*NETWORK: 2041 ROM24 Network (20-Year Road Network Development Plan)*
*LAND USE: 2041 MLUFS Land Use (Version 1.4 - August 2018)*

**ROM24 Multi-Modal Model V4.40**
**24-Hour Traffic Volumes (Factor X 100)**

Terms & Conditions :
MRWA Traffic Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations. This data should not be used for any purpose other than the stated purpose for which it was requested from MRWA. The MRWA ROM is for estimating regional traffic volumes on regional and major local roads, and it should not be used for estimating local traffic on local roads. The MRWA ROM includes local roads but this is to provide connectivity in the model.
MRWA Traffic Modelling Data should be interpreted by an experienced/qualified person.
This data should not be used in making decisions relating to commercial or residential developments.




mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Thomas Ng 9323 6366
MRWA Reference Job #42013
Tue 14 Sep 2021
T:\WOYAGERJOBS_V2021\42013\Reports\LVP\42013_LVP_All Day_Y41 MLUFS V140_Berrigan_Jandakot.VPR

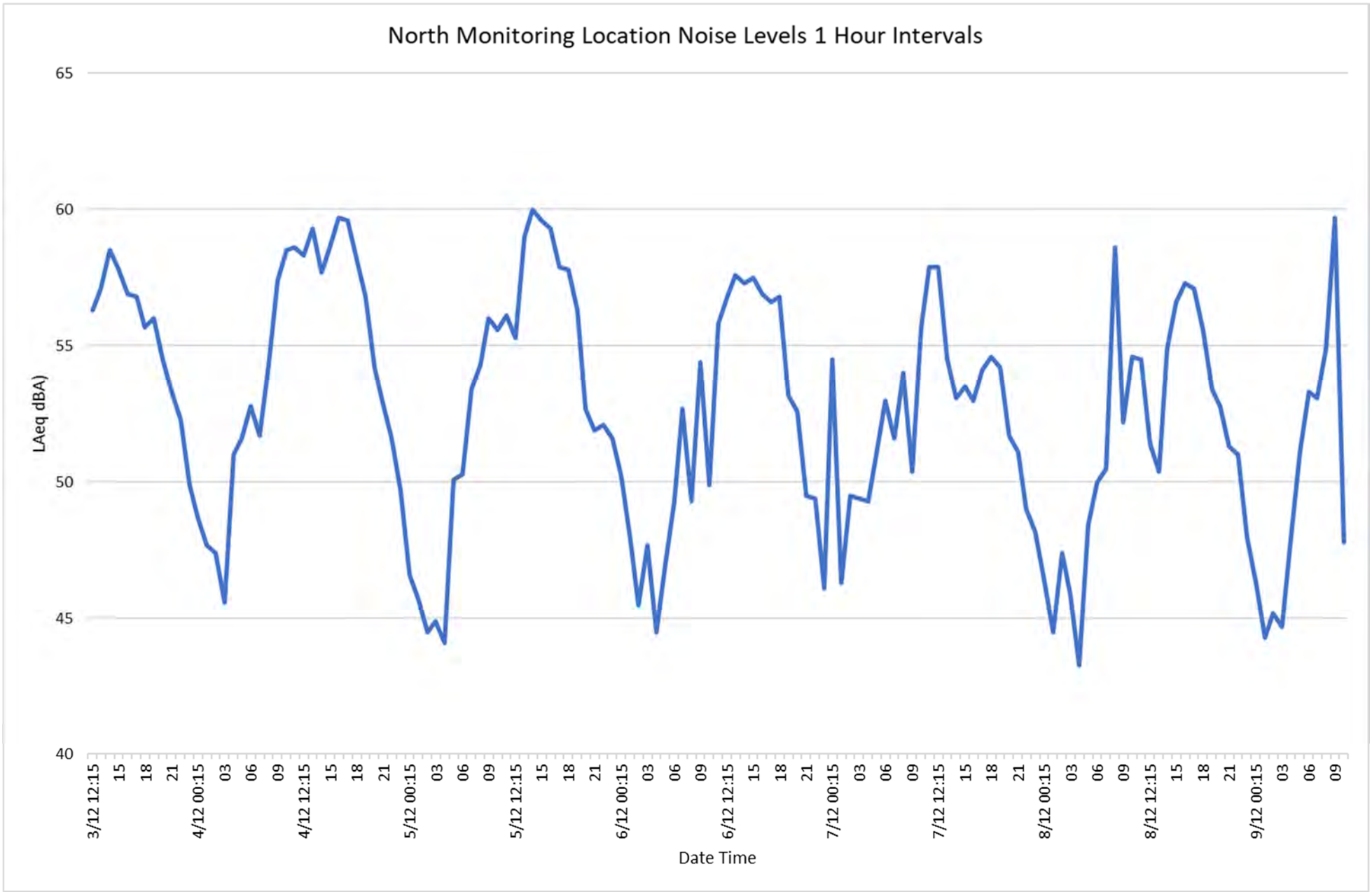
- 1 Lane Each Direction
- 2 Lanes Each Direction
- 3 Lanes Each Direction
- >=4 Lanes Each Direction
- Heavy Vehicle Percentage

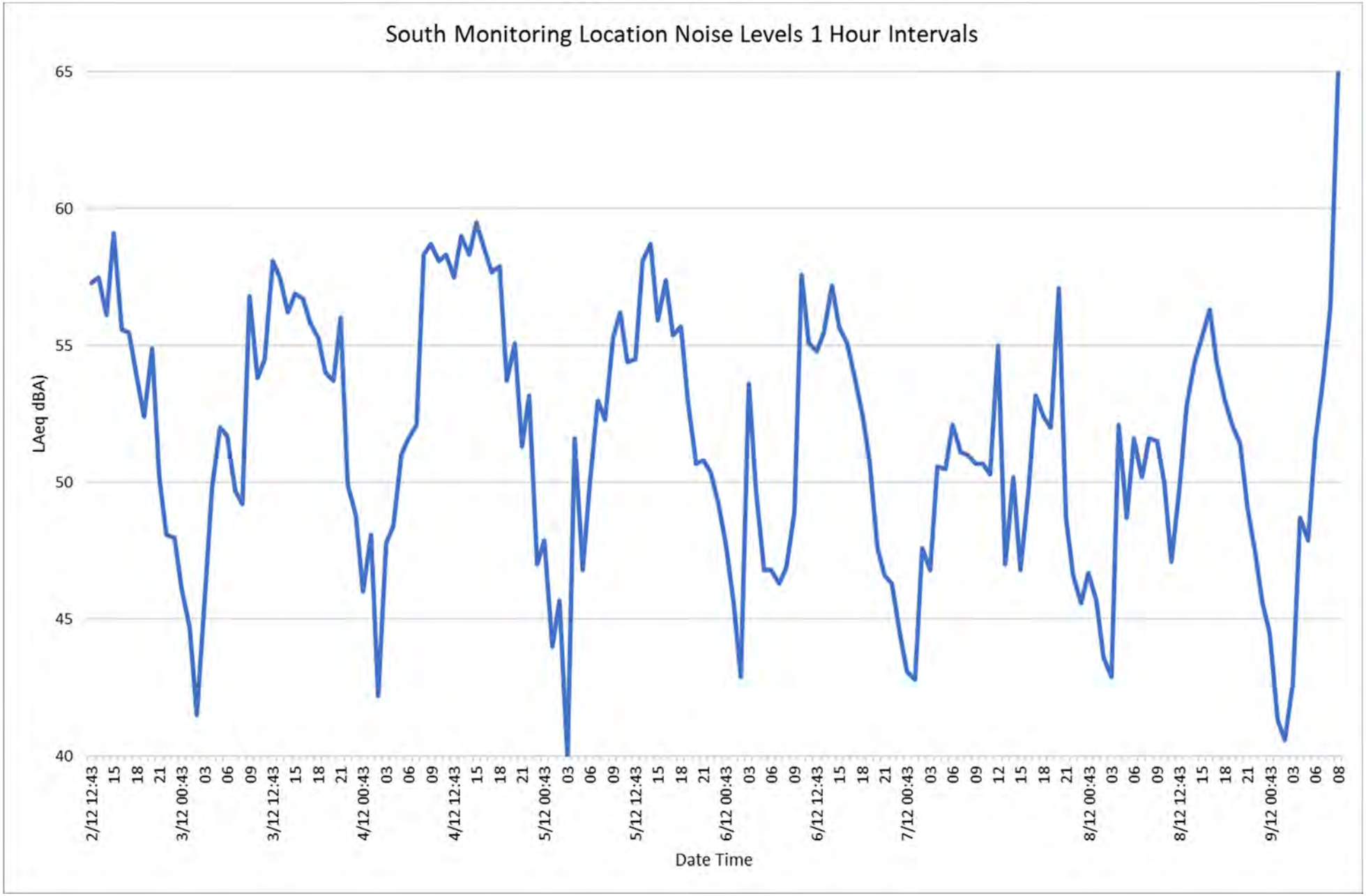
cube

(Licensed to Main Roads Western Australia)

# APPENDIX E

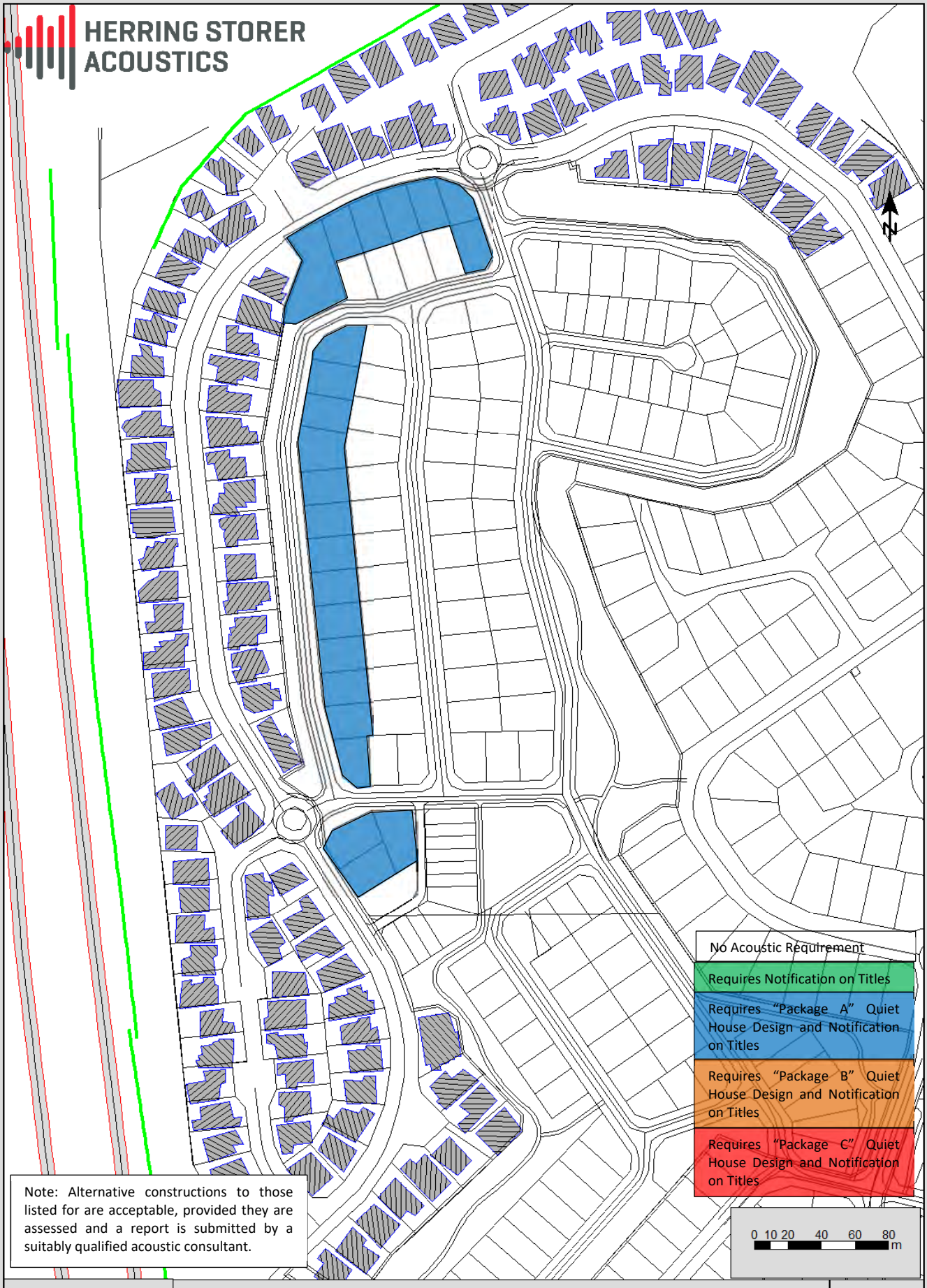
MONITORING DATA

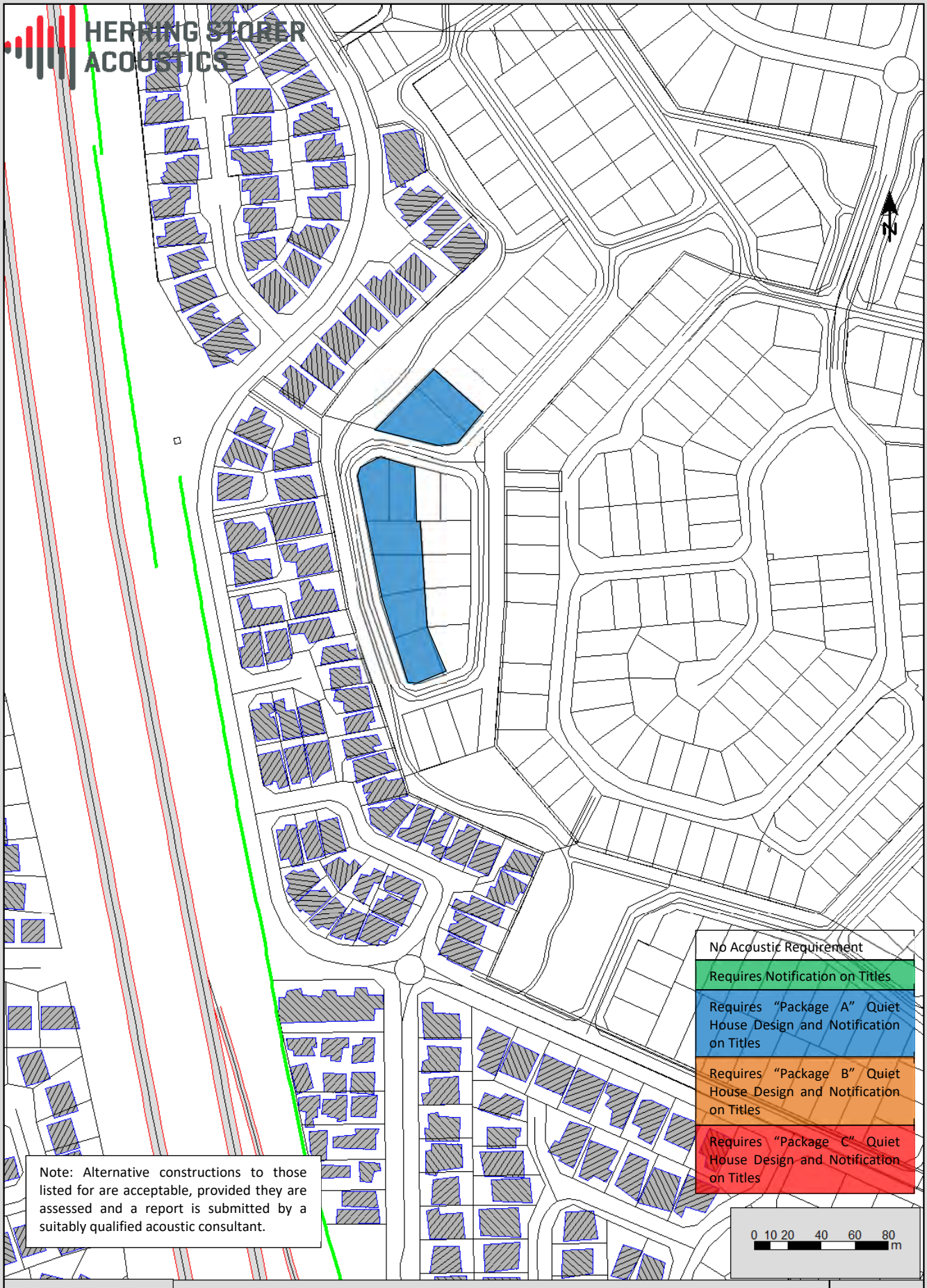

North Monitoring Location Noise Levels 1 Hour Intervals
LAeq dBA)
65
60
55
50
45
40
3/12 12:15
15
18
21
4/12 00:15
03
06
09
4/12 12:15
15
18
21
5/12 00:15
03
06
09
5/12 12:15
15
18
21
6/12 00:15
03
06
09
6/12 12:15
15
18
21
7/12 00:15
03
06
09
7/12 12:15
15
18
21
8/12 00:15
03
06
09
8/12 12:15
15
18
21
9/12 00:15
03
06
09
Date Time


South Monitoring Location Noise Levels 1 Hour Intervals
LAeq dBA)
65
60
55
50
45
40
2/12 12:43
15
18
21
3/12 00:43
03
06
09
3/12 12:43
15
18
21
4/12 00:43
03
06
09
4/12 12:43
15
18
21
5/12 00:43
03
06
09
5/12 12:43
15
18
21
6/12 00:43
03
06
09
6/12 12:43
15
18
21
7/12 00:43
03
06
09
12
15
18
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06
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8/12 12:43
15
18
21
9/12 00:43
03
06
08
Date Time

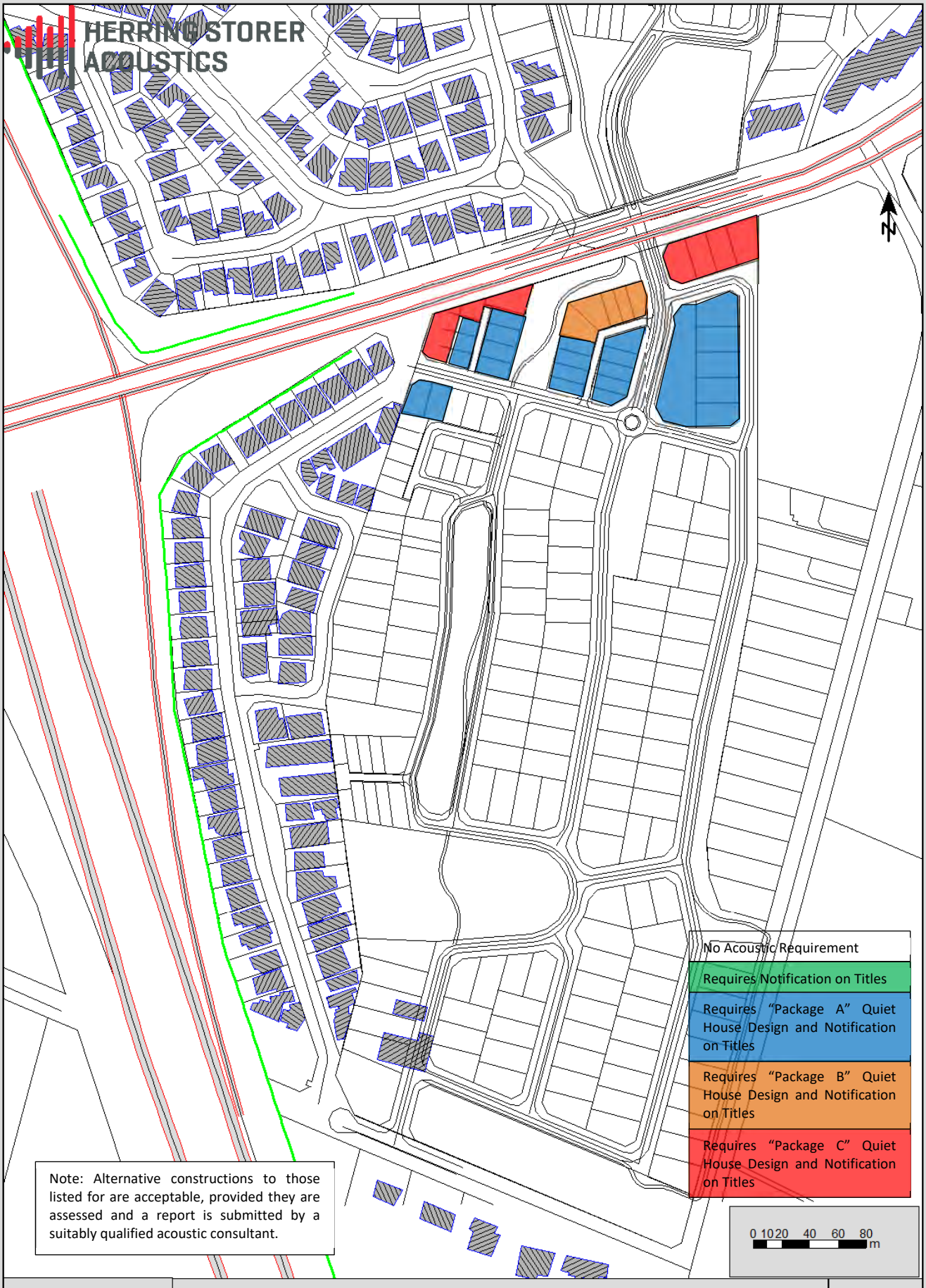
# APPENDIX F

QUIET HOUSE DESIGN REQUIREMENTS


HERRING STORER ACOUSTICS
N
No Acoustic Requirement
Requires Notification on Titles
Requires "Package A" Quiet House Design and Notification on Titles
Requires "Package B" Quiet House Design and Notification on Titles
Requires "Package C" Quiet House Design and Notification on Titles
0 10 20 40 60 80 m
Note: Alternative constructions to those listed for are acceptable, provided they are assessed and a report is submitted by a suitably qualified acoustic consultant.
Herring Storer Acoustics
Job No - 20325
GLEN IRIS GOLF COURSE REDEVELOPMENT
QHD AREA A - NORTH
Figure 01
Ref # 005




| | | |
|---|---|---|
| **Herring Storer Acoustics**<br>**Job No - 20325** | **GLEN IRIS GOLF COURSE REDEVELOPMENT**<br>**QHD AREA B - CENTRAL** | **Figure 02**<br>**Ref # 005** |




| | | |
|---|---|---|
| Herring Storer Acoustics<br>Job No - 20325 | GLEN IRIS GOLF COURSE REDEVELOPMENT<br>QHD AREA C - SOUTH | Figure 03<br>Ref # 005 |

## Road Traffic and Passenger Rail
## Quiet House Requirements
## (*Based on Table 3 of State Planning Policy 5.4 2019*)

| Exposure Category | Orientation to corridor | Acoustic rating and example constructions | | | | | Mechanical ventilation/air conditioning considerations |
|---|---|---|---|---|---|---|---|
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | |
| **A**<br>**Quiet House A** | **Facing** | **Bedroom and Indoor Living and work areas to Rw + Ctr 45dB**<br><br>**Stud Frame Walls**<br>➢ One row of 92mm studs at 60mm centres with:<br>➢ Resilient steel channels fixed to the outside of the studs; and<br>➢ 9.5mm hardboard or 9mm fibre cement weatherboards or one layer of 19mm board cladding fixed to the outside of the channels; and<br>➢ 75mm glass wool (11kg/m3) or 75mm polyester (14kg/m3) insulation, positioned between the studs; and<br>➢ -Two layers of 16mm fire-protective grade plasterboard fixed to the inside face of the studs.<br><br>**Brick Walls**<br>➢ Single leaf of 150mm brick masonry with 13mm cement render on each face: **OR**<br>➢ Double brick: two leaves of 90 mm clay brick masonry with a 20mm cavity between leaves. | **Bedrooms**:<br>➢ Fully glazed hinged door with certified **$R_w+C_{tr}$ 28dB** rated door and frame including seals and 6mm glass<br><br>**Indoor Living and work areas:**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**$R_w+C_{tr}$ 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead**: OR**<br>➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**$R_w+C_{tr}$ 31dB**).<br><br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 25dB**)**: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB : OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 31 dB**). | **To $R_w+C_{tr}$ 35dB**<br>➢ Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard ceiling | ➢ At least one outdoor living area located on the opposite side of the building from the transport corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces<br>➢ Evaporative systems require attenuated ceiling air vents to allow closed windows<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable |
| | **Side On** | | As per "Facing" above, except $R_w+C_{tr}$ values may be 3dB less, e.g. glazed sliding door with 10 mm glass and weather seals for bedrooms | As above, except $R_w+C_{tr}$ values may be 3dB less, or max % area increased by 20% | | | |
| | **Opposite** | | No specific requirements | No specific requirements | | | |

# Freight Rail
# Quiet House Requirements
## (*Based on Table 3 of State Planning Policy 5.4 2019*)

| Exposure Category | Orientation to corridor | Acoustic rating and example constructions | | | | | Mechanical ventilation/air conditioning considerations |
|---|---|---|---|---|---|---|---|
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | |
| **A+**<br>**Quiet House A+** | **All Facades** | **Brick Walls Only**<br>➢ Double brick: two leaves of 90 mm clay brick masonry with a 20mm cavity between leaves. | **Bedrooms**:<br>➢ No external doors for bedrooms with entry facing rail corridor and for other facades, fully glazed hinged door with certified **$R_w+C_{tr}$ 28dB** rated door and frame including seals and 6mm glass<br>**Indoor Living and work areas:**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ All windows comprise minimum 6mm thick laminated or toughened glass in sealed awning or casement type frames. Polymer (e.g. uPVC) window framing should be used (**$R_w+C_{tr}$ 31dB**).<br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 25dB**). **: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB**) **: OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 31 dB**). | **To $R_w+C_{tr}$ 35dB**<br>➢ Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard ceiling | ➢ At least one outdoor living area located on the opposite side of the building from the transport corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces<br>➢ Evaporative systems not recommended<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable |

## Road Traffic and Passenger Rail
## Quiet House Requirements
## (*Based on Table 3 of State Planning Policy 5.4 2019*)

| Exposure Category | Orientation to corridor | Acoustic rating and example constructions | | | | | Mechanical ventilation/air conditioning considerations |
|---|---|---|---|---|---|---|---|
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | |
| **B**<br>**Quiet House B** | **Facing** | **Bedroom and indoor living and work areas to $R_w+C_{tr}$ 50dB**<br><br>**Single leaf of 90 mm clay brick masonry with:**<br>➢ A row of 70 mm x 35 mm timber studs or 64 mm steel studs at 600 mm centres;<br>➢ A cavity of 25 mm between leaves;<br>➢ 50 mm glass wool or polyester cavity insulation (R2.0+) insulation between studs; and<br>➢ One layer of 10mm plasterboard fixed to the inside face<br>➢ Single leaf of 220mm brick masonry with 13mm cement render on each face<br>➢ 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face<br><br>**Double brick: two leaves of 90mm clay brick masonry with:**<br>➢ A 50mm cavity between leaves<br>➢ 50mm glass wool or polyester cavity insulation (R2.0+)<br>➢ Resilient ties where required to connect leaves<br><br>**Double brick: two leaves of 110mm clay brick masonry with**<br>➢ 50mm cavity between leaves and R2.0+ cavity insulation | **Bedrooms**<br>➢ Fully glazed hinged door with certified **$R_w+C_{tr}$ 31dB** rated door and frame including seals and 10mm glass<br><br>**Indoor Living and work areas**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ Total external door and window system area up to 40% of room floor areas: Fixed sash, awning or casement with minimum 6mm single or 6mm-12mm-6mm double insulted glazing (**Rw+Ctr 31dB**).<br>➢ Up to 60% floor area: as per above but must be minimum10mm single or 6mm-12mm-10mm double insulated glazing (**Rw+Ctr 34dB**)<br><br>**Indoor Living and work areas**<br>➢ Up to 40% floor area; Sliding or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing ($R_w+C_{tr}$ 28dB). Sealed awning or casement windows may use 6mm glazing instead. **: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**$R_w+C_{tr}$ 31dB**). **: OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 34dB).** | **To $R_w+C_{tr}$ 35dB**<br>➢ Concrete or terracotta tile sarking and at least 10mm plasterboard ceiling, R3.0+ insulation<br>**OR**<br>➢ Metal sheet roof, sarking and at least 10mm plasterboard ceiling, R3.0+ insulation | ➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces<br>➢ Evaporative systems require attenuated ceiling air vents to allow closed windows<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable |
| | **Side-On** | | **Bedrooms**:<br>➢ Fully glazed hinged door with certified **$R_w+C_{tr}$ 28dB** rated door and frame including seals and 6mm glass<br><br>**Indoor Living and work areas:**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**$R_w+C_{tr}$ 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead. **: OR**<br>➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**$R_w+C_{tr}$ 31dB**).<br><br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 25dB**). **: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB**) **: OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 31 dB**). | | | |
| | **Opposite** | | As above, except $R_w+C_{tr}$ values may be 3dB less, or max % area increased by 20% | As above, except $R_w+C_{tr}$ values may be 3dB less, or max % area increased by 20% | | | |

## Freight Rail
## Quiet House Requirements

| (*Based on Table 3 of State Planning Policy 5.4 2019*) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Exposure Category** | **Orientation to corridor** | **Acoustic rating and example constructions** | | | | | **Mechanical ventilation/air conditioning considerations** |
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | |
| **B+**<br>**Quiet House B** | **All Facades** | **Double brick: two leaves of 90mm clay brick masonry with:**<br>➢ A 50mm cavity between leaves<br>➢ 50mm glass wool or polyester cavity insulation (R2.0+)<br>➢ Resilient ties where required to connect leaves<br>**Double brick: two leaves of 110mm clay brick masonry with**<br>➢ 50mm cavity between leaves and R2.0+ cavity insulation | **Bedrooms**<br>**Bedrooms**:<br>➢ No external doors for bedrooms with entry facing or side on to rail corridor and for other facades, fully glazed hinged door with certified **$R_w+C_{tr}$ 31dB** rated door and frame including seals and 10mm glass<br>**Indoor Living and work areas**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ All windows comprise minimum 6mm thick laminated or toughened glass in sealed awning or casement type frames. Polymer (e.g. uPVC) window framing should be used (**$R_w+C_{tr}$ 31dB**).<br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 28dB**) **: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr31 dB**) **: OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 34 dB**). | **To $R_w+C_{tr}$ 40dB**<br>➢ To all bedrooms, 2 layers of 10mm plasterboard, or one layer 13mm high density sealed plasterboard (minimum surface density of 12.5 kg/m2), affixed using steel furring channels beneath ceiling rafters/supports**: and**<br>➢ R3.0+ insulation batts laid in cavity**: and**<br>➢ Concrete or terracotta tile roof with sarking, or metal sheet roof with foil backed R2.0+ fibre insulation between steel sheeting and roof battens | ➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces<br>➢ Evaporative systems not recommended<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable |

## Road Traffic and Passenger Rail
## Quiet House Requirements
## (*Based on Table 3 of State Planning Policy 5.4 2019*)

| Exposure Category | Orientation to corridor | Acoustic rating and example constructions | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | **Mechanical ventilation/air conditioning considerations** |
| **C**<br>**Quiet House C** | **Facing** | **Bedroom and indoor living and work areas to $R_w+C_{tr}$ 50dB**<br><br>**Single leaf of 90 mm clay brick masonry with:**<br>➢ A row of 70 mm x 35 mm timber studs or 64 mm steel studs at 600 mm centres;<br>➢ A cavity of 25 mm between leaves;<br>➢ 50 mm glass wool or polyester cavity insulation (R2.0+) insulation between studs; and<br>➢ One layer of 10mm plasterboard fixed to the inside face<br>➢ Single leaf of 220mm brick masonry with 13mm cement render on each face<br>➢ 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face | **Bedrooms**<br>➢ External doors to bedrooms facing the corridor are not recommended.<br><br>**Indoor Living and work areas**<br>➢ Fully glazed hinged door with certified **Rw+Ctr 31dB** rated door and frame including seals and 10mm glass**: OR**<br><br>40mm solid core timber frame and door (without glass or with glass inserts not less than 6mm), side hinged with certified **Rw 32dB** acoustically rated door and frame system including seals | **Bedrooms**:<br>➢ Total external door and window system area up to 20% of room floor area: Fixed sash, awning or casement with minimum 6mm single or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 31dB): OR**<br><br>➢ Up to 40% floor area; as per above but must be minimum 10mm single or 6mm-12mm-10mm double insulted glazing (**$R_w+C_{tr}$ 34dB**).<br><br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulated glazing (**$R_w+C_{tr}$ 31dB**). Sealed awning or casement windows may use 6mm glazing instead**: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr 34dB)** | **To $R_w+C_{tr}$ 40dB**<br>➢ To al bedrooms, 2 layers of 10mm plasterboard, or one layer 13mm high density sealed plasterboard (minimum surface density of 12.5 kg/m2), affixed using steel furring channels beneath ceiling rafters/supports**: and**<br>➢ R3.0+ insulation batts laid in cavity **: and**<br>➢ Concrete or terracotta tile roof with sarking, or metal sheet roof with foil backed R2.0+ fibre insulation between steel sheeting and roof battens | ➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of Rw 40dB into sensitive spaces.<br>➢ Evaporative systems require attenuated ceiling air cents to allow closed windows.<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, close or relocated to building sides facing away from the corridor where practicable. |
| | **Side-on** | | **Bedrooms**<br>➢ Fully glazed hinged door with certified **$R_w+C_{tr}$ 31dB** rated door and frame including seals and 10mm glass<br><br>**Indoor Living and work areas**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | | | | |
| | **Opposite** | **Double brick: two leaves of 90mm clay brick masonry with:**<br>➢ A 50mm cavity between leaves<br>➢ 50mm glass wool or polyester cavity insulation (R2.0+)<br>➢ Resilient ties where required to connect leaves<br><br>**Double brick: two leaves of 110mm clay brick masonry with**<br>➢ 50mm cavity between leaves and R2.0+ cavity insulation | **Bedrooms**:<br>➢ Fully glazed hinged door with certified **$R_w+C_{tr}$ 28dB** rated door and frame including seals and 6mm glass<br><br>**Indoor Living and work areas:**<br>➢ 35mm solid core timber hinged door and frame system certified to **Rw 28dB** including seals**: OR**<br>➢ Glazed sliding door with 10 mm glass and weather seals | **Bedrooms**:<br>➢ Total external door and window system area up to 40% of room floor area: Sliding or double hung with minimum 10 mm single or 6mm-12mm-10mm double insulted glazing (**$R_w+C_{tr}$ 28 dB**). Sealed awning or casement windows may use 6 mm glazing instead**: OR**<br>➢ Up to 60% floor area: as per above but must be sealed awning or casement type windows (**$R_w+C_{tr}$ 31dB**).<br><br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 25dB): OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr28 dB : OR**<br>➢ Up to 80% floor area: As per Bedrooms at up to 60% area (**$R_w+C_{tr}$ 31 dB**). | | | |

## Freight Rail
## Quiet House Requirements

| (*Based on Table 3 of State Planning Policy 5.4 2019*) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Exposure Category** | **Orientation to corridor** | **Acoustic rating and example constructions** | | | | | |
| | | **Walls** | **External doors** | **Windows** | **Roofs and ceilings of highest floors** | **Outdoor Living areas** | **Mechanical ventilation/air conditioning considerations** |
| **C+**<br>**Quiet House C+** | **All Facades** | **Double brick: two leaves of 90mm clay brick masonry with:**<br>➢ A 50mm cavity between leaves<br>➢ 50mm glass wool or polyester cavity insulation (R2.0+)<br>➢ Resilient ties where required to connect leaves<br>**Double brick: two leaves of 110mm clay brick masonry with**<br>➢ 50mm cavity between leaves and R2.0+ cavity insulation | **Bedrooms**<br>➢ External doors to bedrooms facing or side onto the corridor are not recommended.<br>**Indoor Living and work areas**<br>➢ Fully glazed hinged door with certified **Rw+Ctr 31dB** rated door and frame including seals and 10mm glass**: OR**<br>➢ 40mm solid core timber frame and door (without glass or with glass inserts not less than 6mm), side hinged with certified **Rw 32dB** acoustically rated door and frame system including seals | **Bedrooms**:<br>➢ All windows comprise minimum 6mm thick laminated or toughened glass in sealed awning or casement type frames. Polymer (e.g. uPVC) window framing should be used (**$R_w+C_{tr}$ 31dB**).<br>**Indoor Living and work areas**<br>➢ Up to 40% floor area: Sliding, awning, casement or double hung with minimum 6mm single pane or 6mm-12mm-6mm double insulted glazing (**$R_w+C_{tr}$ 31dB**) **: OR**<br>➢ Up to 60% floor area: As per Bedrooms at up to 40% area (**Rw+Ctr34 dB**) | **To $R_w+C_{tr}$ 45dB**<br>➢ To al bedrooms, 2 layers of 10mm plasterboard, affixed using steel furring channels beneath ceiling rafters/supports**: and**<br>➢ R3.0+ insulation batts laid in cavity **: and**<br>➢ Concrete or terracotta tile roof with sarking, (No metal sheet roofing) | ➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level | ➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of Rw 40dB into sensitive spaces.<br>➢ Evaporative systems require attenuated ceiling air cents to allow closed windows.<br>➢ Refrigerant-based systems need to be designed to achieve National Construction Code fresh air ventilation requirements<br>➢ Openings such as eaves, vents and air inlets must be acoustically treated, close or relocated to building sides facing away from the corridor where practicable. |