

# Environmental Assessment Report

State Football Centre

Project No: EP20-012(07)

**Prepared for Department of Finance - Building Management  
and Works  
December 2020**



# Environmental Assessment Report

## State Football Centre



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## Executive Summary

The Department of Local Government, Sport and Cultural Industries (DLGSC) (the proponent) through the Department of Finance – Building Management and Works intends to develop a State Football Centre ('the SFC') within a portion of the Queens Park Open Space Masterplan area ('the site'). The site is located within the City of Canning and is approximately 16 hectares (ha) in size reflecting the development footprint required to facilitate development of the SFC and associated works including drainage upgrades. The site is reserved 'parks and recreation' under the Metropolitan Region Scheme (MRS) and the City of Canning Local Planning Scheme No. 42 (LPS 42) and extends over the following landholdings:

- Part Lot 501 on Deposited Plan 416666 (305 Welshpool Road, Queens Park) – Western Australian Planning Commission (WAPC) landholding
- Part Lot 222 of Diagram 64644 (343 Wharf Street, Queens Park) – City of Canning landholding
- Unnamed road reserve – Land ID: 3848050 – under City of Canning management
- Welshpool road reserve – Land ID: 4423461 – under City of Canning management.

As a project jointly funded by the Commonwealth and State Government, the SFC will provide a location for high-performance training, community programs and house Football West's administration facilities. The development will include playing fields capable of high-intensity usage, supporting infrastructure such as change rooms, strength and conditioning spaces, spectator amenity as well as reconfiguration of an existing surface drainage network and landscaped public open space areas (integrating retained vegetation with water sensitive urban design features and enhancement of natural features on the site). The SFC is proposed to be operational in time for the FIFA Women's World Cup in 2023 when it will be used as a training base for visiting teams.

The SFC Development Plan is provided in **Appendix A** and the City of Canning's wider Queens Park Open Space Masterplan in which it sits is provided in **Appendix B**.

This Environmental Assessment Report (EAR) has been prepared as supporting documentation for a development application to facilitate development of the SFC. The EAR provides a synthesis of information from a range of sources regarding the environmental features, attributes and values of the site, and presents the management actions required to support the environmental assets present across the site and adjacent areas.

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

- Topography across the site is relatively uniform, with elevation ranging between 9.45 and 16.2 m Australian height datum (m AHD). The lowest points of the site are found within the compensating basin towards the central east, and the highest point is located towards the northern site boundary.
- Topsoil across the site is underlain by Bassendean sand up to 8 m below ground level (BGL), with an average thickness of 3.2 m BGL.
- The site is classified in Regional acid sulfate soils (ASS) risk mapping as having a moderate to low risk of ASS occurring within 3 m of the natural soil surface.

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- The site has historically been cleared of native vegetation prior to 1953, with scattered trees retained in the north-eastern portion of the site. Since 1953, native vegetation regrowth has occurred in the north-eastern and southern portions of the site. This has resulted in over 93% of vegetation within the site identified as being in a 'degraded' to 'completely degraded' condition on the Keighery (1994) vegetation condition scale.
- The north eastern portion of the site has the best vegetation condition rating with a patch of *Corymbia callophylla* woodland in 'very good' condition. The *Threatened Ecological Community Assessment* (Emerge Associates 2020d) found that this vegetation is representative of the state-listed Priority Ecological Community (PEC) SCP 21c.
- Two (2) threatened or priority flora species have been recorded within the site: *Macarthuria keigheryi* (threatened) and *Jacksonia gracillima* (Priority 3).
- Three threatened black cockatoo species have potential to utilise the site: *Calyptorhynchus baudinii* (Baudin's cockatoo) although it is noted that the site is on the edge of the habitat range for this species; *Calyptorhynchus latirostris* (Carnaby's cockatoo); and *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo). The *Targeted Black Cockatoo Assessment* (Emerge Associates 2020a) undertaken for the site confirmed the presence of 46 habitat trees suitable for black cockatoo breeding, however none of these contain potentially suitable nesting hollows. Limited foraging habitat for black cockatoos is also present within the site. The proposal was referred to the Commonwealth pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and found to be 'not a controlled action'.
- The site is located within Bush Forever Site No. 283 (Queens Park Bushland, Queens Park), and adjacent to Bush Forever Site No. 424 (McDowell Street Bushland, Welshpool), located to the immediate north-east of the site, separated by Welshpool Road.
- The entirety of the site is mapped within a large Environmentally Sensitive Area (ESA) that extends to the north, west, south and east of the site.
- Maximum measured groundwater levels beneath the site in September 2020 range from 10.4 m AHD at the southern boundary to 12.4 m AHD at the northern boundary (1 m to 3 m BGL), resulting in a groundwater flow direction of north-west to south-east (Emerge Associates 2020e).
- Two major drains are present within the site (UFI 416995 and UFI 417218) which intersect and then lead into a compensating basin (UFI 416669 and UFI 416670), operated by the Water Corporation. A third shallower drain is present to the south-west of the compensating basin. The drainage channels intersect groundwater for a portion of the year, with the compensating basin intersecting groundwater for all of the year.
- One resource enhancement wetland (REW) (UFI 15819) is located along the eastern boundary of the site, while the west and south of the site is located within a multiple use wetland (MUW) (UFI 7490).
- No Registered Aboriginal Heritage Sites or Other Heritage Places are mapped within the site. An Heritage Identification Survey undertaken with traditional owners concluded "that the site is not, and does not contain, any known Aboriginal heritage sites".
- There are no registered non-indigenous heritage sites located within the site.
- There are no existing land uses in proximity to the site which are incompatible with the proposed SFC development.

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- The site is not registered as a contaminated site pursuant to the *Contaminated Sites Act 2003*, however historical aerial photography indicates structures were constructed within the northern portion prior to 1953 and consequently there is an increased risk of asbestos containing material (ACM) being present. The site has also been subject to fly tipping as it has been vacant for an extended period of time.
- The site and surrounding areas have been identified as bushfire prone under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019).

The SFC Development Plan has been developed with consideration to the identified environmental values of the site. A number of design responses have been incorporated into the layout in this regard, including:

- Retention of approximately 1.86 ha of native vegetation, incorporating threatened and priority flora species, a priority ecological community and black cockatoo foraging habitat and breeding habitat trees.
- Retention of resource enhancement category wetland UFI 15819.
- Reconfiguration of drainage features, with continued incorporation of an open waterbody to provide waterbird and aquatic fauna habitat.
- Incorporation of native flora species into landscaping to maximise fauna habitat around the SFC.

This EAR also outlines the environmental management framework to be implemented across the site as part of the development process, including preparation and implementation of the following:

- *Water Management Plan* (Emerge Associates 2020e)
- *Bushfire Management Plan* (Emerge Associates 2020c) including bushfire attack level (BAL) assessment
- Acid Sulfate Soils and Dewatering Management Plan
- Construction Management Plan
- Fauna Management Plan
- Irrigation Management Plan
- Nutrient Management Plan.

Overall, the environmental attributes and values of the site have been accommodated within the SFC Development Plan design or can be managed appropriately through the development process in line with relevant State and local government legislation, policies and guidelines.

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State Football Centre Development Plan

### **Appendix B**

Queens Park Open Space Masterplan

### **Appendix C**

Definitions and Criteria

### **Appendix D**

Flora and Fauna Assessment for Queens Park Regional Open Space

### **Appendix E**

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### **Appendix F**

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Basic Fauna and Targeted Black Cockatoo Assessment

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## 1 Introduction

### 1.1 Background

Emerge Associates (Emerge) has been engaged by the Department of Local Government, Sport and Cultural Industries (DLGSC) (the proponent), through the Department of Finance – Building Management and Works, to provide environmental consultancy services to support the development and construction of a State Football Centre (SFC). The SFC is proposed to be constructed in a portion of the Queens Park Open Space Masterplan area in the City of Canning, specifically within the following lots ('the site'):

- Part Lot 501 on Deposited Plan 416666 (305 Welshpool Road, Queens Park) – Western Australian Planning Commission (WAPC) landholding
- Part Lot 222 of Diagram 64644 (343 Wharf Street, Queens Park) – City of Canning landholding
- Unnamed road reserve – Land ID: 3848050 – under City of Canning management
- Welshpool road reserve – Land ID: 4423461 – under City of Canning management.

The site comprises a total area of approximately 16 hectares (ha) and is reserved 'parks and recreation' under the Metropolitan Region Scheme (MRS) and the City of Canning Local Planning Scheme (LPS) No. 42 (**Figure 1**). It is bounded by Welshpool Road to the north, Gibbs Street to the south-east, Wharf Street to the west and residential areas to the south-west. Bush Forever Site No. 283 (Queens Park Bushland, Queens Park) also extends across the entire extent of the site, whilst Bush Forever Site No. 424 (McDowell Street Bushland, Welshpool) is located to the north of the site.

The site has historically been cleared of native vegetation prior to 1953, with scattered trees retained in the north-eastern portion of the site. Since 1953, native vegetation regrowth has occurred in the north-eastern and southern portions of the site. A compensating basin is located in the southern portion of the site which accepts runoff from upstream catchments, and is conveyed through the site through artificial drainage channels (Emerge Associates 2020e).

As a project jointly funded by the Commonwealth and State Government, the SFC will provide a location for high-performance training, community programs and house Football West's administration facilities. The development will include playing fields capable of high-intensity usage, supporting infrastructure such as change rooms, strength and conditioning spaces, spectator amenity as well as reconfiguration of an existing surface drainage network and landscaped public open space areas (integrating retained vegetation with water sensitive urban design features and enhancement of natural features on the site). The SFC is proposed to be operational in time for the FIFA Women's World Cup in 2023 when it will be used as a training base for visiting teams.

The SFC Development Plan is provided in **Appendix A** and the wider Queens Park Open Space Masterplan in which it sits is provided in **Appendix B**.

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### 1.2 Purpose of this report

The purpose of this Environmental Assessment Report (EAR) is to provide a synthesis of information regarding the environmental values and attributes of the site. Specifically, this report:

- Identifies the existing environmental values and attributes of the site (**Section 2**)
- Discusses the proposal and corresponding environmental approvals (**Section 3**)
- Discusses how the proposed design responds to the existing environment and outlines the environmental management framework (**Section 4**).

The EAR is the key supporting environmental document for the development application, ultimately facilitating the consideration of environmental issues by the various local and state government agencies and authorities.

### 1.3 Scope of work

Emerge were engaged by the proponent to undertake an environmental assessment to document the existing environmental attributes and values of the site and ensure relevant environmental values were considered within the SFC Development Plan design. This involved utilising a range of information sources including local and regional reports, databases, mapping and site-specific investigations. The outcomes of these findings include information on the following attributes:

- Landform and soils
- Biodiversity and natural assets, including flora, vegetation and terrestrial fauna
- Hydrology
- Heritage
- Historical and existing land uses within and surrounding the site
- Bushfire hazards.

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## 2 Existing Environment

### 2.1 Landform and soils

#### 2.1.1 Topography

Topography within the site is relatively uniform, with elevation ranging from approximately 9.45 metres Australian height datum (m AHD) to 16.17 m AHD (Veris 2020) (**Figure 2**). The lowest points of the site are found within the compensating basin towards the central east (detailed in **Section 2.3.2**), and the highest point is located towards the northern site boundary.

#### 2.1.2 Landform, soils and geology

Environmental geology for the site has been mapped by the *Geological Survey of Western Australia* (DPIRD 2019). Based on this mapping, the site consists entirely of S8 – Bassendean Sand - White to pale grey at the surface, yellow at depth, fine to medium-grained, moderately sorted, subangular to subrounded, minor heavy minerals, of eolian origin (**Figure 3**).

A number of site-specific geological investigations have been conducted and are discussed in depth in the *Water Management Plan* (Emerge Associates 2020e). The geological investigations indicate that the topsoil of the site is underlain by Bassendean sand up to 8 m below ground level (BGL), with an average thickness of 3.2 m BGL. Clay was found to intrude beneath the sand generally at depths starting at 2.5 m BGL, and coffee rock was found in five test pits at depths ranging from 0.15 to 6 m BGL.

#### 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 anoxic conditions and do not present any risk to the environment. ASS can present issues when oxidised, producing sulphuric acid, which can impart a range of impacts on the surrounding environment, infrastructure and human health. Projects involving the disturbance of ASS must therefore assess the risk associated with disturbance by considering potential impacts.

Regional ASS risk mapping indicates that the site is classified as having a moderate to low risk of ASS occurring within 3 m of the natural soil surface, as shown in **Figure 4** (DWER 2020a).

An *Acid Sulfate Soils Investigation* was conducted by GHD (2010) in 2010 and additional ASS field screening tests were conducted by Arup (2020). These investigations found actual and possible acid sulfate soils (AASS and PASS) at a number of locations over the site, suggesting that ASS management would be required during development (see **Section 4.1**).

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## 2.2 Biodiversity and natural assets

### 2.2.1 Flora and vegetation

#### 2.2.1.1 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 Perth subregion of the Swan Coastal Plain, which is characterised as mainly containing *Banksia* low woodland on leached sands within ill-drained *Melaleuca* swamps, and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990).

At a regional scale, vegetation complex mapping undertaken by Heddle *et al.* (1980) indicates the site occurs within the Southern River Complex, which is described as 'open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - *Banksia* spp. with fringing woodland of *Eucalyptus rudis* - *Melaleuca raphiophylla* along creek beds'. As of March 2019, there was 18.43% of the pre-European extent of the Southern River Complex remaining on the Swan Coastal Plain (Government of Western Australia 2019).

#### 2.2.1.2 Site specific surveys and investigations

Two flora and vegetation assessments have been undertaken across portions of the site:

- *Flora and Fauna Assessment for Queens Park Regional Open Space* (Ecoscape 2010) (**Appendix D**).
- *State Football Centre –Environmental Planning Process Road Map: Flora Survey Report* (GHD 2020) (**Appendix E**).

A follow up survey was also conducted by Emerge Associates (2020) across the entire development area to refine the previous mapping prepared by Ecoscape and GHD and to confirm the presence of a marri threatened ecological community (TEC) or any threatened flora species (**Appendix F**).

#### 2.2.1.3 Plant communities

The site has historically been cleared of native vegetation prior to 1953, with scattered trees retained in the north-eastern portion of the site. Since 1953, native vegetation regrowth has occurred in the north-eastern and southern portions of the site.

Plant communities identified as part of the Ecoscape (2010) survey and the GHD (2020) survey as confirmed by Emerge in August and September 2020 are listed in **Table 1** and shown in **Figure 5**.

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Table 1: Plant communities identified within the site adapted from Ecoscape (2010) and GHD (2020)

Plant community	Description
<b><i>Corymbia calophylla</i> woodland (VT1)</b>	<i>Corymbia calophylla</i> tall woodland over <i>Jacksonia floribunda</i> tall open shrubland over <i>Xanthorrhoea preissii</i> and <i>X. gracilis</i> low open shrubland over <i>Dasypogon bromeliifolius</i> and <i>Phellocarya ciliata</i> herbland.
<b><i>Banksia</i> low woodland (VT2)</b>	<i>Banksia menziesii</i> and <i>Eucalyptus marginata</i> low woodland over <i>Scholtzia involucrata</i> low sparse shrubland over mixed open sedgeland and/ or herbaceous weeds.
<b><i>Melaleuca preissiana</i> low woodland (VT3)</b>	<i>Melaleuca preissiana</i> low woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over introduced herbland.
<b>Mixed, introduced trees and shrubs (VT4)</b>	Mostly introduced, planted or naturalised species of tall trees and tall shrubs including: <i>Eucalyptus cladocalyx</i> , <i>Eucalyptus</i> sp., <i>Ficus</i> sp., <i>Melia azedarach</i> , <i>Erythrina indica</i> , <i>Lantana camera</i> , <i>Leptospermum laevigatum</i> and <i>Callistemon</i> sp., over introduced grasses and herbs.
<b>Scattered natives over weeds (VT5)</b>	Mixed native species such as <i>Macrozamia reidleyi</i> , <i>Acacia saligna</i> , <i>Agonis flexuosa</i> over introduced grasses and herbs.
<b>Mixed shrubs and sedges/grasses (VT6)</b>	Isolated <i>Melaleuca preissiana</i> over <i>Cortaderia selloana</i> (Pampas grass) and <i>Typha</i> dense tall shrubland over <i>Juncus pallidus</i> and <i>Baumea articulata</i> closed low sedgeland with <i>Azolla rubra</i> and <i>Lemna disperma</i> water plants associated with an artificial/modified wetland.
<b><i>Adenanthos cygnorum</i> tall shrubland (VT7)</b>	<i>Adenanthos cygnorum</i> tall shrubland with isolated <i>Allocasuarina fraseriana</i> over closed introduced herbs and grasses.
<b><i>Eucalyptus rudis</i> forest (VT8)</b>	<i>Eucalyptus rudis</i> tall forest and scattered <i>Melaleuca preissiana</i> and <i>Kunzea glabrescens</i> over scattered introduced herbs. Understorey mostly absent, potentially winter wet.

### 2.2.1.4 Vegetation condition

Vegetation condition was assessed across the site by both Ecoscape (2010) and GHD (2020) as part of the flora surveys, against the methods used in the *Bushland Plant Survey: A guide to plant community survey for the community* Keighery (1994). Detailed descriptions of the vegetation condition ratings are provided in (Appendix C). Vegetation condition was confirmed by Emerge in August and September 2020 and is shown in Figure 6 with areas listed in Table 2.

Based on the survey results the majority of the site supports non-native vegetation in ‘completely degraded’ condition. The north-eastern portion of the site has the best condition rating with a patch of *Corymbia calophylla* woodland in ‘very good’ condition and adjacent patches in ‘good’ and ‘degraded’ condition.

Table 2: Vegetation condition and area (adapted from Ecoscape (2010) and GHD (2020))

Vegetation condition rating	Area (ha)
Pristine	0
Excellent	0
Very Good	0.89
Good	0.22
Degraded	1.48
Degraded - completely degraded	0.74

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Table 2: Vegetation condition and area (adapted from Ecoscape (2010) and GHD (2020)) (continued)

Vegetation condition rating	Area (ha)
Completely degraded	11.98
N/A (revegetation)	0.69

### 2.2.1.5 Threatened and Priority Ecological Communities

Generally, ecological communities can be described as vegetation communities that are assemblages of species that occur together in a particular type of habitat. An ecological community's structure, composition and distribution are determined by a range of environmental factors. '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'. Any action likely to have a significant impact on a TEC listed under the EPBC Act (either critically endangered or endangered TECs) requires approval from the Commonwealth Minister for the Environment.

Within Western Australia, state-listed threatened flora and TECs are statutorily protected through the *Biodiversity Conservation Act 2016* (BC Act), and licences (or similar) may be required where these values are proposed to be disturbed or modified. In addition to the BC Act, impacts to TECs are considered under the EP Act. The Environmental Protection Authority (EPA) produces environmental factor guidelines to outline how environmental factors are considered by the EPA in the environmental impact assessment. Under the flora and vegetation environmental factor guideline (EPA 2016a) TECs are considered to be significant values, and approval may be required from the EPA in order to impact a TEC.

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 statutory protection in Western Australia, they are considered during the approval process.

Known locations of TECs and PECs within 5 km of the site were searched for using the publicly available *Weed and native flora dataset* (Keighery *et al.* 2012), *Protected Matters Search Tool* (DAWE 2020a) and the Department of Biodiversity, Conservation and Attractions (DBCA) threatened and priority ecological communities' database (reference no. 19-01119EC). The database search results identified 14 TECs and two PECs occurring or potentially occurring within a 5 km radius of the site (**Appendix F**).

#### Banksia woodlands TEC

GHD (2020) identified 0.26 ha of the state-listed PEC occurring within the eastern and northern portions of the site, associated with the Banksia low woodland (VT2) plant community, which was identified to be in 'good' condition. DBCA have since updated the listing information for this PEC.

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The PEC is now named '*banksia woodlands of the Swan Coastal Plain*' and the description, area and condition thresholds that apply to the EPBC-listed TEC of the same name also apply to this PEC.

Due to the small size of the vegetation patch and the degraded nature of the vegetation, no patches of vegetation within the site are considered representative of the banksia woodland TEC (and state-listed PEC).

### *Banksia attenuata* PEC

The recent Emerge (2020) TEC assessment found that the ***Corymbia calophylla* woodland (VT1)** vegetation within the north eastern portion of the site is representative of SCP 21c, based upon an analysis of the Floristic Community Type (FCT) (**Appendix F**).

SCP 21c/FCT 21c is 'low lying *Banksia attenuata* woodlands or shrublands' and is a state listed PEC. A total of 1.09 ha of this PEC occurs within the site, located in the north-eastern corner. Other areas within the site were considered too degraded to undertake a FCT analysis. There is no TEC present within the SFC development area.

### 2.2.1.6 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 and any action likely to have a significant impact on a listed threatened species requires approval from the Commonwealth Minister for the Environment.

At a State level, plant species may also be classed as 'threatened' under the BC Act. Species which are potentially rare or threatened, or 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.

A search was conducted for threatened and priority flora within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a), *NatureMap* (DBCA 2020a) and DBCA's threatened and priority flora database (reference no. 22-1119FL). A total of 22 threatened and 64 priority flora species were identified as potentially occurring in the wider local area. The DBCA search identified a single threatened flora species, *Macarthur keigheryi*, as occurring within the eastern and western portions of the site.

The GHD (2020) survey did not identify any threatened or priority flora specimens within the site. However, it is noted that *Macarthuria keigheryi* is described as a 'cryptic species', and is primarily present after fire, and undergoes a rapid die-down within 2 – 3 years after fire.

The flora surveys undertaken within the site (Ecoscape 2010; GHD 2020), did not identify any threatened flora. However, as part of the TEC assessment conducted by Emerge in Spring 2020 (see **Appendix F**, a total of eight *Macarthuria keigheryi* individuals were recorded within the north-eastern portion of the SFC development area. In addition, one 'Priority 3' flora species, *Jacksonia gracillima*, was also recorded within the survey area. A total of 38 *J. gracillima* individuals have been recorded within the site (**Figure 5**).

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#### 2.2.2 Terrestrial fauna

A *Basic Fauna Assessment* was undertaken within the site in July 2020 (Emerge Associates 2020a) (**Appendix G**). No EPBC Act listed conservation significant reptiles, amphibians or mammals were identified, and the survey found that the habitat had limited potential for them to occur due to the small size of the site and its highly modified and fragmented environment.

A search of the Department of Agriculture, Water and the Environment (DAWE) PMST identified 31 threatened fauna species and 25 migratory species listed under the EPBC Act as potentially occurring within the site and/or surrounding 5 km area. Based on the fauna survey and the available habitat within the site, only three of these fauna species are considered to potentially occur within the site:

- *Calyptorhynchus baudinii* (Baudin's cockatoo), although it is noted that the site is on the edge of the habitat range for this species.
- *Calyptorhynchus latirostris* (Carnaby's cockatoo).
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo).

A *Targeted Black Cockatoo Assessment* (Emerge Associates 2020a) has been undertaken for the site and is provided in **Appendix G** and summarised below. A targeted native bee survey is also currently being undertaken for the site (December 2020).

##### 2.2.2.1 Black cockatoo habitat

###### Foraging habitat

Black cockatoos feed on the fruit and seeds of a range of native and non-native plants species. 'Foraging habitat' is defined as vegetation that contains plant species known to be foraged on by black cockatoos.

The *Targeted Black Cockatoo Assessment* (Emerge Associates 2020a) defines foraging habitat within the site as either primary or secondary as follows:

- Primary foraging habitat refers to vegetation with historical and contemporary records of regular consumption by black cockatoos and includes native and non-native species.
- Secondary foraging plants are defined as plants that black cockatoos have occasionally been recorded consuming, or that based on their limited extent or agricultural origin, should not be considered a sustaining resource (Emerge Associates 2020a).

The site currently supports:

- 1.57 ha of primary and 0.23 ha of secondary foraging habitat for CC (**Figure 7**)
- 1.4 ha of primary and 0.33 ha of secondary foraging habitat for BC (**Figure 8**)
- 1.4 ha of primary and 0.39 ha of secondary foraging habitat for FRTBC (**Figure 9**).

###### Breeding habitat

The site contains 46 habitat trees, none of which contain potentially suitable nesting hollows. The locations of the trees are shown in **Figure 10**.

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### Roosting

The site supports limited black cockatoo roosting habitat in the form of large native and non-native trees. No evidence of roosting activity such as droppings, feathers or branch clippings were observed during the black cockatoo habitat assessment (Emerge Associates 2020a).

#### 2.2.3 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.

The site is located within Bush Forever Site No. 283 (Queens Park Bushland, Queens Park), which extends across the majority of the site (excluding Maniana Park in the southern portion) and into landholdings to the east of Gibbs Street (**Figure 11**). Bush Forever Site No. 424 (McDowell Street Bushland, Welshpool) is also located to the immediate north-east of the site, separated by Welshpool Road.

#### 2.2.4 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).

No regional ecological linkages have been identified as occurring within or adjacent to the site. The closest mapped linkage is approximately 3.8 km to the east.

#### 2.2.5 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 significant, threatened or scheduled flora, vegetation communities or ecosystems. Exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply within ESAs.

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However, exemptions under Schedule 6 of the EP Act still apply, including any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

The entirety of the site is mapped within a large ESA that extends to the north, west, south and east of the site (**Figure 11**).

## 2.3 Hydrology

### 2.3.1 Groundwater

The *Water Register* (DWER 2020d) indicates that aquifers beneath the site are a multi-layered system comprising of the following;

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

A review of the regional groundwater contours shown in the *Perth Groundwater Map* (DWER 2020c) identified that groundwater beneath the site likely ranges from 11 m AHD at the southern boundary to 13.5 m AHD at the northern boundary (1 m to 3 m BGL), resulting in a groundwater flow direction of north-west to south-east (DWER 2020c) (**Figure 12**). Measured groundwater levels recorded during monitoring conducted by Emerge from July to November 2020 across the site between June indicated peak winter levels of between 10.4 and 12.4 m AHD. The groundwater monitoring conducted is detailed fully in the *Water Management Plan* (WMP)(Emerge Associates 2020e).

### 2.3.2 Surface water

The Department of Water and Environmental Regulation (DWER) *linear hydrography* spatial dataset (DWER 2020) indicates that there are two major drains within the site (UFI 416995 and UFI 417218) which intersect and then lead into a compensating basin (UFI 416669 and UFI 416670) which is operated by the Water Corporation (WC) (**Figure 12**). A small drain in the south-west also connects into the compensating basin. The drainage channels convey flows from upstream catchments to the north-west, and northern industrial areas, and the southern, south-west and south-east residential areas.

Inverts of the drainage channels are between 12.6 and 10.8 m AHD as they grade across the site, with the invert of the compensating basin at 9.45 m AHD (Veris 2020). The compensating basin has an outlet that discharges into the WC drainage network (set at 9.85 m AHD) on the eastern boundary of the site, conveying flows downstream.

Based on the regional and measured groundwater data it is apparent that the drainage channels intersect groundwater for a portion of the year and the compensating basin for all of the year.

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### 2.3.3 Wetlands

Wetlands are areas which are permanently, seasonally or intermittently waterlogged or inundated with water. Naturally occurring wetland features are common across the Swan Coastal Plain and can contain fresh or salty water, which may be flowing or still.

The DBCA maintains the *Geomorphic Wetlands of the Swan Coastal Plain* database, which categorises geomorphic wetland features into specific management categories based on their attributes and management objectives. The three management categories are described in **Table 3**.

*Table 3: Management categories defined in the Geomorphic Wetlands of the Swan Coastal Plain (DBCA 2020)*

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)	Modified or degraded but still supporting substantial attributes and functions	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 remaining important wetland attributes and functions but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset (DBCA 2020) indicates that one resource enhancement wetland (REW) (UFI 15819) is located along the eastern boundary of the site, while the west and southern portion of the site is located within a multiple use wetland (MUW) (UFI 7490) (**Figure 12**). There is also an REW (UFI15817) to the south-west of the site within the Bush forever reserve.

Emerge Associates have completed flora surveys of the site which indicate that the vegetation within the mapped REW in the site is of a condition that would be considered at the lower end of the classification.

Updated wetland mapping completed by the DBCA (yet to be formally released) indicates the REW area in the site (UFI 15819) is likely to be remapped as a MUW, which would be supported by Emerge Associates' site specific flora survey.

The REW (UFI15817) located in the Bush Forever reserve is likely to be remapped as a conservation category wetland (CCW) and therefore requires a 50 m protection buffer.

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## 2.4 Heritage

### 2.4.1 Aboriginal 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, containing information on Registered Aboriginal Heritages 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 (DPLH 2020) was undertaken which did not identify any Registered Aboriginal Heritage Sites or Other Heritage Places within the site.

A Heritage Identification Survey was also undertaken with traditional owners which concluded 'that does not contain, any known Aboriginal heritage sites' pursuant to Section 5 of the *Aboriginal Heritage Act 1972*, however a number of management actions were recommended for the development of the site (see **Section 0**).

The proponent has also implemented Noongar Standard Heritage Agreement to ensure that activities are carried out on site in a manner that protects Aboriginal Sites and Aboriginal Objects.

### 2.4.2 Non-indigenous heritage

A desktop search of the Australian Heritage Database (DAWE 2020), the State Heritage Office database (Heritage Council 2020) and the City of Canning Heritage List (City of Canning 2018) has indicated there are no registered heritage sites located within the site.

## 2.5 Land use considerations

### 2.5.1 Historical and existing land uses

A review of publicly available historic aerial imagery (Landgate 2020) indicated that the majority of the site was cleared of native vegetation prior to 1953, with the exception being the south-western portion of the site. A surface water feature was present in the southern portion of the site from 1953, and was formalised as a drainage basin between 1977 and 1979. Two surface water drainage features were constructed within the site at the same time, conveying water from Welshpool Road to the drainage basin. Since the initial clearing occurred prior to 1953, scattered native vegetation regrowth has been evident in the north-eastern portion of the site, in addition to the eastern portion of the site associated with REW UFI 15819. Several buildings were constructed within the northern portion of the site adjacent to Welshpool Road prior to 1953. The last of these buildings were removed between February and September 2014. The small southern drain was constructed in association with residential development in 2012.

### 2.5.2 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*, however a property located to the immediate north of the site is registered as 'remediated for restricted use' (**Figure 4**).

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Lot 3071 to the south is also identified as a 'potential contaminated site'.

Whilst the site is not identified in the *Contaminated Sites Database*, a review of historical aerial photography indicates that several structures were constructed within the northern portion of the site prior to 1953. A preliminary contamination assessment by Emerge found that there is a significant amount of illegal dumping activity that has contributed to the presence of ACM, C&D waste and general inert rubbish across the north portion site, although there are no current or known historical land uses with potential for contamination of soils at the site. Removal of ACM, C&D and general inert rubbish and validation of ACM removal is required prior to construction.

The results of the soil investigation identified no evidence of chemical contamination of the fill materials within the site.

### 2.5.3 Surrounding land uses

Land to the south, west and south-east of the site is zoned 'urban' under the MRS. 'Industrial' zoned land is identified to the north-west of the site, a small pocket of urban zoned land is located to the immediate north of the site, whilst land reserved for 'parks and recreation' is located to the north-east. Land to the north is zoned 'light industry' under the City of Canning LPS No. 42, with the land to the north-east reserved 'parks and recreation' as per the MRS. Land to south, west and south-east is zoned 'residential' under the City of Canning LPS No. 42.

There are no land uses identified surrounding the site that would be incompatible with the proposed development of the SFC within the site.

## 2.6 Bushfire hazard

The site and surrounding areas have been identified as bushfire prone under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019), as shown in **Figure 13**. The identification of a site within an area declared as bushfire prone necessitates that further assessment of the determined bushfire risk of the proposed development is to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017). This has been addressed through the preparation of a site-specific *Bushfire Management Plan* (Emerge Associates 2020b).

All areas within the site and surrounding 150 m have been assessed for the presence of bushfire prone vegetation and have been classified as per Table 2.5 of *Australian Standard 3959:2018 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia 2018) to determine the associated bushfire hazard rating levels and bushfire risk.

Whilst the majority of the site has historically been cleared, bushfire hazards within the site exist predominantly within the western and northern portions, in addition to a small patch in the north-eastern portion of the site, associated with remnant vegetation. The majority of this vegetation will be retained as development occurs within the site.

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Long-term bushfire hazards surrounding the site that will pose extreme bushfire hazards that will need to be considered as part of future development within the site are vegetation to the west of the site, within Bush Forever Site No. 283, in addition to north-east of the site within Bush Forever Site No. 424. Areas of revegetation within the western, southern and eastern portions of the site will present increased bushfire risks.

Bushfire management associated with the SFC development is discussed in **Section 4.5**.

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## 3 Proposal

### 3.1 Proposed development

The SFC Development Plan has been prepared for the site on behalf of the Proponent by Carabiner and is included in **Appendix A**.

The SFC Development Plan incorporates the inputs from a multi-disciplinary project team and the outcomes of a range of site-specific technical studies and investigations, and proposes the following uses:

- Two elite level playing fields, one for training (100 m by 64 m) and one for competitions (130 m by 78 m).
- Two traditional playing fields for general use (both 100 m by 64 m).
- Three small-format (5-a-side) playing fields (synthetic turf).
- Supporting infrastructure including a 1,500 m<sup>2</sup> footprint building, with a tiered seating podium which will house 700 seats.
- Two car parks (located toward the north and north-west).
- Landscaped public open spaces (POS) areas integrating retained vegetation and a biodiversity link to the south of the development area.
- Water sensitive urban design (WSUD) features.
- Stormwater management assets and incorporation of a Constructed Wetland feature within the biodiversity link to treat stormwater from upstream catchments and the site and provide habitat for existing fauna.

Specific design considerations to respond to identified environmental values are discussed in detail in **Section 4**.

### 3.2 Planning approvals

The construction of the SFC development forms part of the broader Queens Park Open Space Masterplan that has recently been endorsed by the City of Canning (**Appendix B**). The SFC Development Plan forms the first stage of the Masterplan, with future works as part of the surrounding Masterplan to be completed by the City of Canning.

The proponent is only responsible for the delivery of the first stage of the project i.e. construction of the SFC and surrounding infrastructure and development as detailed in the SFC Development Plan (**Appendix A**).

In order to progress the SFC development, landownership of the site will be retained by the Western Australia Planning Commission (WAPC). Following practical completion of the SFC Development Plan, the land will be transferred to the Crown estate. An overarching Management Order for the site with the City of Canning will guide the use and management of the land. The SFC facility (including the buildings, two northern playing fields and 5-a-side pitches) will be leased to Football West for ongoing management responsibility.

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The development application facilitating development of the SFC will be submitted to the City for consideration, with final approval given by the Western Australian Planning Commission (WAPC).

### 3.3 Environmental approvals

#### 3.3.1 Native Vegetation Clearing Permit

A Native Vegetation Clearing Permit pursuant to Part V of the *Environmental Protection Act 1986* is currently being sought from DWER to facilitate construction of the SFC development. The application (ref. CP 9049/1) is to clear 4.19 ha of native vegetation that has the potential to be affected by the works based on the SFC Development Plan.

A decision from DWER on the Native Vegetation Clearing Permit application is pending (as of preparation of this report) and is expected late 2020.

#### 3.3.2 Environment Protection and Biodiversity Conservation Act 1999

A referral (EPBC 2020/8824) was made to the Commonwealth Department of Agriculture, Water and Environment (DAWE) pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Proposed Action is likely to result in the following impacts to Matters of National Environmental Significance (MNES):

- Removal of 0.76 ha of Baudin's cockatoo (BC) foraging habitat, 0.87 ha of Carnaby's cockatoo (CC) foraging habitat and 0.88 ha of forest red-tailed black cockatoo (FRTBC) foraging habitat. Both BC and CC are listed as 'Endangered' under the EPBC Act, whilst the FRTBC is listed as 'vulnerable'.
- Removal of up to 11 black cockatoo habitat trees, of which none contain any suitable hollows. The project will retain at least 35 black cockatoo habitat trees within the broader site.
- Removal of three individuals of *Macarthuria keigheryi*, which is listed as 'Endangered' pursuant to the EPBC Act. A further five known individuals will be retained within the broader site.

As part of the Proposed Action, at least 0.97 ha of BC foraging habitat, 0.93 of CC foraging habitat and 0.91 of FRTBC foraging habitat will be retained within the site, as well as 5 individuals of *Macarthuria keigheryi*.

The Proposed Action received a 'Not a controlled action if undertaken in a particular manner' decision in December 2020. Provided the action is undertaken in accordance with the directions provided by DAWE then further assessment and approval under the EPBC Act is not required. Specifically, DAWE require the following action is implemented to mitigate impacts to *Macarthuria keigheryi*:

*A fence must be established completely surrounding, but not impacting, the retained native vegetation patch prior to, and for the duration of, any construction occurring within 100 m of any individual Keighery's Macarthuria. The fence must be a permanent fence prior to completion of the action.*

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## 4 Environmental Assessment and Management Framework

This section outlines how the SFC Development Plan has been designed to accommodate the environmental attributes and values associated with the site and details the environmental management considerations required. Only those environmental values and attributes that require specific consideration based on their presence within the site, and/or applicable legislation and policy requirements are assessed.

### 4.1 Acid sulfate soils

#### 4.1.1 Policy framework, site context and management objectives

The DWER, through the WAPC, ensures ASS are adequately managed during the land use planning and development process. The objective of the DWER's ASS policy framework is to manage ASS appropriately to prevent the release of metals, nutrients and acidity into the soil and groundwater system that may adversely affect the natural and built environment and human health.

The principal management objective for acid sulfate soils within the site is to ensure that any future development that may disturb acid sulfate soils is appropriately managed to avoid impacts on the environment.

#### 4.1.2 Design considerations for acid sulfate soils

ASS management does not require any spatial consideration within the SFC Development Plan, and any ASS risk can be appropriately managed through future environmental management.

#### 4.1.3 Acid sulfate soils management requirements

It is anticipated that dewatering will be necessary during construction of the sewer and the constructed wetland. Therefore, a dewatering licence from DWER will be required, with the specific details of the application dependent on the construction requirements. The proponent will prepare an Acid Sulfate Soil and Dewatering Management Plan (ASSDMP) prior to works to inform the management of ASS, with implementation of identified monitoring and treatment completed during and following works as required.

### 4.2 Flora and vegetation

#### 4.2.1 Policy framework and management objective

In the context of environmental impact assessment, the EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*'.

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Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. **Avoid** impacts
2. **Minimise** impacts
3. **Offset** impacts.

The EPBC Act also provides protection for listed 'threatened' species, including *Macathuria keigheryi*. Any proposed action which is considered likely to result in a 'significant' impact upon these species, identified as Matters of National Environmental Significance (MNES), should be referred to the Commonwealth DAWE. As outlined in **Section 3.3.2**, the project has recently been referred to DAWE who determined that the proposal was 'not a controlled action – if undertaken in a particular manner'.

### 4.2.2 Design considerations for flora and vegetation

While the vegetation within the site is largely degraded, some significant flora and vegetation values have been recorded within the site which require specific spatial responses within the SFC Development Plan.

Specifically, the SFC Development Plan identifies 'Protection zones' to correspond to significant flora and vegetation values. The northern 'Protection zone' incorporates the highest quality vegetation and includes five individuals of *Macathuria keigheryi*, a threatened species pursuant to the BC Act and the EPBC Act. The southern 'Protection zone' incorporates the mapped REW which incorporates wetland vegetation in 'degraded' condition.

The SFC Development Plan has retained the highest quality areas of vegetation within the site and the majority of threatened flora species within the site.

### 4.2.3 Flora and vegetation management requirements

During the development of the project impacts to the 'Protection zones' will be minimised through:

- Preparation of a Construction Management Plan which is likely to include:
  - Survey of 'Protected zone' boundaries and temporary fencing prior to construction/clearing works to ensure these areas are retained.
  - Induction for personnel that outlines areas of vegetation retention and how access to these must be restricted.
  - Management measures to minimise impacts from dust or weed encroachment during construction including the cleaning of all machinery prior to site entry and the provision of water carts if required.

Following development, the northern 'Protection zone' will be permanently fenced with restricted access and managed by the City. As outlined in the City's Policy ET520: Conservation of Flora and Fauna, the City will *'implement management strategies for all sustainable areas of natural vegetation to ensure the continued integrity and ecological diversity of natural bush reserves. Annual*

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*maintenance works will include weed control, rubbish removal and revegetation with indigenous species.'*

Vegetation will also be retained where possible within the balance of the site and native flora species incorporated into landscaping around the SFC.

The proponent submitted an EPBC Act referral for impacts to *Macathuria keigheryi* which was determined to be 'not a controlled action if undertaken in a particular manner' (EPBC 2020/8824). Specifically, DAWE require that the northern 'Protection zone' is fenced for the duration of construction and that this fence is a permanent fence (preventing unauthorised access to the retained native vegetation) prior to completion of construction of the SFC.

In addition, the proponent has submitted applications under Section 40 of the BC Act in order to remove the individuals of *Macathuria keigheryi* and undertake cuttings and/or seed as required. These applications are currently under assessment by the DBCA.

### 4.3 Terrestrial fauna

#### 4.3.1 Policy framework and management objectives

In the context of environmental impact assessment, the EPA's objective for terrestrial fauna is 'to protect fauna so that biological diversity and ecological integrity are maintained'. The application of the mitigation hierarchy should be applied to avoid or minimise impacts to terrestrial fauna where possible.

The EPBC Act also provides protection for listed 'threatened' species, including black cockatoos, for which the site contains foraging and potential breeding habitat. Any proposed action which is considered likely to result in a 'significant' impact upon these species, identified as Matters of National Environmental Significance (MNES), should be referred to the Commonwealth DAWE. As outlined in **Section 3.3.2**, the project was referred to DAWE who determined that the proposal was 'not a controlled action – if undertaken in a particular manner'.

#### Design considerations for terrestrial fauna

The SFC Development Plan has identified two 'Protection zones' which will be retained. These areas will provide habitat for fauna, including retaining the majority of the identified black cockatoo habitat trees and foraging habitat identified within the site. The southern 'Protection zone' will also include retention of existing riparian habitat for wetland fauna.

It is noted that the SFC Development Plan will remove the existing compensating basin, however aquatic fauna and waterbird habitat will be retained through the inclusion of a new open waterbody and ephemeral system within a constructed wetland feature (**Appendix A**).

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### 4.3.2 Terrestrial fauna management requirements

Throughout development impacts to the 'Protection zones' will be minimised through:

- Preparation of a Construction Management Plan which is likely to include:
  - Survey of 'Protected zone' boundaries and temporary fencing prior to construction/clearing works to ensure these areas are not disturbed during construction works.
  - Induction for personnel that outlines the 'Protected zones' and how access to these must be restricted.
  - The requirement for fauna trapping and relocation prior to clearing.

As outlined above, the proponent will undertake fauna trapping and relocation prior to clearing and a Fauna Management Plan will be prepared to the satisfaction of the City. The Fauna Management Plan will include:

- A pre-clearing fauna inspection to identify potential fauna interactions, including an inspection of trees for hollows and signs of use.
- A fauna trapping program to capture and translocate small to medium sized (translocatable) native fauna (including turtles), if such fauna is present and translocation is practical.
  - Any turtles that are captured will be accommodated temporarily and then returned to the site once the open waterbody has been constructed and is habitable.
- A fauna spotter will be present during clearing to direct and manage works to avoid impacts to fauna wherever possible and translocate small to medium sized (translocatable) native fauna, if such fauna is present and translocation is practical.

Following development, the northern 'Protection zone' will be permanently fenced with restricted access and managed by the City. This is also a requirement of the DAWE EPBC Act decision.

As outlined in the City's Policy ET520: Conservation of Flora and Fauna, the City will *'implement management strategies for all sustainable areas of natural vegetation to ensure the continued integrity and ecological diversity of natural bush reserves. Annual maintenance works will include weed control, rubbish removal and revegetation with indigenous species.'* While the 'Protection zone' will be fenced, the fencing will not extend to the ground and therefore allow passage of small to medium sized fauna through the site and wider area.

Vegetation will also be retained wherever possible within the balance of the site and native flora species incorporated into landscaping to maximise fauna habitat around the SFC, including habitat for native bee species.

## 4.4 Hydrology

### 4.4.1 Policy framework and management objective

The *State Water Strategy for Western Australia* (Government of WA 2003) and *Better Urban Water Management* (WAPC 2008) endorse the promotion of integrated water cycle management and application of water sensitive urban design (WSUD) principles to provide improvements in the management of stormwater, and to increase the efficient use of other existing water supplies. Of

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particular relevance to the wetland habitat that occurs adjacent to the site is the *Better Urban Water Management* criteria for ecological protection, which requires development to maintain or restore desirable environmental flows and/or hydrological cycles.

#### 4.4.2 Design considerations for hydrology

The SFC Development Plan includes a stormwater management system, which implements WSUD practices. The design of the stormwater system includes an ephemeral retention system in the north-west of the site, designed to treat, retain and infiltrate runoff entering the site from the upstream catchments to the north and west, and a smaller treatment basin to treat runoff from a portion of the parking and road network for the SFC.

A constructed wetland in the centre-east of the site has been designed to treat and manage runoff from upstream catchments to the north and south of the site, and from the SFC building, plaza area and playing fields, which will be conveyed via a piped system. A portion of the constructed wetland intersects groundwater (below the invert of the outlet to the Water Corporation network) providing a permanent water body (consistent with the existing compensating basin) to maintain habitat for existing fauna present on site.

Inclusion of a subsoil drainage network in areas across the site (specifically under the northern most retention basin and the playing fields) ensures the hydrological regime required to support existing native vegetation on site is maintained, as well as the high level quality of playing surface required for the facility.

#### 4.4.3 Hydrological management requirements

A Water Management Plan (WMP) has been prepared by Emerge Associates (2020) to support the preparation of the SFC Development Plan and provides a framework for the future delivery of a best practice approach to integrated water cycle management utilising WSUD principles. The WMP includes detailed management approaches for groundwater, stormwater, and water supply and conservation.

The water management strategy for the development aims to integrate the proposed sporting land use whilst supporting the sensitive environmental assets located therein by replicating the natural hydrological regime of the site as much as possible.

The WMP outlines strategies and management techniques to address:

- Water supply and conservation
- Stormwater management
- Groundwater management
- Protection of environmental assets.

A key component of the SFC Development Plan is sourcing a non-potable water supply for irrigation of playing fields. Following a detailed assessment, the use of groundwater is considered to be the most suitable source for the development. Abstraction of groundwater from the superficial aquifer is therefore the proposed source of non-potable supply for the development, with an application

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submitted to the DWER currently under review. The use of retention and infiltration structures in the stormwater strategy will help to maximise recharge to the superficial aquifer where possible.

The following management plans will be prepared for the SFC in relation to the turf establishment period and the ongoing management of the irrigation system across the site:

**Irrigation and Nutrient Management Plan:** will outline the establishment and ongoing maintenance requirements of the playing fields, including:

- Soil nutrient testing prior to turf grass establishment.
- Soil nutrient testing and plant tissue analysis during establishment and for ongoing maintenance.
- Use of controlled release fertilisers.
- A fertiliser program that is a “little and often” approach and is matched to turf growth and health.
- Controlled irrigation practices using soil moisture sensors to ensure water and nutrients do not go below the active rootzone of the turf.

**Groundwater Operation Strategy:** expected as a condition of the groundwater licence and will outline the operation of the irrigation system and associated monitoring, including:

- Number and location of production bores required to supply the development.
- Expected draw rates (flows and volumes), times of operation (hours, days, seasons etc.).
- Ongoing monitoring of groundwater levels across the site to determine impacts to surrounding vegetation.
- Contingency measures should negative impacts be identified.
- Reporting requirements.

Confirmation on the requirement for an operating strategy will be provided by DWER on assessment and approval of the licence.

## 4.5 Wetlands

### 4.5.1 Policy framework and management objective

The EPA’s *Environmental Factor Guideline for Inland Waters* (EPA 2018) states the objective for the management of wetlands is “to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected”.

Therefore, the focus of this factor and its objective is:

- the significant impacts the alteration of the hydrological regime will have on water dependent ecosystems and other environmental values.
- how the discharge of waste is minimised.
- how any discharge of waste, or use of land or water, will significantly impact on water quality, the local hydrological regime, and the environmental values inland waters support.

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#### 4.5.2 Design considerations for wetlands

The presence of a multiple use wetland (MUW) within the site does not require a specific spatial response within the SFC Development Plan as this category contains few wetland attributes and are suitable for development if hydrological considerations are addressed appropriately

In comparison, resource enhancement wetlands (REWs) are afforded protection through various state policies and guidelines ((WRC 2001), (WAPC 2006), (EPA 2016b) and (EPA 2016c)). REW UFI 15819 is located along the eastern boundary of the site. Anecdotal discussions with DBCA have confirmed that a future update to the *Geomorphic Wetlands of the Swan Coastal Plain* dataset will see this wetland reclassified to an MUW.

Nevertheless, the SFC Development Plan has included REW UFI15819 into a 'Protected zone' and as such this REW is proposed to be retained in its entirety. Interface treatments for the REW will include hard edge treatments (such as footpaths, paving or walls) to ensure no encroachment of grass from adjacent playing fields into the REW. Native species of planting will be used in adjacent landscape areas that are consistent with those found within the REW to provide integration through the natural areas.

The REW UFI15817 located to the south-west of the site has been identified in the updated DBCA mapping as a CCW, which would be afforded a 50 m protection buffer which extends into the south-west corner of the SFC development area. The land uses within this area include revegetation with native species as part of the biodiversity link which is considered an appropriate land use within the buffer. The majority of the buffer falls outside of the development area.

#### 4.5.3 Wetland management requirements

During the development of the project impacts to the wetland areas will be minimised through:

- Preparation of a Construction Management Plan which is likely to include:
  - Temporary fencing prior to construction/clearing works within proximity to the REW (UFI 15819) to ensure riparian vegetation is retained.
  - Induction for personnel that outlines locations and extent of the REW and how access to this area must be restricted.
  - Management measures to minimise impacts from dust or weed encroachment during construction.

Ongoing management of the REW will consider:

- Maintaining the natural hydrological regime, through implementation of the WMP.
- Managing public access to the REW to minimise the potential for people to impact on the environmental values of the REW.
- Planting of species appropriate to the soil and hydrological conditions present. The exact species selection will be determined as part of future discussions between the proponent, the City of Canning and DBCA.

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#### 4.6 Aboriginal heritage management

As outlined in **Section 2.4.1**, a review of the AHIS did not identify any recorded Aboriginal heritage sites within the site. Additionally, a Heritage Identification Survey was also undertaken with traditional owners concluded that the site does not contain any heritage sites as defined under Section 5 of the *Aboriginal Heritage Act 1972*.

Whilst there are no Aboriginal heritage sites known to occur, the project has liaised with Whadjuk representatives as nominated by the South West Aboriginal Land and Sea Council (SWALSC). These representatives made a number recommendations during consultation including:

- The use of heritage monitors during ground disturbance (up to one metre)
- Retention of *Macrozamia*
- Retention of any artefacts found during ground disturbance.
- Involvement in artwork for the project and any naming
- Opportunities during construction for Aboriginal employment and contracting.

These recommendations will be considered by the project team and implemented as appropriate.

#### 4.7 Bushfire management

##### 4.7.1 Policy framework and management objective

*State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015) stipulates that any development proposal which occurs partly or wholly within a bushfire prone area is required to be accompanied by a bushfire management plan. The preparation of the BMP is required to incorporate the following tasks:

- Classification of existing vegetation types within the site and surrounding 100 m, in accordance with *Australia Standard 3959 Construction of buildings in bushfire-prone areas* (AS 3959) (Standards Australia 2009).
- Assessment of bushfire hazard levels within the site and surrounding 100 m, in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC and DFES 2015).
- Assessment of effective slope under areas of classified vegetation.
- Completion of an indicative Bushfire Attack Level (BAL) assessment and preparation of an associated BAL contour plan.
- Assessment of the design against the bushfire protection criteria, in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC and DFES 2015).

##### 4.7.2 Design considerations for bushfire management

A BMP has been prepared to support the preparation of the SFC Development Plan (Emerge Associates 2020c). The design of the SFC responds to the bushfire protection criteria through the following design elements:

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- **Location:** all proposed habitable buildings can be located in an area with a BAL rating of BAL-29 or less based on implementing appropriate separation from nearby hazards.
- **Siting and Design:** the site is large and can provide sufficient separation within the site, from internal and external bushfire hazards, to achieve a developable area subject to a BAL rating of BAL-29 or less. This separation can be accommodated through the provision of hardstand areas, managed playing fields and landscaped gardens.
- **Vehicular Access:** the site will have direct access to Welshpool Road to the immediate north of the site via a carpark entrance/exit. The entrance/exit is compliant with the technical specifications for vehicular access in the Guidelines and is wide enough to facilitate two-way road traffic, including buses. Welshpool Road is a major road with egress available to the west and east of the site, with further egress options to the north and south available within 500 m of the entrance/exit point.
- **Water:** the development will be provided with a permanent and reticulated water supply to support onsite firefighting requirements.

Further discussion in this regard is provided in the BMP (Emerge Associates 2020c).

### 4.7.3 Bushfire management requirements

As outlined in the BMP, the proposed development does not include any Class 1, 2, 3 or 10a buildings, which means that future buildings are not required to be constructed to an increased building standard in accordance with AS 3939. Notwithstanding, future habitable buildings within the site will not be exposed to a BAL rating exceeding BAL-29 as demonstrated in the BAL Contour Plan contained in the BMP (Emerge Associates 2020c).

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## 5 Conclusions

This EAR has been prepared on behalf of the proponent to support development of a State Football Centre within a portion of the Queens Park Open Space Masterplan area (**Appendix B**) in accordance with the State Football Centre Development Plan (**Appendix A**).

The SFC Development Plan has been developed with consideration to the identified environmental values of the site. A number of design responses have been incorporated into the layout in this regard, including:

- Retention of approximately 1.86 ha of native vegetation, incorporating threatened and priority flora species, a priority ecological community and black cockatoo foraging habitat and breeding habitat trees.
- Retention of resource enhancement category wetland UFI 15819.
- Development of an open waterbody to provide waterbird and aquatic fauna habitat.
- Incorporation of native flora species into landscaping to maximise fauna habitat around the SFC.

This EAR also outlines the environmental management framework to be implemented across the site as part of the development process, including preparation and implementation of the following:

- *Water Management Plan* (Emerge Associates 2020e)
- *Bushfire Management Plan* (Emerge Associates 2020c) including bushfire attack level (BAL) assessment
- Acid Sulfate Soils and Dewatering Management Plan
- Construction Management Plan
- Fauna Management Plan
- Irrigation Management Plan
- Nutrient Management Plan.

Overall, the environmental attributes and values of the site can be accommodated within the design, or can be managed appropriately through the future development applications in line with the relevant state and local government legislation, policies and guidelines and best management practices.

# Environmental Assessment Report

## State Football Centre



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# Figures



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*Figure 2: Topographic Contours*

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*Figure 4: Acid Sulfate Soil Risk Mapping and Contaminated Sites*

*Figure 5: Plant Communities and Threatened and Priority Flora*

*Figure 6: Vegetation Condition*

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

*Figure 8: Potential Baudin's Black Cockatoo Foraging Habitat*

*Figure 9: Potential Forest Red-tailed Black Cockatoo Foraging Habitat*

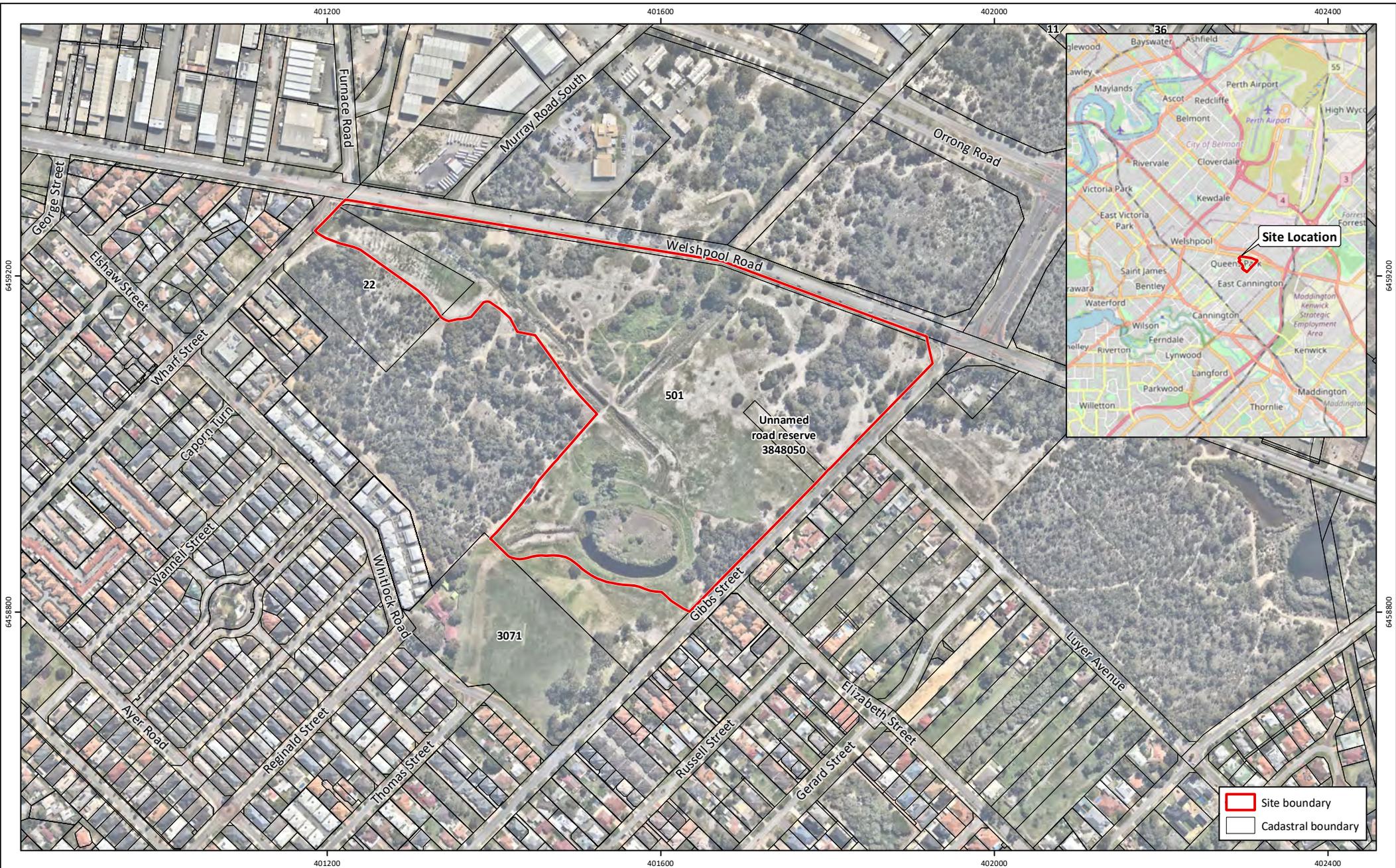
*Figure 10: Black Cockatoo Habitat Trees*

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**Figure 1: Site Locality**

**Project:** Environmental Assessment Report  
State Football Centre

**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(07)-F61

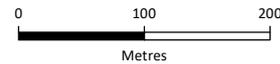
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**Approved:** CKK

**Date:** 30/11/2020

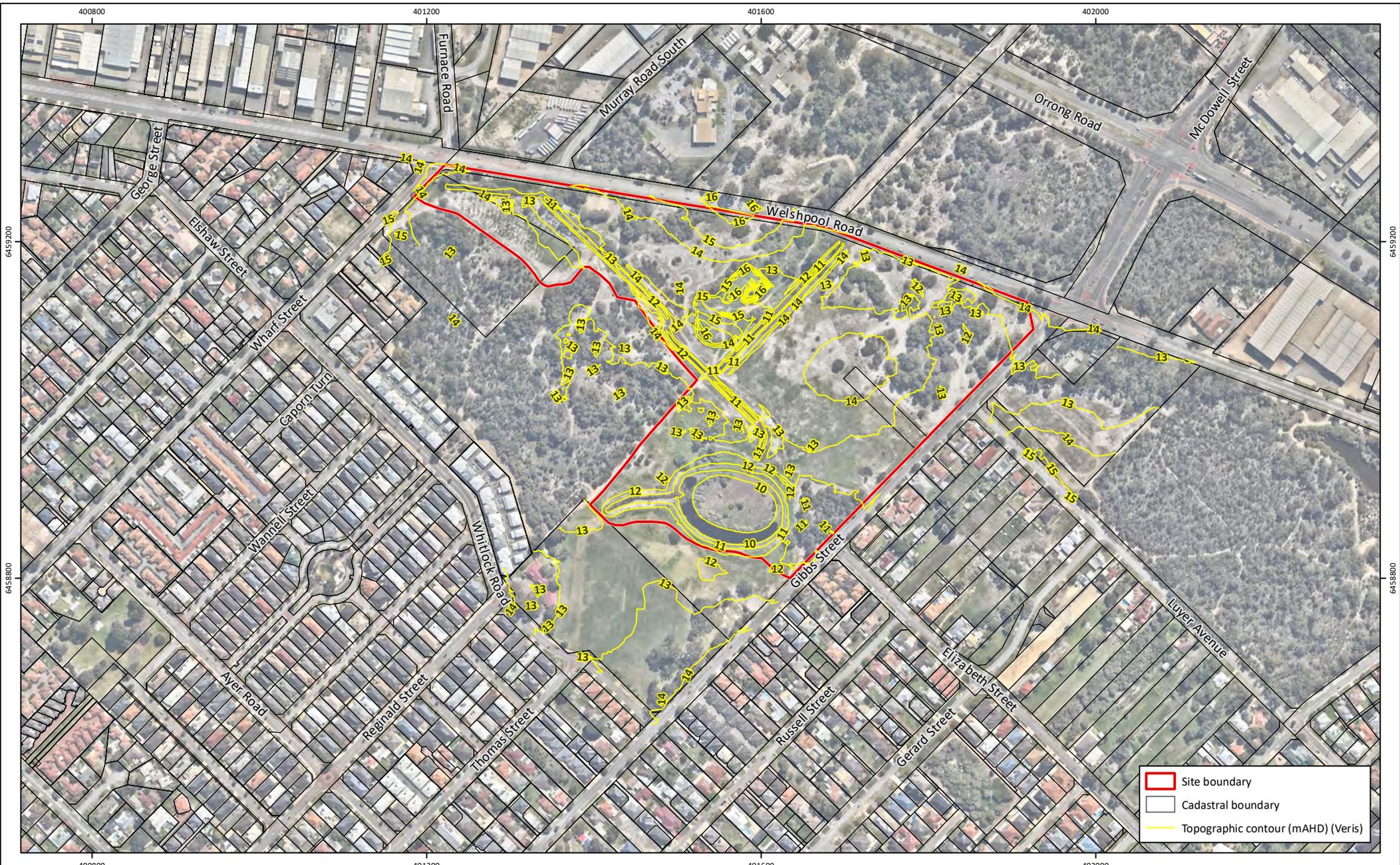


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GDA 1994 MGA Zone 50



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**Figure 2: Topographic Contours**

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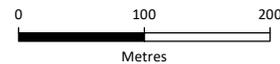
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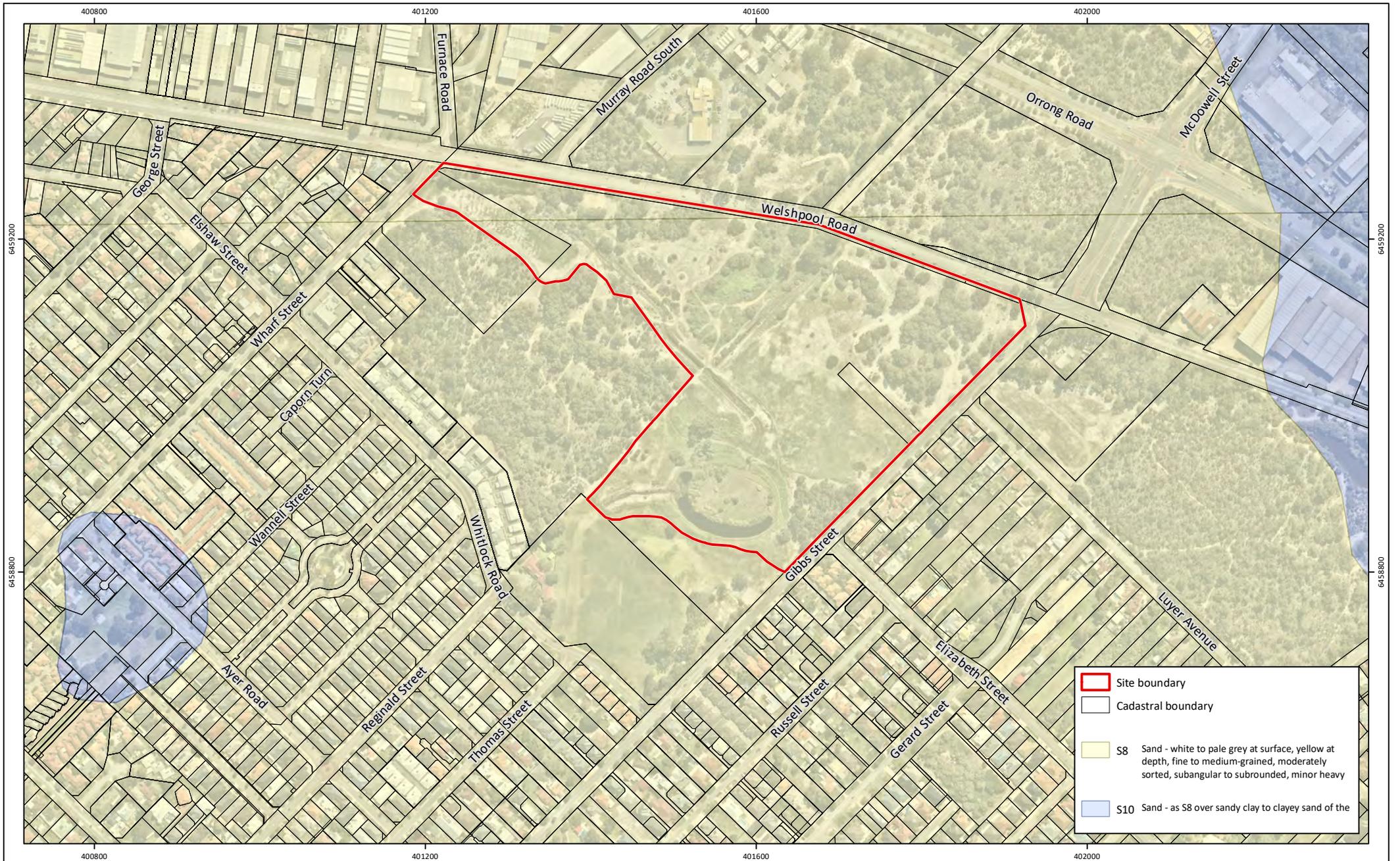


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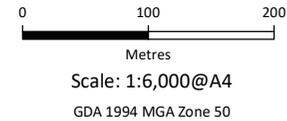
**Figure 3: Environmental Geology**

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State Football Centre

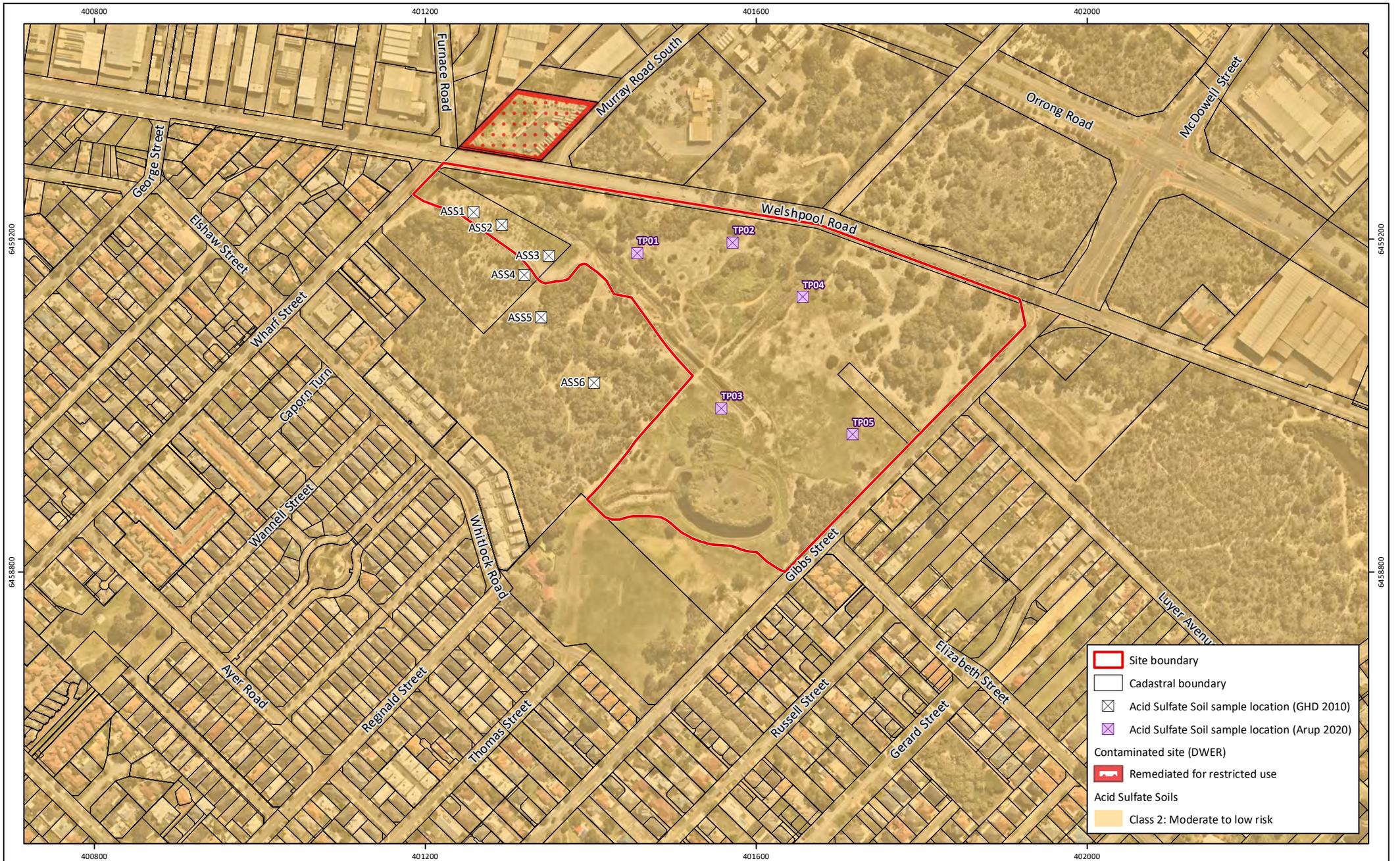
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**Plan Number:**  
EP20-012(07)-F63

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**Figure 4: Acid Sulfate Soil Risk Mapping and Contaminated Sites**

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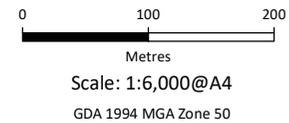
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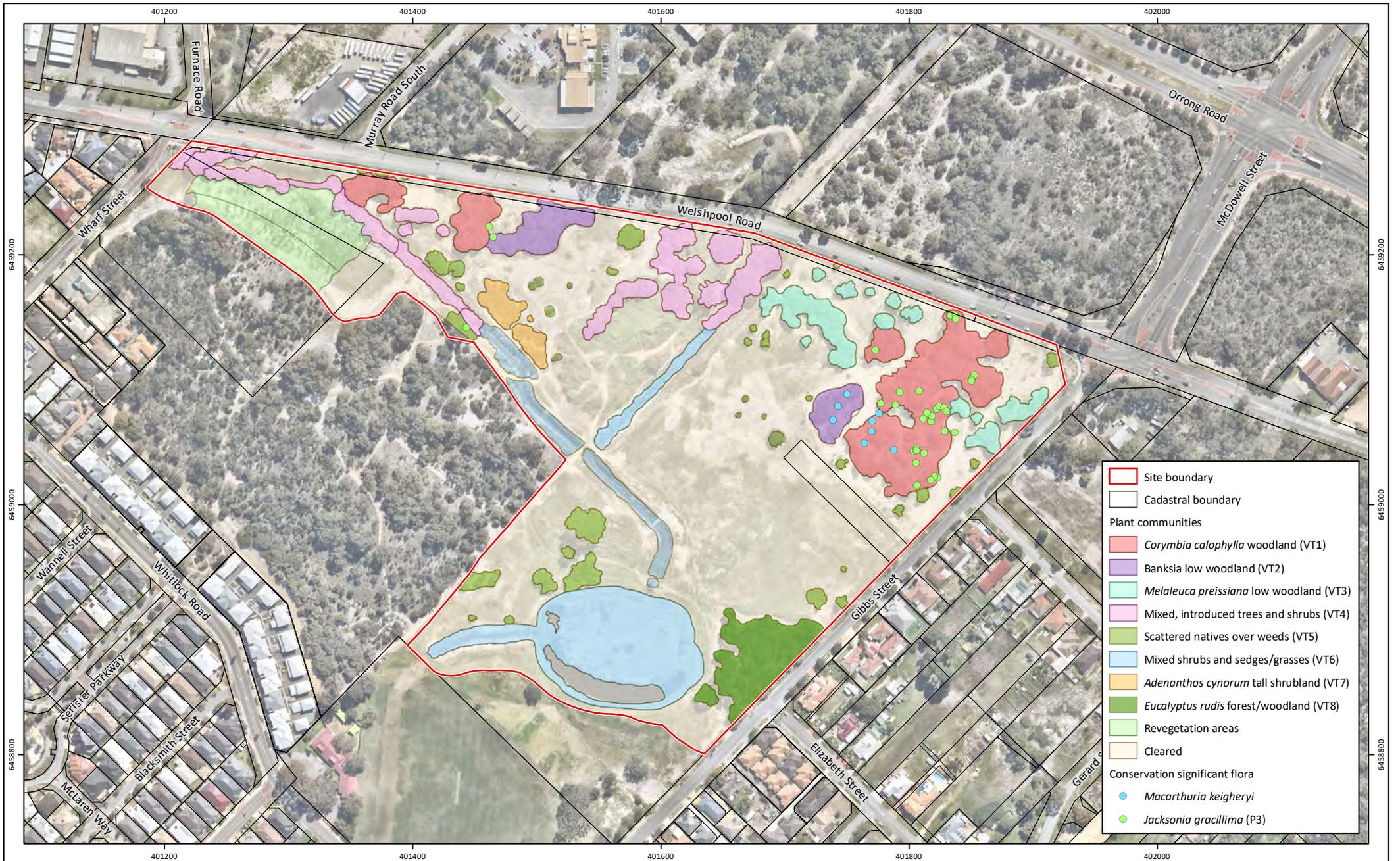
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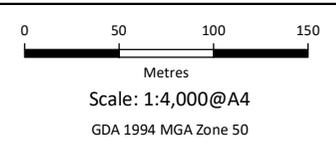




**Figure 5: Plant Communities and Threatened and Priority Flora**

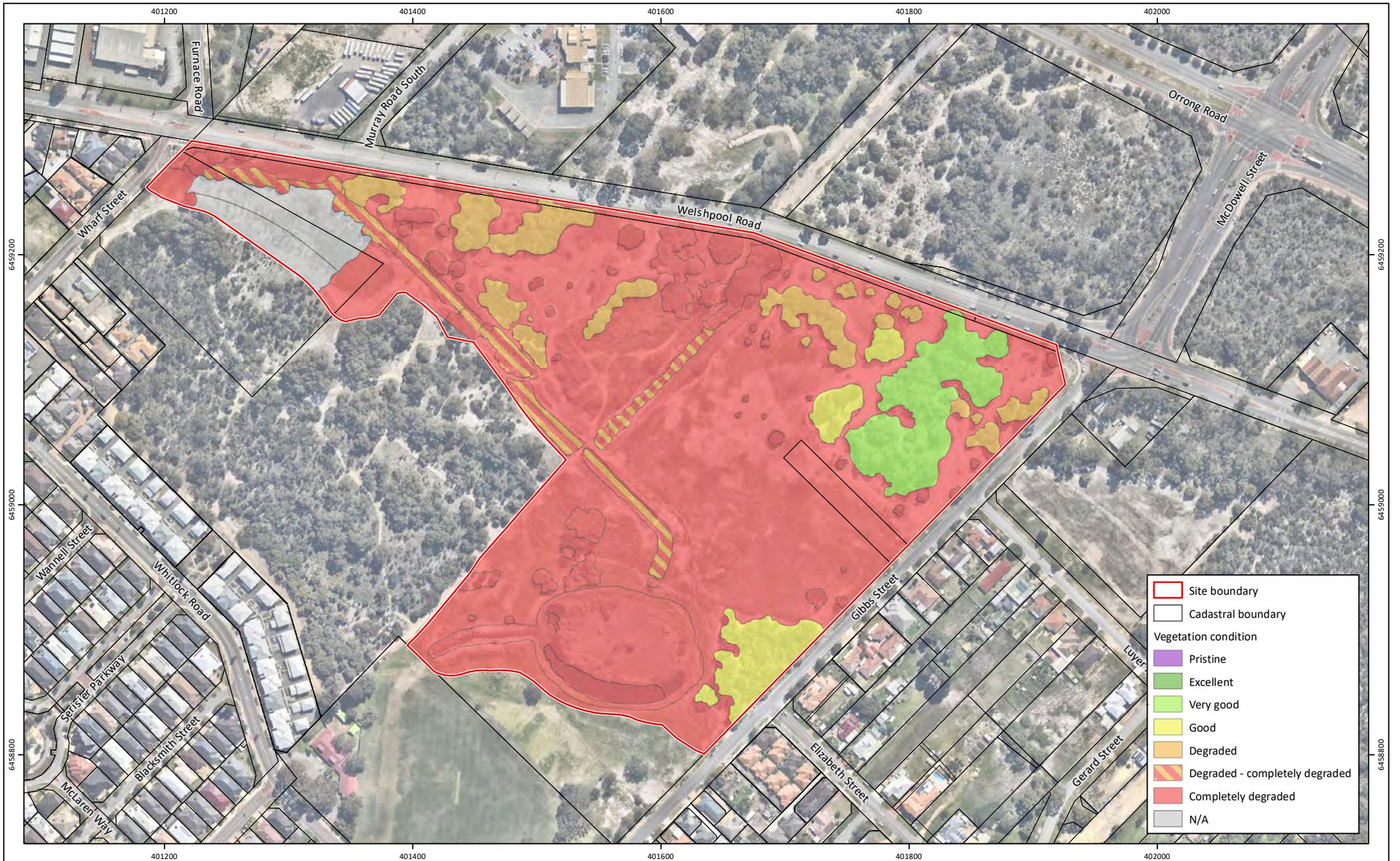
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**Figure 6: Vegetation condition**

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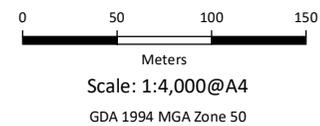




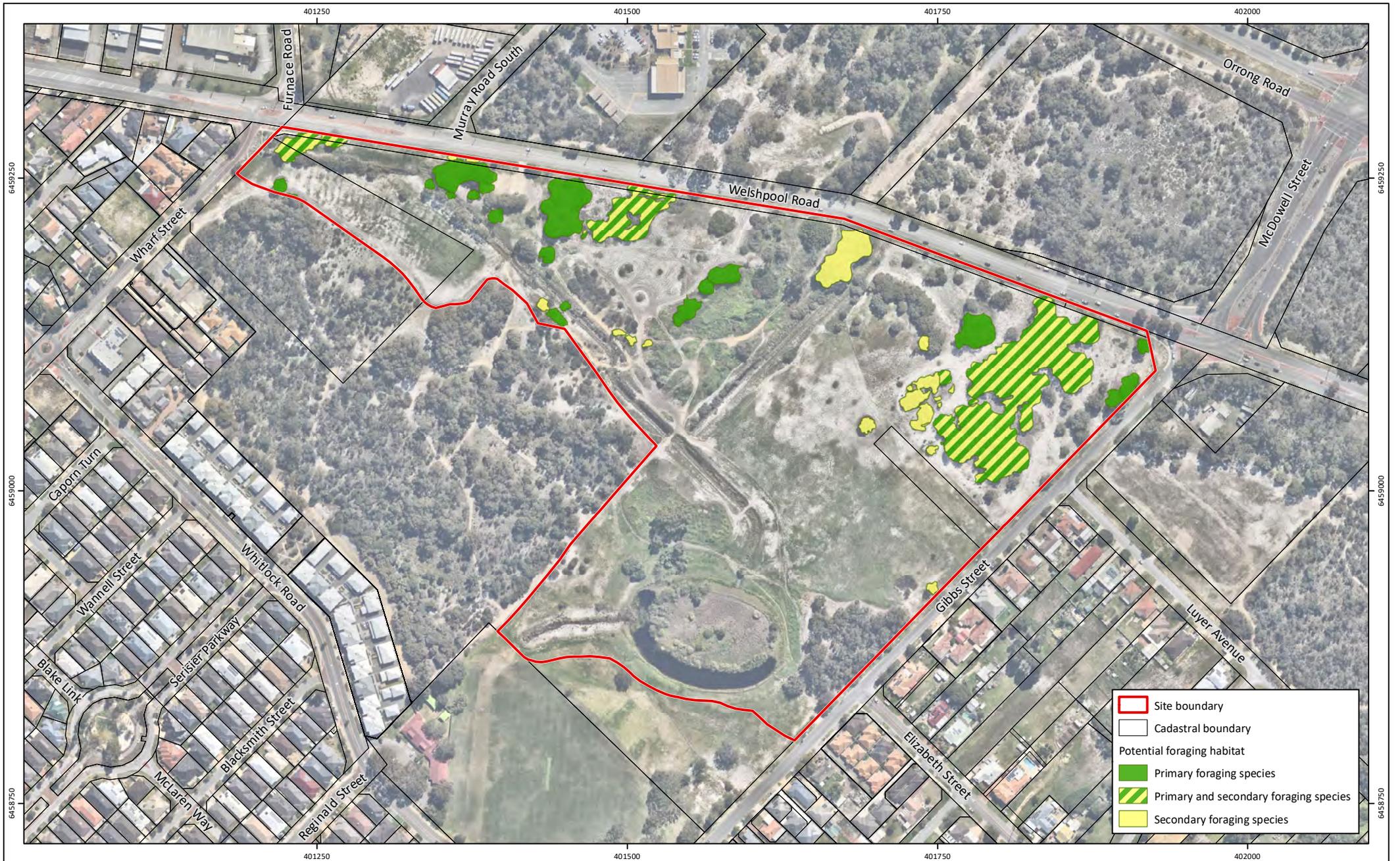
**Figure 7: Potential Carnaby's Cockatoo Foraging Habitat**

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**Plan Number:**  
EP20-012(07)-F70  
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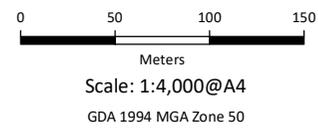




**Figure 8: Potential Baudin's Cockatoo Foraging Habitat**

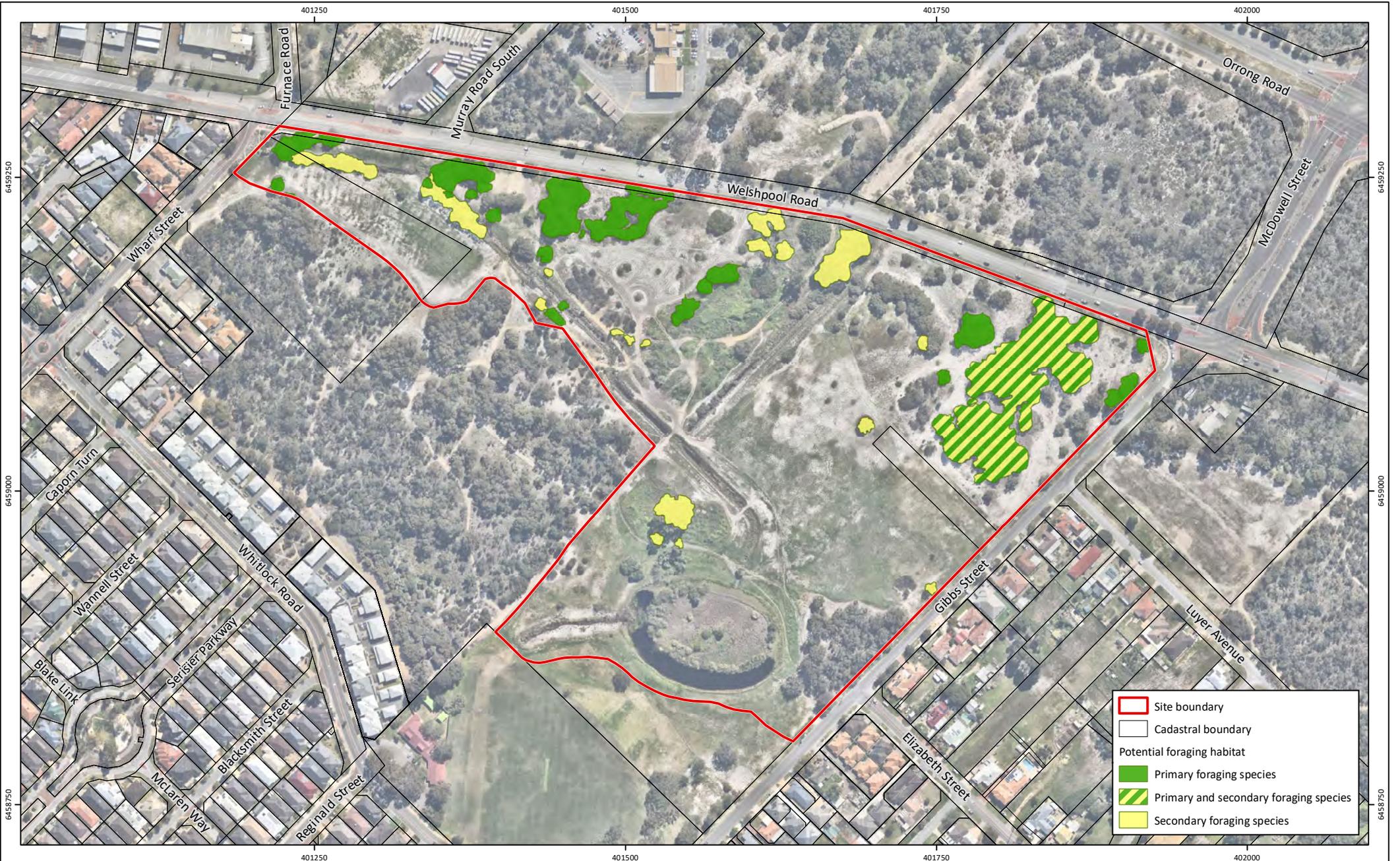
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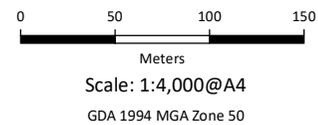




**Figure 9: Potential Forest Red-tailed Black Cockatoo Foraging Habitat**

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State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(07)-F71  
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**Figure 10: Black Cockatoo Habitat Trees**

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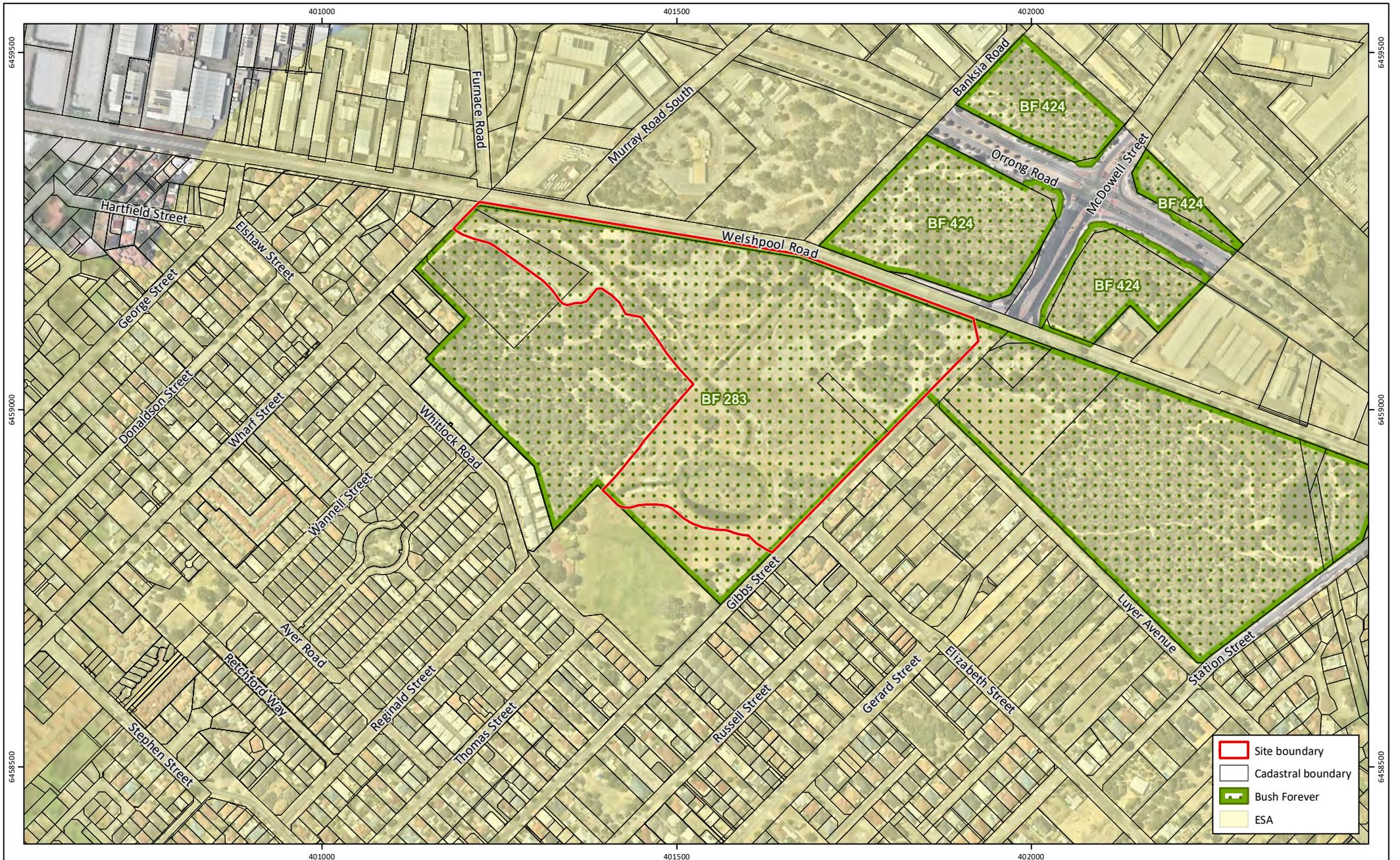
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**Figure 11: Environmentally Sensitive Areas and Bush Forever Sites**

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EP20-012(07)-F72

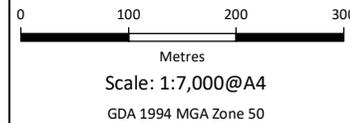
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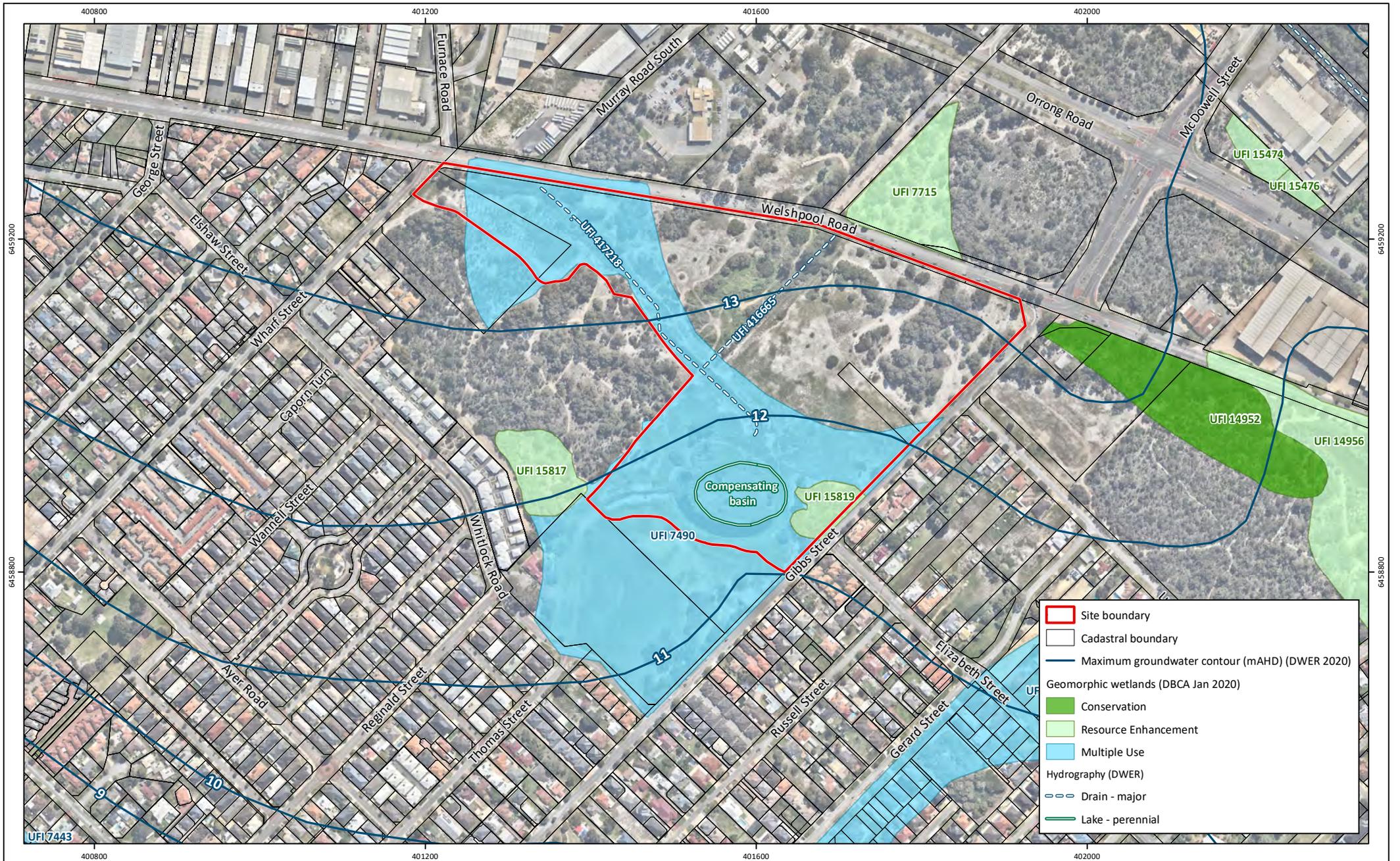
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**Figure 12: Existing Hydrological Features and Groundwater Levels**

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<b>Plan Number:</b>	EP20-012(07)-F73
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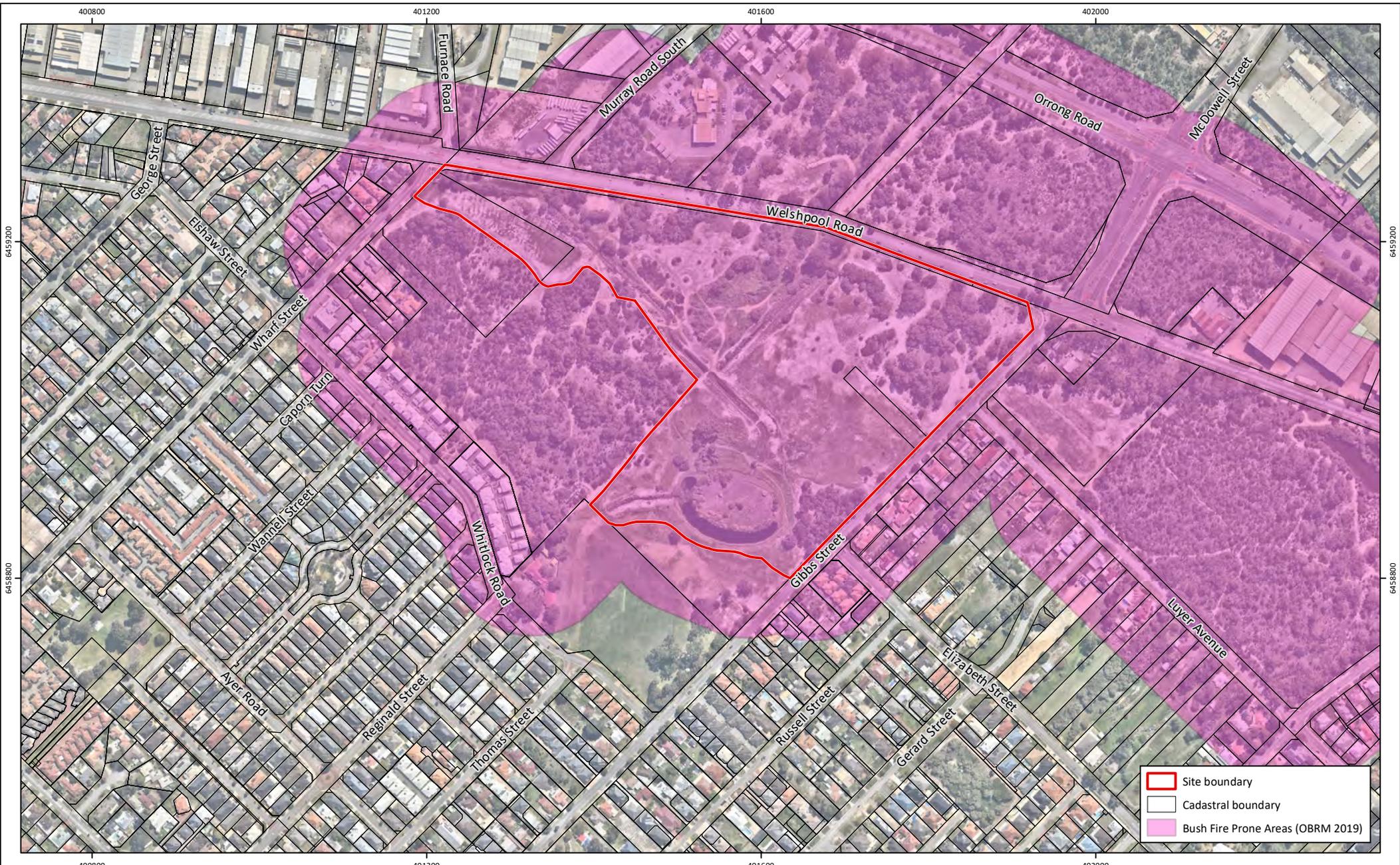
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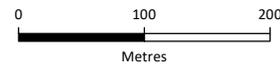


Site boundary  
 Cadastral boundary  
 Bush Fire Prone Areas (OBRM 2019)

**Figure 13: Bushfire Prone Areas**

**Project:** Environmental Assessment Report  
 State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
 EP20-012(07)-F96  
**Drawn:** GAR  
**Date:** 01/12/2020  
**Checked:** SCM  
**Approved:** CKK  
**Date:** 01/12/2020



Scale: 1:6,000@A4  
 GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used  
 ©Landgate (2020). Nearmap Imagery date: 30/08/2020



# Appendix A

State Football Centre Development Plan



Prepared by Carabiner (2020)



### Notes

1. Pitches rotated to optimum angle - 15 degrees off north-south axis.
2. Competition Pitch the same size as HBF Park. Competition pitch can move north-south 15m to manage wear. Competition pitch to the east to avoid afternoon sun for spectators. Competition Pitch can be operated as a ticketed venue, other pitches publicly accessible.
3. Major site arrival point. Drop-off area and bus parking.
4. Football West Administration Building. Large amount of Western facade will require treatment for afternoon sun.
5. High Performance Training and Game-day Facilities including grandstand to Competition Pitch.
6. Building expansion area.
7. Amenities serving internally and externally to the community.
8. Activated Plaza. This public realm provides an address to the different components of the Football Centre, modulation for the afternoon sun and an activated space for community use and event overlay. It will incorporate landscape elements and planting.
9. Small format pitches with operable netting for 5-a-side matches.
10. Maintenance and storage facilities.
11. Service and emergency access.
12. Engaging wetland 'water story' experience.

Proposed Location Plan - 1 : 2000@ A1



# Appendix B

Queens Park Open Space Masterplan



Prepared by the City of Canning (2020)



NEW CARPARK CONSTRUCTION WITH INTERPRETIVE SIGNAGE

IMPROVED PATHWAY AND INTERPRETATION INFORMATION AT INTERVALS INCLUDING SHELTERS AND BENCHES

CONSERVATION AREA ENHANCED

RESOURCE ENHANCEMENT WETLAND PROTECTED AND IMPROVED

PUMP BIKE TRACK

BIODIVERSITY LINK

EXISTING BUILDING RETAINED

CIRCULAR PATHWAY WITH EXERCISE EQUIPMENT AT INTERVALS

SERVICE/ EMERGENCY ACCESS

STORMWATER MANAGEMENT/ TREATMENT BASIN (SUBJECT TO REFINEMENT)

WELSHPOOL ROAD

STATE FOOTBALL CENTRE

MAINTENANCE/ EMERGENCY ACCESS & BRIDGE

ENHANCED BUSHLAND - ENDEMIC SPECIES ONLY

SERVICE/ EMERGENCY ACCESS

RESOURCE ENHANCEMENT WETLAND PROTECTED AND IMPROVED

STORMWATER MANAGEMENT/ TREATMENT BASIN (SUBJECT TO REFINEMENT)

DECKING & BOARDWALK

CARPARK

TOILETS

HALF BASKETBALL COURT

RECREATION/ PLAY FACILITIES

PARALLEL PARKING ON GIBBS STREET

CONNECTION TO GIBBS STREET SAFE ACTIVE STREET (BIKE BOULEVARD)

- EXISTING & NEW TREES
- BUSHLAND
- INFILL PLANTING
- PATHS
- SHELTERS/ PICNIC AREA



REV.	AMENDMENTS	DRAWN	AUTH'D	DATE

SCALE	NTS
SCALE IN METRES	
DATUM:	AHD
GRID:	PG64
SURVEYED	SURVEYOR
DRAWN	N. NGUYEN LANDSCAPE ARCHITECT
DATE	10/2020

DESIGNED	T. THOMPSON LANDSCAPE ARCHITECT	10/2020
CHECKED	SENIOR LANDSCAPE ARCHITECT	
RECOMMENDED	M. ROSS MANAGER NATURAL AREA MGMT & CON.	23/10/2020
APPROVED	D. JOHNSON SVC. MANAGER PARKS & PLACE IMPROVEMENT	23/10/2020

FILE No.	SHEET No.	01 OF 01
CONCEPT MASTER PLAN		
DRAWING No.	SHEET	REVISION
PCAD081 - 01 - 0	A1	



**CITY OF CANNING**  
**QUEENS PARK OPEN SPACE**  
 QUEENS PARK

# Appendix C

Definitions and Criteria



## Definitions and Criteria

Table 1: Vegetation Condition Scale (Keighery 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds and non-aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as “parkland cleared” with the flora comprising weed or crop species with isolated native trees or shrubs.

# Appendix D

Flora and Fauna Assessment for Queens Park Regional Open  
Space



Prepared by Ecoscape (2020)



**FLORA AND FAUNA ASSESSMENT FOR  
QUEENS PARK REGIONAL OPEN SPACE**

---

**CITY OF CANNING**

Prepared by:

**Ecoscape (Australia) Pty Ltd**

## Document Status

Rev. No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	JN/NR/MR	SB				July 2010
1	NR	SB				August 2010
2	NR					Nov 2010

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ABN 70 070 128 675

#### Quality Assurance

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An internal quality review process has been applied to each project task undertaken by us. Each document is carefully reviewed by senior members of the consultancy team and signed off prior to issue to the client. Draft documents are submitted to the client for comment and acceptance prior to final production.

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## Flora and Fauna Assessment for Queens Park Regional Open Space

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Jenni Andrews, City of Canning

Sian Mawson, Friends of Queens Park Bushland

# 1.0 Introduction

## Flora and Fauna Assessment for Queens Park Regional Open Space

### 1.1 Background

The City of Canning engaged Ecoscape to undertake an environmental assessment of the Queens Park Regional Open Space bushlands which consisted of multiple bushlands totalling an area of approximately 36 ha. The objective of this study was to gain an understanding of the biological environment including flora and fauna within these areas and provide information relating to their continued survival within an urban and light industrial area.

### 1.2 Study Area

The study area is located within the suburbs of Queens Park, East Cannington and Welshpool, approximately 12 km to the south east of Perth city (**Map 1**).

Queens Park Regional Open Space is located on either side of Welshpool Road, between Kewdale Road and Roe Highway and consists of nine smaller reserves divided by the roads and urban development. These bushlands have been given informal names which include:

- Maniana Bushland
- an Environmental Protection Policy (EPP) Lake – F.I.D. 498
- Gibbs Street Bushland
- Banksia Gardens West
- Banksia Gardens East
- Jason Windows
- remnant bushland adjacent to the Fire Station
- Queens Park Ecological Area
- Black Creek.

### 1.3 Project Objectives

The project objective was to gain an understanding of the flora and fauna of the Queens Park Regional Open Space and provide information relating to their continued survival within an urban and light industrial area. Ecoscape conducted flora and fauna surveys to the following standards to achieve this objective:

- i. Level 2 Flora survey according to EPA Guidance Statement 51 which includes:
  - an initial survey in spring, including establishment of permanent quadrats with a single stake in the north west corner, Declared Rare (DRF) and Priority Flora search and a Threatened Ecological Community (TEC) search identified from the desktop assessment

- an additional flora survey after the autumn rains from established marked quadrats. This survey will only include a DRF search if the species have been identified to be flowering during this period from the desktop assessment
  - mapping, plant identification and report writing.
- ii. Level 2 Fauna survey according to EPA Guidance Statement 56 which included:
- multiple season surveys
  - identification of significant fauna habitat
  - fauna sampling and trapping.

## 2.0 Survey Methods

### Flora and Fauna Assessment for Queens Park Regional Open Space

## 2.1 Desktop Assessment

A desktop study was undertaken by Ecoscape and the City of Canning to gather information on both flora and fauna species likely to inhabit the study area.

### 2.1.1 Flora and Vegetation

The following sources were interrogated to obtain information on the flora and vegetation of the study area:

- Department of Environment and Conservation (DEC) Threatened Flora Database
- DEC Threatened Ecological Community Database
- NatureMap

A search of the DEC Threatened Flora database identified a number of rare and priority flora within the City of Canning, including 15 Declared Rare Flora species and 18 Priority Listed Flora species. A list of these species is provided in **Appendix 6**.

Four Threatened Ecological Communities (TECs) were identified from the DEC database search which included the Queens Park Regional Open Space as well as a 10 km radius and are shown in **Table 1**.

**Table 1: TEC's occurring within 10 km radius of the Queens Park Regional Open Space**

Community Id	State Listing	EPBC Listing	Community Name
SCP3a	Critically Endangered	Endangered	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils of the Swan Coastal Plain.
SCP3b	Vulnerable		<i>Corymbia calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain.
SCP20a	Endangered		<i>Banksia attenuata</i> woodland over species rich dense shrublands.
MUCHEA LIMESTONE	Endangered	Endangered	Shrublands and woodlands on Muchea Limestone.

---

### 2.1.2 Fauna

The following sources were searched to obtain information on the potential fauna inhabiting the study area:

- Birds Australia Database (2007)
- DEC Threatened Fauna Database (database search request)
- Department of Environment, Water, Heritage and Arts (2009)
- *EPBC Protected Matters Search Tool*
- current Rare and Priority Fauna listings
- *Naturemap* search tool (WA Herbarium & DEC 2007)
- WA Museum Database.

There were 34 species identified from the DEC database search and the EPBC Protected Matters Search Tool (**Appendix 5**). The Birds Australia Database search identified 284 species (**Appendix 5**) and the Naturemap search tool identified 75 species including 4 Rare and 4 Priority species (**Appendix 5**).

## 2.2 Field Assessment

A field assessment was undertaken in October and November in 2009 and repeated in May 2010 to sample the flora and vegetation of the Queens Park Regional Open Space and search for priority species identified in the desktop search. A fauna assessment was also undertaken in October 2009 and repeated in February 2010.

### 2.2.1 Flora and Vegetation

To enable identification of Declared Rare Flora (DRF), the Environmental Protection Authority (EPA) and Department of Environment and Conservation (DEC) recommended that all flora surveys be conducted after the major rainfall period for the particular region. For the South West Botanical Province, including the Swan Coastal Plain, this is considered to be in the spring months from August to November.

A standard vegetation classification and description system was used during the vegetation survey. Descriptions were defined using the height and estimated cover of dominant species of each stratum using the Keighery (1994) framework (**Table 2**).

**Table 2: Classification system used to describe vegetation structure (Keighery 1994)**

Life form/height class	Canopy cover (%)			
	100 – 70	70 – 30	30 – 10	10 – 2
Trees over 30m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree Mallee	Tree Mallee	Open tree Mallee	Very open tree Mallee
Shrub Mallee	Closed shrub Mallee	Shrub Mallee	Open shrub Mallee	Very open shrub Mallee
Shrubs over 2m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

Descriptions were made for all vegetation types encountered during the survey. These vegetation descriptions were then grouped to arrive at vegetation units that were defined on the basis of shared structural, disturbance and floristic (species, abundance, cover) data. These units were also linked to the main landform/habitat types from which they were found to occur.

Vegetation condition was assessed using the Keighery (1994) bushland condition scale detailed in **Table 3**.

**Table 3: Keighery (1994) Bushland Condition Scale.**

Condition	Description
<b>Pristine</b>	No obvious signs of disturbance
<b>Excellent</b>	Vegetation structure intact, disturbance only affecting individual species and weeds are non-aggressive species
<b>Very Good</b>	Vegetation structure altered, obvious signs of disturbance eg repeated fires, aggressive weeds, dieback, logging and grazing.
<b>Good</b>	Vegetation structure altered, obvious signs of disturbance. Retains basic vegetation structure or ability to regenerate it. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.
<b>Degraded</b>	Basic vegetation structure severely impacted by disturbance. Requires intensive management. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.
<b>Completely Degraded</b>	Vegetation structure is no longer intact and the area is completely or almost completely without native flora. 'Parkland Cleared'.

The flora survey involved the systematic sampling of permanent floristic quadrats. Quadrat locations were determined on the basis of topography/landform, interpretation and ground truthing of aerial photography, and field observations of vegetation structure and composition. Quadrats were 10 m x 10 m in dimension, which captures an adequate representation of flora for bushlands in the Southwest Botanical Province. This sampling method is in line with the DEC's Draft Botanical Survey Requirements for the Southwest Region (CALM, 2003) and EPA Guidance Statement *No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*.

Each quadrat was permanently marked with a steel fence dropper on the NW and SE corners and tagged with a unique number. Where possible the quadrat was orientated as close to north-south and east-west as possible. The northwest corner, or nearest equivalent, of each quadrat was labelled with the quadrat number.

The following parameters were recorded from each quadrat:

- MGA coordinates recorded in GDA 94 datum using a hand-held Global Positioning System (GPS), to an accuracy usually within 5 m
- broad vegetation description based on the height and estimated cover of dominant species
- vegetation condition
- inventory of all flora species
- description of landform and habitat
- broad description of surface soil type
- percentage of litter cover and depth
- percentage of bare ground
- evidence of disturbance (grazing, weed invasion, fires, rubbish dumping etc).

Colour photographs of the vegetation at each site were taken from the northwest corner of each quadrat using a digital camera.

Opportunistic flora collections were also made during the threatened flora survey to supplement the list of species recorded from the flora survey sites.

Common species that were well known to the survey botanists were identified in the field. Voucher specimens of potentially significant flora species and other dominant species were collected, assigned a unique number to facilitate tracking of data, and pressed in the field. Specimens collected were then dried and treated in accordance with the requirements of the West Australian Herbarium. These voucher specimens were identified with reference to appropriate publications, and/or comparison with pressed specimens housed at the West Australian Herbarium.

Nomenclature was checked against the current listing of scientific names recognised by the Western Australian Herbarium (WA Herbarium & Department of Conservation and Environment 2009) and updated as necessary.

All raw site data was entered into an Access database, with species names entered following formal identification of the collected specimens.

### **2.2.2 Fauna**

The study area was divided into fauna habitat types based on vegetation community and landform. Each habitat was then sampled using a variety of techniques listed below, to record the fauna species present. The habitats were:

- wetlands
- woodland
- shrubland.

Sampling techniques used to record the fauna species list included:

- trapping using cage, Elliot, pitfall and funnel traps (**Plates 1-4**)
- bird survey
- opportunistic invertebrate sampling by hand and beating
- recording scats, tracks, bones and burrows
- using a Trail Camera to record diurnal and nocturnal fauna
- Anabat II for recording bat calls.

---

**Sampling sites and Frequency**

The sites chosen for sampling by trapping are displayed on **Map 2 (Appendix One)**. Each of these sites was sampled using cage, Elliot, pitfall and funnel traps at the frequency listed in **Table 4**.



***Plate 1: Cage trap***



***Plate 2: Elliot trap***



***Plate 3: Pitfall trap***



**Plate 4: Funnel trap**

**Table 4: Trap Type and Number per Sample Site.**

Site	Site	Trap Type	Trapping Nights
Queens Park Ecological Area	1-5	Cage x 5, Elliot x 25, Pitfall x 5, funnels x 10	8
Maniana Bushland	6-7	Cage x 2, Elliot x 10, Pitfall x 2, funnel x 4	8
Banksia Gardens West	8	Cage x 1, Elliot x 5, Pitfall x 1, funnel x 2	8
Banksia Gardens East	9	Cage x 1, Elliot x 4, Pitfall x 1, funnel x 2	8
Remnant bushland (adjacent to the Fire Station)	10	Cage x 1, Elliot x 5, Pitfall x 1, funnel x 2	8
Black Creek		Anabat	-
EPP Lake – F.I.D. 498		-	-
Gibbs Street Bushland		-	-
Jason Windows		-	-
		<b>Total</b>	40

### 2.2.3 Trail Camera

Trail cameras were placed at appropriate locations throughout the sites by tying them to trees at breast height. They were left to record from the time of placement until the following morning when traps were emptied (approximately 5pm-7am). A total of four trail cameras were used across sampling days.

#### **2.2.4 Anabat**

The Anabat II was formatted to record from 6pm – 6am across 2 nights. It was placed in the most likely location for bat activity which was in close proximity to Black Creek. From this location the Anabat was able to pick up potential bat calls from the surrounding areas. The data was later analysed to identify bat species.

#### **2.2.5 Invertebrate sampling**

##### ***Beating***

Invertebrate assemblages were sampled opportunistically using the beating technique. This involves beating branches of trees, shrubs and other vegetation using a hard object and catching dislodged invertebrates in a white, small-fibred net. This was done in 45 minute blocks across two seasons.

All invertebrates were sorted on site to Order and anything requiring further identification was collected and stored into tubes of ethanol (75% or greater) for closer identification under a microscope. Furthermore, anything resembling a Short Range Endemic (SRE) or a Priority or Listed species was identified to species. In particular, special care was taken to sample and indentify Priority or Listed species.

##### ***Active Sampling***

Invertebrates were sampled opportunistically by hand, which is known as active sampling.

All invertebrates were sorted on site to Order and anything requiring further identification was collected for closer identification under a microscope. Furthermore, anything resembling a Short Range Endemic (SRE) or a Priority or Listed species was identified to species. Again, special care was taken to sample and indentify Priority or Listed species.

## 3.0 Survey Results

### Flora and Fauna Assessment for Queens Park Regional Open Space

#### 3.1 Vegetation

The Southern River complex is the dominant Heddle vegetation type across the study area. This complex consists of open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - *Banksia* species with fringing woodland of *Eucalyptus rudis* - *Melaleuca raphiophylla* along the creek beds (Heddle et al. 1980).

*EPA Guidance Statement No 10* (EPA 2006) using 1997/1998 data, identified the Southern River vegetation complex at 19.8% of the original extent remaining and only 1.5% remaining in secure tenure (**Table 5**). The EPA (2006) has identified several levels to describe the status of a vegetation complex within the metropolitan region and southwest. These are:

- **Threshold level** – 30% of the pre-clearing extent is the level at which species loss appears to accelerate exponentially at an ecosystem level
- **Endangered level** – 10% of the original extent is regarded as being a level representing “endangered”.

**Table 5: 1997/98 extent of the Southern River Vegetation Complex on SCP (EPA 2006)**

Vegetation Complex	Total pre-1750 extent (ha)	Remaining on SCP		Remaining on SCP in Secure Tenure	
		Area (ha)	% Original Area	Area (ha)	% Original Area
Southern River	57,979	11,501	19.8	882	1.5

##### 3.1.1 Plant communities

Ecoscope identified 11 vegetation communities as indicated in **Table 6** and shown on **Map 3a-b (Appendix 1)**. The details recorded at each quadrat are provided in **Appendix 4**.

**Table 6: Vegetation communities of the study area**

Veg Code	Community description	Quadrats	Area (ha)
BaBmLOW	<i>Banksia attenuata</i> , <i>B. menziesii</i> Low Open Woodland over <i>Hibbertia hypericoides</i> , <i>Stirlingia latifolia</i> , <i>Bossiaea eriocarpa</i> Low Open Shrubland over <i>Mesomelaena pseudostygia</i> , <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> Open Sedgeland	QP02, QP03, QP04	7.36
BmEmAfLW	<i>Banksia menziesii</i> , <i>Eucalyptus marginata</i> and <i>Allocasuarina fraseriana</i> Low Woodland over <i>Hibbertia hypericoides</i> , <i>Stirlingia latifolia</i> Low Shrubland over mixed Open Sedgeland	QP10	2.43
CcEtLW	<i>Corymbia calophylla</i> , <i>Eucalyptus todtiana</i> Low Woodland	-	0.23
CcLW	<i>Corymbia calophylla</i> Low Woodland to Woodland over <i>Jacksonia floribunda</i> Very Open Shrubland over <i>Xanthorrhoea preissii</i> , <i>X. gracilis</i> Low Open Shrubland over <i>Dasypogon bromeliifolius</i> Open Herbland	QP01, QP08, QP11	8.64
CcMpLW	<i>Corymbia calophylla</i> , <i>Melaleuca preissiana</i> Low Woodland to Low Open Forest over <i>Stirlingia latifolia</i> Low Open Shrubland	QP06	2.57
CtTOS	<i>Conospermum triplinervium</i> Tall Open Scrub	-	0.2
EpGtSILOS	<i>Eremaea pauciflora</i> , <i>Gompholobium tomentosum</i> , <i>Stirlingia latifolia</i> Low Open Shrubland over Mixed Very Open Herbland and <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> Open Sedgeland.	QP07	1.16
MrAsLOF	<i>Melaleuca raphiophylla</i> , <i>Acacia saligna</i> Low Open Forest over mixed Very Open Sedgeland and mixed introduced Herbland	-	0.79
MrErLW	<i>Melaleuca raphiophylla</i> , <i>Eucalyptus rudis</i> Low Woodland over mixed Open Sedgeland and mixed introduced Open Herbland	QP05	0.53
MpLOF	<i>Melaleuca preissiana</i> Low Open Forest over <i>Juncus pallidus</i> Very Open Sedgeland and mixed introduced herbland	QP09	0.97
miCG	mixed introduced Closed Grassland	-	

### 3.1.2 Vegetation Condition

Ecoscope mapped the vegetation condition for each of the bushland areas using the Keighery method as described in **Section 2**. Vegetation condition is shown on **Map 4a-b (Appendix 1)** and the area of bushland for each condition class is listed in **Table 7**.

**Table 7: Bushland condition of the study area**

Bushland name	Pristine	Excellent	Very		Degraded	Completely Degraded	TOTAL (ha)
			Good	Good			
Maniana	0	1.17	2.06	1.49	0.95	1.85	7.52
EPP Lake	0	0	0	0	0.06	0.99	1.05
Gibbs Street	0	0	0.66	0.06	0.38	2.47	3.57
Banksia Gardens W	0	0	3.13	0.2	0.15	1.4	4.88
Banksia Gardens E	0	0	0.26	0.36	0	0.27	0.89
Jason Windows	0	0	0	0.53	0	0.27	0.8
Fire Station	0	0.8	0.73	0.62	0	0.19	2.34
QP ecological area	0	2.1	4.29	1.68	1.29	0	9.36
Black Creek	0	0	0	0.91	0	0.96	1.87
<b>TOTAL (ha)</b>	<b>0</b>	<b>4.07</b>	<b>11.13</b>	<b>5.85</b>	<b>2.83</b>	<b>8.4</b>	<b>32.28</b>

The vegetation condition amongst the reserves was consistent in the sense that the most degraded areas were at the peripheries and along tracks. Queens Park Ecological Area, Maniana Bushland, Fire Station and Banksia Gardens West were in better condition compared to Black Creek, Gibbs Street and the EPP Lake.

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## 3.2 Flora

From the floristic survey 139 plant taxa were recorded. Of these taxa, 33 were weed species, one species was listed by DEC as Priority 3 and one species was listed by DEC as Rare and as Endangered under the Environmental Protection and Biodiversity Conservation Act (EPBC).

- *Conostylis bracteata* (P3)
- *Macarthuria keigheryi* (Rare and Endangered)

A flora inventory of species recorded during the survey is provided in **Appendix 3**. The locations of conservation significant flora are provided in **Appendix 3** and shown on **Map 3**.

## 3.3 Fauna

The fauna survey recorded 47 species through trapping and opportunistic observations (**Appendix 2**). Two of these species are listed as conservation significant under the EPBC Act

- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - Endangered
- Rainbow Bee Eater (*Merops ornatus*) - Migratory

Carnaby's Black-Cockatoo was sighted within the Queens Park Regional Area and appeared to use the area for feeding, while the Rainbow Bee Eater (*Merops ornatus*) was sighted and heard mainly in the Banksia Gardens East remnant.

### 3.3.1 Trapping Results

Fauna that were recorded during the trapping survey are listed in **Table 8**.

**Table 8: Results of fauna trapping sessions.**

Date	Site	Trap Type	Species Name	Common Name	Abundance
6/10/09	1	Pit trap	<i>Limnodynastes dorsalis</i>	Pobblebonk/ Western Banjo Frog	1
	1	Funnel trap	<i>Pseudonaja affinis</i>	Dugite	1
	9	Pit trap	<i>Hemiergis quadrilineata</i>	Two-toed Earless Skink	1
	8	Pit trap	<i>Menetia greyii</i>	Common Dwarf Skink	1
	8	Funnel trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
	10	Pit trap	<i>Mus musculus</i>	House Mouse	1
	4	Pit trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
			<i>Strophurus spinigerus</i>	South-western Spiny-tailed Gecko	1
				Centipede	1
7/10/09	8	Funnel trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
	8	Funnel trap	<i>Acritoscincus trilineatum</i>	South-western Cool Skink	1
	7	Pit trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
	7	Funnel trap	<i>Heleioporus psammophilus</i>	Sand Frog	1
8/10/09	1	Funnel		Scorpion	1
	2	Pit trap	<i>Limnodynastes dorsalis</i>	Pobblebonk/ Western Banjo Frog	2
	3	Funnel	<i>Laxta sp</i>	Trilobite Cockroach	1
	4	Funnel	<i>Strophurus spinigerus</i>	South-western Spiny Tailed Gecko	1
	5	Pit trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
	7	Elliot	<i>Mus musculus</i>	House Mouse	2
	7	Pit trap	<i>Mus musculus</i>	House Mouse	1
	7	Pit trap	<i>Heleioporus psammophilus</i>	Sand Frog	1
	7	Funnel	<i>Scolopendrid sp.</i>	Centipede	1
	9	Funnel	<i>Drymaplaneta sp</i>	Cockroach	1
	9	Funnel	<i>Heleioporus eyrei</i>	Moaning Frog	1
	9	Elliot	<i>Mus musculus</i>	House Mouse	1
9/10/09	3	Funnel trap	<i>Pogona minor</i>	Western Bearded Dragon	1
	7	Pit trap	<i>Heleioporus eyrei</i>	Moaning Frog	1
			<i>Spirobolida sp</i>	Millipede	1
9/2/2010	1	Pit trap	<i>Heleioporus psammophilus</i>	Sand Frog	1
	1	Pit trap		Scorpion	1
	2	Pit trap		Scorpion	1
	3	Pit trap		Scorpion	1
	9	Pit trap		Scorpion	1
	9	Funnel		Scorpion	1
10/2/2010	7	Pit trap	<i>Menetia sp</i>		1

Date	Site	Trap Type	Species Name	Common Name	Abundance
	7	Pit trap		Scorpion	1
	9	Opp	<i>Helea perforata</i>	Hairy Pie-dish Beetle	1
11/2/2010	1	Pit trap	<i>Lerista distinguenda</i>	South-western Orange-tailed Slider	1
	4	Cage	<i>Tiliqua rugosa</i>	Bob-tail Lizard	1
	5	Funnel	<i>Ctenotus fallens</i>	West Coast Ctenotus	1
				Centipede	1
12/2/2010	1	Pit trap	<i>Pseudophryne guentheri</i>	Gunther's Toadlet	1
	7	Pit trap	<i>Helea perforata</i>	Hairy Pie-dish Beetle	2
	8	Pit trap		Scorpion	2

### 3.3.2 Trail Camera

No fauna were sighted using the trail cameras during either day or night recordings in October 2009 or February 2010 (**Table 9**).

**Table 9: Trail Camera sites and dates**

Date	Site name	Hours recorded
5/10/09	Queens Park Regional Area	12 hours
	Maniana Bushland	12 hours
6/10/09	Queens Park Ecological Area	12 hours
	Queens Park Ecological Area	12 hours
	Queens Park Ecological Area	12 hours
	Maniana Bushland	12 hours
8/10/09	Queens Park Ecological Area	12 hours
	Queens Park Ecological Area	12 hours
	Queens Park Ecological Area	12 hours
	Queens Park Ecological Area	12 hours
8/02/10	Queens Park Ecological Area (2 cameras)	12 hours
	Maniana Bushland	12 hours
	Banksia Garden West	12 hours
	Banksia Garden East	12 hours
9/02/10	Queens Park Ecological Area (2 cameras)	12 hours
	Maniana Bushland	12 hours
	Banksia Garden West	12 hours
	Banksia Garden East	12 hours
10/02/10	Queens Park Ecological Area (2 cameras)	12 hours
	Maniana Bushland	12 hours
	Banksia Garden West	12 hours
	Banksia Garden East	12 hours
11/02/10	Queens Park Ecological Area (2 cameras)	12 hours
	Maniana Bushland	12 hours

Date	Site name	Hours recorded
	Banksia Garden West	12 hours
	Banksia Garden East	12 hours

### 3.3.3 Anabat

Anabat II recordings were analysed for bats species. No bat calls were recorded in October 2009 or February 2010 (**Table 10**).

**Table 10: Anabat II results.**

Date	Site name	Hours recorded	Bats Identified
7/10/09	Black Creek	6pm-6am	No bats recorded
8/10/09	Black Creek	6pm-6am	No bats recorded
8/02/10	Black Creek	6pm-6am	No bats recorded
9/02/10	Black Creek	6pm-6am	No bats recorded
10/02/10	Black Creek	6pm-6am	No bats recorded
11/02/10	Black Creek	6pm-6am	No bats recorded

### 3.3.4 Invertebrate sampling

The results of beating and active sampling of invertebrates are shown in **Table 11**.

**Table 11. Invertebrate groups found through beating and active sampling.**

Order	Family	Common Name	Species
Hymenoptera	-	Ants	-
	Myrmeciinae	Bull Ant	-
	-	Ants	-
	-	Ants	-
	-	Ants	-
	Apidae	Bee	* <i>Apis mellifera</i>
	Apidae	Bee	
Isoptera	-	Termite	-
Diptera	Culicidae	Mosquito	-
	-	Fly	-
	-	Fly	-
	-	Fly	-
Orthoptera	-	Grasshopper	-
Sub-order Blattodea	-	Cockroach	-
	-	Cockroach	-
	-	Cockroach	-
Coleoptera	-	Beetle	-
	-	Beetle	-

	-	Beetle	-
	-	Beetle	-
Hemiptera	Pentatomida	Shield Bug	<i>Nezara viridula</i>
	Coccinellidae	Lady bird	<i>Coccinella transversalis</i>
Diplopoda		Millipede	-
Lepidoptera	-	Moth	-
Odonata	-	Dragon fly	-
	-	Dragon fly	-
	-	Dragon fly	-
Araneae	Salticidae	Spider	-
	-	Spider	-
	-	Spider	-
	-	Spider	-

\*denotes non native species

### 3.3.5 Opportunistic observations

A Fox den (*Vulpes vulpes*, European Red Fox) was seen close to the fence line in the bushland behind the Fire station. Multiple Wolf Spider burrows were also seen across the study area, although no spiders were sighted.

## 4.0 Recommendations

### Flora and Fauna Assessment for Queens Park Regional Open Space

#### 4.1 Threatening Processes

Processes that may impact on the biological environment and the Queens Park Regional Open Space include:

- clearing for urban development
- unmanaged access causing proliferation of tracks and fragmentation of bushland which also contributes to the spread of weeds
- soil disease such as dieback
- arson which is a threat to vegetation and fauna habitat
- dogs that are unleashed and dog waste that is not removed which results in damage to fauna and fauna habitat
- feral animals, including foxes and cats threatening native fauna
- rubbish dumping such as garden waste which has an impact on fauna habitat and contributes to weed invasion.

The predominant issues that affect the Queens Park Regional Open Space are weeds, access, fire and fragmentation. The following section describes broad management recommendations to help manage these impacts.

#### 4.2 Weed Management

##### 4.2.1 Objectives

The objectives for weed control are to:

- identify and control existing weeds with the highest priority for control
- prevent introduction of additional weed species
- prevent further encroachment of weeds into bushland areas
- minimise any detrimental effects of the weed control programme on the native biota
- integrate the weed control programme with bushland restoration programmes.

##### 4.2.2 Background

Environmental weeds are plants that establish themselves in natural ecosystems and modify natural processes, resulting in the decline of the natural communities they invade.

Impacts on ecosystem function by environmental weeds include:

- resource competition, as weeds often outcompete native species

- prevention of seedling recruitment of native species
- alteration to geomorphological processes, such as increased erosion
- changes to soil nutrient status
- alteration of fire regime, usually through increased fire frequency
- changes to the abundance of indigenous fauna due to less diverse habitat
- loss of genetic diversity
- loss of species diversity
- changes to the structure of vegetation communities, often by the removal of the shrub layer or native ground covers.

### 4.2.3 Strategy

#### ***Weed Control Action Plan***

Mapping vegetation condition in conjunction with weed species distribution and abundance allows the formulation of a weed management action plan for the reserve. This action plan is based on three methods of control – species-led, site-led and cause-led, and follows a series of guiding principles.

#### **Species-led Control**

Generally, it is recommended that species-led control be undertaken prior to site-led control. Weed species are placed in this category if they:

- have small populations
- are relatively easy to remove
- have a high potential to spread and therefore become a problem in the future.

#### **Site-led Control**

Generally, it is recommended that site-led control be undertaken after control of species-led weeds. Weed species are placed in this category if they:

- have wide-spread and well-established populations
- require concentrated and/or long-term efforts to remove
- are highly detrimental to ecological functions of bushland if left unchecked.

These weed species should be tackled on a weed by weed basis, using the guiding principles listed above.

#### **Cause-led Control**

If a source or cause of weed infestation can be identified, cause-led control can be used. This is suitable where the cause or source can be eliminated or reduced. An example of this

may be where weed species are able to spread from enrichment plantings from adjacent parklands and urban development.

A general Weed Control Action Plan (**Table 12**) was developed, based on the guiding principles outlined previously. It is provided as a general guide for determining the priority for weed control activities.

### **Action Plan for High Priority Weeds**

As the study area is relatively large and varies considerably in condition and levels of weed infestation, the most appropriate course of action is to conduct a **Site-Led** control strategy across the entire study area. Weeds in areas of *Low* weed infestation should be controlled first, followed by weeds of *Moderate* weed infestation, weeds of *High* weed infestation, and areas in *Extreme* weed infestation. Priority weeds should be targeted when controlling each area, and non-priority weeds should be opportunistically controlled if resources allow.

### **Action Plan for Non-Priority Weeds**

**Table 12: General Weed Control Action Plan**

Priority	General Recommendations
<p><b>Priority 1</b> Start with species-led control</p>	<p><b>Species-led control:</b></p> <ol style="list-style-type: none"> <li>1. Select weeds for control on a species basis according to time of year and available resources.</li> <li>2. For each weed species, use weed infestation distribution maps to: <ul style="list-style-type: none"> <li>• Start control efforts in areas of <i>Low</i> weed infestation.</li> <li>• Move to areas of <i>Moderate</i> weed infestation.</li> <li>• Move to areas of <i>High</i> weed infestation.</li> <li>• Move to areas of <i>Extreme</i> weed infestation.</li> </ul> </li> </ol> <p>The above represents primary weed control. Secondary weed control and long-term monitoring of weed populations will also need to be undertaken.</p>
<p><b>Priority 2</b> Move to site-led control</p>	<p><b>Site-led control:</b></p> <ol style="list-style-type: none"> <li>1. Select sites suitable for site-based control.</li> <li>2. Use weed infestation distribution maps to: <ul style="list-style-type: none"> <li>• Start control efforts in areas of <i>Low</i> weed infestation.</li> <li>• Move to areas of <i>Moderate</i> weed infestation.</li> <li>• Move to areas of <i>High</i> weed infestation.</li> <li>• Move to areas of <i>Extreme</i> weed infestation.</li> </ul> </li> </ol> <p>Depending on resources and time of year it may be necessary to undertake control of different site-led species, prior to moving to other areas. Again, the above represents primary weed control. Secondary weed control and long-term monitoring of weed populations will also need to be undertaken.</p>
<p><b>Priority 3</b> Move to cause-led control</p>	<p><b>Cause-led control:</b></p> <ol style="list-style-type: none"> <li>1. Select sites suitable for cause-based control.</li> <li>2. Use bushland condition and weed distribution maps to: <ul style="list-style-type: none"> <li>• Start control efforts in areas of <i>Low</i> weed infestation.</li> <li>• Move to areas of <i>Moderate</i> weed infestation.</li> <li>• Move to areas of <i>High</i> weed infestation.</li> <li>• Move to areas of <i>Extreme</i> weed infestation.</li> </ul> </li> </ol> <p>Again, the above represents primary weed control. Secondary weed control and long-term monitoring of weed populations will also need to be undertaken.</p>

#### 4.2.4 Recommendations

RECOMMENDATIONS		PRIORITY
	WEED CONTROL	
1	Use the recent South East Regional Centre for Urban Landcare (SERCUL) weed mapping report to prioritise weed control within the Reserves	HIGH
2	Undertake weed control according to the prioritisation of reserves and weed species as developed from the SERCUL weed mapping	HIGH
3	Ensure application of any herbicides is in accordance with the material safety data sheets and DOW (2000) water catchment restrictions when near wetlands	HIGH
4	Implement monitoring program to assess changes in weed species and distribution in the study area and adapt weed strategies accordingly	MED

### 4.3 Access Management

#### 4.3.1 Objectives

The objectives for access within the study area are to:

- provide for a co-ordinated system of access for fire control and other management requirements
- provide access that is compatible with the conservation values of the study area
- restrict access to authorised vehicles only
- ensure that recreational facilities and activities are planned and managed to have minimal impact on the natural environment
- promote the biological, physical and cultural values of the study area to recreational users.

#### 4.3.2 Background

The study area offers some recreational opportunities for the local community. At present the reserves are being used for:

- walking and jogging
- dog exercise
- nature observation

Access management helps to protect the bushland and fauna habitat by minimising the effects of:

- unauthorised vehicle access
- trampling
- track proliferation and weed invasion
- spread of soil disease
- disturbance of native fauna

### 4.3.3 Strategy

#### *Fencing*

Unauthorised access by vehicles, pedestrians and bikes through the bushland areas may lead to trampling and destruction of the vegetation and further degradation of the bushland condition. Areas being rehabilitated are particularly vulnerable to trampling. Any damaged fencing should be repaired to discourage uncontrolled pedestrian and vehicle access.

All new and repaired fencing should be aesthetically consistent with the fencing types present on site. The materials treated pine and galvanised wire, are durable, cost-effective and visually unobtrusive.

#### *Paths*

Formalised access paths provide safe and convenient access for the community to enjoy the reserve. Good path design is required in the bushland to maximise bushland areas and avoid small islands of bushland which are easily invaded by weed species.

### 4.3.4 Recommendations

RECOMMENDATIONS		PRIORITY
	ACCESS	
5	Construct and upgrade fencing where required to manage access	HIGH
6	Formalise and consolidate paths to manage access	HIGH

## 4.4 Fire Management

### 4.4.1 Objectives

Fires have the potential to destroy the native ecology, both directly (through burning the vegetation) and indirectly (such as allowing weed invasion). It also threatens human life and adjacent properties. A strategy is therefore required to minimise the risk and impact of fire.

A Fire Management Strategy has been set out below, outlining plans and strategies to reduce fire hazards. The aim of this plan is to define fire management and fire response strategies that are consistent with each other, and conserve existing remnant bushland and flora/fauna habitat of the study area. The objectives for fire management are to:

- protect lives, properties and assets
- preserve conservation values of the reserve
- maintain the risk posed by wildfire to adjoining property at an acceptable level
- preserve ecological and evolutionary processes

- conduct the monitoring necessary to ensure that the four above aims are achieved.

There is no single optimal fire regime for balancing all these requirements and fire management must always consider local conditions.

#### 4.4.2 Background

Changed fire regimes can significantly alter the vegetation of an area by favouring different plant groups, depending on fire frequency (Bell 2001).

Changed fire regimes may also impact on native fauna, with animals killed as a result of fire or loss of shelter, including additional prospects of predation, or food resources following fire. Due to the habitat fragmentation of the study area this may also limit the opportunities for fauna species to escape from fire, or limit opportunities for recolonisation of an area following fire.

#### 4.4.3 Recommendations

RECOMMENDATIONS		PRIORITY
FIRE MANAGEMENT		
7	Develop Fire Response Plan to assist fire fighting response	MED
8	Educate community to increase awareness of the damaging effects of arson, particularly through school education programs	HIGH
9	Regularly maintain fire breaks and keep tracks clear of weeds.	HIGH
10	Reduce fuel loads through control of weeds such as Perennial Veldt Grass and Bulrush	HIGH
11	Revise weed control works after any fires to ensure potential damage by works are minimised and efficiencies are maximised.	HIGH

## 4.5 Fauna Management

### 4.5.1 Objectives

The objective for native fauna management is to:

- minimise predation pressure on native animals by foxes and cats
- maximise the quality and quantity of native fauna habitat.

The objective is to suppress feral animal numbers to:

- minimise predation pressure on native animals by foxes, cats and exotic fish

### 4.5.2 Background

The majority of the bushland in the Queens Park Regional Open Space is good habitat for fauna, particularly reptiles as is evident from Ecoscape's trapping records. Due to the fragmentation of the study area, fauna species would find it difficult to travel in search of

food. A key method for maintaining fauna numbers is to reduce predation. In this case, feral cats, domestic cats and dogs have access to the study areas decreasing the chance of native fauna survival.

The alternative options for control of feral animals need careful consideration. The most effective pest control programs are those which integrate several techniques such as exclusion fencing, baiting and trapping, although baiting and trapping are probably not ideal in an urban environment (DAFWA, 2004). In allocating resources to feral animal control, the potential re-invasion of a site by feral animals and the maintenance costs of options such as exclusion fencing needs to be considered.

### 4.5.3 Strategy

Strategies to achieve the objectives for fauna management include minimising fires which could destroy habitat maintaining water quality, improving bushland condition and managing feral animals which may compete with or predate upon them.

Control options for feral animals should be implemented when feral animals are reported.

### 4.5.4 Recommendation

RECOMMENDATIONS		PRIORITY
NATIVE FAUNA		
12	To minimise impacts on frogs & turtles, be careful when herbicide spray near wetlands	HIGH
13	When conducting rehabilitation works consider leaving fallen logs and rocks to provide additional habitat for fauna	HIGH
14	Improve habitat to provide a refuge for native fauna by providing thick understorey of shrubs and keeping logs	HIGH
15	Provide additional safe breeding areas out of reach of predators	MED
16	Investigate the implementation of a cat curfew within a certain buffer of the reserve to minimise predation on the native fauna by domestic cats	MED
17	Provide more plastic bags and bins around the reserve for dog owners to dispose of waste responsibly	HIGH
18	Educate residents on the impact of pets on native wildlife	HIGH
19	Dogs should be kept on a leash when in the Reserves	HIGH

## 4.6 Community Involvement and Education

### 4.6.1 Objective

The objectives for community involvement are to:

- demonstrate sound environmental practices to the community
- engage the community to provide and preserve their unique environment for future generations

- engender a spirit of care for the reserve, and sense of belonging to the environment amongst the community

#### **4.6.2 Background**

There is currently a 'Friends of Queens Park Bushland' community group that is actively trying to preserve these reserves. They are involved in weed control, monitoring and rehabilitation and also organise night walks and other guided tours.

#### **4.6.3 Strategies**

Interpretation and education of the cultural and conservation significance of the Queens Park Regional Open Space is vital to the preservation of the reserves as it raises community awareness and encourages a sense of belonging as well as active management participation. The current local community group and Aboriginal Corporation on Welshpool Road would be the ideal candidates to continue the ongoing interpretation and education of the reserve with the support of the local council.

To raise community awareness of the values of the reserve, the following education and interpretation features could include:

- signs located on the pathways with information about heritage, flora and fauna species
- nature trail with a pamphlet showing the route of the walk and the flora and fauna species likely to be encountered.

Community groups should also be encouraged to provide assistance with focused projects, while managing agencies are responsible for broader on-ground works such as control of extensive weed populations through spraying programs.

The community projects need to be sufficiently focused such that visible results are obtainable. A sense of on-going responsibility and belonging is also important and the development of specific rehabilitation sites can facilitate this, with the community group participating in follow-up weeding after planting the same site.

It is important that community volunteers groups be trained in bush regeneration techniques prior to undertaking works in the bushland. An introductory course in bush regeneration is available from Apace WA in North Fremantle. It is also important to recognise the valuable contribution of community volunteers which can be done through signage at rehabilitation sites. Other signs that can help in educating visitors of the uniqueness of the reserves include; rare flora information, flowering times, fauna information as well as details on the uniqueness of the reserve and any interesting historical facts.

#### 4.6.4 Recommendation

RECOMMENDATIONS		PRIORITY
	<b>COMMUNITY INVOLVEMENT</b>	
20	Develop an Interpretation Plan for the reserve to facilitate a co-ordinated plan for interpretation and education	HIGH
21	Support activities of the local community group through assistance with training and equipment.	HIGH

## 4.7 Summary of Recommendations

**Table 13: Summary of management recommendations for the study area**

RECOMMENDATIONS		PRIORITY
	<b>WEED CONTROL</b>	
1	Use the recent SERCUL weed mapping report to prioritise weed control within the Reserves	HIGH
2	Undertake weed control according to the prioritisation of reserves and weed species as developed from the SERCUL weed mapping	HIGH
3	Ensure application of any herbicides is in accordance with the material safety data sheets and DOW (2000) water catchment restrictions when near wetlands	HIGH
4	Implement monitoring program to assess changes in weed species and distribution in the study area and adapt weed strategies accordingly	MED
	<b>ACCESS</b>	
5	Construct and upgrade fencing where required to manage access	HIGH
6	Formalise and consolidate paths to manage access	HIGH
	<b>FIRE MANAGEMENT</b>	
7	Develop Fire Response Plan to assist fire fighting response	MED
8	Educate community to increase awareness of the damaging effects of fire, particularly through school education programs	HIGH
9	Regularly maintain fire breaks and keep tracks clear of weeds.	HIGH
10	Reduce fuel loads through control of weeds such as Perennial Veldt Grass and Bulrush	HIGH
11	Revise weed control works after any fires to ensure potential damage by works are minimised and efficiencies are maximised.	HIGH
	<b>NATIVE FAUNA</b>	
12	To minimise impacts on frogs & turtles, be careful when herbicide spray near wetlands	HIGH
13	When conducting rehabilitation works consider leaving fallen logs and rocks to provide additional habitat for fauna	HIGH
14	Improve habitat to provide a refuge for native fauna by providing thick understorey of shrubs and keeping logs	HIGH
15	Provide additional safe breeding areas out of reach of predators	MED
16	Investigate the implementation of a cat curfew within a certain buffer of the reserve to minimise predation on the native fauna by domestic cats	MED
17	Provide more plastic bags and bins around the reserve for dog owners to dispose of waste responsibly	HIGH

*Recommendations*

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18	Educate residents on the impact of pets on native wildlife	HIGH
19	Dogs should be kept on a leash when in the Reserves	HIGH
<b>COMMUNITY INVOLVEMENT</b>		
20	Develop an Interpretation Plan for the reserve to facilitate a co-ordinated plan for interpretation and education	HIGH
21	Support activities of the local community group through assistance with training and equipment.	HIGH

# References

## Flora and Fauna Assessment for Queens Park Regional Open Space

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# Appendix One: Maps

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Flora and Fauna Assessment for Queens Park Regional Open Space



SOURCE: NEARMAP 2005

**Map 1**

**Queens Park Flora & Fauna Assessment  
Study Locality**

August 2010

prepared for CITY OF CANNING



1:6,000 @ A3  
Project No. 2079-08

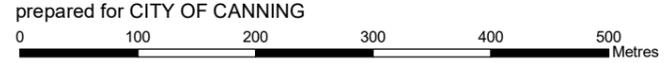


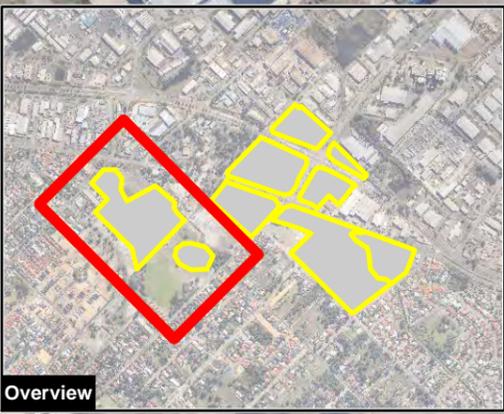


**Legend**

- Trap Site
- Anabat Location
- Bushland Areas

SOURCE: NEARMAP 2005





Overview

**Legend**

- Quadrat
- Conservation Significant Flora
- Photo Point
- Study Area

**Vegetation Type**

- BmEmAfLW : *Banksia menziesii*, *Eucalyptus marginata* and *Allocasuarina fraseriana* Low Woodland over *Hibbertia hypericoides*, *Stirlingia latifolia* Low Shrubland over mixed Open Sedgeland
- CcLW : *Corymbia calophylla* Low Woodland to Woodland over *Jacksonia floribunda* Very Open Shrubland over *Xanthorrhoea preissii*, *X. gracilis* Low Open Shrubland over *Dasyopogon bromeliifolius* Open Herbland
- MplOF : *Melaleuca preissiana* Low Open Forest over *Juncus pallidus* Very Open Sedgeland and mixed introduced herbland
- MrAsLOF : *Melaleuca raphiophylla*, *Acacia saligna* Low Open Forest over mixed Very Open Sedgeland and mixed introduced Herbland
- miG : Closed mixed introduced Grassland

**Map 3a**

**Queens Park Flora & Fauna Assessment  
Vegetation Communities and Conservation Significant Flora**

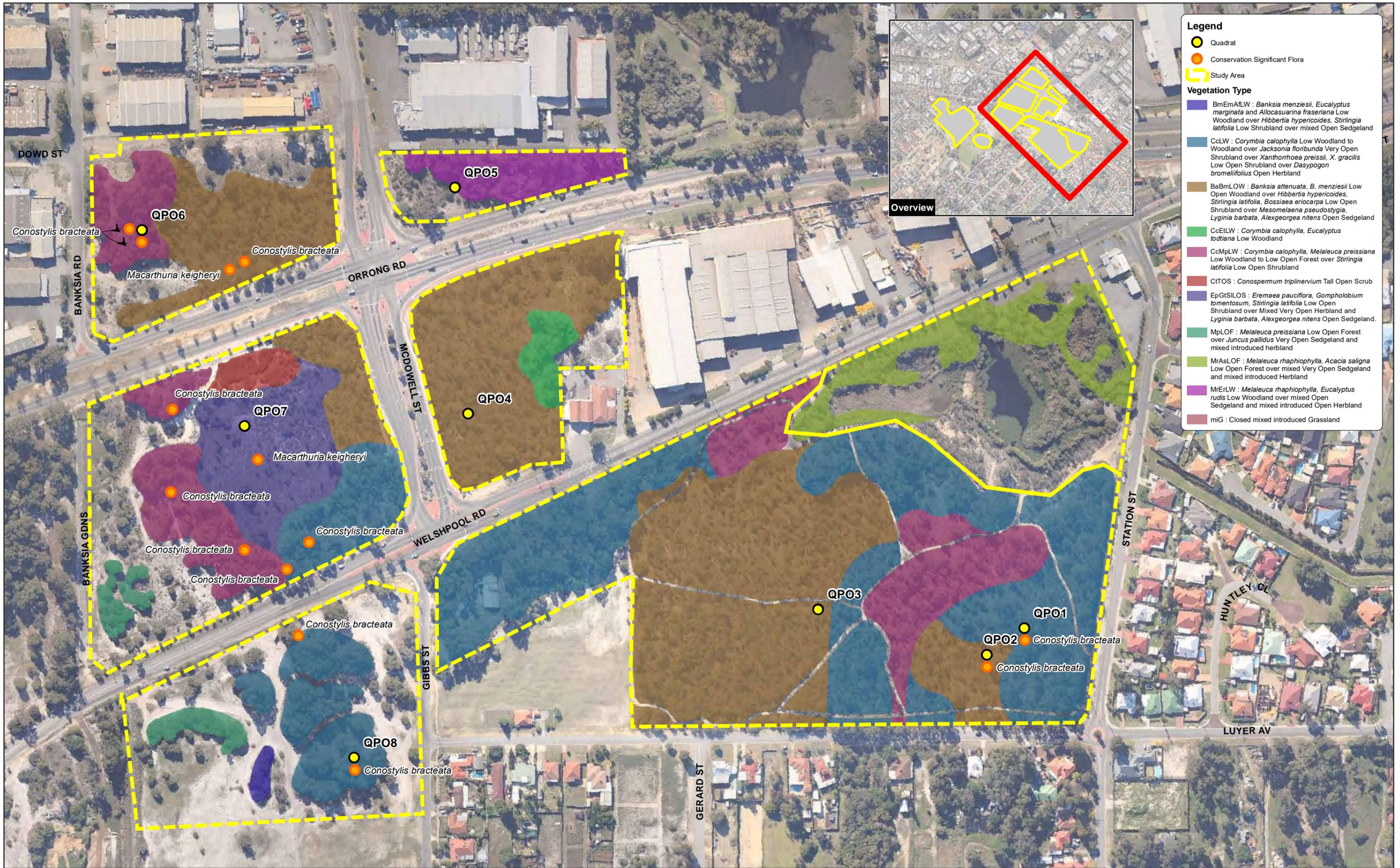
August 2010

prepared for City of Canning



1:2,000 @ A3  
Project No. 2079-08





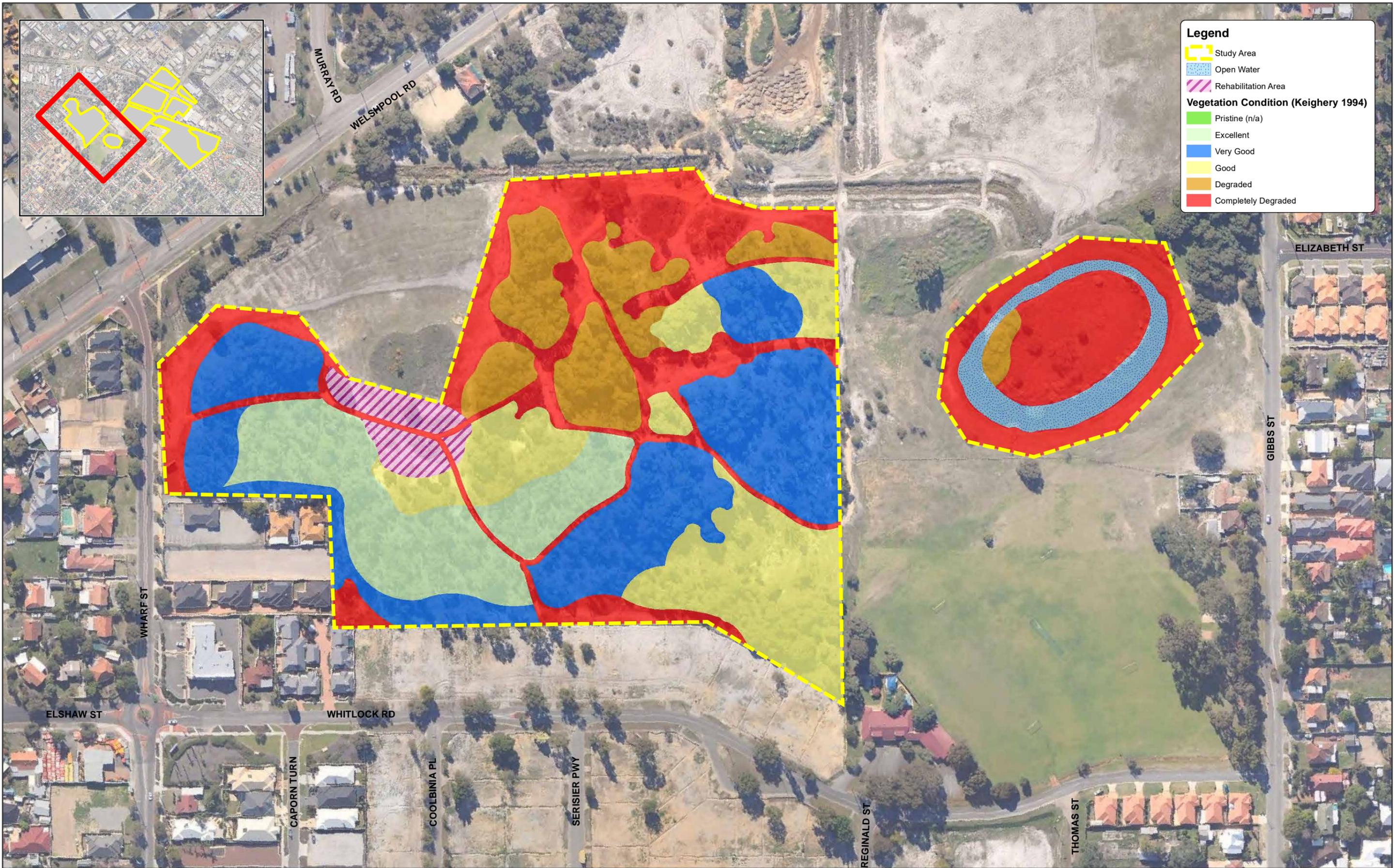
**Legend**

- Quadrat
- Conservation Significant Flora
- Study Area

**Vegetation Type**

- BmEmAtLW : *Banksia menziesii*, *Eucalyptus marginata* and *Allocasuarina fraseriana* Low Woodland over *Hibbertia hypericoides*, *Stirlingia latifolia* Low Shrubland over mixed Open Sedgeland
- CcLW : *Corymbia calophylla* Low Woodland to Woodland over *Jacksonia floribunda* Very Open Shrubland over *Xanthorrhoea preissii*, *X. gracilis* Low Open Shrubland over *Dasyopogon bromeliifolius* Open Herbland
- BaBmLOW : *Banksia attenuata*, *B. menziesii* Low Open Woodland over *Hibbertia hypericoides*, *Stirlingia latifolia*, *Bossiaea eriocarpa* Low Open Shrubland over *Mesomeiaena pseudostygia*, *Lyginia barbata*, *Alexgeorgea nitens* Open Sedgeland
- CcEtLW : *Corymbia calophylla*, *Eucalyptus totitiana* Low Woodland
- CcMpLW : *Corymbia calophylla*, *Melaleuca preissiana* Low Woodland to Low Open Forest over *Stirlingia latifolia* Low Open Shrubland
- CITOS : *Conospermum triplinervium* Tall Open Scrub
- EpGSILOS : *Eremaea pauciflora*, *Gompholobium tomentosum*, *Stirlingia latifolia* Low Open Shrubland over Mixed Very Open Herbland and *Lyginia barbata*, *Alexgeorgea nitens* Open Sedgeland.
- MpLOF : *Melaleuca preissiana* Low Open Forest over *Juncus pallidus* Very Open Sedgeland and mixed introduced herbland
- MrAsLOF : *Melaleuca raphiophylla*, *Acacia saligna* Low Open Forest over mixed Very Open Sedgeland and mixed introduced Herbland
- MrErLW : *Melaleuca raphiophylla*, *Eucalyptus rudis* Low Woodland over mixed Open Sedgeland and mixed introduced Open Herbland
- miG : Closed mixed introduced Grassland





**Legend**

- Study Area
- Open Water
- Rehabilitation Area

**Vegetation Condition (Keighery 1994)**

- Pristine (n/a)
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded





**Legend**

- Study Area
- Open Water
- Rehabilitation Area

**Vegetation Condition (Keighery 1994)**

- Pristine (n/a)
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Overview



# Appendix Two: Fauna Inventory

## Flora and Fauna Assessment for Queens Park Regional Open Space

Fauna observed during the Ecoscape survey

Species Name	Common Name	Type
<b>Birds</b>		
<i>Corvus coronoides</i>	Australian Raven	Sighting
<i>Todiramphus sanctus</i>	Sacred Kingfisher	Sighting
<i>Purpureicephalus spurius</i>	Red Capped Parrot	Sighting
<i>Rhipidura leucophrys</i>	Willie Wagtail	Sighting
<i>Lichmera indistincta</i>	Brown Honeyeater	Sighting
<i>Lichenostomus virescens</i>	Singing Honeyeater	Sighting
<i>Coracina novaehollandiae</i>	Black faced Cuckoo Shrike	Sighting
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	Sighting
<i>Pachycephala rufiventris</i>	Rufous Whistler	Sighting
<i>Phylidonyris nigra</i>	White Cheeked Honeyeater	Sighting
<i>Anthochaera carunculata</i>	Red Wattlebird	Sighting
<i>Barnardius zonarius semitorquatus</i>	Twenty Eight Parrot	Sighting
* <i>Columba livia</i>	Rock Dove/Pigeon	Sighting
<i>Eolophus roseicapillus</i>	Galah	Sighting
<i>Merops ornatus</i>	Rainbow bee-eater	Sighting, call
<i>Calyptorhynchus sp</i>	White-tailed Black Cockatoo	Sighting, call
<i>Threskiornis molucca</i>	Australian White Ibis	Sighting
<i>Zosterops lateralis</i>	Silvereye	Sighting
* <i>Streptopelia senegalensis</i>	Laughing Turtle Dove	Sighting
<i>Anas superciliosa</i>	Pacific Black Duck	Sighting
<i>Tadorna tadornoides</i>	Australian Shelduck	Sighting
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	Sighting
<i>Gallinula tenebrosa</i>	Dusky Moorhen	Sighting
<i>Fulica atra</i>	Eurasian Coot	Sighting
<i>Hirundo neoxena</i>	Welcome Swallow	Sighting
<i>Petrochelidon nigricans</i>	Tree Martin	Sighting
<b>Mammals</b>		
* <i>Mus musculus</i>	House mouse	Sighting
<b>Reptiles</b>		
<i>Strophurus spinigerus inornatus</i>	South-western Spiny Tailed Gecko	Sighting
<i>Pseudonaja affinis</i>	Dugite	Sighting
<i>Hemiergis quadrilineata</i>	Two-toed earless skink	Sighting
<i>Menetia greyii</i>	Common Dwarf Skink	Sighting
<i>Acritoscincus trilineatum</i>	South-western Cool Skink	Sighting

<i>Pogona minor</i>	Western Bearded Dragon	Sighting
<i>Tilqua rugosa</i>	Bobtail	Sighting
<i>Lerista distinguenda</i>	South-western Four-toed Lerista	Sighting
<i>Ctenotus fallens</i>	West Coast Ctenotus	Sighting
<b>Amphibians</b>		
<i>Heleioporus eyrei</i>	Moaning Frog	Sighting
<i>Heleioporus psammophilus</i>	Sand Frog	Sighting
<i>Lymnodynastes dorsalis</i>	Pobblebonk/ Western Banjo Frog	Sighting
<i>Pseudophryne guetheri</i>	Gunther's Toadlet	Sighting
<b>Invertebrates</b>		
-	Cricket	Sighting
* <i>Ommatoiulus moreletii</i>	Portuguese Millipede	Sighting
<i>Scolopendrid sp.</i>	Centipede	Sighting
<i>Scolopendrid sp.</i>	Centipede	Sighting
<i>Goniaea sp</i>	Gumleaf Grasshopper	Sighting
<i>Spirobolida sp.</i>	Millipede	
<b>Arachnids</b>		
Order: Scorpiones	Scorpion	Sighting
Family: Lycosidae	Wolf Spider	Burrows, exoskeleton

\* introduced species

# Appendix Three: Flora Inventory

## Flora and Fauna Assessment for Queens Park Regional Open Space

Flora species recorded during the floristic survey

Family	Species Name	QP01	QP02	QP03	QP04	QP05	QP06	QP07	QP08	QP09	QP10	QP11	
Araliaceae	<i>Trachymene pilosa</i>	+	+	+									
Asparagaceae	* <i>Asparagus asparagoides</i>		+				+		+			+	
	<i>Chamaescilla corymbosa</i>		+								+		
	<i>Corynotheca micrantha</i>							+	+				
	<i>Laxmannia sessiliflora</i>			+				+					
	<i>Lomandra caespitosa</i>			+	+		+		+		+	+	
	<i>Lomandra hermaphrodita</i>	+	+	+				+	+		+	+	
	<i>Lomandra micrantha</i>						+					+	
	<i>Lomandra nigricans</i>			+								+	
	<i>Lomandra preissii</i>	+		+			+				+	+	
	<i>Lomandra purpurea</i>		+	+	+				+				
	<i>Sowerbaea laxiflora</i>	+	+		+								
	<i>Thysanotus manglesianus</i>	+	+	+	+				+	+		+	
	<i>Thysanotus multiflorus</i>	+	+										
	<i>Tricoryne elatior</i>									+		+	
Asteraceae	* <i>Arctotheca calendula</i>									+			
	Asteraceae sp.									+			
	<i>Asteridea pulverulenta</i>		+	+	+								
	* <i>Conyza bonariensis</i>				+	+							
	* <i>Hypochaeris glabra</i>	+	+	+	+			+		+		+	
	* <i>Lactuca serriola</i>					+							
	<i>Lagenophora huegelii</i>	+											
	* <i>Sonchus oleraceus</i>	+			+	+	+	+		+	+	+	
	* <i>Ursinia anthemoides</i>		+	+				+				+	
	* <i>Vellereophyton dealbatum</i>									+			
Caryophyllaceae	* <i>Petrorhagia dubia</i>											+	
	* <i>Silene gallica</i>											+	
Casuarinaceae	<i>Allocasuarina fraseriana</i>	+	+				+						
Chenopodiaceae	<i>Chenopodium</i> sp.									+			
Colchicaceae	<i>Burchardia congesta</i>	+	+		+		+	+	+		+	+	
	<i>Burchardia umbellata</i>			+									
Cyperaceae	<i>Baumea articulata</i>									+			
	<i>Cyathochaeta avenacea</i>	+											
	Cyperaceae sp.					+							
	<i>Cyperus vaginatus</i>					+							
	<i>Lepidosperma</i> sp.				+		+		+				
	<i>Lepidosperma squamatum</i>	+	+	+							+	+	
	<i>Mesomelaena pseudostygia</i>			+	+								
	<i>Mesomelaena tetragona</i>	+									+		
	<i>Schoenus curvifolius</i>		+										
	<i>Tetaria octandra</i>										+		
	<i>Dasypogon bromeliifolius</i>						+	+	+		+	+	
Dilleniaceae	<i>Hibbertia huegelii</i>		+										
	<i>Hibbertia hypericoides</i>	+	+	+	+				+		+		
Droseraceae	<i>Drosera stolonifera</i>	+	+	+	+								
Ericaceae	<i>Brachyloma preissii</i>										+		
	<i>Conostephium pendulum</i>		+		+								

Family	Species Name	QP01	QP02	QP03	QP04	QP05	QP06	QP07	QP08	QP09	QP10	QP11
	<i>Leucopogon conostephioides</i>							+				
	<i>Leucopogon glaucifolius</i>									+		
	<i>Leucopogon propinquus</i>	+			+						+	
Euphorbiaceae	* <i>Euphorbia terracina</i>						+					
	<i>Acacia huegelii</i>										+	
	* <i>Acacia longifolia</i>						+					
	<i>Acacia pulchella</i>	+			+		+		+			
	<i>Acacia willdenowiana</i>		+								+	+
	<i>Bossiaea eriocarpa</i>	+	+	+				+			+	+
	<i>Bossiaea ornata</i>		+		+							
	<i>Daviesia physodes</i>								+			
	<i>Daviesia triflora</i>				+							
	<i>Gastrolobium capitatum</i>	+										
	<i>Gompholobium tomentosum</i>		+	+	+			+			+	+
	<i>Hovea trisperma</i>	+	+	+	+							
	<i>Jacksonia floribunda</i>		+	+				+				+
	<i>Jacksonia sp.</i>						+					+
Fabaceae	* <i>Lotus angustissimus</i>									+		
	* <i>Lupinus sp.</i>									+		
Goodeniaceae	<i>Dampiera linearis</i>	+	+								+	+
	<i>Conostylis bracteata</i>	+	+				+		+		+	+
	<i>Haemodorum brevisepalum</i>							+				
	<i>Haemodorum sp.</i>			+								
Haemodoraceae	<i>Haemodorum spicatum</i>	+			+							
	<i>Phlebocarya ciliata</i>			+			+	+	+			+
Hemerocallidaceae	<i>Dianella revoluta</i>						+					
	* <i>Chasmanthe floribunda</i>			+								
	* <i>Freesia alba x leichtlinii</i>	+										
	* <i>Gladiolus caryophyllaceus</i>	+	+	+	+			+	+		+	+
	<i>Patersonia occidentalis</i>	+	+	+	+			+	+		+	+
Iridaceae	* <i>Romulea rosea</i>	+	+	+	+			+	+		+	+
	* <i>Watsonia meriana</i>								+			
Juncaceae	<i>Juncus pallidus</i>					+				+		
Lythraceae	* <i>Lythrum hyssopifolia</i>					+						
Molluginaceae	<i>Macarthuria australis</i>				+							
	<i>Astartea scoparia</i>									+		
	<i>Corymbia calophylla</i>	+					+		+			+
	<i>Eremaea pauciflora</i>				+			+				
	<i>Eucalyptus marginata</i>								+		+	+
	<i>Eucalyptus rudis</i>					+						
	<i>Melaleuca preissiana</i>						+			+		
	<i>Melaleuca raphiophylla</i>					+						
	<i>Melaleuca sp.</i>									+		
	Myrtaceae sp.			+								
Myrtaceae	<i>Scholtzia involucrata</i>		+					+				
	<i>Verticordia densiflora</i>							+				
	<i>Caladenia flava</i>		+									
	* <i>Disa bracteata</i>										+	+
	<i>Diuris sp.</i>	+	+	+								
	<i>Microtis media</i>								+			
	<i>Pterostylis sp.</i>								+			+
	<i>Thelymitra sp.</i>			+								
Oxalidaceae	* <i>Oxalis pes-caprae</i>						+					
Papaveraceae	* <i>Fumaria capreolata</i>					+	+					
	* <i>Fumaria sp.</i>									+		
Phyllanthaceae	<i>Poranthera microphylla</i>		+									
Pinaceae	* <i>Pinus radiata</i>								+			

Family	Species Name	QP01	QP02	QP03	QP04	QP05	QP06	QP07	QP08	QP09	QP10	QP11
Poaceae	<i>Amphipogon turbinatus</i>			+				+				
	<i>Austrostipa compressa</i>			+								
	<i>Austrostipa</i> sp.		+									
	* <i>Avena barbata</i>								+			+
	* <i>Briza maxima</i>	+	+	+					+			+
	* <i>Bromus diandrus</i>					+						
	* <i>Bromus hordeaceus</i>					+						
	* <i>Ehrharta calycina</i>	+	+	+				+	+			+
	* <i>Ehrharta longiflora</i>					+						
	* <i>Pennisetum clandestinum</i>					+						
	* <i>Phalaris</i> sp.					+						
	<i>Tetrarrhena laevis</i>						+					
Polygonaceae	<i>Rumex</i> sp.					+				+		
Primulaceae	* <i>Anagallis arvensis</i>					+				+		
Proteaceae	<i>Banksia attenuata</i>	+	+	+	+							
	<i>Banksia grandis</i>	+										
	<i>Banksia menziesii</i>		+	+	+			+			+	
	<i>Persoonia saccata</i>								+			
	<i>Petrophile linearis</i>		+		+						+	+
	<i>Stirlingia latifolia</i>	+	+	+	+		+	+			+	
Restionaceae	<i>Alexgeorgea nitens</i>	+	+	+				+			+	+
	<i>Desmocladus fasciculatus</i>	+	+								+	
	<i>Desmocladus flexuosus</i>								+		+	
	<i>Hypolaena exsulca</i>										+	
	<i>Loxocarya cinerea</i>		+	+	+							
	<i>Lyginia barbata</i>	+	+	+	+			+			+	+
Rutaceae	<i>Boronia ramosa</i>		+	+								
	<i>Philotheca spicata</i>	+	+									+
Solanaceae	* <i>Solanum nigrum</i>				+	+				+		
Stylidiaceae	<i>Stylidium brunonianum</i>		+	+								
	<i>Stylidium repens</i>		+	+								
Typhaceae	<i>Typha</i> sp.					+						
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>											+
	<i>Xanthorrhoea preissii</i>	+					+		+			+
Zamiaceae	<i>Macrozamia fraseri</i>		+									+

\* introduced species

**Locations of priority flora found during Ecoscape survey (2009)**

<b>Species</b>	<b>Easting</b>	<b>Northing</b>	<b>Count</b>
<i>Conostylis bracteata</i>	6459454	401975	3
<i>Conostylis bracteata</i>	6459383	402021	1
<i>Conostylis bracteata</i>	6459340	401896	3
<i>Conostylis bracteata</i>	6459294	401848	4
<i>Conostylis bracteata</i>	6459187	401898	1
<i>Conostylis bracteata</i>	6459184	401870	3
<i>Conostylis bracteata</i>	6459219	401857	3
<i>Conostylis bracteata</i>	6459140	401839	3
<i>Conostylis bracteata</i>	6459028	401468	3
<i>Conostylis bracteata</i>	6458976	401434	1
<i>Conostylis bracteata</i>	6459051	401341	6
<i>Conostylis bracteata</i>	6459186	401228	8
<i>Conostylis bracteata</i>	6459173	401202	2
<i>Conostylis bracteata</i>	6459146	401222	1
<i>Conostylis bracteata</i>	6459048	401261	2
<i>Conostylis bracteata</i>	6459017	401317	3
<i>Conostylis bracteata</i>	6459018	401303	14
<i>Conostylis bracteata</i>	6458987	401359	8
<i>Conostylis bracteata</i>	6458975	401413	8
<i>Conostylis bracteata</i>	6458936	401398	8
<i>Conostylis bracteata</i>	6458979	401316	21
<i>Conostylis bracteata</i>	6459074	401185	2
<i>Macarthuria keigheryi</i>	6459387	402008	6
<i>Macarthuria keigheryi</i>	6459263	401916	4
<i>Macarthuria keigheryi</i>	6459197	401213	1
<i>Macarthuria keigheryi</i>	6459146	401222	1

*Conostylis bracteata* also recorded within Quadrats QP01, QP02, QP06, QP08, QP10, QP11.

# Appendix Four: Quadrat Details

## Flora and Fauna Assessment for Queens Park Regional Open Space

<b>Quadrat/Site:</b>	QP01	<b>Dates:</b>	19/10/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6458731 mN 402256 mE				
<b>Photo No:</b>	1	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	50%	<b>Litter depth:</b>	up to 5 cm	<b>Bare ground:</b>	<1%
<b>Condition:</b>	Excellent	<b>Weed cover:</b>	<1%		
<b>Notes:</b>	-				
<b>Community Description</b>	<p><i>Corymbia calophylla</i>, <i>Allocasuarina fraseri</i>, <i>Banksia grandis</i> Low Woodland over <i>Acacia pulchella</i> Open Shrubland over <i>Hibbertia hypericoides</i>, <i>Bossiaea eriocarpa</i> Low Open Shrubland over <i>Sowerbaea laxiflora</i> Herbland.</p>				



### Species

<i>Acacia pulchella</i>	<i>Drosera stolonifera</i>	<i>Patersonia occidentalis</i>
<i>Alexgeorgea nitens</i>	<i>Ehrharta calycina</i>	<i>Philothea spicata</i>
<i>Allocasuarina fraseriana</i>	<i>Freesia alba x leichtlinii</i>	<i>Romulea rosea</i>
<i>Banksia attenuata</i>	<i>Gladiolus caryophyllaceus</i>	<i>Sonchus oleraceus</i>
<i>Banksia grandis</i>	<i>Haemodorum spicatum</i>	<i>Sowerbaea laxiflora</i>
<i>Bossiaea eriocarpa</i>	<i>Hibbertia hypericoides</i>	<i>Stirlingia latifolia</i>
<i>Briza maxima</i>	<i>Hovea trisperma</i>	<i>Thysanotus manglesianus</i>
<i>Burchardia congesta</i>	<i>Hypochaeris glabra</i>	<i>Thysanotus multiflorus</i>
<i>Conostylis bracteata</i>	<i>Lagenophora huegelii</i>	<i>Trachymene pilosa</i>
<i>Corymbia calophylla</i>	<i>Leucopogon propinquus</i>	<i>Xanthorrhoea preissii</i>
<i>Cyathochaeta avenacea</i>	<i>Lomandra hermaphrodita</i>	
<i>Dampiera linearis</i>	<i>Lomandra preissii</i>	
<i>Desmodcladus fasciculatus</i>	<i>Lyginia barbata</i>	
<i>Diuris</i> sp.	<i>Mesomelaena tetragona</i>	

<b>Quadrat/Site:</b>	QP02	<b>Dates:</b>	19/10/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6458716 mN 402218 mE				
<b>Photo No:</b>	2	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	20%	<b>Litter depth:</b>	1.5 cm	<b>Bare ground:</b>	<1%
<b>Condition:</b>	Excellent	<b>Weed cover:</b>	<1%		
<b>Notes:</b>	Existing quadrat "Plot 1"				
<b>Community Description</b>	<i>Banksia attenuata</i> , <i>B. menziesii</i> Low Open Woodland over <i>Jacksonia floribunda</i> Open Shrubland over <i>Hibbertia hypericoides</i> , <i>Bossiaea eriocarpa</i> Low Open Shrubland over <i>Alexgeorgea nitens</i> Sedgeland.				



### Species

<i>Acacia willdenowiana</i>	<i>Ehrharta calycina</i>	<i>Sowerbaea laxiflora</i>
<i>Alexgeorgea nitens</i>	<i>Gladiolus caryophyllaceus</i>	<i>Stirlingia latifolia</i>
<i>Allocasuarina fraseriana</i>	<i>Gompholobium tomentosum</i>	<i>Stylidium brunonianum</i>
<i>Asparagus asparagoides</i>	<i>Hibbertia huegelii</i>	<i>Stylidium repens</i>
<i>Asteridea pulverulenta</i>	<i>Hibbertia hypericoides</i>	<i>Thysanotus manglesianus</i>
<i>Austrostipa</i> sp.	<i>Hovea trisperma</i>	<i>Thysanotus multiflorus</i>
<i>Banksia attenuata</i>	<i>Hypochaeris glabra</i>	<i>Trachymene pilosa</i>
<i>Banksia menziesii</i>	<i>Jacksonia floribunda</i>	<i>Ursinia anthemoides</i>
<i>Boronia ramosa</i>	<i>Lepidosperma squamatum</i>	
<i>Bossiaea eriocarpa</i>	<i>Lomandra hermaphrodita</i>	
<i>Bossiaea ornata</i>	<i>Lomandra purpurea</i>	
<i>Briza maxima</i>	<i>Loxocarya cinerea</i>	
<i>Burchardia congesta</i>	<i>Lyginia barbata</i>	
<i>Caladenia flava</i>	<i>Macrozamia fraseri</i>	
<i>Chamaescilla corymbosa</i>	<i>Patersonia occidentalis</i>	
<i>Conostephium pendulum</i>	<i>Petrophile linearis</i>	
<i>Conostylis bracteata</i>	<i>Philothea spicata</i>	
<i>Dampiera linearis</i>	<i>Poranthera microphylla</i>	
<i>Desmocladius fasciculatus</i>	<i>Romulea rosea</i>	
<i>Diuris</i> sp.	<i>Schoenus curvifolius</i>	
<i>Drosera stolonifera</i>	<i>Scholtzia involucrata</i>	

<b>Quadrat/Site:</b>	QP03	<b>Dates:</b>	19/10/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6458666 mN 402137 mE				
<b>Photo No:</b>	4	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	40%	<b>Litter depth:</b>	2 cm	<b>Bare ground:</b>	1%
<b>Condition:</b>	Very good	<b>Weed cover:</b>	1%		
<b>Notes:</b>	-				
<b>Community Description</b>	<i>Banksia attenuata</i> , <i>Banksia menziesii</i> Low Woodland over <i>Hibbertia hypericoides</i> Low Open Shrubland over <i>Mesomelaena pseudostygia</i> , <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> Sedgeland				



### Species

*Alexgeorgea nitens*  
*Amphipogon turbinatus*  
*Asteridea pulverulenta*  
*Austrostipa compressa*  
*Banksia attenuata*  
*Banksia menziesii*  
*Boronia ramosa*  
*Bossiaea eriocarpa*  
*Briza maxima*  
*Burchardia umbellata*  
*Burchardia umbellata*  
*Chasmanthe floribunda*  
*Diuris* sp.  
*Drosera stolonifera*  
*Ehrharta calycina*  
*Gladiolus caryophyllaceus*  
*Gompholobium tomentosum*  
*Haemodorum* sp.  
*Hibbertia hypericoides*  
*Hovea trisperma*  
*Hypochaeris glabra*

*Jacksonia floribunda*  
*Laxmannia sessiliflora*  
*Lepidosperma squamatum*  
*Lomandra caespitosa*  
*Lomandra hermaphrodita*  
*Lomandra nigricans*  
*Lomandra preissii*  
*Lomandra purpurea*  
*Loxocarya cinerea*  
*Lyginia barbata*  
*Mesomelaena pseudostygia*  
Myrtaceae sp.  
*Patersonia occidentalis*  
*Phlebocarya ciliata*  
*Romulea rosea*  
*Stirlingia latifolia*  
*Stylidium brunonianum*  
*Stylidium repens*  
*Thelymitra* sp.  
*Thysanotus manglesianus*  
*Trachymene pilosa*

*Ursinia anthemoides*

<b>Quadrat/Site:</b>	QP04	<b>Dates:</b>	19/10/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459181 mN	402074 mE			
<b>Photo No:</b>	5	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	<1%	<b>Litter depth:</b>	3 cm	<b>Bare ground:</b>	1%
<b>Condition:</b>	Excellent	<b>Weed cover:</b>	<1%		
<b>Notes:</b>	-				
<b>Community Description</b>	<i>Banksia menziesii</i> , <i>Banksia attenuata</i> Low Open Woodland over <i>Eremaea pauciflora</i> , <i>Stirlingia latifolia</i> Low Shrubland, over <i>Mesomelaena pseudostygia</i> , <i>Lyginia barbata</i> Open Sedgeland				



#### Species

<i>Acacia pulchella</i>	<i>Loxocarya cinerea</i>
<i>Asteridea pulverulenta</i>	<i>Lyginia barbata</i>
<i>Banksia attenuata</i>	<i>Macarthuria australis</i>
<i>Banksia menziesii</i>	<i>Mesomelaena pseudostygia</i>
<i>Bossiaea ornata</i>	<i>Patersonia occidentalis</i>
<i>Burchardia congesta</i>	<i>Petrophile linearis</i>
<i>Conostephium pendulum</i>	<i>Romulea rosea</i>
<i>Conyza bonariensis</i>	<i>Solanum nigrum</i>
<i>Daviesia triflora</i>	<i>Sonchus oleraceus</i>
<i>Drosera stolonifera</i>	<i>Sowerbaea laxiflora</i>
<i>Eremaea pauciflora</i>	<i>Stirlingia latifolia</i>
<i>Gladiolus caryophyllaceus</i>	<i>Thysanotus manglesianus</i>
<i>Gompholobium tomentosum</i>	
<i>Haemodorum spicatum</i>	
<i>Hibbertia hypericoides</i>	
<i>Hovea trisperma</i>	
<i>Hypochaeris glabra</i>	
<i>Lepidosperma</i> sp.	
<i>Leucopogon propinquus</i>	
<i>Lomandra caespitosa</i>	
<i>Lomandra purpurea</i>	

<b>Quadrat/Site:</b>	QP05	<b>Dates:</b>	19/10/09 and 19/05/2010
<b>Field Staff:</b>	JN/FS		
<b>MGA (Zone 50)</b>	6459306 mN	402182 mE	
<b>Photo No:</b>		<b>Direction:</b>	
<b>Aspect:</b>	-	<b>Slope:</b>	-
<b>Surface Soil:</b>	Clay loam	<b>Colour:</b>	Dark Brown
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-
<b>Litter cover:</b>	35%	<b>Litter depth:</b>	1 cm
<b>Condition:</b>	Good	<b>Weed cover:</b>	15%
<b>Notes:</b>	-		
<b>Community Description</b>	<i>Melaleuca raphiophylla</i> , <i>Eucalyptus rudis</i> Woodland over Very Open Sedgeland		



### Species

*Anagallis arvensis*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Conyza bonariensis*  
 Cyperaceae sp.  
*Cyperus vaginatus*  
*Ehrharta longiflora*  
*Eucalyptus rudis*  
*Fumaria capreolata*  
*Juncus pallidus*  
*Lactuca serriola*  
*Lythrum hyssopifolia*  
*Melaleuca raphiophylla*  
*Pennisetum clandestinum*  
*Phalaris* sp.  
*Rumex* sp.  
*Solanum nigrum*

*Sonchus oleraceus*  
*Typha* sp.

<b>Quadrat/Site:</b>	QP06	<b>Dates:</b>	24/11/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459463 mN	401976 mE			
<b>Photo No:</b>	1	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Loamy sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	80%	<b>Litter depth:</b>	5 cm	<b>Bare ground:</b>	nil
<b>Condition:</b>	Very good	<b>Weed cover:</b>	1%		
<b>Notes:</b>	-				
<b>Community Description</b>	<i>Corymbia calophylla</i> , <i>Allocasuarina fraseri</i> Open Woodland over <i>Melaleuca preissiana</i> Low Woodland over <i>Stirlingia latifolia</i> Low Open Shrubland over <i>Dianella revoluta</i> Very Open Herbland				



#### Species

*Acacia longifolia*  
*Acacia pulchella*  
*Allocasuarina fraseriana*  
*Asparagus asparagoides*  
*Burchardia congesta*  
*Conostylis bracteata*  
*Corymbia calophylla*  
*Dasypogon bromeliifolius*  
*Dianella revoluta*  
*Euphorbia terracina*  
*Fumaria capreolata*  
*Jacksonia* sp.  
*Lepidosperma* sp.  
*Lomandra caespitosa*  
*Lomandra micrantha*  
*Lomandra preissii*  
*Melaleuca preissiana*  
*Oxalis pes-caprae*  
*Phlebocarya ciliata*  
*Sonchus oleraceus*  
*Stirlingia latifolia*

*Tetrarrhena laevis*  
*Xanthorrhoea preissii*

<b>Quadrat/Site:</b>	QP07	<b>Dates:</b>	24/11/09 and 24/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459285 mN 401931 mE				
<b>Photo No:</b>	7	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	2%	<b>Litter depth:</b>	1 cm	<b>Bare ground:</b>	20%
<b>Condition:</b>	Very good	<b>Weed cover:</b>	1%		

**Notes:**

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**Community Description**

*Banksia menziesii* Low Open Woodland over *Eremaea pauciflora*, *Gompholobium tomentosum*, *Stirlingia latifolia* Low Open Shrubland over Mixed Very Open Herbland and *Lyginia barbata*, *Alexgeorgea nitens* Open Sedgeland.

**Species**

<i>Alexgeorgea nitens</i>	<i>Romulea rosea</i>
<i>Amphipogon turbinatus</i>	<i>Scholtzia involucrata</i>
<i>Banksia menziesii</i>	<i>Sonchus oleraceus</i>
<i>Bossiaea eriocarpa</i>	<i>Stirlingia latifolia</i>
<i>Burchardia congesta</i>	<i>Thysanotus manglesianus</i>
<i>Corynotheca micrantha</i>	<i>Ursinia anthemoides</i>
<i>Dasypogon bromeliifolius</i>	<i>Verticordia densiflora</i>
<i>Ehrharta calycina</i>	
<i>Eremaea pauciflora</i>	
<i>Gladiolus caryophyllaceus</i>	
<i>Gompholobium tomentosum</i>	
<i>Haemodorum brevisepalum</i>	
<i>Hypochaeris glabra</i>	
<i>Jacksonia floribunda</i>	
<i>Laxmannia sessiliflora</i>	
<i>Leucopogon conostephioides</i>	
<i>Lomandra hermaphrodita</i>	
<i>Lyginia barbata</i>	
<i>Patersonia occidentalis</i>	
<i>Phlebocarya ciliata</i>	

<b>Quadrat/Site:</b>	QP08	<b>Dates:</b>	24/11/09 and 19/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459043 mN    401797 mE				
<b>Photo No:</b>	10	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	70%	<b>Litter depth:</b>	6 cm	<b>Bare ground:</b>	<1%
<b>Condition:</b>	Very good	<b>Weed cover:</b>	1%		

**Notes:**

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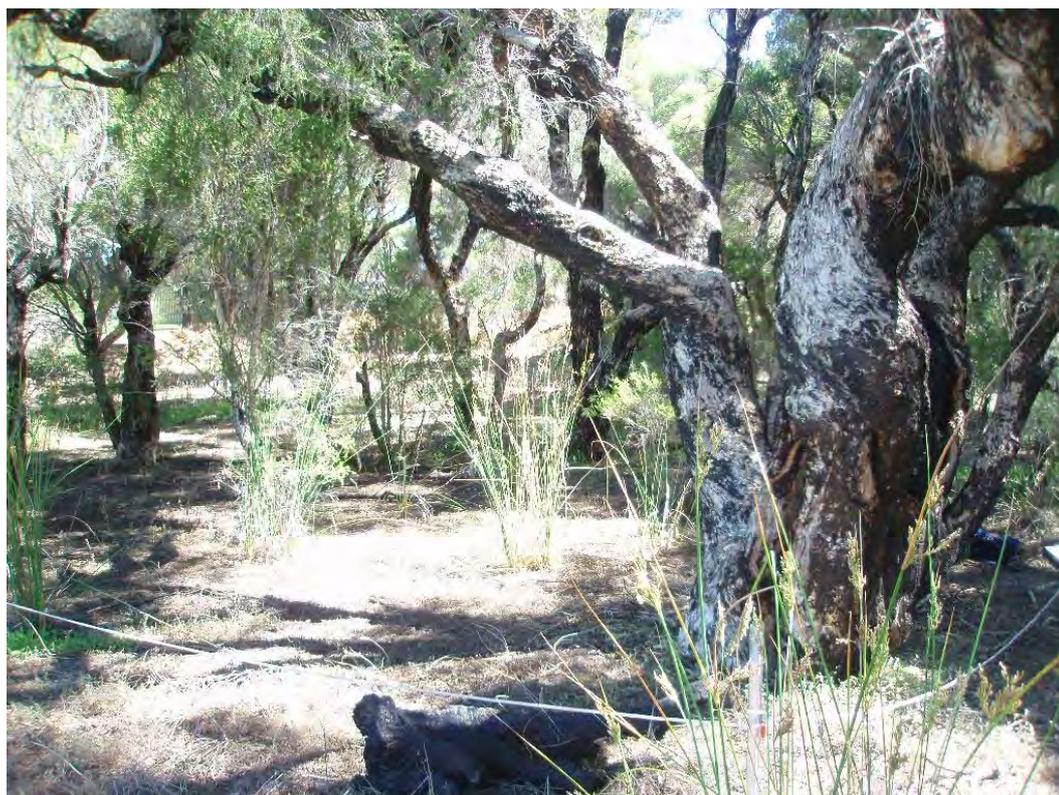
**Community Description**

*Corymbia calophylla* Open Forest over *Acacia pulchella* Open Shrubland over *Daviesia physodes* Low Open Shrubland over *Ehrharta calycina* Very Open Grassland, *Lomandra caespitosa*, *Dasypogon bromeliifolius* Very Open Herbland and *Desmocladius flexuosus* Very Open Sedgeland.

**Species**

<i>Acacia pulchella</i>	<i>Patersonia occidentalis</i>
<i>Asparagus asparagoides</i>	<i>Persoonia saccata</i>
<i>Avena barbata</i>	<i>Phlebocarya ciliata</i>
<i>Briza maxima</i>	<i>Pinus radiata</i>
<i>Burchardia congesta</i>	<i>Pterostylis</i> sp.
<i>Conostylis bracteata</i>	<i>Romulea rosea</i>
<i>Corymbia calophylla</i>	<i>Thysanotus manglesianus</i>
<i>Corynotheca micrantha</i>	<i>Tricoryne elatior</i>
<i>Dasypogon bromeliifolius</i>	<i>Watsonia meriana</i>
<i>Daviesia physodes</i>	<i>Xanthorrhoea preissii</i>
<i>Desmocladius flexuosus</i>	
<i>Ehrharta calycina</i>	
<i>Eucalyptus marginata</i>	
<i>Gladiolus caryophyllaceus</i>	
<i>Hibbertia hypericoides</i>	
<i>Lepidosperma</i> sp.	
<i>Lomandra caespitosa</i>	
<i>Lomandra hermaphrodita</i>	
<i>Lomandra purpurea</i>	
<i>Microtis media</i>	

<b>Quadrat/Site:</b>	QP09	<b>Dates:</b>	24/11/09 and 24/05/2010	
<b>Field Staff:</b>	JN/FS			
<b>MGA (Zone 50)</b>	6458902 mN	401338 mE		
<b>Photo No:</b>	14	<b>Direction:</b>	SE	
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b> Wetland
<b>Surface Soil:</b>	Loamy sand	<b>Colour:</b>	Dark grey	
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b> -
<b>Litter cover:</b>	70%	<b>Litter depth:</b>	1 cm	<b>Bare ground:</b> 5%
<b>Condition:</b>	Good	<b>Weed cover:</b>	5%	
<b>Notes:</b>	-			
<b>Community Description</b>	<i>Melaleuca preissiana</i> Low Open Forest over <i>Hypochaeris glabra</i> Very Open Herbland and <i>Juncus pallidus</i> Very Open Sedgeland			



#### Species

*Anagallis arvensis*  
*Arctotheca calendula*  
*Astartea scoparia*  
 Asteraceae sp.  
*Baumea articulata*  
*Chenopodium* sp.  
*Fumaria* sp.  
*Hypochaeris glabra*  
*Juncus pallidus*  
*Leucopogon glaucifolius*  
*Lotus angustissimus*  
*Lupinus* sp.  
*Melaleuca preissiana*  
*Melaleuca* sp.  
*Rumex* sp.  
*Solanum nigrum*  
*Sonchus oleraceus*  
*Vellereophyton dealbatum*

<b>Quadrat/Site:</b>	QP10	<b>Dates:</b>	24/11/09 and 24/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459037 mN 401305 mE				
<b>Photo No:</b>	15	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	15%	<b>Litter depth:</b>	2 cm	<b>Bare ground:</b>	1%
<b>Condition:</b>	Excellent	<b>Weed cover:</b>	<1%		

**Notes:**

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**Community Description**

*Banksia menziesii*, *Eucalyptus marginata* Low Woodland over *Hibbertia hypericoides*, *Stirlingia latifolia* Low Shrubland over *Dasypogon bromeliifolius* Very Open Herbland and Mixed Open Sedgeland.

**Species**

<i>Acacia huegelii</i>	<i>Leucopogon propinquus</i>
<i>Acacia willdenowiana</i>	<i>Lomandra caespitosa</i>
<i>Alexgeorgea nitens</i>	<i>Lomandra hermaphrodita</i>
<i>Banksia menziesii</i>	<i>Lomandra nigricans</i>
<i>Bossiaea eriocarpa</i>	<i>Lomandra preissii</i>
<i>Brachyloma preissii</i>	<i>Lyginia barbata</i>
<i>Burchardia congesta</i>	<i>Mesomelaena tetragona</i>
<i>Chamaescilla corymbosa</i>	<i>Patersonia occidentalis</i>
<i>Conostylis bracteata</i>	<i>Petrophile linearis</i>
<i>Dampiera linearis</i>	<i>Romulea rosea</i>
<i>Dasypogon bromeliifolius</i>	<i>Sonchus oleraceus</i>
<i>Desmocladius fasciculatus</i>	<i>Stirlingia latifolia</i>
<i>Desmocladius flexuosus</i>	<i>Tetragonia octandra</i>
<i>Disa bracteata</i>	<i>Thysanotus manglesianus</i>
<i>Eucalyptus marginata</i>	<i>Tricoryne elatior</i>
<i>Gladiolus caryophyllaceus</i>	
<i>Gompholobium tomentosum</i>	
<i>Hibbertia hypericoides</i>	
<i>Hypolaena exsulca</i>	
<i>Lepidosperma squamatum</i>	

<b>Quadrat/Site:</b>	QP11	<b>Dates:</b>	24/11/09 and 24/05/2010		
<b>Field Staff:</b>	JN/FS				
<b>MGA (Zone 50)</b>	6459052 mN 401446 mE				
<b>Photo No:</b>	16	<b>Direction:</b>	SE		
<b>Aspect:</b>	-	<b>Slope:</b>	-	<b>Topography:</b>	Plain
<b>Surface Soil:</b>	Sand	<b>Colour:</b>	Grey		
<b>Exposed Rock:</b>	-	<b>% Surface Rock:</b>	-	<b>Fragment size</b>	-
<b>Litter cover:</b>	15%	<b>Litter depth:</b>	3 cm	<b>Bare ground:</b>	<1%
<b>Condition:</b>	Excellent	<b>Weed cover:</b>	<1%		

**Notes:**

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**Community Description**

*Corymbia calophylla* Woodland over *Eucalyptus marginata* Low Open Woodland over *Jacksonia floribunda* Open Shrubland over *Jacksonia* sp., *Xanthorrhoea gracilis* Low open Shrubland over *Dasypogon bromeliifolius* Open Herbland.

**Species**

<i>Acacia willdenowiana</i>	<i>Lomandra caespitosa</i>
<i>Alexgeorgea nitens</i>	<i>Lomandra hermaphrodita</i>
<i>Asparagus asparagoides</i>	<i>Lomandra micrantha</i>
<i>Avena barbata</i>	<i>Lyginia barbata</i>
<i>Bossiaea eriocarpa</i>	<i>Macrozamia fraseri</i>
<i>Briza maxima</i>	<i>Patersonia occidentalis</i>
<i>Burchardia congesta</i>	<i>Petrophile linearis</i>
<i>Conostylis bracteata</i>	<i>Petrorhagia dubia</i>
<i>Corymbia calophylla</i>	<i>Philothea spicata</i>
<i>Dampiera linearis</i>	<i>Phlebocarya ciliata</i>
<i>Dasypogon bromeliifolius</i>	<i>Romulea rosea</i>
<i>Disa bracteata</i>	<i>Silene gallica</i>
<i>Ehrharta calycina</i>	<i>Sonchus oleraceus</i>
<i>Eucalyptus marginata</i>	<i>Thysanotus manglesianus</i>
<i>Gladiolus caryophyllaceus</i>	<i>Tricoryne elatior</i>
<i>Gompholobium tomentosum</i>	<i>Ursinia anthemoides</i>
<i>Hypochaeris glabra</i>	<i>Xanthorrhoea gracilis</i>
<i>Jacksonia floribunda</i>	<i>Xanthorrhoea preissii</i>
<i>Jacksonia</i> sp.	
<i>Lepidosperma squamatum</i>	

# Appendix Five: Desktop Search Results - Fauna

## Flora and Fauna Assessment for Queens Park Regional Open Space

DEC conservation fauna search results.

Species	Common Name	WC Act	DEC
<i>Dasyurus geoffroii</i>	Chuditch	S1	
<i>Myrmecobius fasciatus</i>	Numbat, Walpurti	S1	
<i>Phoebetria fusca</i>	Sooty Albatross	S1	
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black-Cockatoo	S1	
<i>Calyptorhynchus latirostris</i>	Carnaby's Black-Cockatoo	S1	
<i>Calyptorhynchus sp</i>	White-tailed Black Cockatoo	S1	
<i>Dasyornis longirostris</i>	Western Bristlebird	S1	
<i>Pseudemydura umbrina</i>	Western Swamp Tortoise	S1	
<i>Synemon gratiosa</i>	Graceful Sunmoth	S1	
<i>Leioproctus douglasiellus</i>	Bee	S1	
<i>Neopasiphe simplicior</i>	Bee	S1	
<i>Falco peregrinus</i>	Peregrine Falcon	S4	
<i>Arbanitis inornatus</i>	Trapdoor spider		P1
<i>Throscodectes xiphos</i>	Cricket		P1
<i>Leioproctus bilobatus</i>	Bee		P2
<i>Tyto novaehollandiae novaehollandiae</i>	Masked Owl (SW ssp)		P3
<i>Acanthophis antarcticus</i>	Southern Death Adder		P3
<i>Neelaps calonotos</i>	Black-striped Snake		P3
<i>Lerista lineata</i>	Lined Skink		P3
<i>Leioproctus contrarius</i>	Bee		P3
<i>Macropus irma</i>	Western Brush Wallaby		P3
<i>Hydromys chrysogaster</i>	Water-rat, Rakali		P3
<i>Falco hypoleucos</i>	Grey Falcon		P3
<i>Burhinus grallarius</i>	Bush Stonecurlew		P3
<i>Numenius madagascariensis</i>	Eastern Curlew		P3
<i>Isodon obesulus fusciventer</i>	Quenda		P5

## EPBC Act Protected Matters Search Tool fauna results (Australian Government 2010)

Species	Common Name	EPBC Act
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	Vulnerable
<i>Calyptorhynchus baudinii</i>	Baudin's Black-Cockatoo	Vulnerable
<i>Calyptorhynchus latirostris</i>	Carnaby's Black-Cockatoo	Endangered
<b>Mammals</b>		
<i>Bettongia penicillata ogilbyi</i>	Woylie	Endangered
<i>Dasyurus geoffroii</i>	Chuditch	Vulnerable
<i>Phascogale calura</i>	Red-tailed Phascogale	Endangered
<i>Setonix brachyurus</i>	Quokka	Vulnerable
<b>Migratory Terrestrial Species</b>		
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory
<b>Migratory Wetland Species</b>		
<i>Ardea alba</i>	Great Egret, White Egret	Migratory
<i>Ardea ibis</i>	Cattle Egret	Migratory
<b>Migratory Marine Birds</b>		
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory
<i>Ardea alba</i>	Great Egret, White Egret	Migratory
<i>Ardea ibis</i>	Cattle Egret	Migratory
<b>Listed Marine Species</b>		
<i>Apus pacificus</i>	Fork-tailed Swift	Listed - overfly marine area
<i>Ardea alba</i>	Great Egret, White Egret	Listed - overfly marine area
<i>Ardea ibis</i>	Cattle Egret	Listed - overfly marine area
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Listed
<i>Merops ornatus</i>	Rainbow Bee-eater	Listed - overfly marine area

## Birds Australia search results (Birds Australia 2010)

Species	Common Name	DEC	EPBC Act	WC Act
<i>Dromaius novaehollandiae</i>	Emu			
<i>Coturnix pectoralis</i>	Stubble Quail			
<i>Coturnix ypsilophora</i>	Brown Quail			
<i>Pavo cristatus</i>	Indian Peafowl	INT		
<i>Phasianus colchicus</i>	Common Pheasant			
<i>Biziura lobata</i>	Musk Duck			
<i>Stictonetta naevosa</i>	Freckled Duck			
<i>Cygnus atratus</i>	Black Swan			
<i>Tadorna tadornoides</i>	Australian Shelduck			
<i>Chenonetta jubata</i>	Australian Wood Duck			
<i>Malacorhynchus membranaceus</i>	Pink-eared Duck			
<i>Anas rhynchotis</i>	Australasian Shoveler			
<i>Anas gracilis</i>	Grey Teal			
<i>Anas castanea</i>	Chestnut Teal			
<i>Anas platyrhynchos</i>	Northern Mallard			
<i>Anas superciliosa</i>	Pacific Black Duck			
<i>Aythya australis</i>	Hardhead			
<i>Oxyura australis</i>	Blue-billed Duck			
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe			
<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe			
<i>Podiceps cristatus</i>	Great Crested Grebe			
<i>Columba livia</i>	Rock Dove			
<i>Streptopelia senegalensis</i>	Laughing Dove			
<i>Streptopelia chinensis</i>	Spotted Dove			
<i>Phaps chalcoptera</i>	Common Bronzewing			
<i>Phaps elegans</i>	Brush Bronzewing			
<i>Ocyphaps lophotes</i>	Crested Pigeon			
<i>Podargus strigoides</i>	Tawny Frogmouth			
<i>Eurostopodus argus</i>	Spotted Nightjar			
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar			
<i>Apus pacificus</i>	Fork-tailed Swift			
<i>Oceanites oceanicus</i>	Wilson's Storm-Petrel			
<i>Pelagodroma marina</i>	White-faced Storm-Petrel			
<i>Diomedea exulans</i>	Wandering Albatross		VU	
<i>Thalassarche melanophris</i>	Black-browed Albatross			
<i>Thalassarche cauta</i>	Shy Albatross			
<i>Thalassarche chlororhynchos</i>	Yellow-nosed Albatross			
<i>Macronectes giganteus</i>	Southern Giant-Petrel			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Macronectes halli</i>	Northern Giant-Petrel			
<i>Thalassoica antarctica</i>	Antarctic Petrel			
<i>Daption capense</i>	Cape Petrel			
<i>Halobaena caerulea</i>	Blue Petrel			
<i>Pachyptila salvini</i>	Salvin's Prion			
<i>Pachyptila belcheri</i>	Slender-billed Prion			
<i>Ardenna pacifica</i>	Wedge-tailed Shearwater			
<i>Ardenna carneipes</i>	Flesh-footed Shearwater			
<i>Ardenna grisea</i>	Sooty Shearwater			
<i>Puffinus huttoni</i>	Hutton's Shearwater			
<i>Puffinus assimilis</i>	Little Shearwater			
<i>Lugensa brevirostris</i>	Kerguelen Petrel			
<i>Pterodroma mollis</i>	Soft-plumaged Petrel			
<i>Pterodroma macroptera</i>	Great-winged Petrel			
<i>Eudyptula minor</i>	Little Penguin			
<i>Morus serrator</i>	Australasian Gannet			
<i>Anhinga novaehollandiae</i>	Australasian Darter			
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant			
<i>Phalacrocorax carbo</i>	Great Cormorant			
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant			
<i>Phalacrocorax varius</i>	Pied Cormorant			
<i>Phalacrocorax fuscescens</i>	Black-faced Cormorant			
<i>Pelecanus conspicillatus</i>	Australian Pelican			
<i>Ixobrychus dubius</i>	Australian Little Bittern			
<i>Ardea pacifica</i>	White-necked Heron			
<i>Ardea modesta</i>	Eastern Great Egret			
<i>Ardea ibis</i>	Cattle Egret		Migr.	
<i>Egretta novaehollandiae</i>	White-faced Heron			
<i>Egretta garzetta</i>	Little Egret			
<i>Egretta sacra</i>	Eastern Reef Egret		LC	
<i>Nycticorax caledonicus</i>	Nankeen Night-Heron			
<i>Plegadis falcinellus</i>	Glossy Ibis			
<i>Threskiornis molucca</i>	Australian White Ibis			
<i>Threskiornis spinicollis</i>	Straw-necked Ibis			
<i>Platalea regia</i>	Royal Spoonbill			
<i>Platalea flavipes</i>	Yellow-billed Spoonbill			
<i>Pandion cristatus</i>	Eastern Osprey			
<i>Elanus axillaris</i>	Black-shouldered Kite			
<i>Lophoictinia isura</i>	Square-tailed Kite			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		Migr.	
<i>Haliastur sphenurus</i>	Whistling Kite			
<i>Milvus migrans</i>	Black Kite			
<i>Accipiter fasciatus</i>	Brown Goshawk			
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk			
<i>Circus assimilis</i>	Spotted Harrier			
<i>Circus approximans</i>	Swamp Harrier			
<i>Aquila audax</i>	Wedge-tailed Eagle			
<i>Hieraaetus morphnoides</i>	Little Eagle			
<i>Falco cenchroides</i>	Nankeen Kestrel			
<i>Falco berigora</i>	Brown Falcon			
<i>Falco longipennis</i>	Australian Hobby			
<i>Falco peregrinus</i>	Peregrine Falcon			
<i>Porphyrio porphyrio</i>	Purple Swamphen			
<i>Gallirallus philippensis</i>	Buff-banded Rail			
<i>Porzana pusilla</i>	Baillon's Crake			
<i>Porzana fluminea</i>	Australian Spotted Crake			
<i>Porzana tabuensis</i>	Spotless Crake			
<i>Tribonyx ventralis</i>	Black-tailed Native-hen			
<i>Gallinula tenebrosa</i>	Dusky Moorhen			
<i>Fulica atra</i>	Eurasian Coot			
<i>Burhinus grallarius</i>	Bush Stone-curlew	P4	VU	
<i>Haematopus longirostris</i>	Australian Pied Oystercatcher			
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher			
<i>Himantopus himantopus</i>	Black-winged Stilt			
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet			
<i>Cladorhynchus leucocephalus</i>	Banded Stilt			
<i>Pluvialis fulva</i>	Pacific Golden Plover			
<i>Pluvialis squatarola</i>	Grey Plover			
<i>Charadrius dubius</i>	Little Ringed Plover			
<i>Charadrius ruficapillus</i>	Red-capped Plover			
<i>Charadrius mongolus</i>	Lesser Sand Plover			
<i>Charadrius leschenaultii</i>	Greater Sand Plover			
<i>Elsyornis melanops</i>	Black-fronted Dotterel			
<i>Thinornis rubricollis</i>	Hooded Plover			
<i>Erythrogonys cinctus</i>	Red-kneed Dotterel			
<i>Vanellus tricolor</i>	Banded Lapwing			
<i>Vanellus miles</i>	Masked Lapwing			
<i>Limosa limosa</i>	Black-tailed Godwit			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Limosa lapponica</i>	Bar-tailed Godwit			
<i>Numenius phaeopus</i>	Whimbrel			
<i>Numenius madagascariensis</i>	Eastern Curlew			
<i>Xenus cinereus</i>	Terek Sandpiper			
<i>Actitis hypoleucos</i>	Common Sandpiper			
<i>Tringa brevipes</i>	Grey-tailed Tattler			
<i>Tringa nebularia</i>	Common Greenshank			
<i>Tringa stagnatilis</i>	Marsh Sandpiper			
<i>Tringa glareola</i>	Wood Sandpiper			
<i>Arenaria interpres</i>	Ruddy Turnstone			
<i>Calidris tenuirostris</i>	Great Knot			
<i>Calidris canutus</i>	Red Knot			
<i>Calidris alba</i>	Sanderling			
<i>Calidris minuta</i>	Little Stint			
<i>Calidris ruficollis</i>	Red-necked Stint			
<i>Calidris subminuta</i>	Long-toed Stint			
<i>Calidris melanotos</i>	Pectoral Sandpiper			
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper			
<i>Calidris ferruginea</i>	Curlew Sandpiper			
<i>Limicola falcinellus</i>	Broad-billed Sandpiper			
<i>Philomachus pugnax</i>	Ruff			
<i>Phalaropus lobatus</i>	Red-necked Phalarope			
<i>Turnix varius</i>	Painted Button-quail			
<i>Stercorarius antarcticus</i>	Brown Skua			
<i>Stercorarius pomarinus</i>	Pomarine Jaeger			
<i>Stercorarius parasiticus</i>	Arctic Jaeger			
<i>Anous stolidus</i>	Common Noddy			
<i>Onychoprion anaethetus</i>	Bridled Tern			
<i>Sternula albifrons</i>	Little Tern			
<i>Sternula nereis</i>	Fairy Tern			
<i>Gelochelidon nilotica</i>	Gull-billed Tern			
<i>Hydroprogne caspia</i>	Caspian Tern			
<i>Chlidonias hybrida</i>	Whiskered Tern			
<i>Chlidonias leucopterus</i>	White-winged Black Tern			
<i>Sterna dougallii</i>	Roseate Tern			
<i>Sterna hirundo</i>	Common Tern			
<i>Sterna paradisaea</i>	Arctic Tern			
<i>Thalasseus bergii</i>	Crested Tern			
<i>Larus pacificus</i>	Pacific Gull			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Chroicocephalus novaehollandiae</i>	Silver Gull			
<i>Calyptorhynchus banksii</i>	Red-tailed Black-Cockatoo			
<i>Calyptorhynchus latirostris</i>	Carnaby's Black-Cockatoo		EN	S1
<i>Calyptorhynchus baudinii</i>	Baudin's Black-Cockatoo		VU	S1
<i>Eolophus roseicapillus</i>	Galah			
<i>Cacatua tenuirostris</i>	Long-billed Corella			
<i>Cacatua pastinator</i>	Western Corella			
<i>Cacatua sanguinea</i>	Little Corella			
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo			
<i>Nymphicus hollandicus</i>	Cockatiel			
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet			
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet			
<i>Polytelis anthopeplus</i>	Regent Parrot			
<i>Platycercus icterotis</i>	Western Rosella			
<i>Barnardius zonarius</i>	Australian Ringneck			
<i>Purpureicephalus spurius</i>	Red-capped Parrot			
<i>Neophema elegans</i>	Elegant Parrot			
<i>Neophema petrophila</i>	Rock Parrot			
<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo			
<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo			
<i>Cacomantis pallidus</i>	Pallid Cuckoo			
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo			
<i>Ninox novaeseelandiae</i>	Southern Boobook			
<i>Tyto novaehollandiae</i>	Masked Owl			
<i>Tyto javanica</i>	Eastern Barn Owl			
<i>Dacelo novaeguineae</i>	Laughing Kookaburra			
<i>Todiramphus sanctus</i>	Sacred Kingfisher			
<i>Merops ornatus</i>	Rainbow Bee-eater	P5	Migr.	
<i>Climacteris rufa</i>	Rufous Treecreeper			
<i>Malurus splendens</i>	Splendid Fairy-wren			
<i>Malurus lamberti</i>	Variiegated Fairy-wren			
<i>Malurus elegans</i>	Red-winged Fairy-wren			
<i>Stipiturus malachurus</i>	Southern Emu-wren			
<i>Sericornis frontalis</i>	White-browed Scrubwren			
<i>Smicronis brevirostris</i>	Weebill			
<i>Gerygone fusca</i>	Western Gerygone			
<i>Acanthiza nana</i>	Yellow Thornbill			
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			
<i>Acanthiza inornata</i>	Western Thornbill			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Acanthiza apicalis</i>	Inland Thornbill			
<i>Pardalotus punctatus</i>	Spotted Pardalote			
<i>Pardalotus striatus</i>	Striated Pardalote			
<i>Acanthorhynchus superciliosus</i>	Western Spinebill			
<i>Lichenostomus virescens</i>	Singing Honeyeater			
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater			
<i>Manorina flavigula</i>	Yellow-throated Miner			
<i>Anthochaera lunulata</i>	Western Wattlebird			
<i>Anthochaera carunculata</i>	Red Wattlebird			
<i>Epthianura albifrons</i>	White-fronted Chat			
<i>Glyciphila melanops</i>	Tawny-crowned Honeyeater			
<i>Lichmera indistincta</i>	Brown Honeyeater			
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater			
<i>Phylidonyris niger</i>	White-cheeked Honeyeater			
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater			
<i>Melithreptus lunatus</i>	White-naped Honeyeater			
<i>Daphoenositta chrysoptera</i>	Varied Sittella			
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike			
<i>Lalage sueurii</i>	White-winged Triller			
<i>Pachycephala pectoralis</i>	Golden Whistler			
<i>Pachycephala rufiventris</i>	Rufous Whistler			
<i>Colluricincla megarhyncha</i>	Little Shrike-thrush			
<i>Colluricincla harmonica</i>	Grey Shrike-thrush			
<i>Artamus cinereus</i>	Black-faced Woodswallow			
<i>Artamus cyanopterus</i>	Dusky Woodswallow			
<i>Cracticus torquatus</i>	Grey Butcherbird			
<i>Cracticus nigrogularis</i>	Pied Butcherbird			
<i>Cracticus tibicen</i>	Australian Magpie			
<i>Strepera versicolor</i>	Grey Currawong			
<i>Rhipidura albiscapa</i>	Grey Fantail			
<i>Rhipidura leucophrys</i>	Willie Wagtail			
<i>Corvus coronoides</i>	Australian Raven			
<i>Corvus bennetti</i>	Little Crow			
<i>Myiagra inquieta</i>	Restless Flycatcher			
<i>Grallina cyanoleuca</i>	Magpie-lark			
<i>Microeca fascinans</i>	Jacky Winter			
<i>Petroica boodang</i>	Scarlet Robin			
<i>Petroica goodenovii</i>	Red-capped Robin			
<i>Melanodryas cucullata</i>	Hooded Robin			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Eopsaltria griseogularis</i>	Western Yellow Robin			
<i>Eopsaltria georgiana</i>	White-breasted Robin			
<i>Acrocephalus australis</i>	Australian Reed-Warbler			
<i>Megalurus gramineus</i>	Little Grassbird			
<i>Cincloramphus mathewsi</i>	Rufous Songlark			
<i>Cincloramphus cruralis</i>	Brown Songlark			
<i>Zosterops lateralis</i>	Silvereeye			
<i>Cheramoeca leucosterna</i>	White-backed Swallow			
<i>Hirundo neoxena</i>	Welcome Swallow			
<i>Petrochelidon ariel</i>	Fairy Martin			
<i>Petrochelidon nigricans</i>	Tree Martin			
<i>Dicaeum hirundinaceum</i>	Mistletoebird			
<i>Stagonopleura oculata</i>	Red-eared Firetail			
<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin			
<i>Passer domesticus</i>	House Sparrow			
<i>Anthus novaeseelandiae</i>	Australasian Pipit			
<i>Carduelis carduelis</i>	European Goldfinch			
	Domestic Goose			
	Greylag Goose			
	Domestic/Feral Duck			
	Black Duck-Mallard hybrid			
	Muscovy Duck			
	Tattler species			
	White-tailed Black-Cockatoo			
	Corella species			
	Ring-necked Parakeet			
	Crow & Raven species			

Fauna identified from the Naturemap search Tool (Department of Environment and Conservation 2009)

Species	Common Name	DEC	EPBC Act	WC Act
<i>Acritoscincus trilineatum</i>				
<i>Anthus australis</i> subsp. <i>australis</i>				
<i>Aprasia repens</i>				
<i>Aythya australis</i>	Hardhead)			
<i>Brachyurophis fasciolata</i> subsp. <i>fasciolata</i>				
<i>Brachyurophis semifasciata</i>				
<i>Burhinus grallarius</i>	Bush Stone-curlew	P4		

Species	Common Name	DEC	EPBC Act	WC Act
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i>	Forest Red-tailed Black-Cockatoo	VU		
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo		EN	S1
<i>Catasarcus</i> sp.				
<i>Chelodina oblonga</i>	Oblong Turtle			
<i>Christinus marmoratus</i>	Marbled Gecko			
<i>Crinia insignifera</i>	Squelching Froglet			
<i>Cryptoblepharus buchananii</i>				
<i>Ctenophorus adelaidensis</i>	Southern Heath Dragons			
<i>Ctenotus fallens</i>				
<i>Ctenotus labillardieri</i>				
<i>Cuculus pallidus</i>	Pallid Cuckoo			
<i>Dasyurus geoffroii</i>	Western Quoll, Chuditch	VU		
<i>Delma fraseri</i>				
<i>Delma grayii</i>				
<i>Dendrelaphis punctulata</i>	Green Tree Snake			
<i>Diplodactylus polyophthalmus</i>				
<i>Elapognathus coronatus</i>	Crowned Snake			
<i>Ernobius mollis</i>				
<i>Eupelmus</i> sp.				
<i>Felis catus</i>	Cat			
<i>Heleioporus eyrei</i>	Moaning Frog			
<i>Hemiergis quadrilineata</i>				
<i>Heteroboastrychus aequalis</i>				
<i>Heteroboastrychus</i> sp.				
<i>Hydromys chrysogaster</i>	Water-rat	P4		
<i>Isoodon obesulus</i> subsp. <i>fusciventer</i>	Southern Brown Bandicoot, Quenda	P5		
<i>Lerista elegans</i>				
<i>Lerista lineata</i>		P3		
<i>Lialis burtonis</i>				
<i>Lichenostomus virescens</i>	Singing Honeyeater			
<i>Limnodynastes dorsalis</i>	Western Banjo Frog			
<i>Litoria adelaidensis</i>	Slender Tree Frog			
<i>Litoria moorei</i>	Motorbike Frog			
<i>Menetia greyii</i>				
<i>Mus musculus</i>	House Mouse			
<i>Myobatrachus gouldii</i>	Turtle Frog			
<i>Nacaduba biocellata</i> subsp. <i>biocellata</i>				
<i>Neelaps bimaculatus</i>	Black-naped Snake			

Species	Common Name	DEC	EPBC Act	WC Act
<i>Notechis scutatus</i>	Tiger Snake			
<i>Oxyura australis</i>	Blue-billed Duck			
<i>Pachyptila vittata</i>	Broad-billed Prion			
<i>Phoracantha impavida</i>				
<i>Phylacteophaga froggatti</i>				
<i>Platalea flavipes</i>	Yellow-billed Spoonbill			
<i>Pletholax gracilis</i> subsp. <i>gracilis</i>				
<i>Pogona minor</i> subsp. <i>minor</i>				
<i>Pseudechis australis</i>	Mulga Snake			
<i>Pseudemydura umbrina</i>	Western Swamp Turtle	CR		
<i>Pseudonaja affinis</i> subsp. <i>affinis</i>	Dugite			
<i>Pseudophryne guentheri</i>	Crawling Toadlet			
<i>Psyllaephagus</i> sp.				
<i>Pterodroma brevirostris</i>	Kerguelen Petrel			
<i>Ramphotyphlops australis</i>				
<i>Ramphotyphlops braminus</i>				
<i>Ramphotyphlops pinguis</i>				
<i>Ramphotyphlops waitii</i>				
<i>Rattus rattus</i>	Black Rat			
<i>Simoselaps bertholdi</i>	Jan's Banded Snake			
<i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i>				
<i>Strongylorhinus ochraceus</i>				
<i>Strophurus spinigerus</i> subsp. <i>inornatus</i>				
<i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>				
<i>Tiliqua occipitalis</i>	Western Bluetongue			
<i>Tiliqua rugosa</i> subsp. <i>rugosa</i>				
<i>Todiramphus sanctus</i> subsp. <i>sanctus</i>				
<i>Varanus gouldii</i>	Bungarra or Sand Monitor			
<i>Varanus rosenbergi</i>	Heath Monitor			

# Appendix Six:

## Desktop Search Results - Flora

### Flora and Fauna Assessment for Queens Park Regional Open Space

Conservation Significant Flora species identified from the DEC database search.

Species	Common Name	DEC
<i>Andersonia gracilis</i>	Slender Andersonia	R
<i>Aponogeton hexatepalus</i>		P4
<i>Baeckea</i> sp. Perth Region (RJ Cranfield)		P3
<i>Banksia mimica</i>	Summer Honeypot	R
<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>		P3
<i>Byblis gigantea</i>		P2
<i>Caladenia huegelii</i>	Grand Spider Orchid	R
<i>Calytrix breviseta</i> subsp. <i>breviseta</i>	Swamp Starflower	R
<i>Conospermum undulatum</i>	Wavy-leaved Smokebush	R
<i>Darwinia foetida</i>		R
<i>Diuris purdiei</i>	Purdie's Donkey-orchid	R
<i>Drakaea elastica</i>	Glossy-leaved Hammer-orchid	R
<i>Eclipta</i> sp. Perth (S. Lloyd s.n. 3/4/1998)		P1
<i>Eleocharis keigheryi</i>	Keighery's Eleocharis	R
<i>Eremophila glabra</i> subsp. <i>chlorella</i>		R
<i>Grevillea thelemanniana</i>	Fernleaf Hummingbird Bush	P4
<i>Haloragis aculeolata</i>		P2
<i>Isopogon drummondii</i>		P3
<i>Jacksonia gracillima</i>		P3
<i>Lasiopetalum pterocarpum</i>	Wing-fruited Lasiopetalum	R
<i>Lepidosperma rostratum</i>	Beaked Lepidosperma	R
<i>Macarthuria keigheryi</i>	Keighery's Macarthuria	R
<i>Meeboldina decipens</i> subsp. <i>decipens</i>		P3
<i>Ptilotus sericostachyus</i> subsp. <i>roseus</i>		P1
<i>Schoenus benthamii</i>		P3
<i>Schoenus natans</i>		P4
<i>Schoenus pennisetis</i>		P1
<i>Stylidium striatum</i>	Fan-leaved Trigger Plant	P4
<i>Tetraria australiensis</i>		R
<i>Thelymitra magnifica</i>		P3
<i>Thelymitra stellata</i>	Star Sun-orchid	R
<i>Tripterococcus paniculatus</i> ms		P1
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>		P4

## Flora species known to be in the area of the study site (DEC)

Species	DEC
<i>Aponogeton hexatepalus</i>	4
<i>Caladenia huegelii</i>	R
<i>Conospermum undulatum</i>	R
<i>Diuris purdiei</i>	R
<i>Drakaea elastica</i>	R
<i>Drakaea micrantha</i>	R
<i>Eremophila glabra subsp. chlorella</i>	R
<i>Macarthuria keigheryi</i>	R
<i>Rhodanthe pyrethrum</i>	3
<i>Tripterococcus paniculatus</i>	1

## Protected Matters Search Tool Conservation significant flora (Australian Government 2010)

Species	Common Name	Listing
<i>Andersonia gracilis</i>	Slender Andersonia	Endangered
<i>Anthocercis gracilis</i>	Slender Tailflower	Vulnerable
<i>Banksia mimica</i>	Summer Honeypot	Endangered
<i>Caladenia huegelii</i>	King Spider-orchid	Endangered
<i>Calytrix breviseta subsp. breviseta</i>	Swamp Starflower	Endangered
<i>Conospermum undulatum</i>	Wavy-leaved Smokebush	Vulnerable
<i>Darwinia sp. Muchea</i>	Muchea Bell	Critically Endangered
<i>Drakaea elastica</i>	Glossy-leaved Hammer-orchid	Endangered
<i>Hemigenia ramosissima</i>		Critically Endangered
<i>Lasiopetalum sp. Serpentine</i>	Wing-fruited Lasiopetalum	Endangered
<i>Lepidosperma rostratum</i>	Beaked Lepidosperma	Endangered
<i>Macarthuria keigheryi</i>	Keighery's Macarthuria	Endangered
<i>Thelymitra stellata</i>	Star Sun-orchid	Endangered

Flora Species identified from the Naturemap search tool (Department of Environment and Conservation 2009)

Species	Common Name	DEC
<i>Baeckea sp. Darling Range (R.J. Cranfield 1673)</i>		
<i>Banksia attenuata</i>	Slender Banksia	
<i>Banksia grandis</i>	Bull Banksia	
<i>Banksia ilicifolia</i>	Holly-leaved Banksia	
<i>Banksia incana var. incana</i>		
<i>Banksia menziesii</i>	Firewood Banksia	
<i>Banksia pteridifolia subsp. vernalis</i>		P3
<i>Banksia telmatiaea</i>	Swamp Fox Banksia	
<i>Barbula calycina</i>		
<i>Beaufortia squarrosa</i>	Sand Bottlebrush	
<i>Blancoa canescens</i>	Winter Bell	
<i>Boronia crenulata</i>	Aniseed Boronia	
<i>Boronia purdieana subsp. purdieana</i>		
<i>Boronia ramosa subsp. anethifolia</i>		
<i>Bossiaea eriocarpa</i>	Common Brown Pea	
<i>Brassica napus</i>		
<i>Briza minor</i>	Shivery Grass	
<i>Bromus alopecuroides</i>		
<i>Burchardia congesta</i>		
<i>Burchardia umbellata</i>	Milkmaids	
<i>Byblis gigantea</i>	Rainbow Plant	P2
<i>Caladenia arenicola</i>		
<i>Caladenia discoidea</i>	Dancing Orchid	
<i>Caladenia flava subsp. flava</i>		
<i>Caladenia hirta subsp. hirta</i>		
<i>Caladenia huegelii</i>	Grand Spider Orchid	R
<i>Caladenia longicauda subsp. longicauda</i>		
<i>Caladenia paludosa</i>		
<i>Calytrix angulata</i>	Yellow Starflower	
<i>Calytrix breviseta subsp. breviseta</i>		R
<i>Calytrix sapphirina</i>		
<i>Carex divisa</i>	Divided Sedge	
<i>Cassytha glabella forma casuarinae</i>		
<i>Centrolepis aristata</i>	Pointed Centrolepis	
<i>Centrolepis inconspicua</i>		
<i>Chaetanthus aristatus</i>		
<i>Chamaescilla corymbosa var. corymbosa</i>		
<i>Cheiranthus preissiana</i>		

Species	Common Name	DEC
<i>Chordifex sinuosus</i>		
<i>Chorizandra enodis</i>	Black Bristlerush	
<i>Chorizema dicksonii</i>	Yellow-eyed Flame Pea	
<i>Comesperma calymega</i>	Blue-spike Milkwort	
<i>Conospermum acerosum</i> subsp. <i>acerosum</i>		
<i>Conospermum capitatum</i> subsp. <i>glabratum</i>		
<i>Conospermum triplinervium</i>	Tree Smokebush	
<i>Conospermum undulatum</i>		R
<i>Conostephium minus</i>	Pink-tipped Pearl flower	
<i>Conostephium pendulum</i>	Pearl Flower	
<i>Conostylis aurea</i>	Golden Conostylis	
<i>Conostylis juncea</i>		
<i>Conostylis setigera</i>	Bristly Cottonhead	
<i>Cotula turbinata</i>	Funnel Weed	
<i>Crassula colorata</i> var. <i>colorata</i>		
<i>Cuscuta planiflora</i>		
<i>Cyanicula gemmata</i>		
<i>Cyathochaeta clandestina</i>		
<i>Cytogonidium leptocarpoides</i>		
<i>Dampiera linearis</i>	Common Dampiera	
<i>Dasyogon bromeliifolius</i>	Pineapple Bush	
<i>Daviesia angulata</i>		
<i>Daviesia physodes</i>		
<i>Daviesia triflora</i>		
<i>Dioscorea hastifolia</i>	Warrine	
<i>Diplopeltis huegelii</i> subsp. <i>lehmannii</i>		
<i>Diuris corymbosa</i>		
<i>Diuris purdiei</i>	Purdie's Donkey Orchid	R
<i>Drosera</i>		
<i>glanduligera</i>	Pimpernel Sundew	
<i>Drosera menziesii</i> subsp. <i>menziesii</i>		
<i>Drosera rosulata</i>		
<i>Drosera stolonifera</i>	Leafy Sundew	
<i>Echinochloa pyramidalis</i>	Antelope Grass	
<i>Eclipta prostrata</i> Y		
1643 <i>Elythranthera brunonis</i>	Purple Enamel Orchid	
<i>Epiblema grandiflorum</i> var. <i>grandiflorum</i>		
<i>Epilobium ciliatum</i>		
<i>Eragrostis elongata</i>	Clustered Lovegrass	
<i>Eremaea pauciflora</i> var. <i>pauciflora</i>		

Species	Common Name	DEC
<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	Jarrah	
<i>Eucalyptus todtiana</i>	Coastal Blackbutt	
<i>Euchilopsis linearis</i>	Swamp Pea	
<i>Euphorbia terracina</i>	Geraldton Carnation Weed	
<i>Gastrolobium acutum</i>		
<i>Gladiolus carneus</i>		
<i>Gladiolus caryophyllaceus</i>	Wild Gladiolus	
<i>Gompholobium confertum</i>		
<i>Gompholobium tomentosum</i>	Hairy Yellow Pea	
<i>Gonocarpus pithyoides</i>		
<i>Goodenia incana</i>	Hoary Goodenia	
<i>Goodenia pulchella</i> subsp. <i>Coastal Plain A</i>		
<i>Grevillea bipinnatifida</i> subsp. <i>bipinnatifida</i>		
<i>Grevillea thelemanniana</i>	Spider Net Grevillea	P4
<i>Grevillea thelemanniana</i> subsp. <i>thelemanniana</i>	Spider Net Grevillea	
<i>Haemodorum laxum</i>		
<i>Haemodorum simplex</i>		
<i>Hakea ceratophylla</i>	Horned Leaf Hakea	
<i>Hakea lissocarpa</i>	Honey Bush	
<i>Hakea ruscifolia</i>	Candle Hakea	
<i>Hakea sulcata</i>	Furrowed Hakea	
<i>Helianthus annuus</i>	Sunflower	
<i>Hemiandra linearis</i>	Speckled Snakebush	
<i>Hibbertia aurea</i>		
<i>Hibbertia commutata</i>		
<i>Hibbertia huegelii</i>		
<i>Hibbertia hypericoides</i>	Yellow Buttercups	
<i>Hibbertia stellaris</i>	Orange Stars	
<i>Hovea pungens</i>	Devil's Pins	
<i>Hybanthus calycinus</i>	Wild Violet	
<i>Hyparrhenia hirta</i>	Tambookie Grass	
<i>Hypochaeris glabra</i>	Smooth Catsear	
<i>Hypolaena exsulca</i>		
<i>Hypolaena pubescens</i>		
<i>Isolepis prolifera</i>	Budding Club-rush	
<i>Isopogon drummondii</i>		P3
<i>Isotropis cuneifolia</i>	Granny Bonnets	
<i>Jacksonia floribunda</i>	Holly Pea	
<i>Jacksonia lehmannii</i>		
<i>Jacksonia restioides</i>		

Species	Common Name	DEC
<i>Jacksonia sternbergiana</i>	Stinkwood	
<i>Johnsonia pubescens</i>	Pipe Lily	
<i>Johnsonia pubescens subsp. pubescens</i>		
<i>Juncus kraussii subsp. australiensis</i>		
<i>Kennedia prostrata</i>	Scarlet Runner	
<i>Labichea punctata</i>	Lance-leaved Cassia	
<i>Lagenophora huegelii</i>		
<i>Lambertia multiflora var. darlingensis</i>		
<i>Landoltia punctata</i>	Thin Duckweed	
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush	P4
<i>Lawrenzia squamata</i>		
<i>Laxmannia ramosa subsp. ramosa</i>		
<i>Laxmannia sessiliflora subsp. australis</i>		
<i>Lemna disperma</i>	Duckweed	
<i>Lepidosperma angustatum</i>		
<i>Lepidosperma rostratum</i>		R
<i>Leucopogon glaucifolius</i>		
<i>Leucopogon parviflorus</i>	Coast Beard-heath	
<i>Leucopogon squarrosus</i>		
<i>Levenhookia preissii</i>	Preiss's Stylewort	
<i>Levenhookia stipitata</i>	Common Stylewort	
<i>Lobularia maritima</i>	Sweet Alyssum	
<i>Lomandra caespitosa</i>	Tufted Mat Rush	
<i>Lomandra hermaphrodita</i>		
<i>Lomandra odora</i>	Tiered Matrush	
<i>Loxocarya fasciculata</i>		
<i>Lomandra purpurea</i>	Purple Mat Rush	
<i>Lomandra sericea</i>	Silky Mat Rush	
<i>Macarthuria australis</i>		
<i>Lyginia barbata</i>		
<i>Lyginia imberbis</i>		
<i>Lysinema ciliatum forma N of Perth</i>		
<i>Macarthuria keigheryi</i>		R
<i>Macropitilium atropurpureum</i>	Purple Bean	
<i>Medicago sativa</i>	Alfalfa	
<i>Megathyrsus maximus var. maximus</i>		
<i>Melaleuca incana subsp. incana</i>		
<i>Melaleuca preissiana</i>	Moonah	
<i>Melaleuca raphiophylla</i>	Swamp Paperbark	
<i>Melaleuca seriata</i>		

Species	Common Name	DEC
<i>Mesomelaena pseudostygia</i>		
<i>Microtis atrata</i>	Swamp Mignonette Orchid	
<i>Microtis media subsp. media</i>		
<i>Mitrasacme paradoxa</i>	Wiry Mitrewort	
<i>Monotaxis grandiflora</i>	Diamond of the Desert	
<i>Narcissus tazetta</i>	Jonquil	
<i>Nuytsia floribunda</i>	Christmas Tree	
<i>Oenothera laciniata</i>		
<i>Olax scalariformis</i>		
<i>Opercularia apiciflora</i>		
<i>Paspalum urvillei</i>	Vasey Grass	
<i>Patersonia occidentalis</i>	Purple Flag	
<i>Patersonia occidentalis var. occidentalis</i>		
<i>Persoonia saccata</i>	Snottygobble	
<i>Petrophile linearis</i>	Pixie Mops	
<i>Petrophile striata</i>		
<i>Philothea spicata</i>	Pepper and Salt	
<i>Philydrella drummondii</i>		
<i>Philydrella pygmaea subsp. pygmaea</i>		
<i>Phlebocarya ciliata</i>		
<i>Phlebocarya filifolia</i>		
<i>Pimelea angustifolia</i>	Narrow-leaved Pimelea	
<i>Pimelea sulphurea</i>	Yellow Banjine	
<i>Pityrodia bartlingii</i>	Woolly Dragon	
<i>Platysace juncea</i>		
<i>Platysace ramosissima</i>		P3
<i>Platytheca galioides</i>		
<i>Poa annua</i>	Winter Grass	
<i>Podolepis lessonii</i>		
<i>Polypogon tenellus</i>		
<i>Prasophyllum drummondii</i>	Swamp Leek Orchid	
<i>Prasophyllum parvifolium</i>	Autumn Leek Orchid	
<i>Pterochaeta paniculata</i>		
<i>Pyrorchis nigricans</i>	Red beaks	
<i>Regelia ciliata</i>		
<i>Rhodanthe pyrethrum</i>		P3
<i>Scaevola lanceolata</i>		
<i>Scaevola repens var. repens</i>		
<i>Schoenus andrewsii</i>		
<i>Schoenus bifidus</i>		

Species	Common Name	DEC
<i>Schoenus curvifolius</i>		
<i>Schoenus efoliatus</i>		
<i>Schoenus laevigatus</i>		
<i>Schoenus pennisetis</i>		P1
<i>Schoenus subflavus</i>	Yellow Bog-rush	
<i>Setaria sphacelata</i>	South African Pigeon Grass	
<i>Sorghum bicolor</i> subsp. <i>bicolor</i>		
<i>Sowerbaea laxiflora</i>	Purple Tassels	
<i>Sphaerolobium macranthum</i>		
<i>Stenanthemum humile</i>		
<i>Stirlingia latifoli</i>	Blueboy	
<i>Stylidium amoenum</i>	Lovely Triggerplant	
<i>Stylidium androsaceum</i>		
<i>Stylidium bicolor</i>		
<i>Stylidium brunonianum</i>	Pink Fountain Triggerplant	
<i>Stylidium dichotomum</i>	Pins-and-needles	
<i>Stylidium diuroides</i>	Donkey Triggerplant	
<i>Stylidium diuroides</i> subsp. <i>diuroides</i>		
<i>Stylidium divaricatum</i>	Daddy-long-legs	
<i>Stylidium guttatum</i>	Dotted Triggerplant	
<i>Stylidium longitubum</i>	Jumping Jacks	P3
<i>Stylidium perpusillum</i>	Tiny Triggerplant	
<i>Stylidium piliferum</i>	Common Butterfly Triggerplant	
<i>Stylidium pulchellum</i>	Thumbelina Triggerplant	
<i>Stylidium repens</i>	Matted Triggerplant	
<i>Stylidium</i> sp. <i>Bindoon</i> (K.F. Kenneally 11405)		
<i>Stylidium striatum</i>	Fan-leaved Triggerplant	P4
<i>Stylidium utricularioides</i>	Pink Fan Triggerplant	
<i>Styphelia tenuiflora</i>	Common Pinheath	
<i>Symphyotrichum squamatum</i>	Bushy Starwort	
<i>Synaphea spinulosa</i>		
<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>		
<i>Templetonia drummondii</i>		P4
<i>Thelymitra antennifera</i>	Vanilla Orchid	
<i>Thelymitra macrophylla</i>		
<i>Thomasia glutinosa</i> var. <i>glutinosa</i>		
<i>Thomasia macrocarpa</i>	Large Fruited Thomasia	
<i>Thysanotus anceps</i>		P3
<i>Thysanotus arbuscula</i>		
<i>Thysanotus multiflorus</i>	Many-flowered Fringe Lily	

Species	Common Name	DEC
<i>Thysanotus sparteus</i>		
<i>Trachymene pilos</i>	Native Parsnip	
<i>Tricoryne elatior</i>	Yellow Autumn Lily	
<i>Tropaeolum majus</i>	Garden Nasturtium	
<i>Trymalium odoratissimum subsp. odoratissimum</i>		
<i>Ursinia anthemoides</i>	Ursinia	
<i>Utricularia multifida</i>		
<i>Verticordia acerosa var. acerosa</i>		
<i>Verticordia lindleyi subsp. lindleyi</i>		P4
<i>Verticordia plumosa var. brachyphylla</i>		
<i>Villarsia submersa</i>		P4
<i>Viminaria juncea</i>	Swishbush	
<i>Vulpia bromoides</i>	Squirrel Tail Fescue	
<i>Xanthorrhoea preissii</i>	Grass tree	
<i>Xanthosia huegelii</i>		
<i>Xylomelum occidentale</i>	Woody Pear	

## Appendix Seven: Survey Limitations

### Flora and Fauna Assessment for Queens Park Regional Open Space

Possible Limitations	Constraints (Yes/No): Significant, Moderate or Negligible	Comment
Competency/experience of the consultant conducting the survey	No Constraint	Senior staff with 25 plus years of experience
Proportion of the flora identified	No Constraint	100% of vegetation communities sampled
Proportion of fauna identified, recorded and/or collected	No Constraint	100% of fauna assemblages sampled
Proportion of the task achieved and further work that may need to be undertaken	Moderate	Additional Fauna survey for reptiles required
Timing/weather/season/cycle	No Constraint	Above average rainfall recorded for March which would be adequate to trigger flowering and germination of most flora species
Intensity of survey (e.g. In retrospect was the intensity adequate?)	No Constraint	Intensity judged to be adequate other than remaining fauna survey
Completeness (e.g. Was relevant area fully surveyed?)	No Constraint	Area fully covered with all communities sampled
Resources (e.g. Degree of expertise available for plant identification)	No Constraint	Adequate resources available
Remoteness and/or access problems	Negligible	Restricted by lack of tracks
Availability of contextual (e.g. bioregional) information for the survey area	Negligible	Lack of local survey information only

## Appendix Eight: Photos

### Flora and Fauna Assessment for Queens Park Regional Open Space



*Pogona minor*



*Strophurus spinigerus*



*Limnodynastes dorsalis*



*Pseudonaja affinis*



*Hemiergis quadrilineata*



*Heleioporus eyrei*



EPP Lake facing SW from Photo Point 19 (Map 3a)



EPP Lake facing S from Photo Point 20 (Map 3a)



EPP Lake facing SE from Photo Point 21 (Map 3a)

# Appendix E

Flora Survey Report



Prepared by GHD (2020)





Department of Local Government, Sport and  
Cultural

State Football Centre - environmental planning process road  
map

Flora survey report

January 2020

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# Appendices

- Appendix A Figures
- Appendix B Relevant background information and conservation code
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- Appendix D Flora data

# 1. Introduction

## 1.1 Project background

A site within the Queens Park Regional Open Space on the corner of Welshpool Road and Gibbs Street in Queens Park has been identified as a suitable location for the development of a State Football Centre.

A process roadmap and advice from State Government departments identifies the need to undertake a Level 2 Flora survey of this site prior to obtaining required environmental and planning approvals.

## 1.2 Purpose of this report

This report is a variation to the Environmental and Planning approvals roadmap project undertaken by GHD. It will provide ecological information to assist in obtaining environmental and planning approvals.

## 1.3 Survey area

The survey area (17.32 ha) is located within East Cannington, as part of the Queens Park Regional Bushlands (Figure 1, Appendix A)

## 1.4 Relevant legislation, conservation codes and background information

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

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

## 1.5 Report limitations and assumptions

This report has been prepared by GHD for Department of Local Government, Sport and Cultural Industries and may only be used and relied on by Department of Local Government, Sport and Cultural Industries for the purpose agreed between GHD and the Department of Local Government, Sport and Cultural Industries as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Department of Local Government, Sport and Cultural Industries arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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

The opinions, conclusions and any recommendations in this report are based on information obtained from specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of access tracks, operational works, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of the field survey. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

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

## 2. Methodology

### 2.1 Desktop assessment

Prior to the commencement of the field survey, a desktop assessment was undertaken to identify relevant environmental information pertaining to the study area (10 km radius around the survey area) and to assist in survey design. This included a review of:

- The Department of the Environment and Energy (DotEE) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Act 1999* (EPBC Act) potentially occurring within the study area (DotEE 2019) (Appendix C)
- The Department of Biodiversity, Conservation and Attractions (DBCA) TEC and PEC database to determine the potential for conservation significant communities to be present within the study area
- The DBCA *NatureMap* database for flora and fauna species previously recorded within the study area (DBCA 2019) (Appendix C)
- The DBCA Threatened (Declared Rare) and Priority Flora (TPFL) database and the WA Herbarium database (WAHERB) for Threatened flora listed under the *Biodiversity Conservation Act 2016* (BC Act) and listed as Priority by the DBCA, previously recorded within the study area
- Existing datasets including previous pre-European vegetation mapping of the survey area (Beard 1979; Hedde et al. 1980 and Webb et al. 2016), aerial photography, hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas that potentially contain TECs and PECs

### 2.2 Field survey

#### 2.2.1 Flora and vegetation

GHD Senior Botanist Anna Napier completed a broad flora and vegetation survey 22 October 2019.

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

#### **Data collection**

Field survey methods involved a combination of sampling quadrats, relevés, photographic reference points located in identified vegetation types and walking transects.

Two Quadrats (measuring 10 m x 10 m – area of 100 m<sup>2</sup>) were established within the survey area. Quadrats were located in vegetation units considered conservation significant or in vegetation that was in Very Good condition. One Relevé (unmarked area) was established to supplement quadrat data. Field data at each quadrat was recorded on a pro-forma data sheet and included the parameters detailed in Table 1

Table 1 Data collected during the field survey

Aspect	Measurement
Collection attributes	Site code, personnel/recorder; date, quadrat dimensions, photograph of the quadrat.
Physical features	Aspect, slope, landform, soil attributes, ground surface cover, leaf and wood litter.
Location	Coordinates recorded in GDA94 datum using a hand-held GPS tool to accuracy approximately $\pm 5$ m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale adapted by EPA (2016a) for the South West Botanical Province.
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover (using NVIS)

A flora inventory was compiled from taxa listed in described quadrats and relevés and from opportunistic floristic records throughout the survey area Appendix D

### **Vegetation types**

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

Vegetation types were described based on structure, dominant taxa and cover characteristics as defined by quadrat and relevé data and field observations. Vegetation type descriptions follow NVIS and are consistent with NVIS Level V (Association). At Level V up to three taxa per stratum are used to describe the association (NVIS Technical Working Group 2017).

### **Vegetation condition**

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

### **Conservation significant flora**

Prior to the field survey, information obtained from the desktop assessments (e.g. previous surveys, aerial photography, geology, soils and topography data, EPBC Act PMST (DotEE 2019), TPFL, NatureMap (DBCA 2019) and the WAHERB databases search results) were reviewed to determine conservation significant flora taxa potentially present within the study area. Additionally, ecological information (e.g. habitat, associated flora taxa and phenology) was sourced from FloraBase (WA Herbarium 1998–2019) to provide further details.

### **Flora identification and nomenclature**

Species well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. All specimens collected during the field assessment were dried and processed in accordance with the requirements of

the WA Herbarium. Species were identified by the use of taxonomic literature, electronic keys and online electronic databases.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–2019) and the EPBC Act Threatened species database provided by DotEE (2019). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase* (WA Herbarium 1998–2019).

## 2.3 Limitations

### 2.3.1 Desktop limitations

Desktop investigations use a variety of online resources such as the DBCA *NatureMap* database, and the EPBC Act PMST. The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DBCA searches of Threatened fauna provide more accurate information for the general area and local occurrence. However, some collection, cannot be dated and often misrepresent the current range of Threatened species.

### 2.3.2 Field survey limitations

The EPA (2016) technical guideline states that flora survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2. Based on this assessment, the present survey effort has not been subject to any constraints, which affect the thoroughness of the assessment and the conclusions that have been formed.

Table 2 Field survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area, this includes: Regional biogeography (Mitchell et al. 2002). Broad scale (1:250,000) mapping by Beard (1979) and digitised by Shepherd et al. (2002) Vegetation mapping by Heddle et al. (1980) and Webb et al. (2016)
Scope (what life forms were sampled etc.)	Nil	Vascular flora were sampled during the survey. Non-vascular florawere not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity)	Nil	The vegetation survey was a undertaken in October 2019. Spring is considered the optimal time to undertake vegetation surveys in the Swan Coastal Plain bioregion. The vegetation survey was a broad scale and targeted assessment, undertaken to identify and describe the dominant vegetation units and map conservation significant flora. The portion of flora collected and identified was considered appropriate for the purpose of this assessment
Flora determination	Nil	Flora determination was undertaken by GHD Senior Botanist in the field and via a range of on-line resources. All taxa could be identified to species level. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time of report development, but it should be noted this may change in response to ongoing research and review of the International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	The entire survey area was accessible and was accessed by foot.
Mapping reliability	Nil	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1979) and field data. Data was recorded in the field using hand-held GPS tools (Garmin GPS) and tablet (Samsung Galaxy Tablet S2). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within $\pm 5$ metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/season/cycle	Nil	The field survey was conducted in October 2019. In the three months prior to the October flora survey (July to September), Gosnells City weather station (No 009106 Bureau of Meteorology (BoM) 2019) recorded a total of 230 mm of rainfall. This rainfall total is comparable to the long term average for the same period (July to September; 223.5 mm) (BoM 2019).

Aspect	Constraint	Comment
		The timing of the flora and vegetation survey is considered the most optimal time to complete surveys on the Swan Coastal Plain (optimal time is during spring). The weather conditions recorded during the survey did not impact upon the vegetation and flora survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Much of the survey area has been subjected to historical disturbance events (e.g. clearing, weeds); however, these disturbances did not impact the survey.
Resources	Nil	Adequate resources were employed during the field survey. A total of one day was spent undertaking the survey.
Access restrictions	Nil	The majority of the survey area was accessible at the time of the survey. The central, artificially created, island within the wetland was not accessible due to water depth.
Experience levels	Nil	The botanist who executed the survey, Anna Napier, is suitably qualified with over 30 years' experience in undertaking flora surveys and assessments in Western Australia. Anna has extensive experience undertaking flora and assessments on the Swan Coastal Plain.

## 3. Desktop assessment

### 3.1 Regional biogeography

The study area is situated in the South West Botanical Province of Western Australia (Beard 1990) within the Swan Coastal Plain bioregion and Perth sub-region described by the Interim Biogeographic Regionalisation of Australia (IBRA) (DotEE 2019b).

The Swan Coastal Plain bioregion is a low lying coastal plain, mainly covered with woodlands. The Perth sub-region is characterised by colluvial and aeolian sands, alluvial river flats and coastal limestone. Heath and/or Tuart woodlands occur on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, and Marri on Colluvial and alluvials. The region also includes a complex series of seasonal wetlands (Mitchell et al. 2002).

### 3.2 Hydrology

Table 3 summarises the results of the hydrological constraints search relevant to the study area

Table 3 Hydrological features within the survey area

Aspect	Details	Result
Groundwater Areas	Groundwater areas proclaimed under the RIWI Act	Perth
Surface Water Areas	Surface water areas proclaimed under the RIWI Act	Canning River
Irrigation District	Irrigation Districts proclaimed under the RIWI Act	None present
Rivers	Rivers proclaimed under the RIWI Act	None present
Public Drinking Water Source Areas (PDWSAs)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the Metropolitan Water Supply, Sewage and Drainage Act 1909 or the Country Area Water Supply Act 1947	None present
Waterways Conservation Areas	Areas proclaimed under the Waterway Conservation Act 1976.	None present

#### 3.2.1 Wetlands and surface water

##### *Internationally and Nationally important wetlands*

No internationally or nationally important wetlands intersect the survey area or study area.

##### *Geomorphic Wetlands of the Swan Coastal Plain (SCP)*

Three geomorphic wetlands intersect the survey area:

- ID 15819 (Dampland) Resource Enhancement
- ID 7490 (Dampland) Multiple Use

- ID 15817 (Dampland) Resource Enhancement

Surface water present within the survey area is associated with Multiple Use Wetland (UFI 7490). A further 13 geomorphic wetlands are found within 1 km of the survey area Table 4. These are mapped on Figure 4 Appendix A.

Table 4 Geomorphic wetlands mapped within the 1 km of the survey area

Name	Type	Unique Feature Identifier (UFI)	Category	Location relative to survey area
Unknown	Dampland	14956	Resource Enhancement	Located approximately 0.8 km east of the survey area
Unknown	Dampland	7443	Multiple Use	Located approximately 0.7 km west
Unknown	Dampland	7491	Multiple Use	Located approximately 0.5 km south east
Unknown	Palusplain	15254	Multiple Use	Located approximately 0.9 km north east
Unknown	Artificial Lake	7728	Resource Enhancement	Located approximately 1.1 km north east
Unknown	Sumpland	15476	Resource Enhancement	Located approximately 0.93 km north east
Unknown	Dampland	14952	Conservation	Located approximately 0.68 km east of the survey area
Unknown	Dampland	7714	Conservation	Located approximately 0.8 km south east
Unknown	Sumpland	15474	Resource Enhancement	Located approximately 0.92 km north east
Unknown	Not Assessed	7715	Resource Enhancement	Located approximately 0.4 km north east

### 3.3 Landforms and soils

The SWA is comprised of five major geomorphological units, which lie more or less parallel to the coast. These geomorphological units are the Quindalup, Spearwood and Bassendean Dunes, the Pinjarra Plain and the Ridge Hill Shelf (McArthur and Bettenay 1960, Churchwood and McArthur 1980). The survey area lies within the Bassendean Dunes. This land system is broadly described as:

- Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.
- The Department of Primary Industries and Regional Development (previously Department of Agriculture and Food Western Australia (DAFWA)) soil mapping indicates one soil type for the survey area; 212Bs\_S8 - SAND - very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin (DAFWA 2007).

### 3.4 Land use

#### 3.4.1 DBCA legislated lands

No DBCA managed lands intersect the survey area or occur within the study area. The closest to the survey area is located approximately 3.3 km south east (ID R 50529 class A, Kenwick wetlands). No DBCA regional parks intersect the survey area. One occurs within the study area. This is located approximately 3 km south west of the survey area (Canning River).

#### 3.4.2 Bush Forever

The majority of the survey area is intersected by Bush Forever site 283 – Queens Park Bushland, Queens Park Figure 3 Appendix A.

#### 3.4.3 Environmentally Sensitive Areas

The survey area lies within one large ESA.

## 3.5 Vegetation and Flora

### 3.5.1 Broad vegetation mapping and extents

#### **Vegetation associations**

Broad scale (1:250,000) pre-European vegetation mapping of the survey area has been completed by Beard (1979) at an association level. The mapping indicates one vegetation association occurs within the survey area:

- Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina (Association 1001)

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA (Latest update December 2018 – GoWA 2019b). As shown in Table 5, the current extent of vegetation association 1001 is less than 30% at all scales (State, IBRA bioregion, IBRA subregion and Local Government Area (LGA)).

#### **Vegetation complexes**

Regional vegetation complex mapping has been completed by Heddle *et al.* (1980) with updates from Webb *et al.* (2016) based on major landform boundaries within the SWA and forested region of south-west Western Australia. The mapping indicates one vegetation complex present within the survey area; Southern River Complex: Open woodland of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - *Banksia* species with fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca raphiophylla* (Swamp Paperbark) along creek beds.

GoWA (2018c) has assessed the vegetation complexes described and mapped by Heddle *et al.* (1980) against presumed pre-European extents within the SCP IBRA bioregion (Table 6) and the City of Canning (Table 7) respectively. The Southern River Complex has less than 30% of its pre-European extent, with the SCP IBRA bioregion and City of Cockburn.

### 3.5.2 Conservation significant ecological communities

The EPBC Act PMST identified four EPBC Act-listed TEC's potentially occurring within the study area. These included:

- *Banksia* Woodlands of the Swan Coastal Plain (SCP)
- Clay Pans of the Swan Coastal Plain
- *Corymbia calophylla*-*Kingia* Woodlands on heavy soils of the SCP.
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the SCP

DBCA TEC/PEC database searches provided by the Department of Local Government, Sport and Cultural Industries showed the potential presence of multiple TECs and PECs within the survey area and study area, however the names of these communities was not supplied. The locations of the TECs and PECs are illustrated in Figure 2. A description of the TECs identified in the EPBC Act PMST are described in Table 8

Table 5 Extents of vegetation associations

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	% of current extent within the survey area
1001	State: WA	57,410.23	12,660.76	22.05	14.19	0.14%
	IBRA bioregion: Swan Coastal Plain	57,410.23	12,660.76	22.05	14.19	0.14%
	Sub-region: Perth	57,410.23	12,660.76	22.05	14.19	0.14%
	LGA: City of Canning	5,025.15	329.53	6.56	5.55	5.26%

Table 6 Extent of vegetation complexes on the SWA mapped within the City of Canning (GoWA 2019c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	% of current extent within the survey area
Southern River Complex	10,832.18	18.43	947.72	1.60	100 %

Table 7 Extent of vegetation within the City of Canning for the survey area (GoWA 2019c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Proportion of the vegetation complex within the LGA (%)
Southern River Complex	1,645.62	150.43	9.14	25.39%

Table 8 Threatened Ecological Communities identified within the study area

Community type	EPBC Act	Description
<i>Banksia</i> woodlands of the SCP (TEC)	Endangered	The ecological community is a woodland associated with the Swan Coastal Plain. A key diagnostic feature is a prominent tree layer of <i>Banksia</i> , with scattered eucalypts and other tree species often present among or emerging above the <i>Banksia</i> canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range (TSSC 2016).
Tuart ( <i>Eucalyptus gomphocephala</i> ) woodlands and forests of SCP (TEC)	Critically Endangered	Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien Bay to the Sabina River, with outliers along some rivers. Tuart is the key dominant canopy species however Tuart communities comprise a variety of flora and fauna assemblages. Flora commonly occurring with Tuart include <i>Agonis flexuosa</i> , <i>Banksia attenuata</i> , <i>B. grandis</i> , <i>Allocasuarina fraseriana</i> , <i>Xylomelum occidentale</i> , <i>Macrozamia riedlei</i> , <i>Xanthorrhoea preissii</i> , <i>Spyridium globulosum</i> , <i>Templetonia retusa</i> and <i>Diplolaena dampieri</i> (DBCA 2019)
Clay Pans of the Swan Coastal Plain	Critically Endangered	The ecological community generally occurs as a shrubland (less commonly as a low, open woodland) over a ground layer of geophytes, herbs and sedges which are characteristic of the wetter parts of the sites. There are no dominant species which characterise the entire ecological community. The ecological community, however, shows similar landform and vegetation structural features across its range. A distinctive feature of these clay pan wetlands is the suite of geophytes and annual flora that germinates, grows and flowers sequentially as these areas dry over summer, producing a floral display for over three months. The clay pans have very high species richness, a number of local endemics and are the most floristically diverse of the Swan Coastal Plain wetlands. The seasonally inundated clays that support this ecological community are relatively productive agricultural soils and many were cleared and drained soon after European settlement. Others were mined for clay for brick and tile manufacture. Those that remained intact were largely located on the Swan Coastal Plain in close proximity to metropolitan Perth. In more recent years large areas have disappeared under urban development and today the plant communities of the clay pan wetlands are amongst the most threatened in Western Australia (DSEWPC 2012)
<i>Corymbia calophylla</i> – <i>Kingia australis</i> woodlands on heavy soils (SCP 3a) TEC	Endangered	A woodland community located on heavy soils of the eastern side of the Swan Coastal Plain between Capel and Hazelmere. Typical and common native taxa in the community are: <i>Corymbia calophylla</i> ; the shrubs <i>Banksia nivea</i> , <i>Philotheca spicata</i> , <i>Kingia australis</i> and <i>Xanthorrhoea preissii</i> ; herbs, rushes and sedges, <i>Cyathochaeta avenacea</i> , <i>Dampiera linearis</i> , <i>Haemodorum laxum</i> , <i>Desmocladus fasciculatus</i> , <i>Mesomelaena tetragona</i> and <i>Tetraria octandra</i> . The introduced grass <i>Briza maxima</i> is also common in the community (DEE 2017)

### 3.5.3 Flora diversity

The *NatureMap* database identified 1058 flora taxa, representing 116 families and 404 genera previously recorded within the study area. This total comprised 837 native flora taxa and 221 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (86 taxa), Cyperaceae (79 taxa) and Myrtaceae (75 taxa).

The *NatureMap* database search is provided in Appendix C

### 3.5.4 Conservation significant flora

The EPBC Act PMST, *NatureMap* and DBCA Threatened and Priority Flora databases identified the presence/potential presence of 55 conservation significant flora taxa within the study area. The searches identified

- Three Threatened taxa listed under the EPBC Act and/or the BC Act
- Eight priority 1 taxa
- Seven Priority 2 taxa
- 24 Priority 3 taxa
- 13 Priority 4 taxa.

The locations of conservation significant flora registered on the DBCA databases are mapped on Figure 2 Appendix A

## 4. Survey results

### 4.1 Flora and vegetation

#### 4.1.1 Vegetation types

There are only small areas of native vegetation associations within the survey area (Table 9). The largest (1.09 ha) is a remnant of Marri and Jarrah woodland which is similar to the *Corymbia calophylla* – *Kingia australis* woodlands on heavy soils (SCP 3a) TEC, but does not contain any *Kingia australis*. The groundcover species are similar to that of SCP3a but the *Corymbia calophylla* is generally denser than that recorded in other patches of the association.

Two small patches of Banksia woodland in Good condition are also present. These lack much of the original ground-cover layer, being now impacted by introduced grasses and herbs. These align with the Banksia woodland PEC, due to their small size and condition.

A patch of *Eucalyptus rudis* woodland/forest is present in a low lying part of the survey area. Very few other native species are present within this area, with the groundcover mostly not present in any form.

There are two areas of artificial wetland present, relating to low-lying drainage zones. One drain line crosses Welshpool Road into the survey area, and supports mostly introduced trees and sedges, with some native water plants present. The second is a wetland which appears to have been created as a sanctuary area for wetland bird nesting, consisting of an island in the centre of a circular channel. This area supports very few native trees or shrubs, but has patches of native sedges. There was no access to the central island during the survey due to water levels. Native, floating water plants covered the open water areas. Vegetation types mapped for the survey area are illustrated in Figure 5, Appendix A

Table 9 Vegetation types within the survey area

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
<i>Corymbia calophylla</i> woodland (VT1)	<i>Corymbia calophylla</i> tall woodland over <i>Jacksonia floribunda</i> tall open shrubland over <i>Xanthorrhoea preissii</i> and <i>X. gracilis</i> low open shrubland over <i>Dasypogon bromeliifolius</i> and <i>Phellocarya ciliata</i> herbland	White/grey sand on plain	1.09	Quadrat 2 Long unburnt, minimal mid-storey; dense patches of native groundcover species (Possible SCP3a)	
<i>Banksia</i> low woodland (VT2)	<i>Banksia menziesii</i> and <i>Eucalyptus marginata</i> low woodland over <i>Scholtzia involucreta</i> low sparse shrubland over mixed open sedgeland and/ or herbaceous weeds	White/grey sand on plain	0.26	Quadrat 1 Very limited understorey species. Aligns with Banksia Woodland PEC.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
<i>Melaleuca preissiana</i> low woodland (VT3)	<i>Melaleuca preissiana</i> low woodland over <i>Xanthorrea preissii</i> sparse shrubland over introduced herbland	White/grey sand in low lying areas	1.06	Some areas have been planted with additional dampland species.	
Mixed, introduced trees and shrubs (VT4)	Mostly introduced, planted or naturalised species of tall trees and tall shrubs including: <i>Eucalyptus cladocalyx</i> , <i>Eucalyptus</i> sp. <i>Ficus</i> sp., <i>Melia azedarach</i> , <i>Erythrina indica</i> , <i>Lantana camera</i> , <i>Leptospermum laevigatum</i> and <i>Callistemon</i> sp., over introduced grasses and herbs.	Low lying area adjacent to drain. Grey sand.	2.43	Very dense in patches with tall eucalypts and dense, weedy understorey.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Scattered natives over weeds (VT5)	Mixed native species such as <i>Macrozamia reidleyi</i> , <i>Acacia saligna</i> , <i>Agonis flexuosa</i> over introduced grasses and herbs.	White/grey sand on plain	1.32	Some introduced scattered species as well as natives.	
Mixed shrubs and sedges/grasses (VT6)	Isolated <i>Melaleuca preissiana</i> over <i>Cortaderia selloana</i> (Pampas grass) and <i>Typha</i> dense tall shrubland over <i>Juncus pallidus</i> and <i>Baumea articulata</i> closed low sedgeland with <i>Azolla rubra</i> and <i>Lemna disperma</i> water plants associated with an artificial/modified wetland.	Artificial wetland edges and drains. Sandy silt.	0.68	Mixed introduced and native species. Native water plants dominating open water.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
<i>Adenanthos cynorum</i> tall shrubland (VT7)	<i>Adenanthos cynorum</i> tall shrubland with isolated <i>Allocasuarina fraseriana</i> over closed introduced herbs and grasses.	White/grey sand on plain	0.19	Releve 1	

<p><i>Eucalyptus rudis</i> forest (VT8)</p>	<p><i>Eucalyptus rudis</i> tall forest and scattered <i>Melaleuca preissiana</i> and <i>Kunzea glabrescens</i> over scattered introduced herbs. Understorey mostly absent, potentially winter wet.</p>	<p>Low lying, sandy silt.</p>	<p>0.5</p>	<p>N/A</p>	
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Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
					
Cleared areas	Areas with only isolated shrubs and with a groundcover of weedy grasses and herbs.	Various	9.96	N/A	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Water	N/A		0.33	Supports native and introduced seges with floating plant species	

#### 4.1.2 Conservation significant ecological communities

##### ***Banksia dominated woodlands of the SCP IBRA region (PEC)***

The field assessment confirmed the presence of the *Banksia* dominated woodlands of the SCP IBRA region PEC, listed as Priority 3 by DBCA. The PEC differs from the EPBC Act listed *Banksia* woodlands of the SCP TEC in that it has no minimum condition and patch size thresholds. This PEC is associated with VT02, there was 0.26 ha recorded within the survey area Figure 5, Appendix A

#### 4.1.3 Vegetation condition

The condition of the vegetation within the survey area ranged from Very Good to Completely Degraded. The extents of the vegetation condition within the survey area are detailed in Table 10 and mapped in Figure 6 Appendix A

A large proportion of the survey area is in Degraded or worse condition (5.05 ha, 58.3 %). Areas which have been previously cleared of native vegetation and/or selected pruning under existing powerlines have been assigned a condition of Degraded. Disturbance factors include weed invasion, soil dumping and proliferation of informal tracks.

Table 10 Vegetation condition ratings within the survey area

Vegetation Condition	Extent in the survey area (ha)
Completely Degraded (inc. cleared)	13.03
Degraded	1.82
Good	1.46
Very Good	1.00
Total	17.31

#### 4.1.4 Flora diversity

101 flora taxa (including subspecies and varieties) representing 42 families and 84 genera were recorded from the survey area during the field survey. This total composed 52 native taxa and 49 introduced taxa.

Dominant families recorded from the survey area included:

- Fabaceae (17 taxa)
- Myrtaceae (17 taxa)
- Poaceae (10 taxa)

Average species diversity is 12 taxa per Quadrat.

The full list of flora identified within the survey area compiled by quadrat and species inventory by family is provided in Appendix D.

#### 4.1.5 Introduced flora

Forty-five introduced flora species were recorded from the survey area. One introduced species recorded, *Asparagus asparagoides* (Bridal creeper), is listed as a Declared Pest under the *Biosecurity and Management Act 2007* and a WoNS. Five of the introduced plants are recorded as native to WA. The remaining introduced flora species recorded are considered environmental weeds and all have been previously recorded on the Swan Coastal Plain.

#### 4.1.6 Conservation significant flora

No EPBC Act, BC Act listed Threatened flora or Priority flora listed by DBCA were recorded within the survey area.

##### **Likelihood of occurrence assessment**

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

The likelihood of occurrence assessment post-field survey concluded that the majority of species are considered highly unlikely or unlikely to occur in the survey area. A number of potential species are known to occur in dampland habitats, which are present in the survey area, but these are altered and highly weed infested, reducing the likelihood of the presence of these species.

One possible Threatened flora species *Macarthuria keigheryi* was identified on NM, PMST, waHERB and TPFL databases as being located within the survey area. It has also been historically recorded within the Queens Park Regional Regional Open Space.

It was not identified GHD 2019 survey. Possible reasons for this include:

- The previous sightings (Ecoscape 2010) are not within the current survey area
- *Macarthuria keigheryi* can be described as a 'cryptic species'. This is due to its presence primarily after fire, and rapid die-down within 2-3 years following fire.

*Conostylis bracteata* (Priority 3) has been previously recorded in the *Corymbia calophylla* woodland vegetation type by Ecoscape (2010). The *Conostylis* species identified in the current survey did not match *C. bracteata* in some key features, and the species is only shown to be recorded in the northern Perth suburbs on sand and limestone (WA Herbarium 1998 -).

## 5. Conclusion

The vegetation and flora assessment was undertaken in Spring, and the survey area was well surveyed. Much of the area has been significantly altered over many years, although there have been attempts in the last few years to reduce weed cover and replant some parts with local, native species. In summary, the survey identified:

- Seven vegetation types and one water area, of which four patches are in Good or better condition
- One Priority 3 PEC – Banksia dominated woodlands of the SCP IBRA region – in two small areas of Good condition
- Most areas are in Degraded condition or have been cleared
- No EPBC Act/ BC Act listed Threatened flora or Priority flora listed by DBCA were recorded within the survey area
- One plant listed as a Declared Pest and WONs (Bridal Creeper) was recorded
- Species diversity is relatively low, with a large number of introduced species
- The artificial wetland area associated with VT6 includes dense sedge and reed vegetation, which is not diverse and has been previously modified, but provides useful bird habitat.

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# Appendices

# Appendix A Figures

Figure 1 Study area and survey area boundaries

Figure 2 Biological constraints

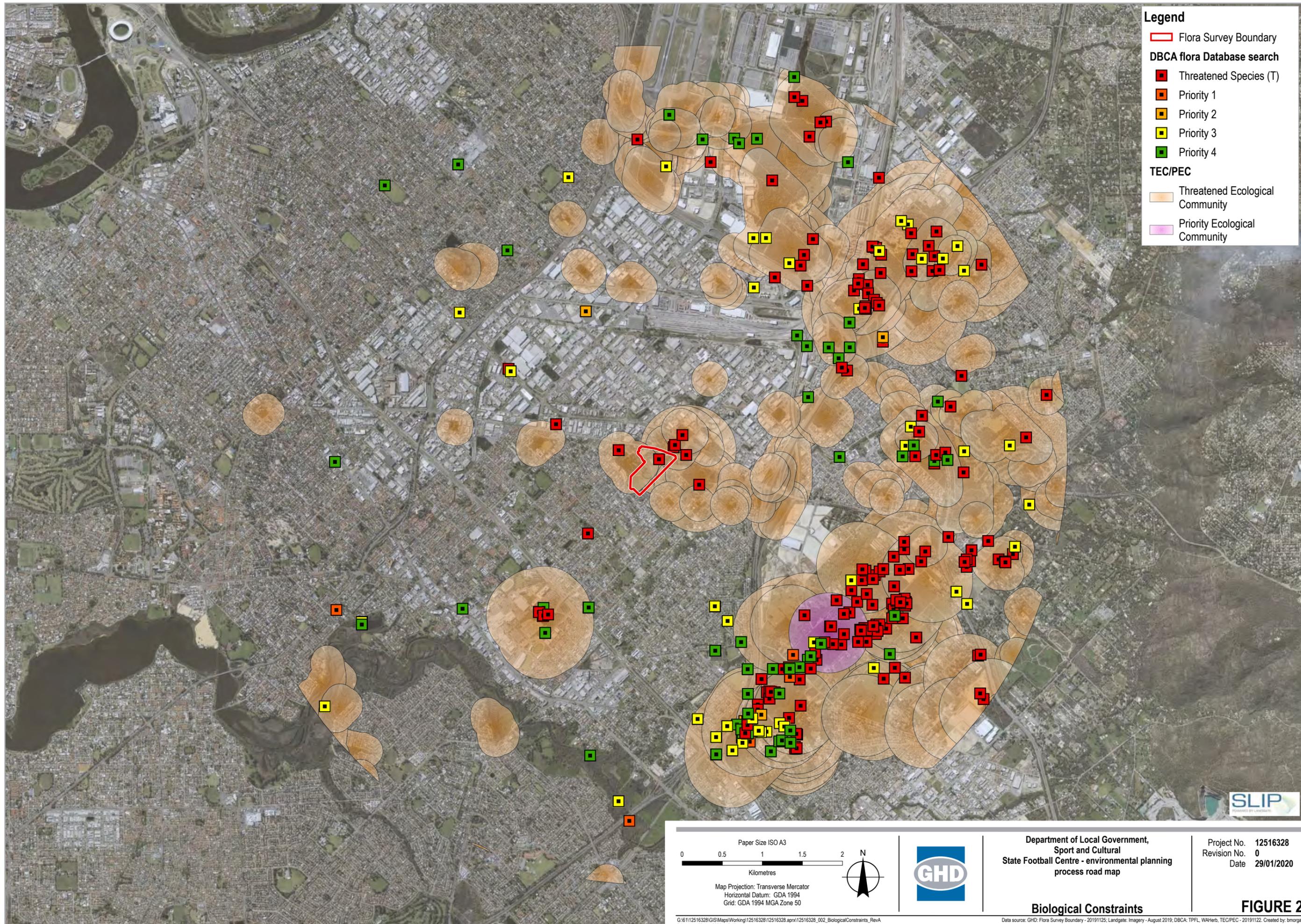
Figure 3 Land use constraints

Figure 4 Hydrological constraints

Figure 5 Vegetation type mapping

Figure 6 Vegetation condition mapping





**Legend**

- Flora Survey Boundary
- DBCAs flora Database search**
- Threatened Species (T)
- Priority 1
- Priority 2
- Priority 3
- Priority 4
- TEC/PEC**
- Threatened Ecological Community
- Priority Ecological Community

Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

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



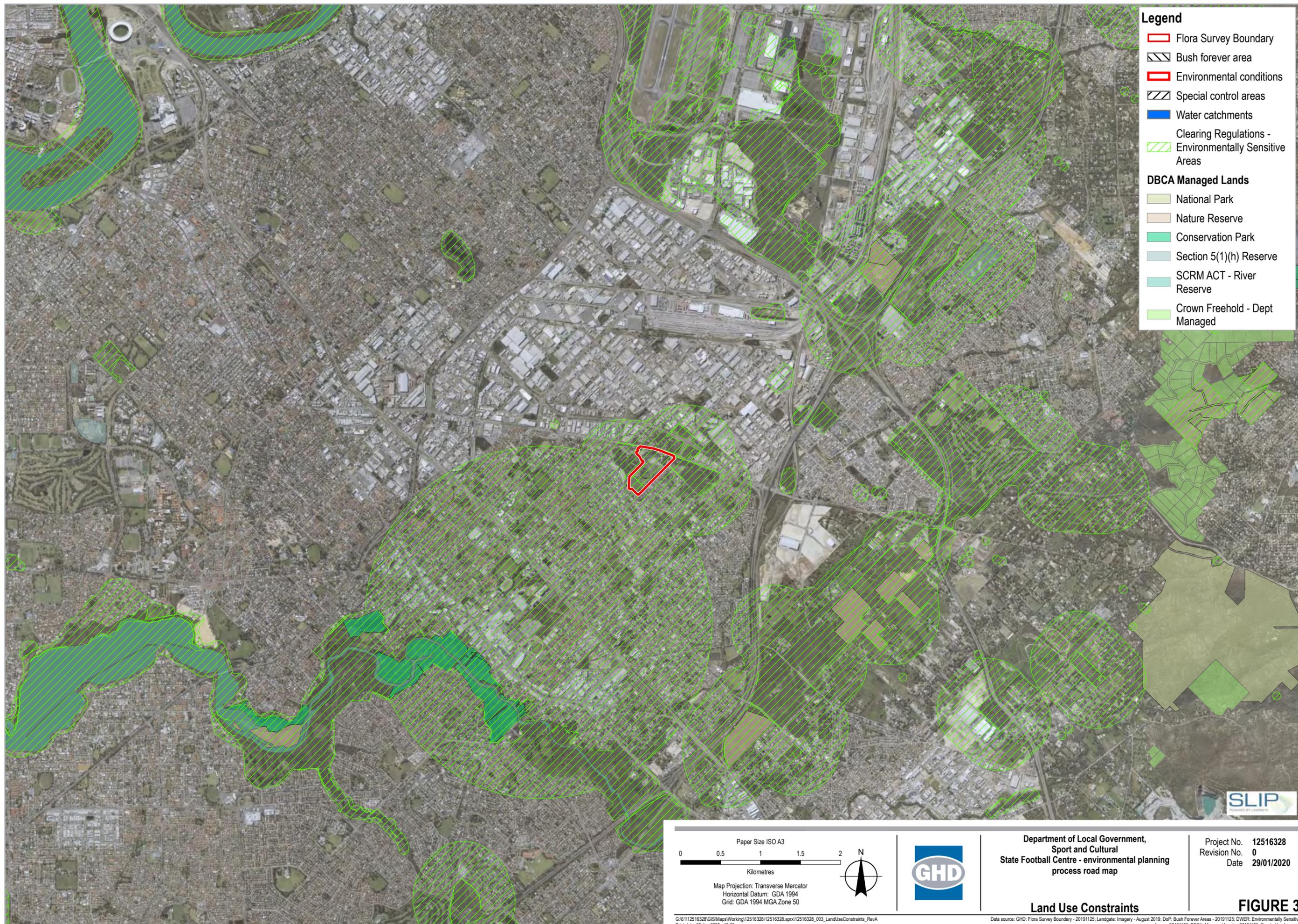
Department of Local Government,  
Sport and Cultural  
State Football Centre - environmental planning  
process road map

Project No. 12516328  
Revision No. 0  
Date 29/01/2020

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Data source: GHD: Flora Survey Boundary - 20191125; Landgate: Imagery - August 2019; DBCA: TPFL, WAHerb, TEC/PEC - 20191122. Created by: bmorgan





**Legend**

- Flora Survey Boundary
- Bush forever area
- Environmental conditions
- Special control areas
- Water catchments
- Clearing Regulations -
- Environmentally Sensitive Areas

**DBCA Managed Lands**

- National Park
- Nature Reserve
- Conservation Park
- Section 5(1)(h) Reserve
- SCRM ACT - River Reserve
- Crown Freehold - Dept Managed

Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

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



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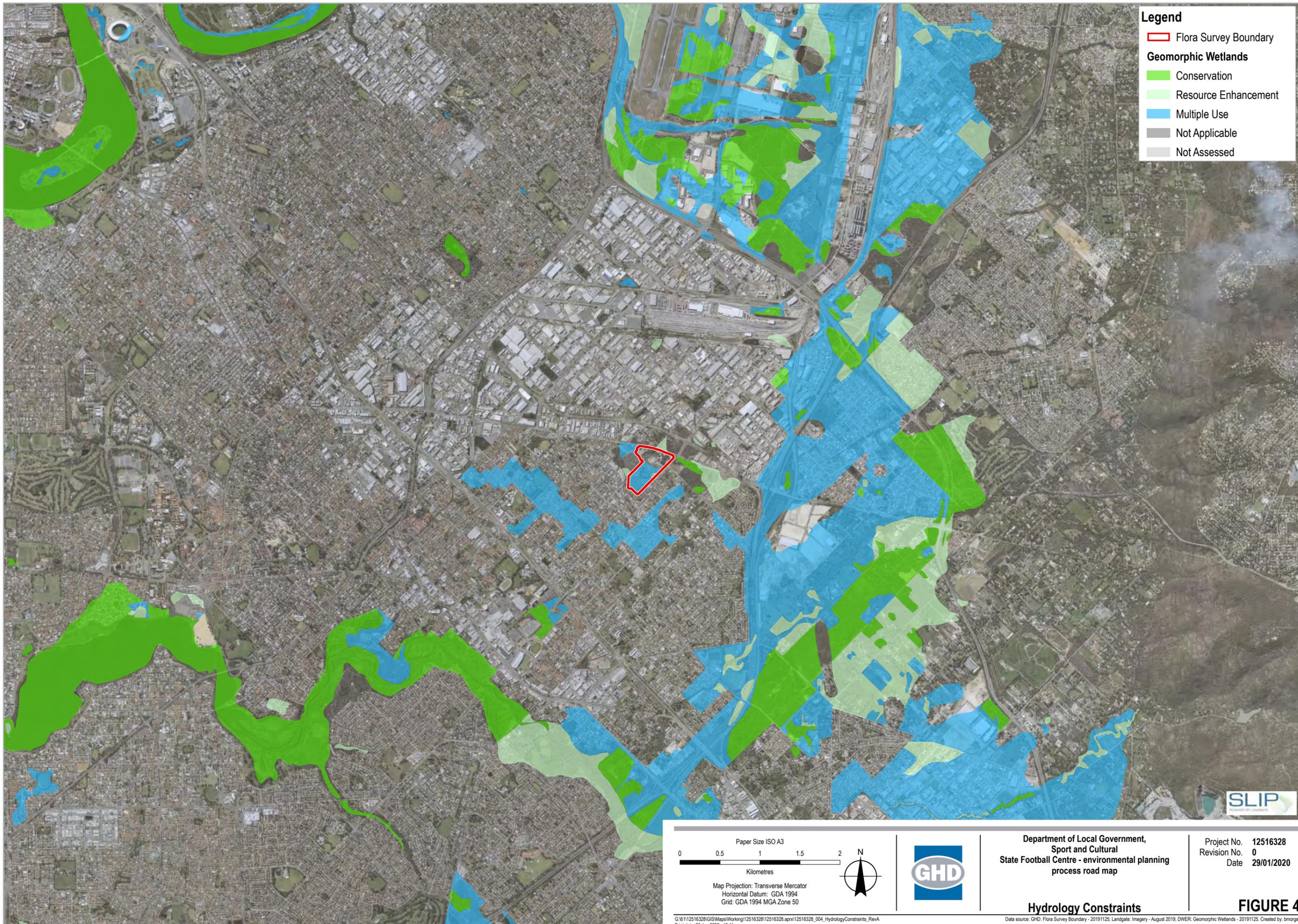
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Revision No. 0  
Date 29/01/2020

**Land Use Constraints**

**FIGURE 3**

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Print date: 29 Jan 2020 - 13:08

Data source: GHD: Flora Survey Boundary - 20191125; Landgate: Imagery - August 2019; DoP: Bush Forever Areas - 20191125; DWER: Environmentally Sensitive Areas - 20191125; DBCA: Managed Lands - 20191125. Created by: bmorgan



**Legend**

- Flora Survey Boundary
- Geomorphic Wetlands**
- Conservation
- Resource Enhancement
- Multiple Use
- Not Applicable
- Not Assessed



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

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



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process road map

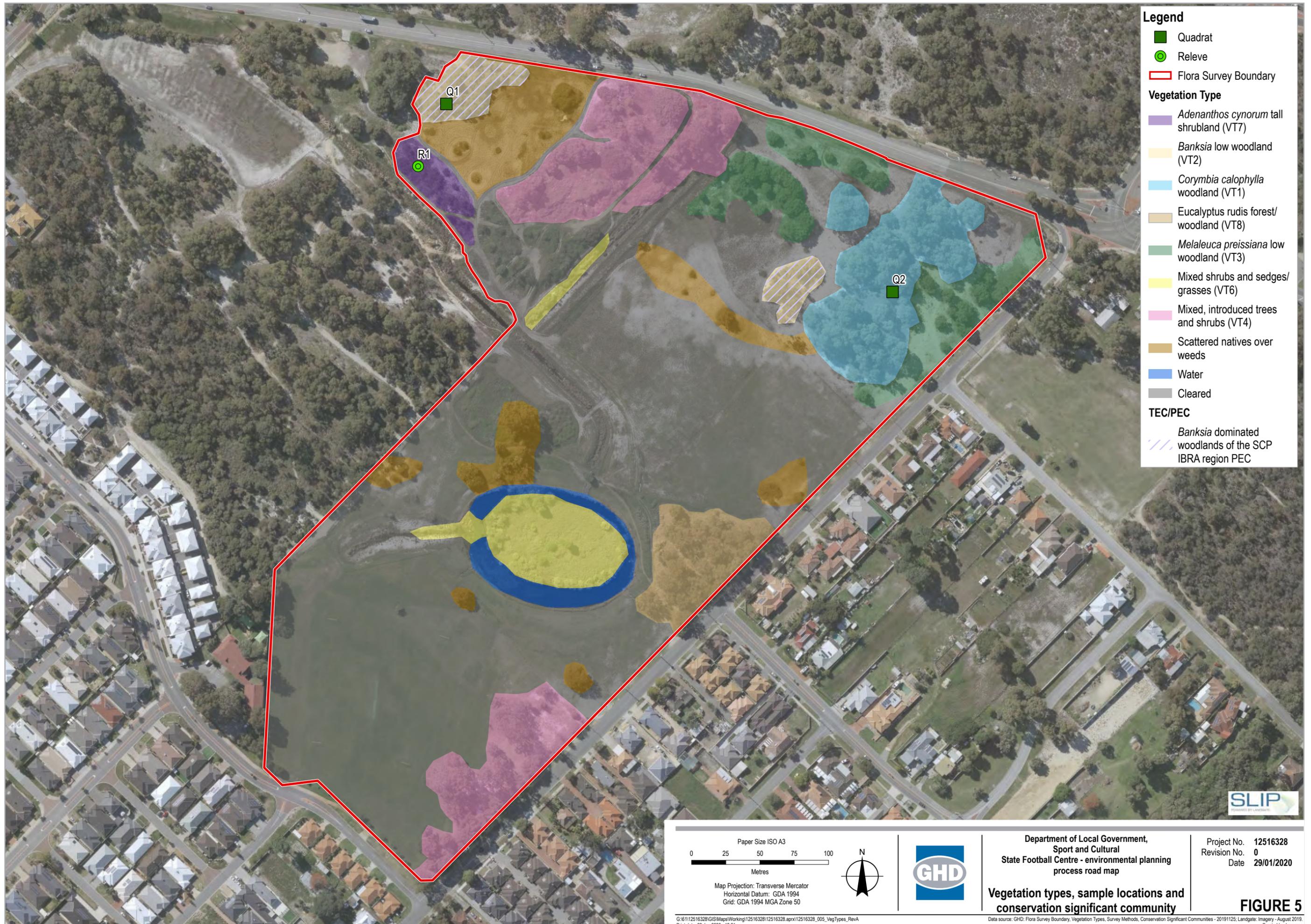
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Revision No. 0  
Date 29/01/2020

**Hydrology Constraints**

**FIGURE 4**

G:\6112516328\GIS\Maps\Working\12516328\12516328.aprx\12516328\_004\_HydrologyConstraints\_RevA  
Print date: 29 Jan 2020 - 13:11

Data source: GHD: Flora Survey Boundary - 20191125; Landgate: Imagery - August 2019; DWER: Geomorphic Wetlands - 20191125. Created by: bmorgan





**Legend**

- Flora Survey Boundary

**Vegetation Type**

- Very Good
- Good
- Degraded
- Completely Degraded

Paper Size ISO A3

0 25 50 75 100

Metres

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




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 process road map

Project No. 12516328  
 Revision No. 0  
 Date 29/01/2020

**Vegetation Condition** **FIGURE 6**

G:\6112516328\GIS\Maps\Working\12516328\12516328.aprx\12516328\_06\_VegCondition\_RevA  
 Print date: 29 Jan 2020 - 13:12

Data source: GHD: Flora Survey Boundary, Vegetation Condition - 20191125; Landgate: Imagery - August 2019. Created by: bmorgan

# Appendix B Relevant background information and conservation code

## Relevant legislation

### Federal Environment Protection and Biodiversity Conservation Act 1999

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

The biological aspects listed as MNES include:

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

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

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

### State Environmental Protection Act 1986

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

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

- a) Native vegetation should not be cleared if it comprises a high level of biodiversity.
- b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
- c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
- d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
- e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
- f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
- g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
- h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
- i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
- j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low

impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

### **State Biodiversity and Conservation Act 2016**

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

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

### **State Wildlife Conservation Act 1950**

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

### **State Biosecurity and Agriculture Management Act 2007**

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

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

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

#### **DPIRD Categories for Declared Pests under the BAM Act**

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

## Background information

### Environmentally Sensitive Areas

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

#### Aspects of ESAs

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

### Reserves and conservation areas

#### Bush Forever

Bush Forever, which was released in December 2000 and proclaimed in 2010, is a Government initiative aimed to retain and protect regionally significant bushland on the Swan Coastal Plain within the Perth Metropolitan Region. Bush Forever aims to protect more than 51,000 hectares of regionally significant bushland within 287 sites across the metropolitan portion of the Swan Coastal Plain (Government of Western Australia (GoWA) 2000). Bush Forever sites constitute ESAs as declared by a notice under Section 51B of the EP Act.

#### Department of Biodiversity, Conservation and Attractions managed lands and waters

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

changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

## **Wetlands**

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil. Approximately 25 percent of the Swan Coastal Plain between Moore River and Mandurah is classified as wetland (Hill et al. 1996).

Though extensive in area, not all wetlands retain significant ecological values due to the concentration of urban and agricultural development in the region. Most wetlands have been cleared, filled or developed over, leaving only 20 percent of all the wetlands that were present on the Swan Coastal Plain prior to European settlement. Of these, an estimated 15 percent of the wetland area has retained high ecological values (Hill et al. 1996).

### **Ramsar Listed Wetlands**

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

### **Nationally important wetlands**

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

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

### **Geomorphic wetlands**

Categorisation of wetlands has been conducted by Hill et al. (1996), delineating Swan Coastal Plain wetlands into levels of protection and management categories. Conservation Category Wetlands are wetlands that support high levels of attributes and functions. Resource Enhancement Wetlands are those that have been partly modified but still support substantial functions and attributes. Multiple Use Wetlands are classified as those wetlands with few attributes that still provide important wetland functions. Multiple Use wetlands have few important ecological attributes and functions remaining.

The Geomorphic Wetlands Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain.

### **Vegetation extent and status**

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level

should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia’s Biological Diversity (ANZECC 2000).

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

### Vegetation condition

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

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

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

### Conservation codes

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

### Ecological communities

#### Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological

Communities (TECs) are protected under the EPBC Act. The DBCA also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

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

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

Categories	Definition
<b>Federal Government Conservation Categories (EPBC Act)</b>	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
<b>Western Australia Conservation Categories</b>	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.
Categories	Definition
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
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### Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	<p>Poorly known ecological communities.</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally <math>\leq 5</math> occurrences or a total area of <math>\leq 100</math> ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
Priority 2	<p>Poorly known ecological communities.</p> <p>Communities that are known from few occurrences with a restricted distribution (generally <math>\leq 10</math> occurrences or a total area of <math>\leq 200</math> ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</p>
Priority 3	<p>Poorly known ecological communities.</p> <p>(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:</p> <p>(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>(iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.</p> <p>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.</p>
Category	Description
Priority 4	<p>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.</p> <p>(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.</p> <p>(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.</p>

Priority 5	<p>Conservation Dependent ecological communities.</p> <p>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.</p>
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### Other significant vegetation

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

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

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

### Flora and fauna

#### Conservation significant flora and fauna

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

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

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

Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)

- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

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

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

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

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

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

Conservation category	Definition
Extinct	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A) A species known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or B) A species that has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A species facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000).
Endangered	A) A species not critically endangered; and B) A species facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Conservation category	Definition
Vulnerable	A) A species not critically endangered or endangered; and B) A species facing a high risk of extinction in the wild in the medium-term, as determined in accordance with the prescribed criteria.
Conservation Dependent	A) The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or B) The following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that Section 180 provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

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

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

### Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	<p>Poorly-known taxa</p> <p>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.</p>
Priority 2	<p>Poorly-known taxa</p> <p>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.</p>

Priority 3	<p>Poorly-known taxa</p> <p>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.</p>
Priority 4	<p>Rare, Near Threatened and other taxa in need of monitoring</p> <p>A. Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.</p> <p>B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.</p>

### Other significant flora

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

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

### Other significant fauna

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

### Introduced plants (weeds)

#### Declared Pests

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

#### Weeds of National Significance

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

- Invasiveness

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

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

# Appendix C Desktop searches

# NatureMap Flora Stats Report

Created By Guest user on 29/10/2019

**Kingdom** Plantae  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 57' 26" E, 32° 00' 02" S  
**Buffer** 5km  
**Group By** Family

<b>Area (ha)</b>		7851.91
<b>Taxa:</b>	Naturalised	221
	Native	837
<b>Endemics:</b>		9
<b>Families:</b>		116
<b>Genera:</b>		404
<b>Conservation Status:</b>	-	999
	1	5
	3	24
	T	16
	4	10
	2	4
<b>MS Status:</b>	-	1040
	PN	16
	MS	2
<b>Rank:</b>	-	929
	forma	4
	subsp.	81
	var.	44

## Top Ten Families

	Species	Records
1. Fabaceae	86	276
2. Cyperaceae	79	354
3. Myrtaceae	75	344
4. Proteaceae	74	395
5. Poaceae	72	230
6. Asteraceae	57	200
7. Orchidaceae	57	142
8. Asparagaceae	34	135
9. Stylidiaceae	34	193
10. Haemodoraceae	30	147

## Top Ten Genera

	Species	Records
1. <i>Schoenus</i>	33	118
2. <i>Stylidium</i>	31	184
3. <i>Drosera</i>	21	99
4. <i>Melaleuca</i>	19	71
5. <i>Acacia</i>	19	70
6. <i>Banksia</i>	17	61
7. <i>Hakea</i>	14	69
8. <i>Thysanotus</i>	13	43
9. <i>Hibbertia</i>	13	37
10. <i>Verticordia</i>	11	86

## <sup>1</sup>Endemic To Query Area

Name ID	Species	Conservation Status
	<i>Avena sp. Yule5</i>	
	<i>Cassytha sp. scps</i>	
	<i>Comesperma sp. Brix1R (possibly virigatum)</i>	
	<i>Conyza sp. Brix1R</i>	
	<i>Conyza sp. Brix4</i>	
48633	<i>Erythrina crista-galli</i>	
2753	<i>Ptilotus pyramidatus</i>	T
	<i>Triglochin sp. Brixton 04 (possibly T. mullerii)</i>	
29491	<i>Vicia tetrasperma</i>	

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.

# NatureMap Fauna Stats report

Created By Guest user on 29/10/2019

**Kingdom** Animalia  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 57' 26" E, 32° 00' 02" S  
**Buffer** 5km  
**Group By** Species Group

<b>Area (ha)</b>		7851.91
<b>Taxa:</b>	Naturalised	11
	Native	323
<b>Endemics:</b>		4
<b>Families:</b>		121
<b>Genera:</b>		243
<b>Conservation Status:</b>	-	309
	3	4
	T	8
	IA	6
	2	1
	4	4
	S	2
<b>MS Status:</b>	-	333
	PN	1
<b>Rank:</b>	-	304
	subsp.	30

## Top Ten Families

	Species	Records
1. Scincidae	17	118
2. Anatidae	15	4268
3. Psittacidae	14	3738
4. Meliphagidae	12	3996
5. Lycosidae	12	70
6. Accipitridae	11	360
7. Elapidae	10	139
8. Rallidae	10	2925
9. Araneidae	8	57
10. Ardeidae	6	431

## Top Ten Genera

	Species	Records
1. <i>Anas</i>	6	2140
2. <i>Falco</i>	5	216
3. <i>Phalacrocorax</i>	4	364
4. <i>Ctenotus</i>	4	25
5. <i>Cracticus</i>	4	1532
6. <i>Cacatua</i>	4	264
7. <i>Calyptorhynchus</i>	4	1850
8. <i>Cormocephalus</i>	4	15
9. <i>Tiliqua</i>	4	19
10. <i>Crinia</i>	3	48

## <sup>1</sup> Endemic To Query Area

Name ID	Species	Conservation Status
	<i>Eurytion incisunguis</i>	
	<i>Holasteron wamuseum</i>	
	<i>Phryganoporus gausapatus</i> subsp. <i>occidentalis</i>	
	<i>Tegenaria atrica</i>	

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.

# NatureMap CS Flora report

Created By Guest user on 29/10/2019

Kingdom Plantae  
 Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)  
 Current Names Only Yes  
 Core Datasets Only Yes  
 Method 'By Circle'  
 Centre 115° 57' 26" E, 32° 00' 02" S  
 Buffer 5km  
 Group By Family

Family	Species	Records
Amaranthaceae	2	5
Apiaceae	3	12
Aponogetonaceae	1	16
Araliaceae	1	11
Asparagaceae	1	2
Asteraceae	1	1
Byblidaceae	1	14
Cyperaceae	12	78
Dasygongonaceae	1	2
Dilleniaceae	1	1
Droseraceae	1	7
Ericaceae	2	10
Fabaceae	2	2
Haemodoraceae	1	3
Haloragaceae	2	3
Macarthuriaceae	1	24
Malvaceae	2	11
Menyanthaceae	1	7
Montiaceae	1	5
Myrtaceae	4	74
Orchidaceae	2	8
Poaceae	1	7
Polygalaceae	2	4
Proteaceae	6	144
Restionaceae	1	1
Rutaceae	1	1
Scrophulariaceae	1	17
Stylidiaceae	3	12
Xanthorrhoeaceae	1	1
<b>TOTAL</b>	<b>59</b>	<b>483</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Amaranthaceae</b>				
1.	2753 <i>Ptilotus pyramidatus</i>		T	Y
2.	11615 <i>Ptilotus sericostachyus</i> subsp. <i>roseus</i>		P1	
<b>Apiaceae</b>				
3.	41801 <i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)		P3	
4.	41810 <i>Eryngium</i> sp. <i>Subdecumbens</i> (G.J. Keighery 5390)		P3	
5.	11132 <i>Platysace ramosissima</i>		P3	
<b>Aponogetonaceae</b>				
6.	141 <i>Aponogeton hexatepalus</i> (Stalked Water Ribbons)		P4	
<b>Araliaceae</b>				
7.	6233 <i>Hydrocotyle lemnoides</i> (Aquatic Pennywort)		P4	
<b>Asparagaceae</b>				
8.	1317 <i>Thysanotus anceps</i>		P3	
<b>Asteraceae</b>				
9.	7831 <i>Angianthus micropodioides</i>		P3	
<b>Byblidaceae</b>				
10.	3178 <i>Byblis gigantea</i> (Rainbow Plant)		P3	
<b>Cyperaceae</b>				
11.	48689 <i>Bolboschoenus fluviatilis</i>		P1	
12.	759 <i>Carex tereticaulis</i>		P3	

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
13.	17605 <i>Eleocharis keigheryi</i>		T	
14.	942 <i>Lepidosperma rostratum</i>		T	
15.	974 <i>Schoenus benthamii</i>		P3	
16.	980 <i>Schoenus capillifolius</i>		P3	
17.	999 <i>Schoenus loliaceus</i>		P2	
18.	1003 <i>Schoenus natans</i> (Floating Bog-rush)		P4	
19.	1008 <i>Schoenus pennisetis</i>		P3	
20.	16280 <i>Schoenus</i> sp. Beaufort (G.J. Keighery 6291)		P1	
21.	17731 <i>Schoenus</i> sp. Waroona (G.J. Keighery 12235)		P3	
22.	1033 <i>Tetragia australiensis</i>		T	
<b>Dasypogonaceae</b>				
23.	1213 <i>Calectasia cyanea</i> (Blue Tinsel Lily)		T	
<b>Dilleniaceae</b>				
24.	5146 <i>Hibbertia montana</i>		P4	
<b>Droseraceae</b>				
25.	3115 <i>Drosera occidentalis</i> (Western Sundew)		P4	
<b>Ericaceae</b>				
26.	6309 <i>Andersonia gracilis</i>		T	
27.	48297 <i>Styphelia filifolia</i>		P3	
<b>Fabaceae</b>				
28.	16317 <i>Isotropis cuneifolia</i> subsp. <i>glabra</i>		P3	
29.	20462 <i>Jacksonia gracillima</i>		P3	
<b>Haemodoraceae</b>				
30.	1469 <i>Haemodorum loratum</i>		P3	
<b>Haloragaceae</b>				
31.	6178 <i>Haloragis scoparia</i>		P1	
32.	6193 <i>Myriophyllum echinatum</i>		P3	
<b>Macarthuriaceae</b>				
33.	17106 <i>Macarthuria keigheryi</i>		T	
<b>Malvaceae</b>				
34.	5025 <i>Lasiopetalum bracteatum</i> (Helena Velvet Bush)		P4	
35.	45081 <i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>		P3	
<b>Menyanthaceae</b>				
36.	36200 <i>Ornduffia submersa</i>		P4	
<b>Montiaceae</b>				
37.	20096 <i>Calandrinia</i> sp. Piawaning (A.C. Beauglehole 12257)		P1	
<b>Myrtaceae</b>				
38.	45402 <i>Babingtonia urbana</i> (Coastal Plain Babingtonia)		P3	
39.	13653 <i>Calytrix breviseta</i> subsp. <i>breviseta</i>		T	
40.	37683 <i>Melaleuca viminalis</i>		P2	
41.	14714 <i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>		P4	
<b>Orchidaceae</b>				
42.	1596 <i>Caladenia huegelii</i> (Grand Spider Orchid)		T	
43.	1637 <i>Diuris purdiei</i> (Purdie's Donkey Orchid)		T	
<b>Poaceae</b>				
44.	38480 <i>Austrostipa bronwenae</i>		T	
<b>Polygalaceae</b>				
45.	14663 <i>Comesperma griffinii</i>		P2	
46.	4560 <i>Comesperma rhadinocarpum</i> (Slender-fruited Comesperma)		P3	
<b>Proteaceae</b>				
47.	32211 <i>Banksia mimica</i> (Summer Honeypot)		T	
48.	32138 <i>Banksia pteridifolia</i> subsp. <i>vernalis</i>		P3	
49.	13999 <i>Conospermum undulatum</i>		T	
50.	2107 <i>Grevillea thelemanniana</i> (Spider Net Grevillea)		T	
51.	29775 <i>Isopogon drummondii</i>		P3	
52.	18590 <i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)		T	
<b>Restionaceae</b>				
53.	19241 <i>Lepyrodia curvescens</i>		P2	
<b>Rutaceae</b>				
54.	4444 <i>Boronia tenuis</i> (Blue Boronia)		P4	

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Scrophulariaceae</b>				
55.	17150 <i>Eremophila glabra</i> subsp. <i>chlorella</i>		T	
<b>Stylidiaceae</b>				
56.	18564 <i>Stylidium aceratum</i>		P3	
57.	7756 <i>Stylidium longitubum</i> (Jumping Jacks)		P4	
58.	7771 <i>Stylidium periscelanthum</i> (Pantaloons Triggerplant)		P3	
<b>Xanthorrhoeaceae</b>				
59.	19338 <i>Chamaescilla gibsonii</i>		P3	

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.

# NatureMap CS Fauna report

Created By Guest user on 29/10/2019

**Kingdom** Animalia  
**Conservation Status** Conservation Taxon (T, X, IA, S, P1-P5)  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 57' 26" E, 32° 00' 02" S  
**Buffer** 5km  
**Group By** Species Group

Species Group	Species	Records
Bird	11	1265
Invertebrate	6	16
Mammal	5	45
Reptile	3	9
<b>TOTAL</b>	<b>25</b>	<b>1335</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Bird</b>				
1.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
2.	24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black Cockatoo)		T	
3.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
4.	48400 <i>Calyptorhynchus</i> sp. (white-tailed black cockatoo)		T	
5.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
6.	48587 <i>Hydroprogne caspia</i> (Caspian Tern)		IA	
7.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
8.	48591 <i>Pandion cristatus</i> (Osprey, Eastern Osprey)		IA	
9.	48597 <i>Thalasseus bergii</i> (Crested Tern)		IA	
10.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
11.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
<b>Invertebrate</b>				
12.	48574 <i>Australotomurus morbidus</i> (cemetery springtail, Guildford springtail)		P3	
13.	48581 <i>Glossurocolletes bilobatus</i> (a short-tongued bee (southwest), short-tongued bee)		P2	
14.	48935 <i>Idiosoma sigillatum</i> (Swan Coastal Plain shield-backed trapdoor spider)		P3	
15.	33983 <i>Leioproctus douglasiellus</i> (a short-tongued bee)		T	
16.	33984 <i>Neopasiphae simplicior</i> (a short-tongued bee)		T	
17.	34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel)		T	
<b>Mammal</b>				
18.	24092 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
19.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
20.	48588 <i>Isodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
21.	48022 <i>Notamacropus irma</i> (Western Brush Wallaby)		P4	
22.	48070 <i>Phascogale tapoatafa</i> subsp. <i>wambenger</i> (South-western Brush-tailed Phascogale, Wambenger)		S	
<b>Reptile</b>				
23.	25147 <i>Lerista lineata</i> (Perth Slider, Lined Skink)		P3	
24.	25249 <i>Neelaps calonotos</i> (Black-striped Snake, black-striped burrowing snake)		P3	
25.	25345 <i>Pseudemys umbrina</i> (Western Swamp Tortoise, Western Swamp Turtle)		T	

**Conservation Codes**  
T - Rare or likely to become extinct  
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1 - Priority 1  
2 - Priority 2  
3 - Priority 3  
4 - Priority 4  
5 - Priority 5

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.



# EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/10/19 14:20:42

## [Summary](#)

## [Details](#)

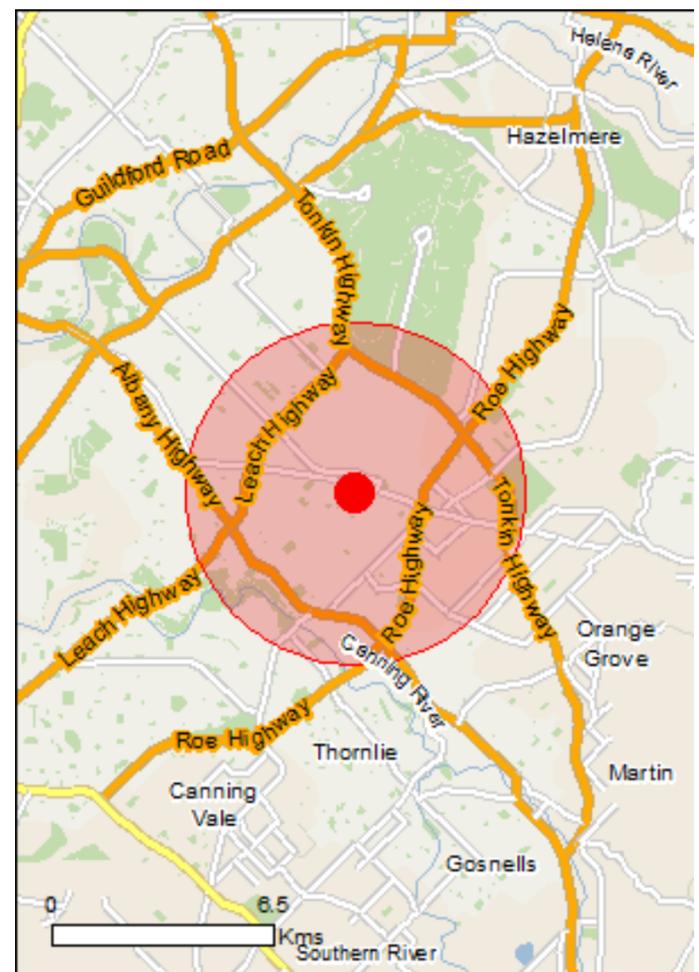
[Matters of NES](#)

[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: 5.0Km



# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	4
<a href="#">Listed Threatened Species:</a>	56
<a href="#">Listed Migratory Species:</a>	25

## 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.

<a href="#">Commonwealth Land:</a>	2
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	32
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	5
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	46
<a href="#">Nationally Important Wetlands:</a>	2
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### 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
<a href="#">Banksia Woodlands of the Swan Coastal Plain ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Clay Pans of the Swan Coastal Plain</a>	Critically Endangered	Community likely to occur within area
<a href="#">Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain</a>	Endangered	Community known to occur within area
<a href="#">Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community</a>	Critically Endangered	Community may occur within area

### Listed Threatened Species

[ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus baudinii</a> Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Roosting known to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<b>Insects</b>		
<a href="#">Leioproctus douglasiellus</a> a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
<b>Mammals</b>		
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Setonix brachyurus</a> Quokka [229]	Vulnerable	Species or species habitat may occur within area
<b>Other</b>		
<a href="#">Westralunio carteri</a> Carter's Freshwater Mussel, Freshwater Mussel	Vulnerable	Species or species

Name	Status	Type of Presence
[86266]		habitat known to occur within area
<b>Plants</b>		
<a href="#">Acacia anomala</a> Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat may occur within area
<a href="#">Andersonia gracilis</a> Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
<a href="#">Austrostipa bronwenae</a> [87808]	Endangered	Species or species habitat known to occur within area
<a href="#">Banksia mimica</a> Summer Honey-pot [82765]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calytrix breviseta subsp. breviseta</a> Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area
<a href="#">Chamelaucium sp. Gingin (N.G.Marchant 6)</a> Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
<a href="#">Conospermum undulatum</a> Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diplolaena andrewsii</a> [6601]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diuris drummondii</a> Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diuris purdiei</a> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
<a href="#">Eleocharis keigheryi</a> Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Eremophila glabra subsp. chlorella</a> [84927]	Endangered	Species or species habitat known to occur within area
<a href="#">Eucalyptus x balanites</a> Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
<a href="#">Grevillea curviloba subsp. incurva</a> Narrow curved-leaf Grevillea [64909]	Endangered	Species or species

Name	Status	Type of Presence
<a href="#">Grevillea thelemanniana</a> Spider Net Grevillea [32835]	Critically Endangered	habitat likely to occur within area Species or species habitat known to occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
<a href="#">Macarthuria keigheryi</a> Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
<a href="#">Ptilotus pyramidatus</a> Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Synaphea sp. Fairbridge Farm (D. Papenfus 696)</a> Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Thelymitra dedmaniarum</a> Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
<a href="#">Thelymitra stellata</a> Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta</a> Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Manta alfredi</a> 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
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
<a href="#">Pandion haliaetus</a> Osprey [952]		habitat may occur within area  Breeding known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely 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 - Defence - AIRTC CANNINGTON

### 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat likely to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Thalassarche cauta</a> Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Mammals

Name	Threatened	Type of Presence
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Canning River	WA
Dundas Road	WA
Kenwick Wetlands	WA
Unnamed WA37997	WA
Unnamed WA49363	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 Resources Audit, 2001.	

Name	Status	Type of Presence
<b>Birds</b>		
<i>Acridotheres tristis</i> Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
<i>Anas platyrhynchos</i> Mallard [974]		Species or species habitat likely to occur within area
<i>Carduelis carduelis</i> European Goldfinch [403]		Species or species habitat likely to occur within area
<i>Columba livia</i> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<i>Passer domesticus</i> House Sparrow [405]		Species or species habitat likely to occur within area
<i>Passer montanus</i> Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
<i>Streptopelia chinensis</i> Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Anredera cordifolia 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 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 Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara 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 African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla 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 Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla 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

Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
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#### Nationally Important Wetlands

[ Resource Information ]

Name	State
<a href="#">Brixton Street Swamps</a>	WA
<a href="#">Perth Airport Woodland Swamps</a>	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

-32.00046 115.95661

# Appendix D Flora data

Flora species list by site

Quadrat data

Flora likelihood of occurrence

## Flora species list

Species	Status	Q1	Q2	Opportunistic
<i>Acacia iteaphylla</i>	*Planted			X
<i>Acacia pulchella</i>				X
<i>Acacia saligna</i>				X
<i>Acacia wildenowiana</i>				X
<i>Adenanthos cygnorum</i>	Planted			X
<i>Agonis flexuosa</i>	Planted			X
<i>Allocasuarina fraseriana</i>				X
<i>Arctotheca calendula</i>	*			X
<i>Asparagus asparagoides</i>	*DP & WoNS	X		
<i>Astartea scoparia</i>				X
<i>Avena barbata</i>	*			X
<i>Azolla rubra</i>				X Water plant
<i>Banksia attenuata</i>		X		
<i>Banksia menziesii</i>		X		
<i>Baumea articulata</i>				X
<i>Bossiaea eriocarpa</i>				X
<i>Briza maxima</i>	*	X	X	
<i>Briza minor</i>	*			X
<i>Bromus diandrus</i>	*			X
<i>Burchardia congesta</i>			X	
<i>Callistemon sp.</i>	Planted			X
<i>Callitris sp.</i>	Planted			X
<i>Centella asiatica</i>				X
<i>Chamaecytisys palmensis</i>	*			X
<i>Citharexylum spinosum</i>	*Planted			X
<i>Constylis sp.</i>				X
<i>Cortaderia selloana</i>	*			X
<i>Corymbia calophylla</i>		X	X	
<i>Corynotheca micrantha var. micrantha</i>				X
<i>Cynodon dactylon</i>	*			X
<i>Dasypogon bromeliifolius</i>		X	X	
<i>Daviesia incrassata</i>				X
<i>Daviesia physodes</i>				X
<i>Desmocladius fasciculatus</i>				X
<i>Desmocladius flexuosa</i>			X	
<i>Eragrostis curvula</i>	*			X
<i>Erharta calycinus</i>	*	X		
<i>Erythrina indica</i>	*Planted			X
<i>Eucalyptus cladocalyx</i>	*Planted			X
<i>Eucalyptus marginata</i>				X
<i>Eucalyptus rudis</i>				X
<i>Eucalyptus sp.</i>	*Planted			X
<i>Eucalyptus todtiana</i>				X
<i>Euphorbia terracina</i>	*			X
<i>Ficinia nodosa</i>				X
<i>Ficus sp.</i>	* Planted			X

Species	Status	Q1	Q2	Opportunistic
<i>Freesia sp.</i>	*			X
<i>Fumaria capreolata</i>	*			X
<i>Gladiolus cayophyllaceus</i>	*		X	
<i>Gompholobium tomentosum</i>				X
<i>Grevillea robusta</i>	*Planted			X
<i>Hibbertia hypericoides</i>		X		
<i>Hypocalymma robustum</i>				X
<i>Hypochoeris glabra</i>	*			X
<i>Ipomoea sp.</i>	*			X
<i>Isolepis cyperoides</i>				X
<i>Jacksonia floribunda</i>				X
<i>Jacksonia furcellata</i>			X	
<i>Jacksonia sternbergiana</i>				X
<i>Juncus pallidus</i>				X
<i>Kennedia prostrata</i>				X
<i>Kunzea glabrescens</i>		X		
<i>Lantana camera</i>	*			X
<i>Laxmannia squarrosa</i>	*			X
<i>Lechenaultia floribunda</i>				X
<i>Lemna disperma</i>				X water plant
<i>Lepidosperma pubisquameum</i>		X		X
<i>Leptospermum laevigatum</i>	*	X		X
<i>Lolium sp.</i>	*			X
<i>Lomandra sp.</i>				X
<i>Lophostomon confertus</i>	*Planted			X
<i>Macrozamia reidleyi</i>		X		
<i>Melaleuca lateritia</i>	Planted			X
<i>Melaleuca preissiana</i>				X
<i>Melia azedarach</i>	*Planted			X
<i>Mesomelaena pseudostygia</i>				X
<i>Microtis media subsp media</i>				X
<i>Oenothera sp.</i>	*			X
<i>Olea europea</i>	*Planted			X
<i>Patersonia occidentalis</i>			X	X
<i>Pelargonium capitatum</i>	*			X
<i>Pennisetum clandestinum</i>	*			X
<i>Phlebocarya ciliata</i>				X
<i>Poranthera microphylla</i>				X
<i>Protea sp.</i>	*			X
<i>Ricinus communis</i>	*			X
<i>Romulea rosea</i>	*			
<i>Schinus terebinthifolia</i>	*			X
<i>Scholtzia involucrata</i>				X
<i>Sonchus sp.</i>	*			X
<i>Trachyandra divaricata</i>	*			X
<i>Tricoryne elatior</i>			X	
<i>Trifolium avense</i>	*			X
<i>Typha orientalis</i>	*			

Species	Status	Q1	Q2	Opportunistic
<i>Ursinia anthemoides</i>	*			X
<i>Verticordia densiflora</i> subsp. <i>densiflora</i>				X
<i>Viminaria juncea</i>				X
<i>Wahlenbergia capensis</i>	*			X
<i>Watsonia</i> sp.		X		
<i>Xanthorrhoea ?brunonis</i>				X
<i>Xanthorrhoea preissii</i>			X	

\* Introduced species

## Quadrat data

Site ID: Queen's Park	Q01	VT: Banksia woodland	VT02
Type:	Quadrat	Size: 10 x 10 m	
Date:	22/10/19	Described by: Anna Napier GHD	
Co-ordinates:			N/A
Landform and slope:	Plain, negligible		
Drainage:	Good		
Soil colour & type:	Grey sand		
Surface Component	Loose soil 5% Humus/litter 60%		
Vegetation condition:	Degraded		
Fire age & intensity:	Old, negligible fire damage		
Disturbances:	Weeds		
Leaf litter:	Plentiful		
Wood litter:	N/A		

Family	Taxon	Status	Cover (%)	Height (m)
Asparagaceae	<i>Asparagus asparagoides</i>	*DP & WoNS	<2T<10	0.4
Protaceae	<i>Banksia attenuata</i>		<10	7.0
Protaceae	<i>Banksia menziesii</i>		70-30	7.0
Poaceae	<i>Briza maxima</i>	*	<2N	0.25
Poaceae	<i>Cynodon dactylon</i>	*	<2T<10	0.15
Dasypogonaceae	<i>Dasypogon bromelifolius</i>		<2T<10	0.3
Poaceae	<i>Ehrharta calycinus</i>	*	<2N	0.6
Dillaniaceae	<i>Hibbertia hypericoides</i>		<2T<10	0.6
Myrtaceae	<i>Kunzea glabrescens</i>		30-10	2.0
Myrtaceae	<i>Leptospermum laevigatum</i>	*	<2T<10	2.0
Fabaceae	<i>Macrozamia reidlei</i>		<10	1.4
Iridaceae	<i>Watsonia sp.</i>	*	70-30	0.8

## Photo Q1



Site ID: Queen's park	Q02	VT: Marri woodland	VT0?
Type:	Quadrat	Size: 10 x 10 m	
Date:	22/10/2019	Described by: Anna Napier, GHD	
Co-ordinates:	MGA 50	392866.3 mE	6449146 mN
Landform and slope:	Plain, negligible		
Drainage:	Good		
Soil colour & type:	Sandy loam, grey		
Surface Component	Humus/litter 10%		
Vegetation condition:	Very good		
Fire age & intensity:	Old, negligible fire damage		
Disturbances:	Weeds		
Leaf litter:	Plentiful		
Wood litter:	Sparse		

Family	Taxon	Status	Cover (%)	Height (m)
Cochiacaceae	<i>Burchardia congesta</i>			0.4
Haemodoraceae	<i>Conostylis sp.</i>			0.2
Myrtaceae	<i>Corymbia calophylla</i>		70-30	14
Dasypogonaceae	<i>Dasypogon bromeliifolius</i>		70-30	0.3
Restionaceae	<i>Desmocladius fasciculatus</i>			0.2
Restionaceae	<i>Desmocladius flexuosa</i>		100-70	0.15
Iridaceae	<i>Gladiolus cayophyllaceus</i>		<2T<10	0.6
Fabaceae	<i>Jacksonia furcellata</i>		<2T<10	0.6
Iridaceae	<i>Patersonia occidentalis</i>		<2T<10	0.3
Araliaceae	<i>Tricoryne elatior</i>		<2T<10	0.3
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>		<10	<1.8

### Photo Q2





### Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within survey area from field survey results.
Likely	Species previously recorded within 5 km and large areas of suitable habitat occur in the project area.
Possible	Species previously recorded within 5 km and areas of suitable habitat occur/may occur in the project area.
Unlikely	Species previously recorded within 5 km, but suitable habitat does not occur in the project area.
Highly unlikely	Species not previously recorded within 5 km, suitable habitat does not occur in the project area and/or the project area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Source information - desktop searches

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

TPFL and WAHERB – records of threatened flora from TPFL and WAHERB database searches within the study area

NM – DBCA *NatureMap* (accessed May 2018)

### Flora likelihood of occurrence assessment

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Acacia anomala</i>		T	VU	x	x	x	Slender, rush-like shrub, 0.2-0.5 m high. Fl. yellow, Aug to Sep. Lateritic soils. Slopes.	Highly unlikely- suitable habitat does not occur in the project area
<i>Acacia benthamii</i>		P2			x		Shrub, ca 1 m high. Fl. yellow, Aug to Sep. Sand. Typically on limestone breakaways.	Highly unlikely- suitable habitat does not occur in the project area
<i>Acacia horridula</i>		P3			x		Harsh, slender, single-stemmed shrub, 0.3-0.6(-1) m high. Fl. yellow, May to Aug. Gravelly soils over granite, sand. Rocky hillsides.	Highly unlikely- suitable habitat does not occur in the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Acacia lasiocarpa</i> var. <i>bracteolata long peduncle variant</i> (G.J. eighery 5026)		P1			x		Shrub, 0.4-1.5 m high. Fl. yellow, May or Aug. Grey or black sand over clay. Swampy areas, winter wet lowlands.	Unlikely- suitable habitat is highly altered in the project area
<i>Acacia oncinophylla</i> subsp. <i>patulifolia</i>		P4			x		Shrub, 0.5-2.5(-3) m high, 'minni-ritchi' bark, phyllodes 4-9 cm long, 3-6 mm wide. Fl. yellow, Aug to Nov or Nov to Dec. Granitic soils, occasionally on laterite.	Highly unlikely- suitable habitat does not occur in the project area
<i>Amanita preissii</i>		P3			x		No habitat description	Unlikely – suitable habitat in the project area is highly degraded
<i>Amanita quenda</i>		P1			x		No habitat description	Unlikely – suitable habitat in the project area is highly degraded
<i>Amanita wadjukioru</i>		P3			x			Unlikely – suitable habitat in the project area is highly degraded
<i>Andersonia gracilis</i>		T	EN	x	x	x	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple, Sep to Nov. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Unlikely – suitable habitat in yhe project area is highly degraded
<i>Andersonia</i> sp. <i>Blepharifolia</i> (F. & J. Hort 1919)		P2			x		No habitat description	Unlikely - suitable habitat in the project area is highly degraded

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Angianthus micropodioides</i>		P3		x			Erect or decumbent annual, herb, 0.03-0.15 m high. Fl. yellow-white, Nov to Dec or Jan to Feb. Saline sandy soils. River edges, saline depressions, claypans.	Unlikely – suitable habitat does not occur within the project area
<i>Aponogeton hexatepalus</i>	Stalked Water Ribbons	P4		x	x		Rhizomatous or cormous, aquatic perennial, herb, leaves floating. Fl. green-white, Jul to Oct. Mud. Freshwater: ponds, rivers, claypans.	Possible – suitable habitat occurs within the project area
<i>Anthocercis gracilis</i>		T	EN		x		Erect, spindly shrub, to 0.6(-1) m high. Fl. yellow-green, Sep to Oct. Sandy or loamy soils. Granite outcrops.	Unlikely – suitable habitat does not occur within the project area
<i>Austrostipa bronwenae</i>		T	EN	x	x	x	No description available	Unlikely – the project area is mostly degraded
<i>Babingtonia urbana</i>	Coastal Plain Babingtonia	P3		x	x		Shrub 0.4 to 0.7 m high with erect stems. Fl. White to pale pink. Jan to March. Sandy soils in damp, swampy areas.	Possible – suitable habitat occurs within the project area
<i>Banksia mimica</i>	Summer Honeypot	T	EN	x	x	x	Prostrate, lignotuberous shrub, 0.15-0.4 m high. Fl. yellow-brown, Dec or Jan to Feb. White or grey sand over laterite, sandy loam.	Unlikely – suitable habitat not present.
<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>		P3		x	x		Prostrate, lignotuberous shrub, to 0.4 m high. Fl. cream-white/yellow, Sep to Oct. White/grey sand over laterite.	Unlikely – suitable habitat not present.

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Bolboschoenus fluviatilis</i>		P1		x	x		No description available	Unlikely – suitable habitat in the area is highly degraded
<i>Boronia tenuis</i>	Blue Boronia	P4		x	x		Procumbent or erect & slender shrub, 0.1-0.5 m high. Fl. blue/pink-white, Aug to Nov. Laterite, stony soils, granite.	Unlikely – suitable habitat not present within the project area
<i>Byblis gigantea</i>	Rainbow Plant	P3		x	x		Small, branched perennial, herb (or sub-shrub), to 0.45 m high. Fl. pink-purple/white, Sep to Dec or Jan. Sandy-peat swamps. Seasonally wet areas	Unlikely – suitable habitat is highly degraded within the project area
<i>Caladenia huegelii</i>	Grand Spider Orchid	T	EN	x	x	x	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green & cream & red, Sep to Oct. Grey or brown sand, clay loam.	Unlikely – suitable habitat is highly degraded within the project area
<i>Calandrinia</i> sp. <i>Piawaning</i> (A.C. Beauglehole 12257)		P1		x	x		Decumbent to erect annual, herb, to 0.08 m high. Fl. pink, Oct. Brown/gray silty sandy loam over granite. Near pools, small rise within large saline valley flats, disturbed shrubland.	Highly Unlikely – suitable habitat does not occur within the project area
<i>Calothamnus accedens</i>		P4			x		Erect & slender shrub, to 1.8 m high. Fl. pink-red. Sandy soils over laterite. Road verge.	Highly unlikely- suitable habitat does not occur in the project area
<i>Calytrix breviseta</i> subsp. <i>breviseta</i>		T	EN	x	x	x	Shrub, 0.4-1 m high. Fl. purple-blue, Oct to Nov. Sandy clay. Swampy flats.	Unlikely – suitable habitat is highly degraded within the project area
<i>Carex tereticaulis</i>		P3		x	x		Monoecious, rhizomatous, tufted perennial, grass-like or herb (sedge), 0.7 m high. Fl.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
							brown, Sep to Oct. Black peaty sand.	
<i>Chamaescilla gibsonii</i>		P3		x	x		Clumped tuberous, herb. Fl. blue, Sep. Clay to sandy clay. Winter-wet flats, shallow water-filled claypans.	Unlikely – suitable habitat is highly degraded within the project area
<i>Chamelaucium sp. Gingin (N.G. Marchant 6)</i>		T	EN	x	x		No description available.	Highly unlikely- known location is in a different habitat
<i>Comesperma griffinii</i>		P2		x	x		Annual or perennial, herb, to 0.15 m high. Fl. white, Oct. Yellow or grey sand. Plains.	Unlikely – suitable habitat is highly degraded within the project area
<i>Comesperma rhadinocarpum</i>	Slender-fruited Comesperma	P3		x	x		Perennial, herb. Fl. blue, Oct to Nov. Sandy soils.	Unlikely – suitable habitat is highly degraded within the project area
<i>Conospermum undulatum</i>		T	VU	x	x	x	Erect, compact shrub, 0.6-2 m high. Fl. white-other, May to Oct. Grey or yellow-orange clayey sand.	Possible – suitable habitat occurs within the project area
<i>Darwinia apiculata</i>					x		Densely branched shrub, 0.4-0.5 m high. Fl. green & yellow/red, Oct. Lateritic soils.	Highly unlikely- suitable habitat does not occur in the project area
<i>Diplolaena andrewsii</i>		T	EN			x	Erect shrub, 0.5-1 m high, inner involucre bracts glabrous, leaves broadly cordate. Fl. red, Jul to Oct. Loam, clay. Granite outcrops & hillsides.	Highly unlikely- suitable habitat does not occur in the project area
<i>Diuris drummondii</i>		T	VU			x	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow, Nov to	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
							Dec or Jan. Low-lying depressions, swamps.	
<i>Diuris micrantha</i>		T	VU	x		x	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow & brown, Sep to Oct. Brown loamy clay. Winter-wet swamps, in shallow water.	Unlikely – suitable habitat is highly degraded within the project area
<i>Diuris purdiei</i>	Purdie's Donkey Orchid	T	EN		x	x	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow, Sep to Oct. Grey-black sand, moist. Winter-wet swamps	Unlikely – suitable habitat is highly degraded within the project area
<i>Drakaea elastica</i>		T	EN	x		x	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow, Oct to Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Unlikely – suitable habitat is highly degraded within the project area
<i>Drosera occidentalis</i>	Western Sundew	P4		x	x		Fibrous-rooted, rosetted perennial, herb, to 0.025 m high. Fl. pink/white, Oct to Dec or Jan.	Unlikely – suitable habitat is highly degraded within the project area
<i>Eleocharis keigheryi</i>		T	VU	x	x	x	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green, Aug to Nov. Clay, sandy loam. Emergent in freshwater: creeks, claypans	Unlikely – suitable habitat is highly degraded within the project area
<i>Eremophila glabra</i> subsp. <i>chlorella</i>		T	EN	x	x	x	Prostrate & spreading or sprawling shrub, 0.2-1 m high. Fl. green-yellow, Jul to Nov. Sandy clay. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)		P3		x	x			Unlikely – suitable habitat does not occur within the project area
<i>Eryngium</i> sp. <i>Subdecumbens</i> (G.J. Keighery 5390)		P3			x		No habitat information.	Unlikely – suitable habitat is highly degraded within the project area
<i>Eucalyptus x balanites</i>		T	EN			x	(Mallee), to 5 m high, bark rough, flaky. Fl. white, Oct to Dec or Jan to Feb. Sandy soils with lateritic gravel.	Highly unlikely- suitable habitat does not occur in the project area
<i>Grevillea curviloba</i> subsp. <i>incurva</i>		T	EN	x		x	Prostrate to erect shrub, 0.1-2.5 m high. Fl. white-cream, Aug to Sep. Sand, sandy loam. Winter-wet heath.	Highly unlikely- suitable habitat does not occur in the project area
<i>Grevillea thelemanniana</i>	Spider Net Grevillea	T	CR	x	x	x	Spreading, lignotuberous shrub, 0.3-1.5 m high. Fl. pink-red, May to Nov. Sand, sandy clay. Winter-wet low-lying flats	Unlikely – suitable habitat is highly degraded within the project area
<i>Haemodorum loratum</i>		P3		x	x		Bulbaceous, perennial, herb, 0.45-1.2(-2) m high. Fl. black/brown-black/green, Nov. Grey or yellow sand, gravel	Unlikely- suitable habitat does not occur in the project area
<i>Haloragis scoparia</i>		P1		x			Perennial, herb, 0.3-0.6 m high.	Unlikely – suitable habitat is highly degraded within the project area
<i>Hibbertia montana</i>				x			Erect, straggling or sprawling shrub, 0.1-0.7 m high. Fl. yellow, Jul to Oct. Loam over granite, lateritic soils, gravel.	Highly unlikely- suitable habitat does not occur in the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
							Granite rocks, lateritic ridges & boulders, hills.	
<i>Hydrocotyle lemnoides</i>	Aquatic Pennywort	P4		x			Aquatic, floating annual, herb. Fl. purple, Aug to Oct. Swamps.	Possible – suitable habitat available
<i>Isopogon drummondii</i>		P4		x	x		Aquatic, floating annual, herb. Fl. purple, Aug to Oct. Swamps.	Unlikely – suitable habitat is highly degraded within the project area
<i>Isotropis cuneifolia</i> subsp. <i>glabra</i>		P3		x	x		Prostrate to ascending, spreading perennial, herb or shrub, 0.05-0.15 m high. Fl. yellow/orange & red, Sep. Sand, clay loam. Winter-wet flats.	Unlikely – suitable habitat is highly degraded within the project area
<i>Jacksonia gracillima</i>		P3		x	x		Grey, white sand on flats.	Possible - suitable habitat is present in the project area
<i>Lasiopetalum bracteatum</i>	Helena Velvet Bush	P4		x	x		Erect, open shrub, 0.4-1.5 m high. Fl. pink-purple, Aug to Nov. Sandy clay, clay, lateritic gravel. Along drainage lines, creeks, gullies, granite outcrops.	Highly unlikely- suitable habitat does not occur in the project area
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>		P3		x	x		No habitat information available.	Possible - suitable habitat may occur in the project area
<i>Lepidosperma rostratum</i>		T	EN	x	x	x	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown. Peaty sand, clay.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Lepyrodia curvescens</i>		P2		x	x		Dioecious, shortly creeping, tufted rhizomatous, herb, 0.24-0.4 m high, rhizomes on surface or to 1 cm deep. Fl. Sep to Nov. Sand, laterite. Seasonally inundated swampland.	Unlikely – suitable habitat is highly degraded within the project area
<i>Levenhookia preissii</i>		P1			x		Annual (ephemeral), herb, 0.03-0.17 m high. Fl. pink-red, Sep to Dec or Jan. Grey or black, peaty sand. Swamps.	Unlikely – suitable habitat is highly degraded within the project area
<i>Macarthuria keigheryi</i>		T	EN	x	x	x	Erect or spreading perennial, herb or shrub, 0.2-0.4 m high, 0.3-0.6 m wide. Fl. Sep to Dec or Feb to Mar. White or grey sand	Possible – suitable habitat may occur within the project area. This species was not recorded by GHD 2019
<i>Melaleuca viminalis</i>		P2		x	x		Large shrub or small tree to 10m. Fl. red, most months. Sand and sandstone soils on creek edges.	Unlikely – suitable habitat is highly degraded within the project area
<i>Meionectes tenuifolia</i>		P3			x		No description.	Unlikely – suitable habitat is highly degraded within the project area
<i>Myriophyllum echinatum</i>		P3		x	x		Erect annual, herb, 0.02-0.03 m high. Fl. red, Nov. Clay. Winter-wet flats.	Unlikely – suitable habitat is highly degraded within the project area
<i>Ornduffia submersa</i>		P4		x	x			Unlikely – suitable habitat is highly degraded within the project area
<i>Platysace ramosissima</i>		P3		x	x		Perennial, herb, to 0.3 m high. Fl. white-cream, Oct to Nov. Sandy soils.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Ptilotus pyramidatus</i>		T	CR	x	x	x	Small herb. Fl. white.	Unlikely – suitable habitat is highly degraded within the project area
<i>Ptilotus sericostachyus subsp. roseus</i>		P1		x	x		Prostrate to ascending perennial, herb. Fl. pink-white, Sep to Dec.	Unlikely – suitable habitat is unlikely to occur within the project area
<i>Schoenus benthamii</i>		P3		x	x		Tufted perennial, grass-like or herb (sedge), 0.15-0.45 m high. Fl. brown, Oct to Nov. White, grey sand, sandy clay. Winter-wet flats, swamps.	Unlikely – suitable habitat is highly degraded within the project area
<i>Schoenus capillifolius</i>		P3		x	x		Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green, Oct to Nov. Brown mud. Claypans.	Unlikely – suitable habitat does not occur within the project area
<i>Schoenus loliaceus</i>		P2		x	x		Annual, grass-like or herb (sedge), 0.03-0.06 m high. Fl. Aug to Nov. Sandy soils. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area
<i>Schoenus natans</i>	Floating Bog-rush	P4		x	x		Aquatic annual, grass-like or herb (sedge), 0.3 m high. Fl. brown, Oct. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area
<i>Schoenus pennisetis</i>		P3		x	x		Tufted annual, grass-like or herb (sedge), 0.05-0.15 m high. Fl. purple-black, Aug to Sep. Grey or peaty sand, sandy clay. Swamps, winter-wet depressions.	Unlikely – suitable habitat does not occur within the project area
<i>Schoenus sp. Beaufort (G.J. Keighery 6291)</i>		P1		x	x		Annual, grass-like or herb (sedge), ca 0.05 m high. Fl.	Highly unlikely – suitable habitat does not occur within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
							green. Mud. Winter-wet claypans.	
<i>Schoenus</i> sp. <i>Waroona</i> (G.J. Keighery 12235)		P3		x	x		Tufted annual, grass-like or herb (sedge), 0.02-0.06 m high. Fl. brown-red-green, Oct to Nov. Clay or sandy clay. Winter-wet flats	Unlikely – suitable habitat does not occur within the project area
<i>Senecio leucoglossus</i>		P4			x		Erect annual, herb, to 1.3 m high. Fl. white, Aug to Dec. Gravelly lateritic or granitic soils. Granite outcrops, slopes.	Highly unlikely- suitable habitat does not occur in the project area
<i>Stenanthemum sublineare</i>		P2			x		Erect shrub, to 0.1 m high. Fl. green, Oct to Dec. Littered white sand. Coastal plain.	Unlikely – suitable habitat is highly degraded within the project area
<i>Stylidium aceratum</i>		P3		x	x		Fibrous rooted annual, herb, 0.05-0.09 m high, leaves spathulate. Fl. pink/white, Oct to Nov. Sandy soils. Swamp heathland.	Unlikely – suitable habitat does not occur within the project area
<i>Stylidium longitubum</i>	Jumping Jacks	P4		x	x		Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink, Oct to Dec. Sandy clay, clay. Seasonal wetlands.	Unlikely – suitable habitat is highly degraded within the project area
<i>Stylidium periscelanthum</i>	Pantaloons Triggerplant	P3		x			Bulb-forming perennial, herb, 0.07-0.15 m high. Fl. pink, Sep to Oct. Loamy clay, moist soils pockets. Wet flats, low granitic hills	Highly unlikely- suitable habitat does not occur in the project area
<i>Stylidium paludicola</i>		P3			x		Reed-like perennial, herb, 0.35-1 m high, Leaves tufted, linear or subulate or narrowly oblanceolate, 0.5-4 cm long, 0.5-1.5 mm wide, apex acute,	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
							margin entire, glabrous. Scape mostly glabrous, inflorescence axis glandular. Inflorescence racemose. Fl. pink, Oct to Dec. Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	
<i>Stylidium striatum</i>		P4			x		Rosetted perennial, herb, 0.15-0.55 m high, Fl. yellow, Oct to Nov. Brown clay loam over laterite. Hillslopes. Jarrah/Marri forest, Wandoo woodland	Highly unlikely- suitable habitat does not occur in the project area
<i>Styphelia filifolia</i>		P3		x	x		Shrub to 0.9 m high. Fl. white, Mar to May. Sandy soils in low lying Banksia or Jarrah woodland.	Possible – suitable habitat occurs within the project area
<i>Synaphea</i> sp. Fairbridge Farm ( <i>D. Papenfus</i> 696)		T	CR	x	x	x	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. yellow, Oct. Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Unlikely – suitable habitat is highly degraded within the project area
<i>Tetralia australiensis</i>		T			x		Rhizomatous, tufted perennial, grass-like or herb (sedge), to 1 m high. Fl. brown, Nov to Dec.	Unlikely – suitable habitat is unlikely to occur within the project area
<i>Thelymitra dedmaniarum</i>	Cinnamon Sun Orchid	T	EN			x	Tuberous, perennial, herb, to 0.8 m high. Fl. yellow, Nov to Dec or Jan. Granite.	Highly unlikely- suitable habitat does not occur in the project area
<i>Thelymitra magnifica</i>		P1			x		Perennial, herb. Stony ridges.	Highly unlikely- suitable habitat does not occur in the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/TPFL	PMST		
<i>Thelymitra stellata</i>	Star Sun-orchid	T	EN	x	x	x	Tuberous, perennial, herb, 0.15-0.25 m high. Fl. yellow & brown, Oct to Nov. Sand, gravel, lateritic loam.	Highly unlikely- suitable habitat does not occur in the project area
<i>Thysanotus anceps</i>		P3		x	x		Rhizomatous, leafless perennial, herb, to 0.4 m high. Fl. purple, Oct to Dec. White or grey sand, lateritic gravel, laterite.	Unlikely – suitable habitat is highly degraded within the project area
<i>Thysanotus sp. Badgingarra</i> (E.A. Griffin 2511)		P2			x		Perennial, herb (with tuberous roots), ca 0.35 m high. Fl. blue, Dec. Grey sand with lateritic gravel.	Highly unlikely- suitable habitat does not occur in the project area
<i>Tripterococcus sp. Brachylobus</i> (A.S. George 14234)		P4			x			Unlikely – suitable habitat is highly degraded within the project area
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>		P4			x		Erect shrub, 0.2-0.75 m high. Fl. pink, May or Nov to Dec or Jan. Sand, sandy clay. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area

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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	A Napier, N. Barratt	A. Benkovic	On file	C Thompson	On file	10.12.2019

# Appendix F

Threatened Ecological Community Assessment



Prepared by Emerge Associates (2020)



# Threatened Ecological Community Assessment

State Football Centre

Project No: EP20-012(06)

**Prepared for Department of Finance – Building  
Management and Works  
December 2020**



# Threatened Ecological Community Assessment

## State Football Centre



## Document Control

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# Threatened Ecological Community Assessment

## State Football Centre



## Executive Summary

Emerge Associates (Emerge) were engaged by Department of Finance – Building Management and Works to provide environmental consultancy services to support the development and construction of a State Football Centre in a portion of the Queens Park Open Space area (the site), within the City of Canning. Review of background information and informal discussions between Emerge and the Department of Biodiversity, Conservation and Attractions (DBCA) Threatened Species and Communities Branch indicated the potential that a threatened ecological community (TEC) may occur within the eastern portion of the site (hereafter referred to as the 'survey area'). The purpose of this assessment was to determine the floristic community type (FCT) of the vegetation within the survey area and whether it represents a TEC.

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken over seven visits during July and November 2020. During the field survey the vegetation was sampled to prepare a species list suitable for undertaking analysis of floristic community type (FCT).

Outcomes of the survey include the following:

- The survey area supports patches of marri woodland, one patch of banksia woodland and scattered native plants such as *Melaleuca preissiana*.
- Four relevés were used to sample the marri woodland vegetation to undertake FCT analysis. The remainder of the survey area was considered too degraded to sample and undertake FCT analysis.
- A total of 56 native and 16 non-native (weed) species were recorded within the survey area, with 11-45 species recorded within each sample.
- One threatened flora species, *Macarthuria keigheryi*, was recorded opportunistically within the survey area. A total of eight *M. keigheryi* individuals were recorded. One priority flora species, *Jacksonia gracillima* (P3), was also recorded within the survey area. A total of 38 *J. gracillima* individuals were recorded.
- Three of the four relevés showed similarity to FCT 21c 'low lying *Banksia attenuata* woodlands or shrublands'. The marri woodland vegetation and banksia woodland vegetation within the survey area were determined to represent FCT 21c.
- No TECs occur within the site.
- The FCT 21c vegetation represents the 'low lying *Banksia attenuata* woodlands or shrublands' priority ecological community (PEC)(P3). A total of 1.09 ha of this PEC occurs within the survey area.
- The vegetation in the survey area contributes to the ecological values of the local area and may provide habitat for threatened fauna such as black cockatoos.

# Threatened Ecological Community Assessment

## State Football Centre



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# Threatened Ecological Community Assessment

## State Football Centre



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# Threatened Ecological Community Assessment State Football Centre



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Cluster Dendrograms

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## 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

*Table A2: Abbreviations – General terms*

General terms	
FCT	Floristic community type
IBRA	Interim Biogeographic Regionalisation of Australia
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

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*Table A3: Abbreviations –Legislation*

Legislation	
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
BC Regs	<i>Biodiversity Conservation Regulations 2018</i>

*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

Emerge Associates (Emerge) has been engaged by the Department of Local Government, Sport and Cultural Industries, through the Department of Finance – Building Management and Works, to provide environmental consultancy services to support the development and construction of a State Football Centre (SFC). The SFC development is proposed to be constructed in a portion of the Queens Park Open Space in the City of Canning, specifically within the following lots (hereafter referred to as 'the site):

- Lot 501 on Deposited Plan 416666 (305 Welshpool Road, Queens Park) – Western Australian Planning Commission (WAPC) landholding
- Lot 222 of Diagram 64644 (343 Wharf Street, Queens Park) – City of Canning landholding
- Unnamed road reserve – Land ID: 3848050 – under City of Canning management.

The location of the SFC development area is shown in (site boundary).

Review of background information and informal discussions between Emerge and the Department of Biodiversity, Conservation and Attractions (DBCA) Threatened Species and Communities Branch indicated the potential that a threatened ecological community (TEC) may occur within the eastern portion of the site (hereafter referred to as the 'survey area'). Specifically, it was considered that part of the vegetation within the survey area may represent SCP3a, SCP3b or SCP3c TEC (refer to **Section 4.3.1** for TEC descriptions). The survey area extends over 2.49 ha as shown in .

### 1.2 Purpose and scope of work

Emerge were engaged to provide information regarding the environmental values and attributes of the site. The purpose of this assessment was to determine the floristic community type (FCT) of the vegetation within the survey area and whether it represents a TEC, particularly SCP3a, SCP3b or SCP3c.

The scope of work was specifically to undertake a vegetation assessment to the standard required of a targeted survey in accordance with the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

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

- Desktop review of relevant background information pertaining to the survey area and surrounds, including database searches for threatened ecological communities and review of previous studies completed over the area.
- Sampling within the survey area and compilation of a comprehensive list of flora species recorded as part of the field survey.
- Statistical analysis and mapping of conservation significant vegetation within the survey area.
- Documentation of the desktop assessment, survey methodology and results into a report.

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## 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 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 804.3 millimetres (mm) of rainfall is recorded annually from the Gosnells City weather station, which is the closest weather station, located approximately 5 km south east from the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Gosnells City weather station range from 18.7°C in July to 33.0°C in January and February, while mean minimum temperatures range from 8.8°C in July to 18.8°C in February (BoM 2020).

A total of 145.9 mm of rain was recorded from May to November 2020 prior to the survey which is approximately 21% of the mean of 700.8 mm for this period (BoM 2020). No rainfall data is available from BoM for May, June and November 2020 which may explain the difference between 2020 data and the mean.

### 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 comprises the Pinjarra Plain which 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.

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Examination of broad scale soil mapping places the site on the eastern side of the Bassendean dune system, near the Pinjarra Plain. The Bassendean dunes comprise old, low hills of quartz sand with numerous interdunal swamps and lakes (Beard 1990).

Finer scale landform and soil mapping places the site within the Southern River association (Churchward and McArthur 1980). The Southern River association lies in the transitional zone between the Bassendean dune system and the Pinjarra Plain, where sands from the Bassendean dunes overlay the alluvial soils of the Pinjarra Plain (Churchward and McArthur 1980). The site is also located close to the Cannington association, which is described as a poorly drained plain with calcareous substrate (Churchward and McArthur 1980). Due to the scale the Churchward and McArthur (1980) mapping was drawn, the site may be located within either of these soil associations.

The soil associations mapped within the site and local area are shown in **Figure 2**.

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

### 2.3 Topography

A survey undertaken by Veris (2020) indicates the topography of the survey area is relatively uniform, with elevation ranging between 12 and 14 m in relation to the Australian height datum (mAHD) (**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 occur within the survey area.

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 DBCA maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2020), which further categorises geomorphic wetland features into specific management categories to guide land use and conservation. Note that

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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 2020) indicated that no wetland features occur within the survey area. One multiple use category wetland and one resource enhancement wetland occur within the site to the west and south of the survey area.

### 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 site as comprising the 'Southern River complex', which is described as 'open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - *Banksia* spp. with fringing woodland of *Eucalyptus rudis* - *Melaleuca raphiophylla* along creek eds'. This complex was determined to have 18.43% of its pre-European extent remaining in 2019, of which 1.37% is under formal protection (Government of Western Australia 2019).

More recent Beard *et al.* (2013) mapping shows the site comprises vegetation association 'Bassendean\_1001'. This association is described as 'low forest, woodland or low woodland with scattered trees' of '*Eucalyptus marginata*, *Banksia* spp., *Allocasuarina* spp.' (Beard *et al.* 2013). This complex was determined to have 22.05% of its pre-European extent remaining in 2019, with 2.80% protected for conservation purposes (Government of Western Australia 2018).

Studies have indicated that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent (Miles 2001). The national objectives and targets for biodiversity conservation established an objective of retaining 30% of the original extent of each vegetation complex (Environment Australia 2001). However, a lower objective of 10% is applied in 'constrained urban areas' such as the Swan Coastal Plain (Ministry for Planning 1995). The percentage protected for conservation of the 'Southern River complex' and the 'Bassendean\_1001' association fall below both the 30% and 10% retention objectives.

### 2.6 Historic land use

Review of historical images available from 1953 (WALIA 2020) onwards shows that the survey area has consistently supported scattered patches of native vegetation between 1953 and 2020. Imagery shows some historical disturbance, with tracks installed around the patches of vegetation.

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## 2.7 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 (DAWE 2020). '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**.

## 2.8 Previous surveys

Three flora and vegetation assessments have been previously undertaken across the site and survey area:

- *Flora and Fauna Assessment for Queens Park Regional Open Space* (Ecoscape 2010)
- *Queens Park Targeted Flora Survey* (Ecoscape 2014)
- *State Football Centre –Environmental Planning Process Road Map: Flora Survey Report* (GHD 2020).

### 2.8.1 Flora

One priority flora species, *Conostylis bracteata* (P3), was recorded in two locations within the survey area by Ecoscape (2010). However, the targeted flora survey in 2014 determined that the *C. bracteata* records were incorrectly identified and were actually *C. juncea*, which is not a conservation significant taxon (Ecoscape 2014).

One threatened flora species, *Macarthuria keigheryi*, was recorded within the south eastern portion of the survey area in 2014 (Ecoscape 2014). One individual was recorded.

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### 2.8.2 Vegetation

Ecoscape (2010) and GHD (2020) both identified four native plant communities within the survey area, of which one is a *Corymbia calophylla* (marri) woodland. The GHD (2020) descriptions of each plant community is provided in **Table 1** and the location of each plant community is shown in **Plate 1**.

Table 1: Plant communities identified within the site adapted from Ecoscape (2010) and GHD (2020)

Plant community	Description
<b><i>Corymbia calophylla</i> woodland (VT1)</b>	<i>Corymbia calophylla</i> tall woodland over <i>Jacksonia floribunda</i> tall open shrubland over <i>Xanthorrhoea preissii</i> and <i>X. gracilis</i> low open shrubland over <i>Dasypogon bromeliifolius</i> and <i>Phellocarya ciliata</i> hermland.
<b><i>Banksia</i> low woodland (VT2)</b>	<i>Banksia menziesii</i> and <i>Eucalyptus marginata</i> low woodland over <i>Scholtzia involuocrata</i> low sparse shrubland over mixed open sedgeland and/ or herbaceous weeds.
<b><i>Melaleuca preissiana</i> low woodland (VT3)</b>	<i>Melaleuca preissiana</i> low woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over introduced hermland.
<b>Scattered natives over weeds (VT5)</b>	Mixed native species such as <i>Macrozamia reidlei</i> , <i>Acacia saligna</i> , <i>Agonis flexuosa</i> over introduced grasses and herbs.



Plate 1: Plant communities previously identified within the survey area

The ***Corymbia calophylla* woodland (VT1)** vegetation in the survey area was mostly mapped as being in 'very good' condition, except the patch in the north western portion of the survey area which was mapped as being in 'good' condition.

The one patch of ***Banksia* low woodland (VT2)** vegetation in the survey area was mapped as being in 'good' condition.

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The other plant communities within the site were mapped as being in 'degraded' condition' and the cleared area was mapped as being in 'completely degraded' condition.

### 2.8.3 Threatened and priority ecological communities

No statistical analysis of floristic community type (FCT) is known to have been undertaken within the survey area.

Ecoscape (2010) did not identify any TECs or PECs as occurring within the survey area.

GHD (2020) determined that the ***Banksia low woodland (VT2)*** plant community represented the priority ecological community (PEC) 'banksia dominated woodlands of the SCP IBRA region' (P3). At the time of the GHD (2020) survey no size or condition thresholds applied to this PEC. DBCA have since updated the listing information for this PEC. The PEC is now named 'banksia woodlands of the Swan Coastal Plain' and the description, area and condition thresholds that apply to the EPBC-listed TEC of the same name also apply to this PEC.

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## 3 Methods

### 3.1 Desktop assessment

A search was conducted for TECs and PECs that may occur or have been recorded within a 5 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a), the *weed and native flora dataset* (Keighery *et al.* 2012) and DBCA's threatened and priority ecological communities' database (reference no. 19-01119EC).

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

Botanists from Emerge visited the survey area on the following dates in 2020 to conduct the flora and vegetation field survey:

- 20 July
- 26 and 31 August
- 4 September
- 2 and 19 October
- 10 November.

#### 3.2.1 Flora and vegetation

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

Detailed sampling of the vegetation was undertaken using relevés focused on the marri woodland vegetation. Relevés were used due to the small size of the vegetation patches and to maximise the species recorded in each sample (as opposed to 10 m x 10 m quadrats).

A total of four relevés were sampled. Three relevés were located within the large patch of ***Corymbia calophylla* woodland (VT1)** vegetation in the centre of the survey area, which was able to be divided into three patches during the survey based on gaps in canopy trees. One relevé was located in the patch of ***Corymbia calophylla* woodland (VT1)** vegetation in the north western portion of the survey area. The position of each sample location was recorded with a hand-held GPS unit, as shown in **Figure 3**.

The data recorded within each sample 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)

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- biological information (vegetation structure and condition, 'foliage projective cover' (FPC), degree of disturbance and species present).

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

The locations of conservation significant flora species were recorded using a hand-held GPS unit.

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 location and changes in vegetation condition were also noted across the site. The condition of the vegetation was assessed using methods from Keighery (1994) (**Table 2**).

Table 2: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
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
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.
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.
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.

### 3.3 Mapping and data analysis

#### 3.3.1 Floristic community type assignment

The samples were compared to the regional 'floristic community type' (FCT) dataset *A floristic survey of the southern Swan Coastal Plain* by Gibson *et al.* (1994). The sample data (presence/absence) was reconciled with Gibson *et al.* (1994) by standardising the names of taxa with those used in the earlier study. This was necessary due to changes in nomenclature in the intervening period. Taxa that were only identified to genus level were excluded, while some infra-species that have been identified since

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1994 were reduced to species level. The combined dataset was then imported into the statistical analysis package PRIMER v6 (Clarke and Gorley 2006). As data from a localised survey is often spatially correlated, data for each sample was compared to Gibson *et al.* (1994) separately. This removed the influence of spatial correlation when assigning a FCT. Classification was then undertaken using a group-average hierarchical clustering technique using the Bray-Curtis distance measure (as described above for plant community determination).

Where the sample tended to cluster with a grouping of different FCTs, samples were assessed separately to differentiate between FCTs. Ultimately the cluster analysis, as well as contextual information relating to the soils, landforms and known locations of FCTs within the region, was considered in the final determination of an FCT for vegetation within the survey area.

### 3.3.2 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)*
- *Approved Conservation Advice for Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain (DoEE 2017a)*
- *Approved Conservation Advice for Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain (DoEE 2017b).*

### 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**.

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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 <b>Section 2</b> is adequate to place the site and vegetation in context.  The previous reports for the site and survey area were reviewed.
	No limitation	Regarding assignment of FCTs, the authoritative Gibson <i>et al.</i> (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. Furthermore, Gibson <i>et al.</i> (1994) collected data in the spring main flowering period and in many cases sampled plots multiple times to provide a complete species list. This survey sampled the vegetation seven times during the main flowering period and thus the data was considered suitable for FCT assignment.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by qualified botanists each with over nine 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 within the main flowering season. Climate data prior to the survey indicates that winter rainfall was lower than average but the BOM appears to be missing records for multiple months prior to the survey. However, the condition and number of native plants flowering within the survey area was considered to be typical based on the botanists' experience on the Swan Coastal Plain region. Annual species including geophytic orchids were also recorded during the field survey. Therefore, the survey timing was considered adequate to allow the detection of 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 a number of years, to enable observation of all species present. The survey area was visited seven times between August and November 2020. Therefore, according to the EPA guidelines this survey is considered to meet the requirements of a 'detailed' survey.
Spatial coverage and access	No limitation	Coverage was comprehensive (track logged).
	No limitation	All parts of the survey area could be accessed as required.
Sampling intensity	No limitation	A total of 73 species were recorded from four samples. Minimum species richness within the survey area is estimated at between 96 (Jackknife1) and 107 (Chao2) (refer species accumulation curve and estimates shown in <b>Plate 2</b> ). The number of species recorded in the survey area was lower than estimated. However, coverage of the site was intensive and it is considered that few species remain undetected. Therefore, this discrepancy may reflect fine scale variation in plant composition due to disturbance and/or statistical error.
Influence of disturbance	Minor limitation	Time since fire is greater than 60 years as interpreted from aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance or varying intensity was evident throughout the survey area. The disturbance history of the survey area was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

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## 4 Results

### 4.1 General conditions

The survey area is flat with grey sandy soils. Vegetation exists as patches of marri woodland, one patch of banksia woodland and scattered native plants such as *Melaleuca preissiana*. Scattered non-native species and bare sandy areas occur across the remainder of the survey area.

### 4.2 Flora

#### 4.2.1 Species inventory

A total of 59 native and 16 non-native (weed) species were recorded within the survey area during the field survey, representing 29 families and 62 genera. The dominant families containing native taxa were Fabaceae (eight native taxa and one weed taxon) and Asparagaceae (six native taxa and one weed taxa).

The number of native species recorded within each sample ranged from 11 to 45, as shown in **Table 4**.

Table 4: Number of native species recorded within each sample

Sample	No. native species recorded
R1	45
R2	29
R3	36
R4	11

Two species listed as declared pests (C3) pursuant to the BAM Act, \* *Asparagus asparagoides* (bridal creeper) and \* *Zantedeschia aethiopica* (arum lily), were recorded within the survey area. Bridal creeper is also listed as a 'weed of national significance' (WoNS).

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

#### 4.2.2 Threatened and priority flora

One threatened flora species, *Macarthuria keigheryi*, was recorded opportunistically within the survey area during the field survey. Subsequent detailed searches of the survey area recorded a total of eight *M. keigheryi* individuals. The *M. keigheryi* plants were flowering during the time of the survey.

One priority flora species, *Jacksonia gracillima* (P3), was also recorded opportunistically within the survey area during the field survey. Targeted searches of the survey area recorded a total of 38 individuals.

The location of the *M. keigheryi* and *J. gracillima* individuals recorded within the survey area are shown in **Figure 3**.

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#### 4.3 Vegetation

The ***Corymbia calophylla* woodland (VT1)** vegetation previously identified within the survey area (refer **Section 2.8.2**) was determined to comprise four patches of *Corymbia calophylla* (marri) woodland vegetation, with differing cover of native understorey vegetation. The patch of vegetation in the southern portion of the survey area supported the highest cover and diversity of native species, compared to the other patches.

The ***Banksia low woodland (VT2)*** vegetation previously identified within the survey area (refer **Section 2.8.2**) was determined to comprise one patch of banksia woodland vegetation with very few native understorey species.

##### 4.3.1 Desktop assessment

The database search results identified 14 TECs and two PECs occurring or potentially occurring within a 5 km radius of the site. Information on these communities is provided in **Appendix C**.

Based geomorphology, soils and regional vegetation patterns, eight TECs and two PECs were considered to have potential to occur in the survey area, as shown in **Table 5**.

Table 5: TECs and PEC considered to have potential to occur in the survey area based on existing information

Code	Community name	TEC/PEC	Level of significance	
			State	EPBC Act
SCP3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	TEC	CR	EN
SCP3b	<i>Corymbia calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain	TEC	VU	-
SCP3c	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain	TEC	CR	EN
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain	TEC	EN	EN (Banksia woodlands of the Swan Coastal Plain)
SCP20a	<i>Banksia attenuata</i> woodlands over species rich dense shrublands	TEC	EN	
Banksia WL SCP	Banksia woodlands of the Swan Coastal Plain	TEC/PEC	P3	
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	TEC/PEC	P3	
SCP20c	Shrublands and woodlands of the eastern side of the Swan Coastal Plain	TEC	CR	EN

CR=critically endangered, EN=endangered, VU=vulnerable, P3=priority 3.

##### 4.3.2 Floristic community types

The marri woodland vegetation and the banksia woodland vegetation within the survey area was determined to represent FCT 21c 'low lying *Banksia attenuata* woodlands or shrublands'. This FCT is listed as 'well reserved' and 'susceptible' by Gibson *et al.* (1994).

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R1 and R3 grouped with FCT 21c in the cluster and resemblance analyses and were similar to Gibson *et al.* (1994) sites representing FCT 21c with 38-43% similarity (**Table 6**).

R2 grouped with FCT 11 in the cluster analysis and FCT 21c in the resemblance analysis, with 34-36% similarity to Gibson *et al.* (1994) sites representing FCT 21c (**Table 6**).

R4 grouped with multiple FCTs in the cluster analysis and resemblance analyses, with low similarity to multiple FCTs. The FCT analysis is considered inconclusive for this sample due to the low similarity. However, this vegetation is considered to also represent FCT 21c due to the similar flora species and structure to other patches of marri woodland within the survey area.

The patch of banksia woodland vegetation in the south western portion of the site is also considered to represent FCT 21c. No sampling was undertaken within this patch of vegetation but the species present generally match the description of FCT 21c.

Sample data is provided in **Appendix D** and the relevant portions of the cluster dendrograms showing R1-R4 are provided in **Appendix E**.

The remainder of the survey area was not sampled as it is too disturbed to assign to an FCT.

Table 6: Sample and likely FCT represented within the survey area for each sample

Sample unit	Most similar Gibson <i>et al.</i> (1994) sites	Similarity (%)	Most likely floristic community type (FCT)	Reservation and conservation status (Gibson <i>et al.</i> 1994)		
R1	TWIN-8 (FCT 21c)	43	FCT 21c low lying <i>Banksia attenuata</i> woodlands or shrublands	Well reserved Susceptible		
	SHENT-1 (FCT 28)	41				
	LOW06B (FCT 21c)	41				
R2	TWIN-8 (FCT 21c)	36				
	SHENT-1 (FCT 28)	34				
	LOW06B (FCT 21c)	34				
R3	AUSTRA-1 (FCT 21a)	40				
	LOW06B (FCT 21c)	40				
	FL-4 (FCT 21a)	38				
	TWIN-8 (FCT 21c)	38				
R4	CARD11 (FCT 6)	22			Inconclusive	N/A
	ROWE01 (FCT 11)	22				
	FL-4 (FCT 21a)	19				

### 4.3.3 Threatened and priority ecological communities

FCT 21c is associated with the Commonwealth listed 'banksia woodlands of the Swan Coastal Plain' TEC. As outlined in **Table 7**, the marri woodland vegetation within the survey area does not satisfy the criteria to be considered a patch of the 'banksia woodland TEC' due to its lack of a tree layer of

# Threatened Ecological Community Assessment

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*Banksia* sp. Similarly, the patch of banksia woodland vegetation within the survey area is too small to be considered a patch of the 'banksia woodland TEC' (refer to **Table 7**).

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

Criteria	Requirements for meeting criteria	Implications for survey area
1. Must meet key diagnostic characteristics	A variety of factors relating to: <ul style="list-style-type: none"> <li>• Location</li> <li>• Soils</li> <li>• Structure</li> <li>• Composition</li> </ul>	<ul style="list-style-type: none"> <li>• Site meets location and soils criteria.</li> <li>• FCT 21c is one of the FCTs that may represent the banksia woodland TEC.</li> <li>• The marri woodland vegetation does <u>not</u> include the key diagnostic feature of a tree layer of <i>Banksia attenuata</i>, <i>Banksia menziesii</i> and/or <i>Banksia ilicifolia</i>.</li> <li>• The banksia woodland vegetation does include the key diagnostic feature of a tree layer of <i>Banksia menziesii</i>.</li> <li>• The banksia woodland vegetation meets structure and composition criterion.</li> </ul>
2. Must meet condition thresholds	<ul style="list-style-type: none"> <li>• A patch should at least meet the 'good' condition category (see <b>Table 2</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• The banksia woodland vegetation is present in 'good' condition' which meets this criterion.</li> </ul>
3. Must meet minimum patch size	Minimum size of patch: <ul style="list-style-type: none"> <li>• Pristine=no minimum size</li> <li>• Excellent=0.5 ha</li> <li>• Very Good=1 ha</li> <li>• Good=2 ha</li> </ul>	<ul style="list-style-type: none"> <li>• The banksia woodland vegetation in 'good' condition' comprises 0.13 ha which does <u>not</u> meet this criterion.</li> <li>• There is no adjacent banksia woodland vegetation that would be viewed as contiguous. Therefore, the banksia woodland vegetation within the survey area does <u>not</u> comprise a patch of the TEC.</li> </ul>
4. Must incorporate surrounding context	<ul style="list-style-type: none"> <li>• Breaks (e.g. tracks) &lt; 30 m do not separate vegetation into separate patches</li> <li>• Buffer zones may apply (20-50 m recommended from patch edge)</li> <li>• The site should be thoroughly sampled (2 surveys in same spring).</li> <li>• Survey timing should be appropriate.</li> <li>• Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat)</li> </ul>	<ul style="list-style-type: none"> <li>• This survey was conducted in spring during the main flowering season</li> <li>• Native vegetation that is likely to represent the TEC exists in the surrounding area but is separated from the banksia woodland vegetation within the survey area by more than 30m.</li> </ul>

FCT 21c is synonymous with the State listed PEC 'low lying *Banksia attenuata* woodlands or shrublands' (P3). There is no conservation advice for this PEC so it is unclear whether a condition threshold should be applied when identifying its presence. The DBCA has historically applied good condition as a threshold for the identification of PEC vegetation. Using good condition as a basis for identification, 1.09 ha of the FCT 21c vegetation is considered to represent the 'low lying *Banksia attenuata* woodlands or shrublands' PEC (P3). The area of this PEC within the survey area is outlined in **Figure 4**.

No other TECs or PECs occur within the survey area.

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#### 4.3.4 Locally and regionally significant vegetation

Mature eucalypt trees (diameter at breast height larger than 500 mm) including *Corymbia calophylla* (marri) are present in the survey area. Due to their size these trees have the potential to provide foraging, roosting and nesting habitat for threatened species of black cockatoo, along with other ecological services.

The local area supports multiple patches of intact native vegetation of which some supports conservation significant flora, TECs and/or PECs. The vegetation in the survey area is more disturbed and present in smaller patches than much of that within the local area but it would nevertheless contribute to local biodiversity and amenity values.

#### 4.4 Species richness and sampling adequacy

A total of 73 species were recorded from four samples. A species accumulation curve derived from sample data is presented in **Plate 2**. After four samples the curve is still increasing and has not reached its asymptote. This indicates that a proportion of species likely remain undetected by sampling.

Species richness was estimated in PRIMER v6 to be between 96 (Jackknife1) and 107 (Chao2). Based on the trend of the species accumulation curve approximately 30 samples would be required to capture that many species. With the additional species recorded opportunistically, a total of 76 species were recorded which is 71% and 79% of the estimated 96-107 species. However, coverage of the site was intensive and it is considered that few species remain undetected. Therefore, this discrepancy may reflect fine scale variation in plant composition due to disturbance and/or statistical error.

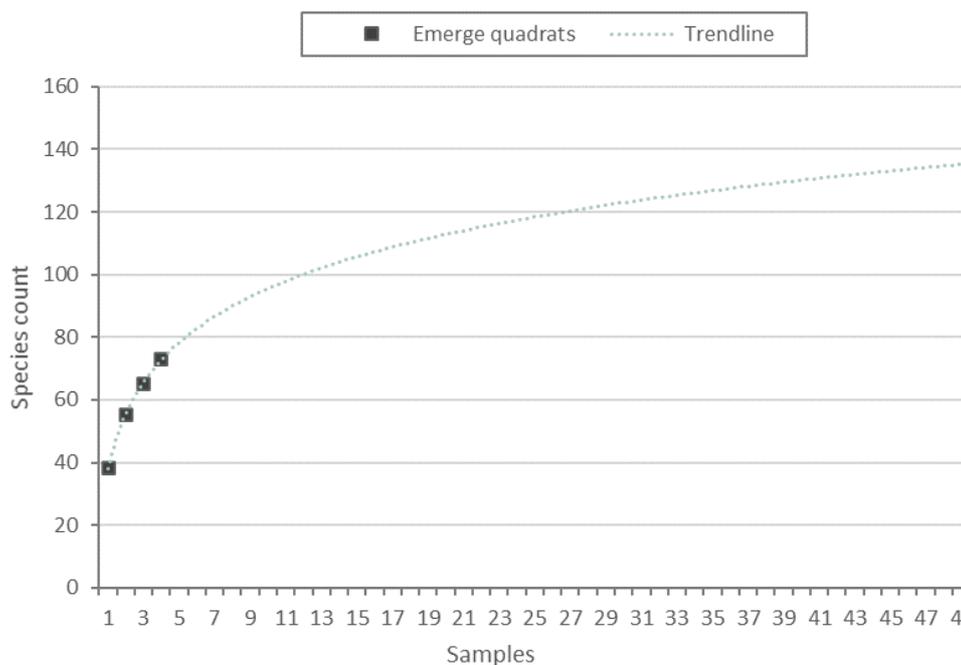


Plate 2: Species accumulation curve derived from sample data ( $y = 24.959 \ln(x) + 38.087$ ,  $R^2 = 0.9996$ )

## Threatened Ecological Community Assessment

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## 5 Discussion

The survey area was visited seven times during spring 2020. Considering the small size of the patches of vegetation in the survey area, the time spent sampling and searching the vegetation during each visit and the disturbance history, the survey effort is considered comprehensive. In addition, the samples within the current survey recorded more native species than previous surveys (Ecoscape 2010; GHD 2020) and included identification of specimens by specialist taxonomists at the Western Australian Herbarium, where required.

### 5.1 Threatened and priority flora

One threatened and one priority flora species were recorded in the survey area. Although targeted surveys were not part of the scope of this assessment, these species were identified due to the small size of the survey area and the comprehensiveness of the field survey. Eight *M. keigheryi* individuals were recorded during the current survey, compared to one individual recorded in the previous survey (Ecoscape 2014). *M. keigheryi* is 'cryptic' as it dies back to rootstock during the summer. Therefore, it is possible that *M. keigheryi* was dormant or at the very least less conspicuous when the site was previously surveyed.

*J. gracillima* was not previously recorded in the survey area.

### 5.2 Floristic community type assignment

The results of the FCT analysis was considered to be conclusive for R1 and R3 due to the high similarity to Gibson *et al.* (1994) sites representing FCT 21c. Similarly, whilst R2 grouped with FCT 11 in the cluster analysis it showed high similarity to Gibson *et al.* (1994) sites representing FCT 21c in the resemblance analysis and was considered to also represent this FCT.

The similarity in the analysis can be linked to the number of native species recorded, with R1 and R3 recording the highest number of native species and percent similarity. The low similarity between R4 and Gibson *et al.* (1994) sites was likely due to the low number of native species recorded in R4 (eleven compared to 45 species recorded in R1). This indicates that the vegetation associated with R4 has been subject to disturbance which has reduced the native species diversity. The previous survey by GHD (2020) supports this, with the patch of vegetation associated with R4 mapped as being in 'degraded' condition.

The scope of this assessment focused on determining whether the marri woodland vegetation within the survey area represented a TEC and hence samples were located within the ***Corymbia calophylla* woodland (VT1)** vegetation. The patch of ***Banksia low woodland (VT2)*** vegetation in the survey area was not formally sampled. Based on the species present within this vegetation type and abiotic information such as soils and landform, it was considered reasonable to infer that the ***Banksia low woodland (VT2)*** vegetation also represents FCT21c.

## Threatened Ecological Community Assessment

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### 5.3 Threatened and priority ecological communities

Superficially, the ***Corymbia calophylla* woodland (VT1)** vegetation appears to have similarities to three marri woodland TECs that occur on the eastern side of the Swan Coastal Plain: SCP3a, SCP3b and SCP3c (refer to **Table 5**). All three of these TECs occur in the local area, with DBCA records located to the east of the site. However, the FCT analysis did not indicate that the ***Corymbia calophylla* woodland (VT1)** vegetation represents any of these TECs. Rather, the FCT analysis indicated the vegetation was representative of SCP 21c TEC.

The title of SCP21c/FCT 21c indicates it comprises banksia woodland type vegetation. However, Gibson *et al.* (1994) states that FCT 21c is variously dominated by *Melaleuca preissiana*, *Banksia attenuata*, *B. menziesii*, *Eucalyptus marginata* or *Corymbia calophylla*, either singly or in combination. Therefore, SCP21c is considered appropriate for the ***Corymbia calophylla* woodland (VT1)** vegetation in the survey area.

The survey area lies in the transitional zone between the Bassendean dune system and the Pinjarra Plain. Vegetation in transitional zones often support a combination of species from each region. The site supports marri woodland vegetation, banksia woodland vegetation and scattered *Melaleuca preissiana* trees. It is likely that historically the survey area supported a contiguous patch of vegetation with these species combined in a mosaic pattern.

### 5.4 Local and regional significance

Vegetation on the eastern side of the Swan Coastal Plain is generally poorly reserved. The local area supports multiple patches of intact native vegetation of which some is of conservation significance. The survey area supports small patches of intact native vegetation and scattered native plants, which would be considered to be present in poorer condition than that in the surrounding area. Nevertheless, the vegetation in the survey area, particularly that which represents SCP21c and supports conservation significant flora, would contribute to the ecological significance of the local area.

The survey area also supports native trees which have the potential to provide foraging, roosting and nesting values for threatened species of black cockatoos.

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### 6 Conclusions

The survey area supports patches marri woodland, one patch of banksia woodland and scattered native plants such as *Melaleuca preissiana*.

Four relevés were used to sample the marri woodland vegetation to undertake FCT analysis. The remainder of the survey area was considered too degraded to sample and undertake FCT analysis.

A total of 60 native and 16 non-native (weed) species were recorded within the survey area, with 11-45 species recorded within each sample.

One threatened flora species, *Macarthuria keigheryi*, was recorded opportunistically within the survey area. A total of eight *M. keigheryi* individuals were recorded. One priority flora species, *Jacksonia gracillima* (P3), was also recorded within the survey area. A total of 38 *J. gracillima* individuals were recorded.

Three of the four relevés showed similarity to FCT 21c 'low lying *Banksia attenuata* woodlands or shrublands'. The marri woodland vegetation and banksia woodland vegetation within the survey area were determined to represent FCT 21c.

No TECs occur within the survey area.

The FCT 21c vegetation represents the 'low lying *Banksia attenuata* woodlands or shrublands' PEC (P3). A total of 1.09 ha of this PEC occurs within the survey area.

The vegetation in the survey area contributes to the ecological values of the local area and may provide habitat for threatened fauna such as black cockatoos.

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# Figures



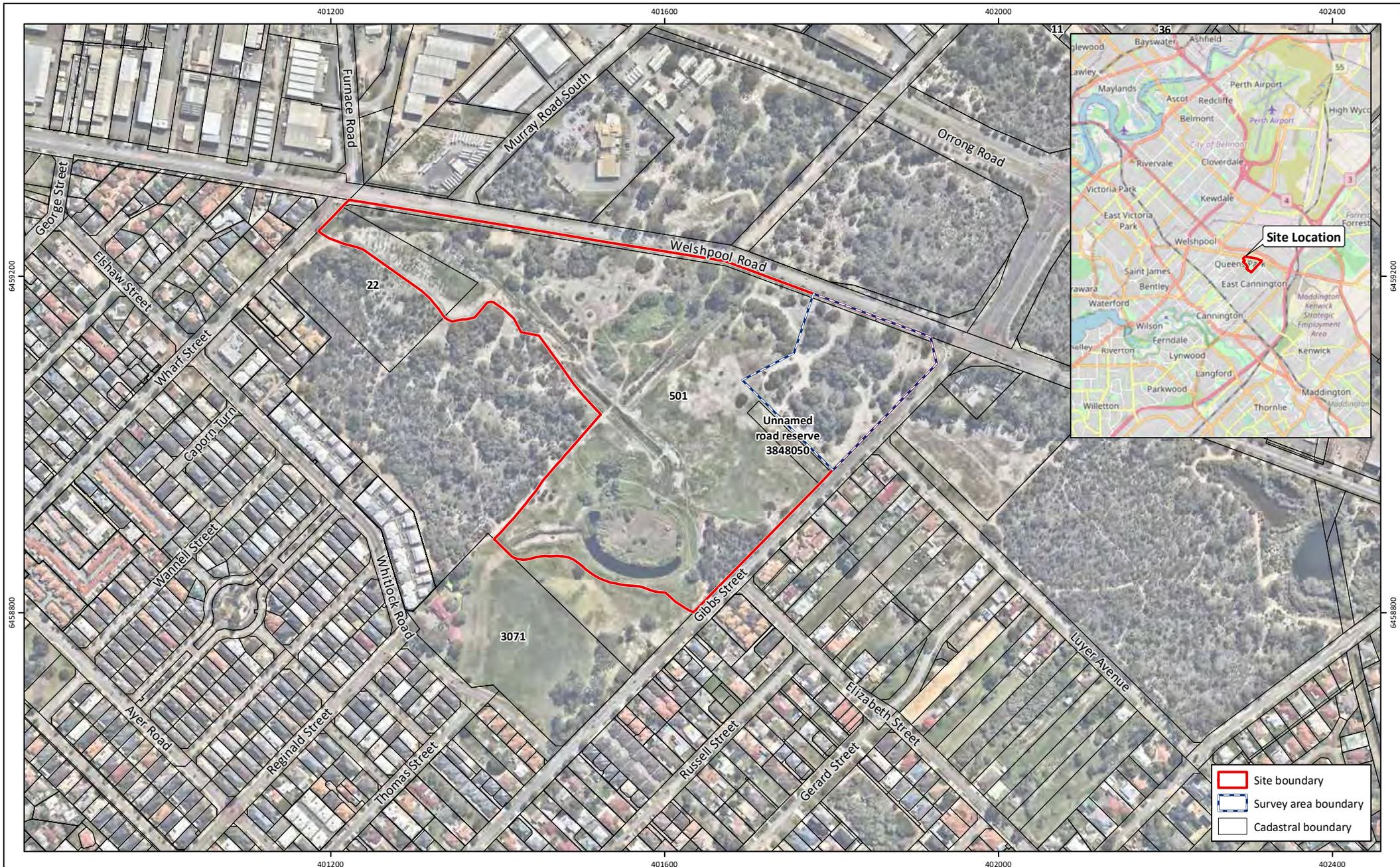
*Figure 1: Site and Survey Location*

*Figure 2: Geomorphology*

*Figure 3: Vegetation Samples and Conservation Significant Flora*

*Figure 4: Priority Ecological Community*

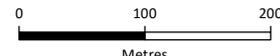




**Figure 1: Site and Survey Location**

**Project:** Threatened Ecological Community Assessment  
State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(06)-F88  
**Drawn:** GAR  
**Date:** 30/11/2020  
**Checked:** RAW  
**Approved:** TAA  
**Date:** 01/12/2020

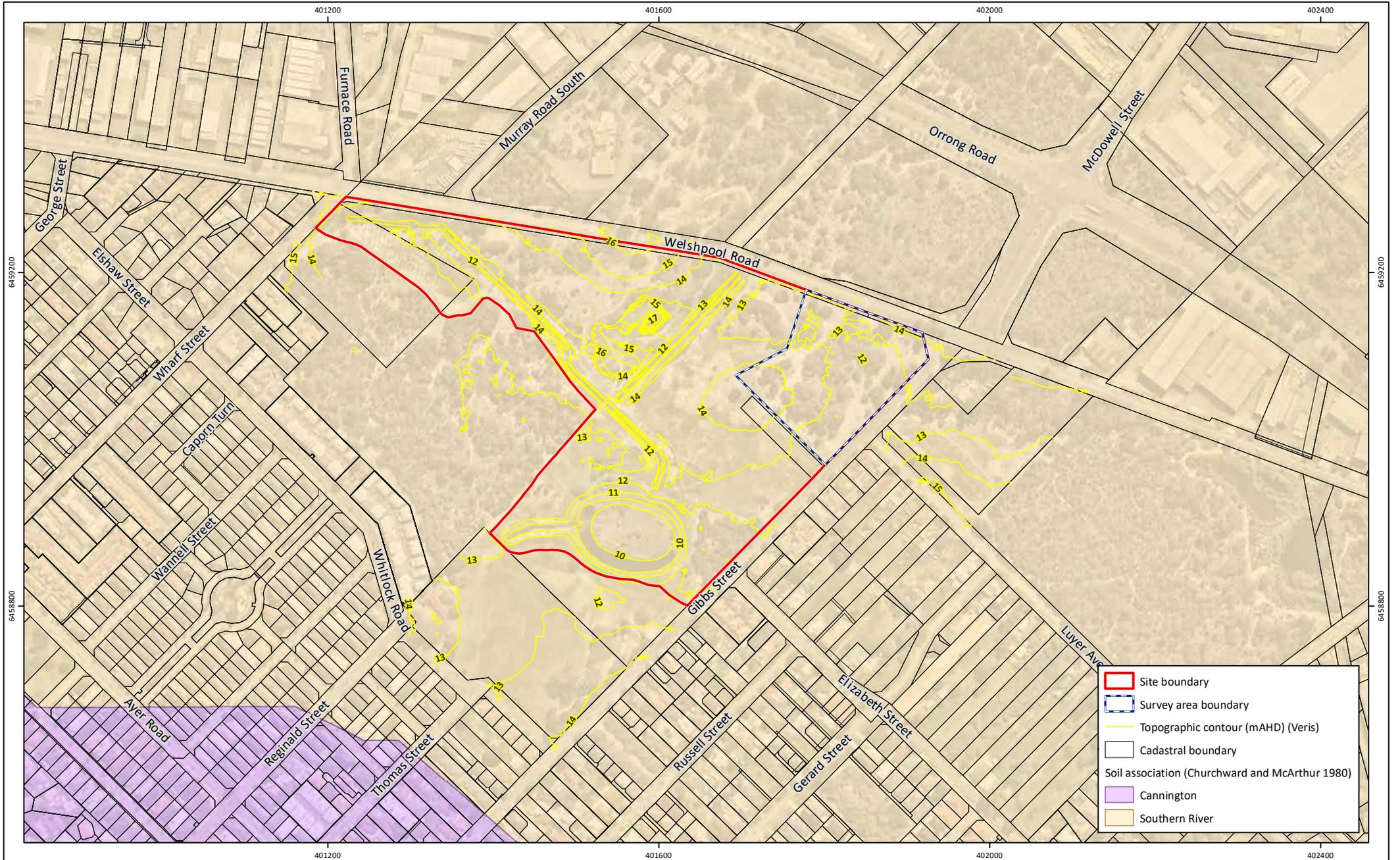


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GDA 1994 MGA Zone 50



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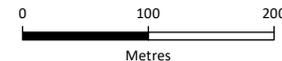




**Figure 2: Geomorphology**

**Project:** Threatened Ecological Community Assessment  
State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(06)-F89  
**Drawn:** GAR  
**Date:** 30/11/2020  
**Checked:** RAW  
**Approved:** TAA  
**Date:** 01/12/2020



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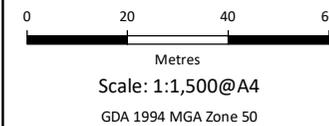




**Figure 3: Vegetation Samples and Conservation Significant Flora**

**Project:** Threatened Ecological Community Assessment  
State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(06)-F90  
**Drawn:** GAR  
**Date:** 30/11/2020  
**Checked:** RAW  
**Approved:** TAA  
**Date:** 01/12/2020





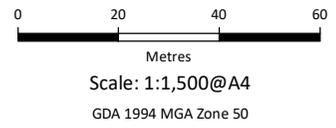


	Site boundary
	Survey area boundary
	Cadastral boundary
	SCP21c 'Low lying <i>Banksia attenuata</i> woodlands or shrublands' PEC (P3)
	Releve

**Figure 4: Priority Ecological Community**

**Project:** Threatened Ecological Community Assessment  
State Football Centre  
**Client:** Department of Finance - Building Management and Works

**Plan Number:**  
EP20-012(06)-F91  
**Drawn:** GAR  
**Date:** 30/11/2020  
**Checked:** RAW  
**Approved:** TAA  
**Date:** 01/12/2020



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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 2018b). Priority flora species are considered during State approval processes. Priority flora categories and definitions are listed in **Table 1**.

## Additional Background Information



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

Conservation code	Description
EX <sup>†</sup>	Threatened Flora – Presumed Extinct 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 <sup>†</sup>	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR <sup>^</sup>	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN <sup>^</sup>	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU <sup>^</sup>	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1 <sup>□</sup>	Priority One – Poorly Known 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 <sup>□</sup>	Priority Two – Poorly Known 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 <sup>□</sup>	Priority Three – Poorly Known 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 <sup>□</sup>	Priority Four – Rare 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.

<sup>^</sup>pursuant to the EPBC Act, <sup>†</sup>pursuant to the BC Act, <sup>□</sup>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.

## Additional Background Information



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 2018a).

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 An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered 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 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 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 2017).

## Additional Background Information

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

Priority code	Description
P1	<p>Priority One: Poorly known ecological communities</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally <math>\leq 5</math> occurrences or a total area of <math>\leq 100</math>ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
P2	<p>Priority Two: Poorly known ecological communities</p> <p>Communities that are known from few occurrences with a restricted distribution (generally <math>\leq 10</math> occurrences or a total area of <math>\leq 200</math>ha). 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.</p>
P3	<p>Priority Three: Poorly known ecological communities</p> <p>(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;</p> <p>(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;</p> <p>(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.</p> <p>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.</p>
P4	<p>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.</p> <p>(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.</p> <p>(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.</p> <p>(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.</p>
P5	<p>Priority Five: Conservation Dependent ecological communities</p> <p>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.</p>

## References

### General references

Department of Biodiversity Conservation and Attractions (DBCA) 2017, *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, *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment*, Perth.

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

### 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

Species List





Family	Status	Species
Anarthriaceae		<i>Lyginia imberbis</i>
Araceae	*DP	<i>Zantedeschia aethiopica</i>
Asparagaceae	*DP, WoNS	<i>Asparagus asparagoides</i> <i>Laxmannia ramosa subsp. ramosa</i> <i>Lomandra caespitosa</i> <i>Lomandra hermaphrodita</i> <i>Lomandra preissii</i> <i>Lomandra ?sonderi</i> <i>Thysanotus manglesianus</i>
Asteraceae	*	<i>Hypochaeris glabra</i>
	*	<i>Ursinia anthemoides</i>
Campanulaceae	*	<i>Wahlenbergia capensis</i>
Casuarinaceae		<i>Allocasuarina fraseriana</i>
Colchicaceae		<i>Burchardia congesta</i>
Cyperaceae		<i>Chaetospora curvifolia</i> <i>Cyathochaeta ?avenacea</i> <i>Isolepis marginata</i> <i>Lepidosperma pubisquameum</i> <i>Lepidosperma ?pubisquameum</i>
Dasypogonaceae		<i>Dasypogon bromeliifolius</i>
Dilleniaceae		<i>Hibbertia hypericoides</i>
Droseraceae		<i>Drosera erythrorhiza</i> <i>Drosera porrecta</i>
Fabaceae		<i>Acacia applanata</i> <i>Acacia pulchella var. glaberrima</i> <i>Daviesia physodes</i> <i>Gompholobium tomentosum</i> <i>Isotropis cuneifolia</i> <i>Jacksonia floribunda</i> <i>Jacksonia gracillima</i> <i>Kennedia prostrata</i>
	P3	
	*	<i>Vicia sativa</i>
Goodeniaceae		<i>Dampiera linearis</i>
Haemodoraceae		<i>Conostylis juncea</i>

Family	Status	Species
Hemerocallidaceae		<i>Phlebocarya ciliata</i>
		<i>Phlebocarya filifolia</i>
Iridaceae		<i>Caesia occidentalis</i>
		<i>Corynotheca micrantha</i>
		<i>Dianella revoluta</i>
		<i>Tricoryne elatior</i>
Macarthuriaceae	*	<i>Gladiolus caryophyllaceus</i>
		<i>Patersonia occidentalis</i>
	*	<i>Romulea flava</i>
Myrtaceae	*	<i>Romulea rosea</i>
	T	<i>Macarthuria keigheryi</i>
Orchidaceae		<i>Corymbia calophylla</i>
		<i>Eucalyptus marginata</i>
		<i>Hypocalymma angustifolium</i>
		<i>Melaleuca preissiana</i>
		<i>Scholtzia involucrata</i>
		<i>Verticordia densiflora</i>
Orobanchaceae		<i>Caladenia flava subsp. flava</i>
		<i>Diuris brumalis</i>
		<i>Microtis media</i>
		<i>Pterostylis sanguinea</i>
Papaveraceae	*	<i>Orobanche minor</i>
Phyllanthaceae	*	<i>Fumaria capreolata</i>
Poaceae		<i>Poranthera microphylla</i>
Proteaceae	*	<i>Avena barbata</i>
	*	<i>Briza maxima</i>
	*	<i>Ehrharta calycina</i>
	*	<i>Ehrharta longiflora</i>
Restionaceae		<i>Eragrostis elongata</i>
		<i>Banksia ilicifolia</i>
		<i>Banksia menziesii</i>
Rutaceae		<i>Persoonia saccata</i>
		<i>Alexgeorgea nitens</i>
		<i>Desmocladius fasciculatus</i>
		<i>Desmocladius flexuosus</i>
		<i>Hypolaena exsulca</i>

Family	Status	Species
		<i>Cyanothamnus ramosus subsp. anethifolius</i>
Scrophulariaceae	*	<i>Dischisma capitatum</i>
Stylidiaceae		<i>Stylidium repens</i> <i>Xanthorrhoea gracilis</i> <i>Xanthorrhoea preissii</i>
Zamiaceae		<i>Macrozamia fraseri</i>

Note: \* denotes introduced weed species, T=threatened, P3=Priority 3, DP=declared pest under BAM Act, WONS=weed of National significance



# Appendix C

Conservation Significant Communities and Likelihood of  
Occurrence Assessment





Code	Community name	TEC/PEC	Level of significance	
			State	EPBC Act
SCP3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	TEC	CR	EN
SCP3b	<i>Corymbia calophylla</i> - <i>Eucalyptus marginata</i> woodlands	TEC	VU	-
SCP3c	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain	TEC	CR	EN
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain	TEC	EN	EN (Banksia woodlands of the Swan Coastal Plain)
SCP20a	<i>Banksia attenuata</i> woodlands over species rich dense shrublands	TEC	EN	
Banksia WL	Banksia woodlands of the Swan Coastal Plain	TEC/PEC	P3	
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	TEC/PEC	P3	
SCP20c	Shrublands and woodlands of the eastern side of the Swan Coastal Plain	TEC	CR	EN
SCP07	Herb rich saline shrublands in clay pans	TEC	VU	CR (Clay pans of the Swan Coastal Plain)
SCP08	Herb rich shrublands in clay pans	TEC	VU	
SCP10a	Shrublands on dry clay flats	TEC	EN	
Muchea Limestone	Shrublands and woodlands on Muchea Limestone of the Swan Coastal Plain	TEC	EN	EN
	Tuart ( <i>Eucalyptus gomphocephala</i> ) woodlands and Forests of the Swan Coastal Plain ecological community	TEC	-	CR
SCP02	Southern wet shrublands, Swan Coastal Plain	TEC	EN	-

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P3=priority 3. Communities which occur within the survey area are highlighted green.



# Appendix D

Sample Data





## Sample Name: R1

**Project no.:** EP20-012

20/07/2020, 26/08/2020,

**Date:** 31/08/2020, 04/09/2020,

02/10/2020, 19/10/2020,

10/11/2020

**Status** Non-permanent

**Author:** RAW,SKP

R1: Page 2 of 3

### Quadrat and landform details

Sample type: releve

Size: other

NW corner easting: 401785.9826

NW corner northing: 6459038.58

Altitude (m): -

Geographic datum/zone: GDA94/Zone 50

Soil water content: damp

Landform: flat

Time since fire: no evidence

Disturbance: low -

Soil type/texture sand/ with organic layer

Bare ground (%): 0

Rocks (%) and type: No rocks

Soil colour: grey/

Litter: 90% (leaves,twigs,logs)

Vegetation condition: very good



**Sample Name:**

**R1**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R1: Page 2 of 3

**Species Data**

\* denotes non-native species

Status	Confirmed name
	<i>Acacia applanata</i>
	<i>Acacia pulchella</i> var. <i>glaberrima</i>
	<i>Alexgeorgea nitens</i>
	<i>Allocasuarina fraseriana</i>
*	<i>Avena barbata</i>
	<i>Banksia ilicifolia</i>
*	<i>Briza maxima</i>
	<i>Burchardia congesta</i>
	<i>Caladenia flava</i>
	<i>Conostylis juncea</i>
	<i>Corymbia calophylla</i>
	<i>Corynotheca micrantha</i>
	<i>Dampiera linearis</i>
	<i>Dasypogon bromeliifolius</i>
	<i>Daviesia physodes</i>
	<i>Daviesia physodes</i>
	<i>Desmocladus fasciculatus</i>
	<i>Desmocladus flexuosus</i>
	<i>Dianella revoluta</i>
*	<i>Dischisma capitatum</i>
	<i>Diuris brumalis</i>
	<i>Drosera erythrorhiza</i>
	<i>Drosera porrecta</i>
*	<i>Ehrharta calycina</i>
*	<i>Ehrharta longiflora</i>
	<i>Eucalyptus marginata</i>
*	<i>Gladiolus caryophyllaceus</i>
	<i>Hibberia hypericoides</i>
	<i>Hypocalymma angustifolium</i>
*	<i>Hypochaeris glabra</i>
*	<i>Hypolaena exsulca</i>
	<i>Jacksonia floribunda</i>
	<i>Kennedia prostrata</i>
	<i>Laxmannia ramosa</i> subsp. <i>ramosa</i>

**Sample Name:**

**R1**

**Project no.:** EP20-012

**Date:** 0/01/1900

**Status** Non-permanent

**Author:** RAW,SKP

R1: Page 3 of 3

*Lepidosperma ?pubisquameum*

*Lepidosperma pubisquameum*

*Lomandra caespitosa*

*Lomandra hermaphrodita*

*Lomandra preissii*

*Macarthuria keigheryi*

*Macrozamia fraseri*

*Microtis media*

\*

*Orobanche minor*

\*

*Orobanche minor*

*Patersonia occidentalis*

*Persoonia saccata*

*Phlebocarya filifolia*

*Pterostylis sanguinea*

\*

*Romulea flava*

\*

*Romulea rosea*

*Scholtzia involucreta*

*Stylidium repens*

*Thysanotus manglesianus*

*Tricoryne elatior*

*Tricoryne elatior*

\*

*Ursinia anthemoides*

*Verticordia densiflora*

\*

*Wahlenbergia capensis*

*Xanthorrhoea gracilis*

*Xanthorrhoea preissii*

**Sample Name:**

**R2**

**Project no.:** EP20-012

20/07/2020, 26/08/2020,

31/08/2020, 04/09/2020,

**Date:** 02/10/2020, 19/10/2020,

10/11/2020

**Status** Non-permanent

**Author:** RAW,SKP

R2: Page 2 of 3

**Quadrat and landform details**

Sample type: releve

Size: other

NW corner easting: 401802.7408

NW corner northing: 6459087.694

Altitude (m): 8

Geographic datum/zone: GDA94/Zone 50

Soil water content: damp

Landform: flat

Time since fire: no evidence

Disturbance: low -

Soil type/texture sand/ with organic layer

Bare ground (%): 0

Rocks (%) and type: No rocks

Soil colour: grey/

Litter: 70% (leaves,twigs,branches)

Vegetation condition: very good



**Sample Name:**

**R2**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R2: Page 2 of 3

**Species Data**

\* denotes non-native species

**Status**

**Confirmed name**

*Acacia pulchella* var. *glaberrima*  
*Alexgeorgea nitens*  
 \* *Asparagus asparagoides*  
 \* *Briza maxima*  
*Burchardia congesta*  
*Caladenia flava*  
*Conostylis juncea*  
*Corymbia calophylla*  
*Corynotheca micrantha*  
*Dasypogon bromeliifolius*  
*Daviesia physodes*  
*Diuris brumalis*  
*Drosera porrecta*  
 \* *Ehrharta calycina*  
 \* *Fumaria capreolata*  
 \* *Gladiolus caryophyllaceus*  
*Hypocalymma angustifolium*  
*Jacksonia gracillima*  
*Kennedia prostrata*  
*Laxmannia ramosa* subsp. *ramosa*  
*Lepidosperma ?pubisquameum*  
*Lepidosperma pubisquameum*  
*Lomandra hermaphrodita*  
*Lomandra preissii*  
*Lyginia imberbis*  
*Macrozamia fraseri*  
*Microtis media*  
*Patersonia occidentalis*  
*Phlebocarya ciliata*  
*Pterostylis sanguinea*  
*Pterostylis sanguinea*  
 \* *Romulea flava*  
 \* *Romulea rosea*  
*Thysanotus manglesianus*  
*Tricoryne elatior*

**Sample Name:**

**R2**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R2: Page 3 of 3

\*

*Vicia sativa*

*Xanthorrhoea gracilis*

*Xanthorrhoea preissii*

\*

*Zantedeschia aethiopica*

**Sample Name:** R3

**Project no.:** EP20-012

20/07/2020, 26/08/2020,

**Date:** 31/08/2020, 04/09/2020,

02/10/2020, 19/10/2020,

10/11/2020

**Status** Non-permanent

**Author:** RAW,SKP

R3: Page 2 of 3

**Quadrat and landform details**

Sample type: releve

Size: other

NW corner easting: 401851.1762

NW corner northing: 6459103.542

Altitude (m): 8

Geographic datum/zone: GDA94/Zone 50

Soil water content: damp

Landform: flat

Time since fire: no evidence

Disturbance: low -

Soil type/texture sand/ with organic layer

Bare ground (%): 0

Rocks (%) and type: No rocks

Soil colour: grey/

Litter: 80% (leaves,twigs,branches)

Vegetation condition: very good



**Sample Name:**

**R3**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R3: Page 2 of 3

## Species Data

\* denotes non-native species

Status	Confirmed name
	<i>Acacia applanata</i>
	<i>Acacia pulchella</i> var. <i>glaberrima</i>
	<i>Alexgeorgea nitens</i>
*	<i>Briza maxima</i>
	<i>Burchardia congesta</i>
	<i>Caesia occidentalis</i>
	<i>Caesia occidentalis</i>
	<i>Caladenia flava</i>
	<i>Chaetospora curvifolia</i>
	<i>Conostylis juncea</i>
	<i>Corymbia calophylla</i>
	<i>Corynotheca micrantha</i>
	<i>Cyanothamnus ramosus</i> subsp. <i>anethifolius</i>
	<i>Cyathochaeta ?avenacea</i>
	<i>Dasypogon bromeliifolius</i>
	<i>Daviesia physodes</i>
	<i>Desmocladius fasciculatus</i>
*	<i>Ehrharta calycina</i>
*	<i>Gladiolus caryophyllaceus</i>
	<i>Gompholobium tomentosum</i>
*	<i>Hypolaena exsulca</i>
	<i>Isotropis cuneifolia</i>
	<i>Jacksonia floribunda</i>
	<i>Jacksonia gracillima</i>
	<i>Kennedia prostrata</i>
	<i>Laxmannia ramosa</i> subsp. <i>ramosa</i>
	<i>Lepidosperma ?pubisquameum</i>
	<i>Lepidosperma pubisquameum</i>
	<i>Lomandra ?sonderi</i>
	<i>Lomandra caespitosa</i>
	<i>Lomandra hermaphrodita</i>
	<i>Lomandra preissii</i>
	<i>Lyginia imberbis</i>
	<i>Microtis media</i>
	<i>Patersonia occidentalis</i>

**Sample Name:**

**R3**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R3: Page 3 of 3

*Phlebocarya ciliata*

*Phlebocarya filifolia*

*Poranthera microphylla*

*Pterostylis sanguinea*

\*

*Romulea flava*

\*

*Romulea rosea*

*Tricoryne elatior*

\*

*Wahlenbergia capensis*

*Xanthorrhoea gracilis*

**Sample Name:**

**R4**

**Project no.:** EP20-012

20/07/2020, 26/08/2020,

31/08/2020, 04/09/2020,

**Date:** 02/10/2020, 19/10/2020,

10/11/2020

**Status** Non-permanent

**Author:** RAW,SKP

R4: Page 2 of 2

**Quadrat and landform details**

Sample type: releve

Size: other

NW corner easting: 401776.7753

NW corner northing: 6459129.777

Altitude (m): 11

Geographic datum/zone: GDA94/Zone 50

Soil water content: damp

Landform: flat

Time since fire: no evidence

Disturbance: low -

Soil type/texture sand/ with organic layer

Bare ground (%): 0

Rocks (%) and type: No rocks

Soil colour: grey/

Litter: 90% (leaves,twigs,branches)

Vegetation condition: very good



**Sample Name:**

**R4**

**Project no.:** EP20-012

**Date:** 20/07/2020, 26/08/2020, 31/08/

**Status** Non-permanent

**Author:** RAW,SKP

R4: Page 2 of 2

**Species Data**

\* denotes non-native species

Status	Confirmed name
	<i>Acacia applanata</i>
*	<i>Asparagus asparagoides</i>
	<i>Burchardia congesta</i>
	<i>Corymbia calophylla</i>
	<i>Corynotheca micrantha</i>
	<i>Dasypogon bromeliifolius</i>
*	<i>Ehrharta calycina</i>
	<i>Isolepis marginata</i>
	<i>Jacksonia gracillima</i>
	<i>Lepidosperma ?pubisquameum</i>
	<i>Microtis media</i>
	<i>Phlebocarya ciliata</i>
	<i>Pterostylis sanguinea</i>
*	<i>Romulea flava</i>



# Appendix E

Cluster Dendrograms





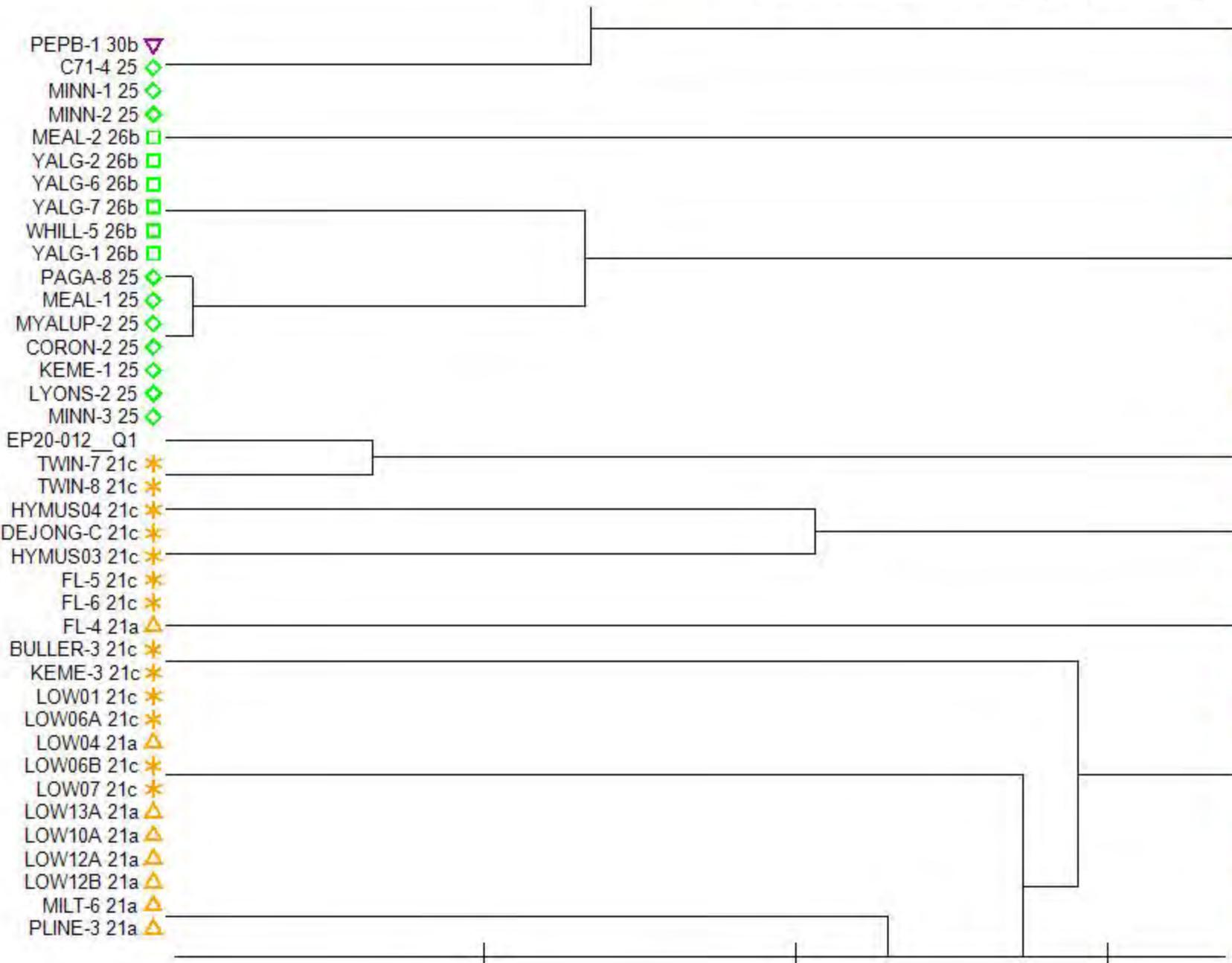
# Group average

Resemblance: S17 Bray Curtis similarity

## FCT

- |       |       |
|-------|-------|
| ▲ 1a  | ▼ 3b  |
| ▼ 1b  | ◻ 10a |
| ■ 2   | ◇ 25  |
| ◆ 4   | ○ 12  |
| ● 20a | ▲ 6   |
| + 7   | ▼ 26a |
| × 11  | ■ 17  |
| * 5   | ◆ 19  |
| △ 21a | ● 3c  |
| ▽ 15  | + 23b |
| ◻ 22  | × 18  |
| ◇ 13  | * 30a |
| ○ 23a | △ 10b |
| ▲ 24  | ▼ 30b |
| ▼ 21b | ◻ 26b |
| ■ 3a  | ◇ 30c |
| ◆ 20b | ○ 14  |
| ● 9   | ▲ 16  |
| + 8   | ▼ 29b |
| × 28  | ■ 27  |
| * 21c | ◇ 20c |
| △ 29a |       |

Samples



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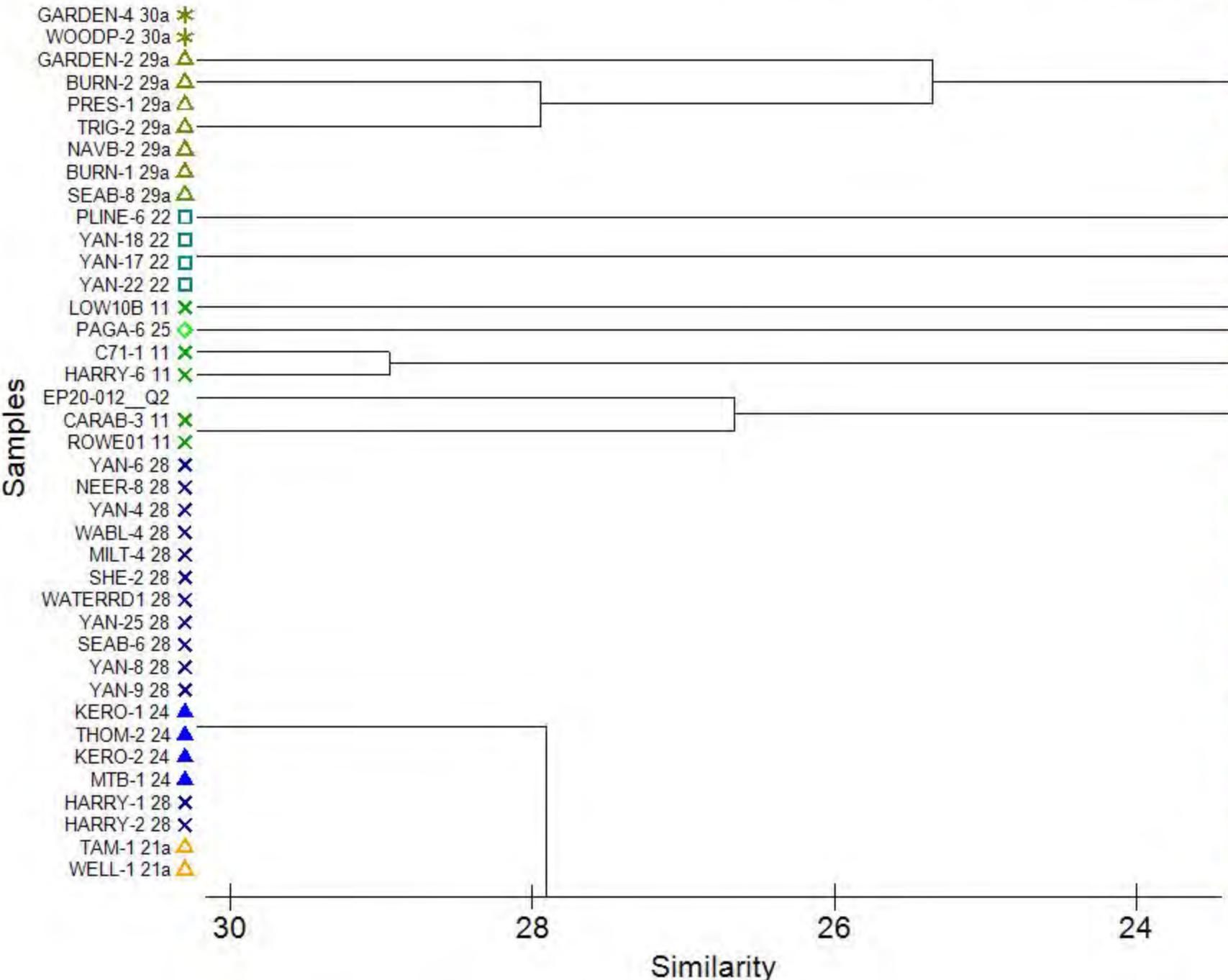
Similarity

# Group average

Resemblance: S17 Bray Curtis similarity

## FCT

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| ◆ 4   | ○ 12  |
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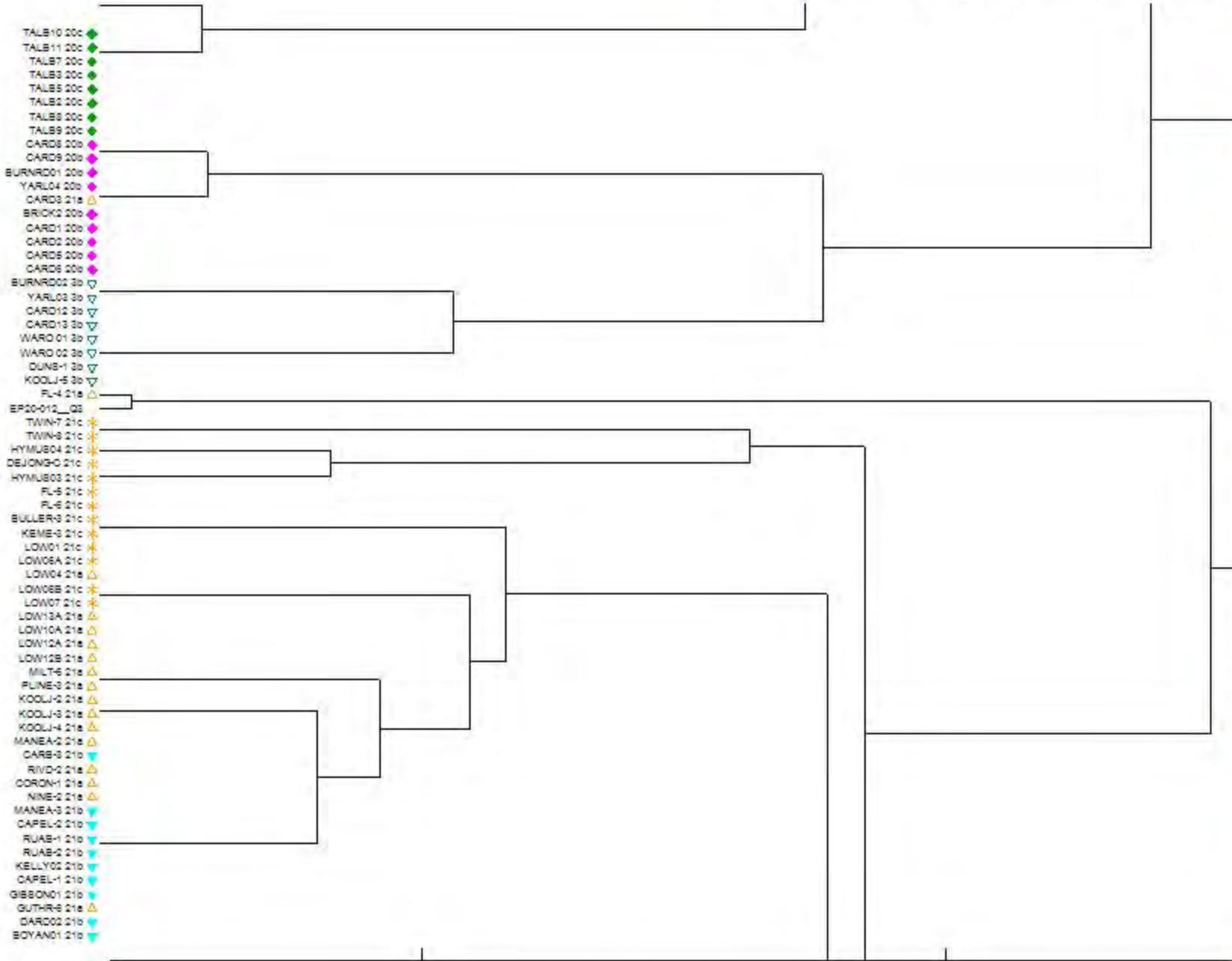
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Resemblance: S17 Bray Curtis similarity

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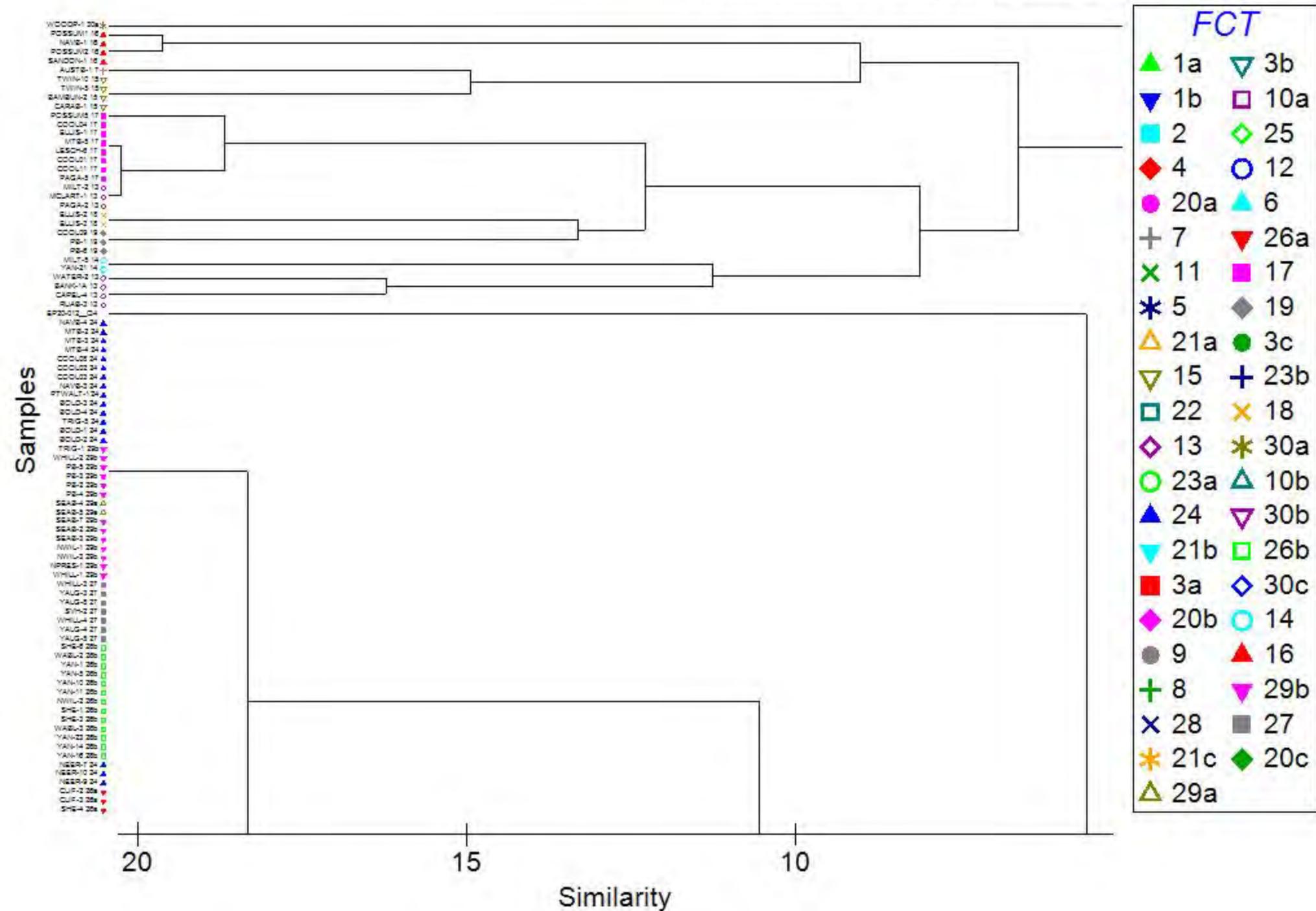
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Similarity

# Group average

Resemblance: S17 Bray Curtis similarity





# Appendix G

Basic Fauna and Targeted Black Cockatoo Assessment



Prepared by Emerge Associates (2020)

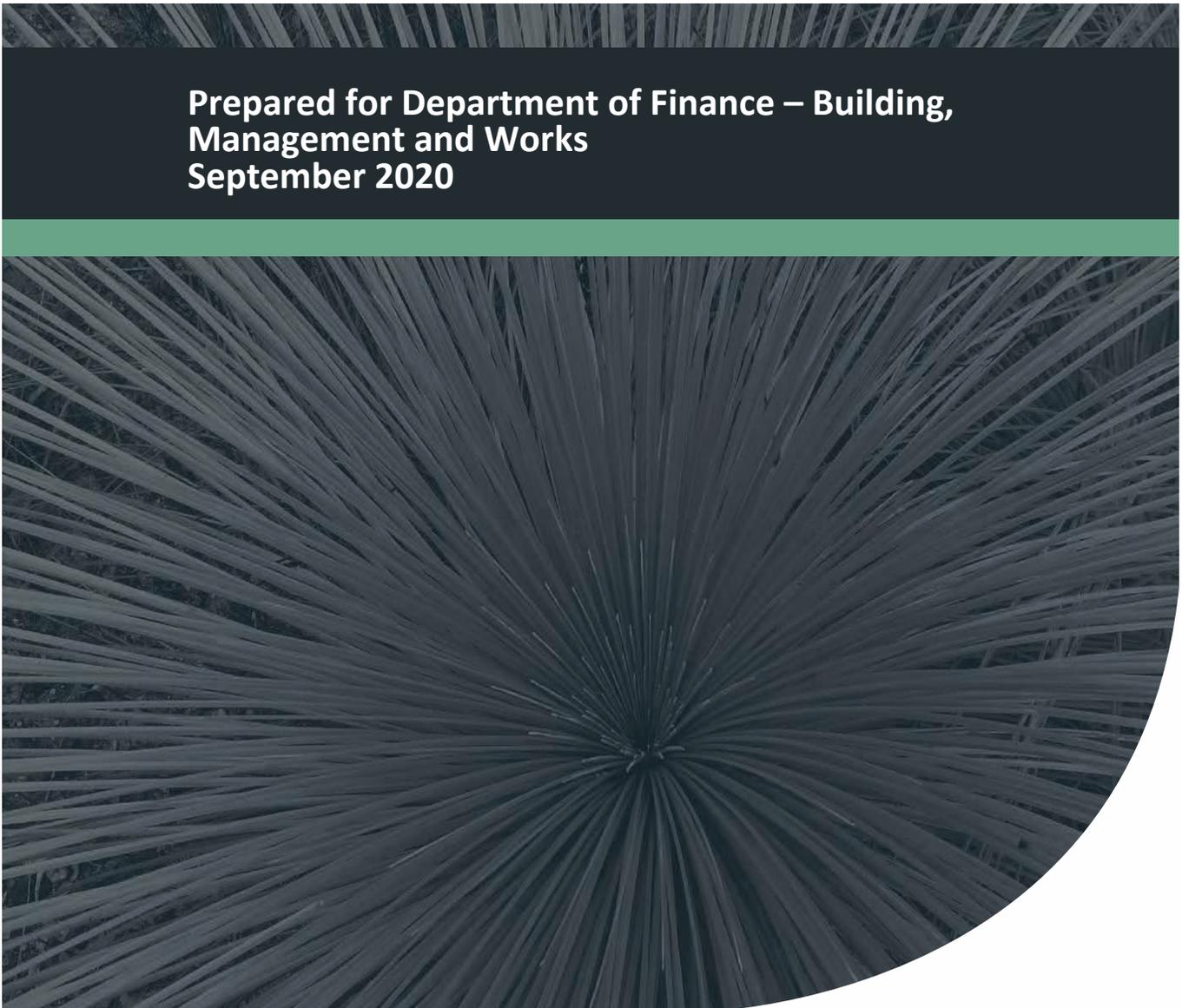


# Basic Fauna and Targeted Black Cockatoo Assessment

State Football Centre

Project No: EP20-012(14)

**Prepared for Department of Finance – Building,  
Management and Works  
September 2020**



# Basic Fauna and Targeted Black Cockatoo Assessment

## State Football Centre



## Document Control

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Version	Date	Author	Reviewer		
1	September 2020	Melanie Schubert	MS	Tom Atkinson	TAA
	Submitted for client review				

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## Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre



### Executive Summary

The Department of Local Government, Sport and Cultural Industries (DLGSC) in collaboration with the City of Canning (CoC) intends to develop part Lots 22 Wharf Street, 501 Welshpool Road, and two unnamed road reserves (land IDs 4423461 and 3848050) in Queens Park into a sporting facility for football (soccer). These lots (referred to as 'the site') is located approximately 10 kilometres (km) south-east of the Perth Central Business District within the City of Canning.

As part of the assessment a desktop assessment of relevant background information was completed and a field survey was undertaken on 29 July 2020. During the field survey an assessment was made on the fauna habitat within the site and its suitability to provide habitat for conservation significant fauna. A targeted survey was undertaken concurrently to determine the presence of habitat for three threatened black cockatoo species, Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo that occur on the Swan Coastal Plain.

Outcomes of the basic fauna survey include the following:

- The majority of the site contains turf and bare ground with low fauna habitat values. The site also contains small patches of native woodland which provides the highest habitat value for native fauna.
- A total of 20 native and four introduced fauna species were positively identified to occur within the site, including threatened (endangered) Carnaby's cockatoo and (vulnerable) forest red-tailed black cockatoo.
- Additionally, it is considered possible that eight species of conservation significance not recorded during the field survey might occasionally occur within the site. Targeted surveys would need to be undertaken to confirm whether these species occur within the site.

Outcomes of the targeted black cockatoo survey include the following:

- The site occurs within the modeled distribution of all three species of black cockatoo and within the breeding range for Carnaby's cockatoo and forest red-tailed black cockatoo. Secondary foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo were recorded in multiple locations in the site.
- A total of 46 habitat trees were recorded of which none contain hollows that are suitable for breeding by black cockatoos. Therefore, the site does currently not provide breeding habitat for any of the three species of black cockatoo. The site lies outside of the known and predicted breeding range of Baudin's cockatoo and so the site would not provide breeding habitat for this species even if suitable hollows were present.
- No evidence of black cockatoo roosting activity was observed within the site. Roosting habitat for all three species of black cockatoo occurs within the site in the form of large trees.
- Foraging habitat for black cockatoos occurs within the site as scattered trees and relatively small patches of vegetation. A total of 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo was recorded within the site.

## Basic Fauna and Targeted Black Cockatoo Assessment

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- The overall black cockatoo habitat quality score for the site was determined to be seven (high to moderate) for forest red-tailed black cockatoo, six (moderate) for Baudin's cockatoo and five (moderate) for Baudin's cockatoo.

# Basic Fauna and Targeted Black Cockatoo Assessment

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## Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
BMW	Department of Finance – Building, Management and Works
CoC	City of Canning
DBCA	Department of Biodiversity, Conservation and Attractions
DLGSC	The Department of Local Government, Sport and Cultural Industries
DPaW	Department of Parks and Wildlife (now DBCA)
DAWE	Department of Agriculture, Water and the Environment
EPA	Environmental Protection Authority
WA Museum	Western Australian Museum

Table A2: Abbreviations – General terms

General terms	
EN	Endangered
EX	Extinct
VU	Vulnerable
MI	Migratory
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>

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Table A4: Abbreviations – planning

Planning terms	
MRS	Metropolitan Region Scheme
LPS	Local Planning Scheme

Table A5: Abbreviations – units of measurement

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

# Basic Fauna and Targeted Black Cockatoo Assessment

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# Basic Fauna and Targeted Black Cockatoo Assessment

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## 1 Introduction

### 1.1 Project background

The Department of Local Government, Sport and Cultural Industries (DLGSC) in collaboration with the City of Canning (CoC) intends to develop part Lots 22 Wharf Street, 501 Welshpool Road, and two unnamed road reserves (land IDs 4423461 and 3848050) in Queens Park into a sporting facility for football (soccer). These lots (referred to as 'the site') are located approximately 10 kilometres (km) south-east of the Perth Central Business District within the City of Canning and are zoned 'parks and recreation' under the *Metropolitan Region Scheme* and 'parks and recreation' under the City of Canning *Local Planning Scheme No. 42*.

The site is approximately 16 hectares (ha) in size and is surrounded by Welshpool Road to the north, Wharf Street and residential lots to the west, Gibb Street to east and native bushland and Maniana Park to the south. 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 Department of Finance – Building, Management and Works (BMW) on behalf of the DLGSC and the CoC to provide environmental consultancy services to support the planning process for the site. The purpose of this assessment is to provide sufficient information on the fauna values within the site to inform this process, with particular focus on identifying habitat for threatened species of black cockatoo.

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

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 fauna species.
- Field survey to identify fauna species and fauna habitats within the site, including potential habitat for species of black cockatoo.
- Compilation of a list of fauna species with potential to occur within the site as identified from the desktop assessment and opportunistically recorded as part of the field survey.
- Identification of potential habitat for conservation significant fauna species and an assessment of likelihood of occurrence.
- An assessment of the quality of black cockatoo habitat within the site.
- Mapping of fauna and black cockatoo habitat.
- Documentation of the desktop assessment, survey methodology and results into a report.

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## 2 Environmental Context

### 2.1 Climate

Climate has a strong influence on the fauna habitat and species present in a region and a site. The south west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters.

An average of 14.4 mm of rainfall is recorded in July 2020 from the Gosnells weather station. Temperatures at the Gosnells weather station in July 2020 ranged from a mean maximum of 19°C to a mean minimum of 8°C (BoM 2020).

The average rainfall in July 2020 was therefore significantly lower than the average rainfall for July of 157.4 mm recorded from the Gosnells weather station (BoM 2020). The mean maximum and minimum temperatures are approximately consistent with the mean temperatures recorded for July by the Gosnells weather station.

### 2.2 Geomorphology and soils

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.

Examination of soil mapping by (Gozzard 2011) places the site in Bassendean sand (S8) which was later confirmed during the field survey. The Bassendean sands are typically very light grey at the 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 14 m in relation to the Australian height datum (mAHD) in the central part of the site to 11 mAHD in the southern part of the site (DoW 2008) (Figure 2).

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## 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). Many wetlands provide important fauna habitat and support high levels of fauna biodiversity and endemism.

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 two ‘perennial lakes’ are located in the southern portion of the site. Aerial photography indicates that these features are connected or part of the same feature. The dataset also shows that four separate ‘major drains’ occur in the eastern and central portion of the site. Aerial photography indicates that three of these features are connected and are part of the same hydrological feature.

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 2020), which further categorises geomorphic wetland features into specific wetland types and 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 2020) indicates that part of a ‘multiple use’ category wetland features (UFIs 7490) occurs within the majority of the site. One ‘resource enhancement category wetland feature (UFI 15819) occurs in the south-eastern part of the site. Both features are classified as ‘dampland’ wetlands. A small portion of a larger wetland feature classed as ‘no longer a wetland’ is mapped over the western portion of the site. The locations of the geomorphic wetlands (excluding the wetland feature classed as no longer being a wetland) and other hydrological features in and near the site are shown in **Figure 2**.

## 2.5 Regional vegetation

Vegetation types and resulting fauna habitats also influence the diversity and composition of fauna taxa present within an area. 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 ‘SWAO2’ or Perth subregion, which is characterised as mainly

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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 fauna species.

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 'Southern river complex', which is described as open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - *Banksia* spp. with fringing woodland of *Eucalyptus rudis* - *Melaleuca raphiophylla* along creek beds.

## 2.6 Historic land use

Review of historical images available from 1953 (WALIA 2020) onwards shows that the majority of the site was cleared of native vegetation prior to 1953, likely for residential, grazing and/or cropping uses.

## 2.7 Significant fauna

### 2.7.1 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 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**.

#### 2.7.1.1 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.

## Basic Fauna and Targeted Black Cockatoo Assessment

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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’ is therefore described as ‘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 2012). A minimum DBH for a habitat trees is defined as  $\geq 50$  centimetres (cm) for most tree species used by black cockatoos and  $\geq 30$  cm for *Eucalyptus wandoo* (wandoo) and *Eucalyptus salmonophloia* (salmon gum) (DSEWPaC 2012). Breeding habitat is also generally expected to be located within 7 km of food and water resources (Saunders 1990).
- ‘Roosting habitat’ consists of groups or individual tall trees that are used by black cockatoos for roosting during the day or overnight. Roosts generally comprise the tallest trees in an area and can include native and non-native trees (DSEWPaC 2012). Roosts are often located within 6 km of water and food resources, with additional foraging ranges within 12 km (Shah 2006; DSEWPaC 2012; Le Roux 2017). The use of a particular roost site 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 therefore 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 2012). Forest red-tailed black cockatoo breeds in October/November but may breed in March/April if there is good autumn rainfall (DSEWPaC 2012). 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).

Publicly available regional datasets relating to black cockatoo distribution, records and extent of habitat types were reviewed in relation to the site and surrounding area, as summarised in **Table 1**, **Table 2** and **Table 3**, and shown in **Figure 4**. Detailed information on each dataset considered as part of the desktop review is provided in **Appendix A**.

Table 1: Summary of black cockatoo background review

Category	Site context	Source
Species distribution	<ul style="list-style-type: none"> <li>• Site is in the western-most extent of the modelled distribution of Baudin’s cockatoo, but not within its known or predicted breeding range.</li> <li>• Site is within the modelled distribution of Carnaby’s cockatoo and within its breeding range</li> <li>• Site is within the modelled distribution for forest red-tailed black cockatoo and within its known breeding range.</li> </ul>	(DoEE 2016a, c, b)
Breeding sites	<ul style="list-style-type: none"> <li>• No confirmed nesting records occur within the site or within 12 km.</li> <li>• Potential evidence of forest red-tailed black cockatoo breeding activity occurs within 6 km of the site.</li> </ul>	BirdLife Australia database search (2020)

# Basic Fauna and Targeted Black Cockatoo Assessment

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Table 1: Summary of black cockatoo background review (continued)

Category		Site context	Source
Carnaby's cockatoo breeding areas (12 km radius surrounding breeding sites)		<ul style="list-style-type: none"> <li>No confirmed breeding areas intersect the site.</li> <li>No possible breeding areas intersect the site.</li> </ul>	(Glossop <i>et al.</i> 2011)
Important bird areas for Carnaby's cockatoo		<ul style="list-style-type: none"> <li>None within the site</li> <li>Northern Swan Coastal Plain and Mundaring-Kalamunda important bird areas occur within 12 km of the site</li> </ul>	DPaW (2013)
Roost site		<ul style="list-style-type: none"> <li>None within the site</li> <li>43 roost sites within 12 km of the site (see <b>Table 2</b> and <b>Table 3</b>): <ul style="list-style-type: none"> <li>10 associated with white-tailed<sup>^</sup> black cockatoos</li> <li>19 associated with forest red-tailed black cockatoos</li> <li>14 associated with white<sup>^</sup> and red-tailed black cockatoos</li> </ul> </li> </ul>	BirdLife Australia database search (2020)
Foraging habitat	White-tailed black cockatoo <sup>^</sup>	<ul style="list-style-type: none"> <li>Potential native foraging habitat mapped within the eastern portion of the site.</li> <li>Extensive areas of potential native foraging habitat mapped within the wider local area of the site.</li> </ul>	(Emerge Associates 2020a)
	White-tailed black cockatoo <sup>^</sup>	<ul style="list-style-type: none"> <li>No pine plantations mapped within the site or within 12 km.</li> </ul>	Forest Products Commission (2017)
	Forest red-tailed black cockatoo	<ul style="list-style-type: none"> <li>Potential native foraging habitat mapped within eastern portions of the site.</li> <li>Extensive areas of potential native foraging habitat mapped within the wider local area.</li> </ul>	(Emerge Associates 2020b)

<sup>^</sup>Carnaby's and/or Baudin's cockatoo

Table 2: White-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CANWILR001	0	0	0	0	68	0	0	0	0	0
GOSCVR001	0	19	NS	NS	0	0	0	0	NS	80
GOSCVR002	NS	NS	26	52	0	0	151	0	0	0
GOSMARR001	NS	0	120	36						
GOSSOUR002	NS	NS	NS	NS	NS	NS	50	0	0	0
KALMAIR002	NS	NS	NS	NS	0	NS	0	0	0	11
KALPIER001	NS	82	46	0	0	0	163	NS	210	133
KALWALR001	0	5	0	0	0	0	NS	0	0	NS
MELLEER001	0	0	12	0	70	0	0	0	15	2

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Table 2: White-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020) (continued)

Roost ID	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MUNHEL001	NS	3	16	42	124	0	44	0	3	0
MUNHEL002	NS	0	66							
SOUCOMR001	408	645	558	301	402	460	242	289	470	563
SOUSALR001	12	0	0	0	5	0	0	0	2	0
VICKENR001	0	NS	0	0	0	0	0	0	0	2

NS = not surveyed

Table 3: Forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year					
	2014	2015	2016	2017	2018	2019
BAYMAYR001	NS	NS	0	0	NS	4
CANRIVR001	NS	NS	6	11	7	16
CANROSR001	NS	NS	0	0	14	2
CANWILR001	4	7	7	5	16	82
GOSCNVR001	2	0	0	0	NS	0
GOSCNVR002	0	4	0	0	0	0
GOSGOSR004	19	NS	31	32	79	0
GOSKENR001	NS	NS	NS	51	334	35
GOSKENR002	NS	NS	NS	NS	72	0
GOSMARR001	NS	NS	NS	75	37	18
GOSSOUR002	NS	NS	0	36	208	15
KALCARR003	NS	NS	NS	NS	NS	76
KALFORR002	NS	NS	NS	NS	42	65
KALFORR003	NS	NS	NS	NS	31	10
KALHIGR001	NS	NS	NS	7	78	5
KALHIGR003	NS	NS	0	7	0	NS
KALMAIR002	25	NS	56	98	137	304

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Table 3: Forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020) (continued)

Roost ID	Year					
	2014	2015	2016	2017	2018	2019
KALMAIR005	NS	NS	3	0	0	0
KALMAIR006	NS	NS	NS	3	NS	NS
KALPIER001	0	0	25	NS	29	6
KALWALR001	43	1	NS	0	0	NS
KALWATR002	NS	NS	150	31	150	23
MELLEER001	0	0	11	25	5	0
MUNHEL001	0	0	4	31	0	13
MUNHEL002	NS	NS	NS	NS	79	0
SOUCOMR001	0	0	0	0	0	1
SOUSALR001	2	0	0	0	8	0
STIMENR002	0	NS	0	5	0	0
SWAHAZR001	NS	NS	NS	NS	NS	12
VICKENR001	94	121	0	116	108	140
VICKENR002	NS	35	42	0	NS	NS
VICLATR001	0	0	0	0	15	32
VICWATR002	NS	NS	0	45	85	51

NS = not surveyed

### 2.7.2 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**.

### 2.7.3 Migratory fauna species

Migratory fauna species that migrate to Australia and its external territories or pass through or over Australian waters during their annual migrations are protected 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

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significant impact on a taxon listed under the EPBC Act requires Ministerial approval. Further information on migratory species is provided in **Appendix A**.

#### 2.7.4 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. Further information on specially protected species and their categories is provided in **Appendix A**.

#### 2.7.5 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. Pest fauna species are generally not native to Australia but some Australian or West Australian fauna may also be considered pests.

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**.

### 2.8 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.

The entirety of the site is mapped as a Bush Forever Site No. 283 (Queens Park Bushland), that also extends to the east of the site. Bush Forever Site No. 424 (McDowell Street Bushland) is adjacent to the site in the north-eastern corner but is separated from the site through Welshpool Road. The location of Bush Forever sites associated with the site is shown in **Figure 2**.

### 2.9 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. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply. However, exemptions under Schedule 6 of the EP Act still apply, which includes any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

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One ESA is mapped over the entirety of the site. Multiple additional ESAs are located within the wider area of the site. The location of the ESA mapped over the site and ESAs near the site are shown in **Figure 2**.

#### 2.10 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 or adjacent to the site. Multiple ecological linkages occur within the wider area of the site as shown in **Figure 2**.

#### 2.11 Previous surveys

Ecoscope (2010) have undertaken a 'Level 2' fauna assessment over a larger area including the site. One fauna species of conservation significance, namely Carnaby's cockatoo was positively identified as occurring within the surveys study area.

Prendergast (2020) have conducted surveys for native bees over multiple study sites in the wider Perth area including Maniana Park in close proximity to the site. Unpublished results available online indicate a range of bee species have been recorded including one undescribed bee species (*Leioproctus* (Euryglossidia) sp. F480 'knob-nosed').

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### 3 Methods

#### 3.1 Desktop assessment

A search was conducted for conservation significant fauna that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020), *NatureMap* (DBCA 2020a) and within 5 km using DBCA's conservation significant fauna database (reference no. FAUNA6196), previous surveys and literature references.

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

#### 3.2 Field survey

An ecologist from Emerge visited the site on 29 July 2020 during the day to conduct the basic fauna survey and targeted black cockatoo field survey. The survey was conducted from approximately 9:00 AM until 4:00 PM.

The weather conditions during the survey were dry with temperatures ranging from a minimum of 11.6°C to maximum of 21°C (AccuWeather 2020).

##### 3.2.1 Basic fauna

Transects were traversed across the site, during the day, 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.

An opportunistic fauna species list was compiled and fauna habitat values were described, with particular reference to conservation significant fauna species with potential to occur within the site.

##### 3.2.2 Targeted black cockatoo

Transects were traversed across the site and the presence of 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 marri or banksia fruit were conducted.

###### 3.2.2.1 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  $\geq 50$  cm or DBH  $\geq 30$  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.

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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) (Groom 2010; Saunders *et al.* 1982; 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, tagged and the attributes outlined in **Table 4** were recorded for each tree.

Table 4: Attributes recorded for each habitat tree in the site

Attribute	Description
Tag	Unique identifier on a metal tag was nailed to each habitat tree
Image	Each habitat tree was individually photographed
GPS location	The location of each habitat tree 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 (assessed from ground level only)

If hollows potentially suitable for breeding by a black cockatoo were recorded, the hollow was inspected further using a drone and/or a pole-mounted camera to confirm whether the hollows' internal dimensions were suitable. The internal hollow inspection also searched for signs of hollow use such as chew marks around the hollow entrance, nesting material such as feathers and presence of birds perching at the entrance or entering the hollow.

Following the internal hollow inspection, where required, all habitat trees were assigned to a category listed in **Table 5**.

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Table 5: 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 <sup>^</sup> 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 <sup>^</sup>
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 <sup>^</sup>
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 <u>or</u> contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection <sup>^</sup>

<sup>^</sup>Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above in **Section 3.1.1**.

### 3.2.2.2 Roosting habitat

The site was assessed for the presence of active or historical roosts and its potential to provide roosting habitat for black cockatoos. Groups of large native and non-native trees were assumed to provide potential roosting habitat.

No dusk roost survey was undertaken but the site was searched for secondary evidence of roosting activity, such as branch clippings, droppings or moulted feathers.

### 3.2.2.3 Foraging habitat

Foraging habitat was identified by comparing the literature on plant species known to be foraged upon by black cockatoos against the vegetation within the site (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DSEWPac 2012).

Foraging habitat was then further classified as 'primary' or 'secondary' foraging habitat. Primary foraging plants were defined as those with historical and contemporary records of regular consumption by black cockatoos. Secondary foraging plants were defined as plants that black cockatoos have occasionally been recorded consuming 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 foraging plants. Where plants that had no foraging value occurred amongst foraging plants, they were also assigned a cover. A list of plant species classified as primary or secondary foraging plants is provided as **Appendix B**.

Evidence of black cockatoo foraging, such as chewed marri, jarrah, tuart or banksia 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 mapped using a hand-held GPS unit.

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### 3.3 Data analysis, presentation and 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. The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field.

#### 3.3.2 Likelihood of occurrence

Information on specific habitat requirements and distribution of conservation significant fauna species identified to potentially occur within the site or wider area was reviewed and assessed against the general site conditions and fauna habitat types recorded during the field survey.

Based on the results of the desktop assessment and information recorded during the field survey, an assessment of the likelihood of occurrence of conservation significant fauna within the site was undertaken using the categories outlined in **Table 6**.

*Table 6: Likelihood of occurrence assessment categories and definitions*

Likelihood	Definition
Recorded	The species was recorded during the current field survey or during previous field surveys.
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 habitat of at least marginal quality and/or extent for the species and the site is located within the known distribution range of the species which is supported by recent literature records from near the site.
Unlikely	The site contains no or marginal habitat for the species and/or no recent literature records occur near the site.

#### 3.3.3 Black cockatoo habitat

Habitat trees were classified according to the scheme outlined in **Table 5** 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 and vegetation type present, as determined from observations made during the field survey. Primary and secondary foraging habitat was mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field. Patches of vegetation comprising a combination of primary and secondary foraging plants were mapped as 'mixed' foraging habitat. As it was not always possible to separate non-foraging plants from foraging plants, some of the mapped foraging habitat also include a proportion of non-foraging plant species.

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#### 3.3.3.1 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 black cockatoo habitat (DAWE 2020a). DAWE does not provide a methodology for scoring habitat quality but instead specifies that an assessment of quality should be undertaken by an experienced technical expert (DSEWPac 2012).

Emerge have developed a method to provide a systematic assessment of overall black cockatoo habitat quality. The 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. 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 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 7**.

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Table 7: 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 basic survey (desktop study and field survey) in combination with a targeted black cockatoo survey was undertaken. The level of survey and survey effort are considered adequate to assess the fauna and black cockatoo habitat values within the site.
Scope	No limitation	The survey focused on vertebrate fauna and habitat values, with particular focus on black cockatoos and other conservation significant taxa with potential to occur within the site. Consideration of invertebrate fauna species was limited to those of conservation significance listed in <i>Protected Matters Search Tool</i> (DAWE 2020) and <i>NatureMap</i> (DFCA 2020a). The basic scope of this fauna assessment did not include the application of search methods, sampling or identification techniques or expertise required to detect invertebrate fauna within the site.
Proportion of fauna identified, recorded and/or collected.	No limitation	All observed vertebrate fauna were identified. No reptiles were observed within the site. It is likely that reptiles are present within the site but not detected due to typically low activity during cold weather.
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. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is of limited value and relies heavily on technical experts preparing their own assessment methodology.
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	No limitation	This fauna assessment was undertaken by qualified ecologist with three-years' experience, respectively. Technical review was undertaken by a senior environmental consultant with 18 years' experience in environmental science in Western Australia.
Suitability of timing, weather and season	Minor limitation	Survey timing is not considered to be of great importance for basic fauna assessments. Nonetheless, day time survey limits the ability to detect nocturnal species. The cold seasonal conditions during the field survey likely reduced the detectability of some fauna classes such as reptiles. The targeted black cockatoo survey was undertaken during the Carnaby's cockatoo and forest red-tailed black cockatoo breeding season, maximising the likelihood of detecting breeding activity.
Completeness	No limitation	The desktop assessment, field survey and targeted black cockatoo components of the survey were 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 and the relatively low habitat value present.

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Table 7: 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
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. 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. This assessment applies an internally developed methodology that is considered to provide a systematic and balanced characterisation of black cockatoo habitat.
Compliance the EPA's Technical Guidance (EPA 2020)	Minor limitation	The EPA guidance requires that a full list of all fauna species with potential to occur within the site is compiled. As part of this assessment a comprehensive list of fauna species of conservation significance was compiled. Non-conservation taxa with potential to occur within the site were not compiled into a list but are provided as raw data in <b>Appendix D</b> . Given that all species with potential to occur within the site are still identified within the relevant appendices this is not considered to affect the outcomes of this assessment. The EPA guidance recommends that <i>the Australian Faunal Directory</i> (DAWE 2020b) nomenclature is used for bird species. This assessment uses the <i>WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia</i> (WAM 2020) nomenclature for birds and therefore does not strictly comply.

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### 4 Results

#### 4.1 General site conditions

The landform in the site is gently undulating and soils are sandy and white-grey in colour. Multiple drains are present of which some contained water during the field survey.

The site is largely cleared. However, multiple relatively small patches of native and non-native vegetation are present across the site. Native vegetation occurs in varying condition, with the most intact vegetation located in the north-eastern corner of the site.

#### 4.2 Fauna habitat

Historical disturbance has significantly compromised fauna 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. The site also comprises multiple small areas

A total of eight fauna habitats were identified within the site, including '**banksia woodland**', '**flooded gum woodland**', '**marri woodland**', '**melaleuca woodland**', '**predominantly non-native vegetation associated with perennial lake and drains**', '**predominantly turf and bare ground**', '**scattered native and non-native trees and shrubs**' and '**water**'.

A description and the area of each habitat is provided in **Table 8** and representative photographs of each are provided in **Plate 1** to **Plate 8**. The location of each habitat is shown on **Figure 5**.

Multiple small areas of native vegetation, including **banksia woodland**, **marri woodland** and **flooded gum woodland** and **melaleuca woodland** are present within the site but occur as scattered patches. This vegetation provides a cover of native trees that may be utilised by native birds and arboreal fauna species. Where this vegetation is in better condition it also provides some microhabitats including logs and leaf litter which would provide habitat for a range of native fauna species. The **predominantly non-native vegetation associated with drains and perennial lake** and **water** habitats provide habitat for aquatic fauna species and those associated with riparian areas. The **scattered native and non-native trees and shrubs** and **predominantly turf and bare ground** habitats, while highly modified, would also provide habitat to a range of common and widespread native fauna species.

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Table 8: Fauna habitats identified within the site.

Fauna habitat classification	Description	Area (ha)
<b>Banksia woodland</b>	Open woodland <i>Banksia menziesii</i> (banksia) and <i>Eucalyptus marginata</i> (jarrah) (or absent) over limited native understorey (or absent) including <i>Macrozamia fraseri</i> , <i>Xanthorrhoea preissii</i> (grass tree), over non-native grassland or bare ground.	0.34
<b>Flooded gum woodland</b>	Closed forest <i>Eucalyptus rudis</i> (flooded gum) and <i>Melaleuca preissii</i> (moonah) over weeds, bare ground and occasional native species.	0.42
<b>Marri woodland</b>	Open woodland <i>Corymbia calophylla</i> (marri) over limited native understorey (or absent), including <i>Xanthorrhoea preissii</i> (grass tree) over non-native grassland or bare ground.	1.44
<b>Melaleuca woodland</b>	Open woodland <i>Melaleuca preissiana</i> (moonah) over non-native grassland, bare ground and occasional native species.	0.43
<b>Predominantly non-native vegetation associated with perennial lake and drains</b>	Predominantly non-native grasses and/or reeds with occasional scattered non-native and occasional native trees and shrubs including <i>*Eucalyptus camaldulensis</i> (river gum), <i>*Corymbia maculata</i> (spotted gum), <i>*Callistemon</i> sp. (bottlebrush), <i>Melaleuca preissiana</i> (moonah) and <i>Agonis flexuosa</i> (peppermint) over non-native grassland and occasional native species.	1.92
<b>Predominantly turf and bare ground</b>	Heavily disturbed areas comprising primarily bare ground and non-native grassland with occasional native or non-native trees and shrubs.	10.44
<b>Scattered native and non-native trees and shrubs</b>	Scattered native and non-native trees and shrubs including <i>Allocasuarina fraseriana</i> (sheoak), <i>Macrozamia fraseri</i> , <i>Adenanthos cygnorum</i> (common woollybush) and <i>*Eucalyptus</i> spp.	0.84
<b>Water</b>	Permanent and temporary areas of water as identified on aerial imagery.	0.15

\*denotes non-native plant species



Plate 1: Banksia woodland

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*Plate 2: Flooded gum woodland*



*Plate 3: Marri woodland*

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*Plate 4: Melaleuca woodland*



*Plate 5: Predominantly non-native vegetation associated with drains and perennial lake*

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*Plate 6: Predominantly turf and bare ground*



*Plate 7: Scattered native and non-native trees and shrubs*

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Plate 8: Water

## 4.3 Fauna

### 4.3.1 Desktop assessment

A total number of 643 fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site<sup>1</sup> as listed in **Appendix D**.

Of these species, 70 are conservation significant, including 35 threatened, 14 priority, 19 migratory fauna and two specially protected species as listed in **Appendix E**.

### 4.3.2 Species inventory

A total of 20 native and four introduced fauna species were directly or indirectly recorded during the field survey. A complete species list is provided in **Appendix F**.

### 4.3.3 Conservation significant fauna

Of the 21 native fauna species recorded, two are of conservation significance. Forest red-tailed black cockatoo were observed flying over the site during the field survey. Foraging evidence attributed to Carnaby's cockatoo and forest red-tailed black cockatoo was also observed within the site.

In addition to the aforementioned species of black cockatoo 'recorded' during the field survey, eight fauna species of conservation significance were considered 'possible' to occur in the site based on habitat requirements, species distribution and site conditions as shown in **Table 9**.

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<sup>1</sup> Includes native and non-native species

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The remainder of the conservation significant fauna species identified in the desktop assessment (53 species) are considered 'unlikely' to occur in the site due to lack of suitable habitat or because the site lies outside of the species known distribution. Fauna species classed as unlikely to occur are listed in **Appendix F<sup>2</sup>**.

Table 9: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		BC Act	EPBC Act		
<b>Birds</b>					
<i>Apus pacificus</i>	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 (Johnstone and Storr 1998).	<b>Possible:</b> Potential habitat present. May opportunistically occur in or fly over the site on commute or while searching for prey.
<i>Calyptorhynchus banksii naso</i>	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.	<b>Recorded:</b> Suitable foraging and roosting habitat present. Species observed flying over the site during the field survey. Foraging debris attributed to this species was also observed.
<i>Calyptorhynchus baudinii</i>	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).	<b>Possible:</b> Suitable foraging and roosting habitat present but the site is located at the outer limits of species known distribution range. Opportunistic occurrence possible.

<sup>2</sup> Fauna species with no potential to occur within the site (e.g. marine mammals and marine fish) were excluded from this list.

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Table 9): Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site (continued)

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
<b>Birds</b>					
<i>Calyptorhynchus latirostris</i>	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).	<b>Recorded:</b> Suitable foraging and roosting habitat present. Foraging debris attributed to this species was also observed. Extensive records located adjacent to and within the wider area of the site.
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	<b>Possible:</b> Potential habitat present. Opportunistic fly over possible.
<b>Invertebrate</b>					
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003).	<b>Possible:</b> Potential habitat present (sandy soils) and multiple historical records located near the site.
<b>Mammals</b>					
<i>Isoodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	<b>Possible:</b> Marginal habitat present (perennial lake, marri and banksia woodland) and site located within the species known range. Multiple recent records from near the site.

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Table 9): Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site (continued)

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
<b>Mammals</b>					
<i>Phascogale tapoatafa wambenger</i>	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	<b>Possible:</b> Marginal habitat present (perennial lake, marri and banksia woodland) but very limited in extent. The site is located within the species known range. Recent records located within the wider area of the site.
<b>Reptiles</b>					
<i>Lerista lineata</i>	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). Occurs from Perth's southern suburbs to Mandurah (Bush et al. 1995).	<b>Possible:</b> Marginal habitat present (marri and banksia woodland) but limited in extent. Site is located on northern limit of the species range.
<i>Neelaps calonotos</i>	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002).	<b>Possible:</b> Marginal habitat present (marri and banksia woodland) but very limited in extent. The site is located within the species known distribution range.

#### 4.3.1 Declared pests

A total of two species, *Oryctolagus cuniculus* (rabbit) and *Trichoglossus moluccanus* (rainbow lorikeet) listed as a declared pests (C3) pursuant to the BAM Act, were identified from direct observation or scats within the site.

#### 4.4 Black cockatoos

Forest red-tailed black cockatoos were recorded flying over the site during the field survey. Foraging evidence in the form of chewed marri fruit attributed to Carnaby's cockatoo and forest red-tailed black cockatoo was observed within the site.

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#### 4.4.1 Habitat

##### 4.4.1.1 Breeding

A total of 46 black cockatoo habitat trees were recorded within the site as shown in **Figure 6**. A further 14 native eucalypts with DBH  $\geq 50$  cm that had no potential to form a suitable hollow were noted but not recorded as habitat trees (as discussed in **Section 3.2.2.1**).

The habitat trees comprised 41 *Corymbia calophylla* (marri) and five *Eucalyptus rudis* (flooded gum) trees.

None of the habitat trees present within the site contain hollows that are suitable for us for breeding by black cockatoos. No internal hollow inspection was undertaken, as any small hollows present could be identified as unsuitable from the ground.

A summary of the habitat trees recorded within the site is provided in **Table 10** and an inventory in **Appendix G**.

Table 10: Habitat trees recorded within the site

Category	No. trees	No. suitable hollows
Confirmed nest	0	0
Potential nest	0	0
Suitable hollow(s)	0	0
Potentially suitable hollow(s)	0	0
No suitable hollow(s)	46	0
<b>Total</b>	<b>46</b>	<b>0</b>

##### 4.4.1.2 Roosting

No dusk roost survey was undertaken within the site. No evidence of roosting such as droppings, moulted feathers or branch clipping were observed within the site during the field survey.

Native and non-native trees within the site have the potential to provide roosting habitat for black cockatoos.

##### 4.4.1.3 Foraging

Foraging evidence attributed to Carnaby's cockatoo and forest red-tailed black cockatoo was recorded in multiple locations within the site. Most of the foraging evidence recorded was attributed to forest red-tailed black cockatoo. No black cockatoos were observed foraging within the site during the field survey.

The black cockatoo foraging habitat within the site consists predominantly of marri, jarrah, banksia and sheoak trees. Marri and jarrah were classified as primary foraging plants for all three species of black cockatoo and banksia is a primary foraging plant for Carnaby's cockatoo. Sheoak was classed as a secondary foraging plant for Baudin's cockatoo and forest red-tailed black cockatoo. A summary of foraging habitat within the site is provided in **Table 11**.

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The site also contains scattered non-native or planted secondary foraging plants, including *Agonis flexuosa* (peppermint), *Callistemon* spp. (bottlebrush), *Corymbia citriodora* (lemon scented gum) and *Eucalyptus camaldulensis* (river gum). Lemon scented gum was classified as a secondary foraging plant for all three species of black cockatoo and bottlebrush was classified as a secondary foraging plant for Carnaby's cockatoo and Baudin's cockatoo. Peppermint was classed as a secondary foraging plant for Carnaby's cockatoo and river gum was classes secondary foraging plant for forest red-tailed black cockatoo.

Table 11: Dominant primary and secondary black cockatoo foraging plants recorded within the site

Common name	Foraging habitat category and black cockatoo species		
	Carnaby's	Baudin's	Forest red-tailed
Marri	Primary	Primary	Primary
Jarrah	Primary	Primary	Primary
Banksia	Primary	Secondary	-
Sheoak	-	Secondary	Secondary

Collectively, the site contains approximately 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo as outlined in **Table 12** and in **Figure 3** to **Figure 5**. The foraging habitat within the site occurs as scattered trees and small patches of vegetation. The area mapped as foraging habitat for each species also includes a proportion non-foraging plants as shown in **Table 12**.

Table 12: Proportion of primary, secondary and non-foraging plants within patches of foraging habitat

	Carnaby's	Baudin's	Forest red-tailed
	ha	ha	ha
Primary foraging plants	1.57	1.4	1.4
Secondary foraging plants	0.23	0.33	0.39
Non-foraging plants	0.14	0.05	0.21
<b>Total</b>	<b>1.94</b>	<b>1.78</b>	<b>2.00</b>

#### 4.4.1.4 Overall quality

The outcome of the overall black cockatoo habitat quality assessment is provided in **Appendix C** and summarised in **Table 13**. The site was determined to have an overall habitat score of seven (7) out of a maximum score of 10 for forest red-tailed black cockatoo, six (6) for Carnaby's cockatoo and five (5) for Baudin's cockatoo. The site therefore scored 'moderate to high' for forest red-tailed black cockatoo and 'moderate' for Carnaby's cockatoo and Baudin's cockatoo using the scale provided in **Appendix C**. The full results of the quality assessment are provided in **Appendix H**.

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Table 13: Habitat quality assessment scores

Habitat category	Score		
	Carnaby's	Baudin's	Forest red-tailed
Breeding	2	N/A	3
Roosting	2	2	2
Foraging	6	5	7
<b>Overall Score</b>	<b>6</b> Moderate	<b>5</b> Moderate	<b>7</b> Moderate to high

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Table 14: Summary of attributes contributing to black cockatoo habitat quality scores

Habitat category	Quality component category	Attributes and black cockatoo species		
		Carnaby's	Baudin's	Forest red-tailed
Breeding	Site condition	The site supports habitat trees without suitable hollows.	N/A – site is located outside of its known and predicted breeding range.	The site supports habitat trees without suitable hollows.
	Site context	Potential evidence of black cockatoo (species unconfirmed) breeding activity occurs within 6 km of the site and 828.87 ha of potential Carnaby's cockatoo foraging habitat is mapped within 6 km of the site.		Potential evidence of black cockatoo (species unconfirmed) breeding activity occurs within 6 km of the site and 840.75 ha of potential forest red-tailed black cockatoo foraging habitat is mapped within 6 km of the site.
	Species stocking rate	N/A – no evidence of breeding was recorded within the site.		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.	The site supports potential roosting habitat.
	Site context	No roost occurs within 1 km of the site.	No roost occurs within 1 km of the site.	No roost occurs within 1 km of the site.
	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.	N/A - no evidence of roosting was recorded within the site.
Foraging	Site condition	The site supports foraging habitat that is proportionally of 80.8% primary foraging plants.	The site supports foraging habitat that is proportionally of 78.52% primary foraging plants.	The site supports foraging habitat that is proportionally of 69.93% primary foraging plants.
	Site context	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Potential evidence of forest red-tailed black cockatoo breeding activity and confirmed forest red-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may potentially be used by breeding birds or by birds utilising the roosts.
	Species stocking rate	Limited secondary foraging evidence of Carnaby's cockatoo was observed in the site.	No evidence of Baudin's cockatoo foraging was observed in the site.	Limited secondary evidence of forest red-tailed black cockatoo foraging was observed in the site.

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### 5 Discussion

#### 5.1 Fauna and fauna habitat values

The 20 native and four non-native fauna opportunistically recorded within the site are all generally common and widespread species across the Swan Coastal Plain, including the two threatened species of black cockatoo. The relatively low number of fauna species recorded can likely be attributed to small size of the site, the relatively low fauna habitat values present and the cool weather conditions during the field survey. In addition some species may have been undetectable because they are nocturnal.

Over half of the site (65%) supports **predominantly turf and bare ground** which provides relatively low habitat values for native fauna. The native woodland habitats, including **marri woodland**, **banksia woodland**, **flooded gum woodland** and **melaleuca woodland**, provide the highest habitat values within the site. But these areas of woodland only extend over a small portion of the site (16%) and occur as scattered patches that are disconnected from other vegetation.

The **predominantly non-native vegetation associated with perennial lake and drains** and **water** habitats, although small in area (13% of the site) and primarily comprising non-native vegetation, also provide values for native fauna as water sources and wetland or aquatic habitat. The remainder of the site (5%) supports **scattered native and non-native trees and shrubs** which provide varying habitat values according to the plant species and density. The majority of the **scattered native and non-native trees and shrubs** habitat lacks understorey vegetation and so would mainly provide habitat for common avian or arboreal fauna species.

#### 5.2 Conservation significant fauna

Carnaby's cockatoo and forest red-tailed black cockatoo (further discussed in **Section 5.4** below) were directly or indirectly (from foraging evidence) identified as occurring in the site.

It is considered possible that an additional eight species of conservation significance not recorded during the field survey could occur in the site. Nevertheless, the habitat in the site for these species is generally marginal and limited in extent and so the site is not considered to provide important habitat for them.

Baudin's cockatoo is considered to possibly occur in the site based on the presence of potential foraging habitat associated with the **marri woodland** and **banksia woodland**. However, the site is located on the outer limits of this species distribution and it is therefore likely to use the site opportunistically, if at all, rather than regularly occurring within the site.

*Apus pacificus* (pacific swift) and *Falco peregrinus* (peregrine falcon) may opportunistically fly over or utilise habitat within the site as part of a much larger home range.

The native woodland habitats provide potential habitat for *Idiosoma sigillatum* (Swan Coastal Plain shield-backed trapdoor spider) *Isodooon fusciventer* (quenda), *Phascogale tapoatafa wambenger* (south-western brush-tailed phascogale), *Lerista lineata* (Perth slider) and *Neelaps calonotos* (black-striped snake). However, these habitats would be considered marginal for all of these species due to

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the lack of understorey vegetation and tree hollows. Nonetheless, the site is connected to better quality habitat and the species may therefore also occasionally occur within the site. Further targeted surveys would need to be undertaken to confirm whether these fauna species occur within the site.

### 5.3 Other fauna

A turtle shell attributed to *Chelodina colliei* (snake necked turtle) was recorded within the site. The shell appeared to be quite old. It is unknown whether this species currently occurs within the site. Nonetheless, the perennial lake would provide potential habitat for this species. Snake necked turtles are not currently listed as threatened or priority species, but are considered to be in decline on the swan coastal plain (Santoro 2017).

None of the bee species recorded by Prendergast (2020) within the Maniana park study are listed as threatened or priority species. The Maniana Park study site is reported to support a healthy and diverse population of native bee species (pers. Comms. Kit Prendergast, September 2020). Given the relatively poor condition of habitat within the site, it is considered unlikely that conservation significant bee species occur within the site. However, it is acknowledged that the basic scope of this fauna assessment did not include the application of search methods, sampling or identification techniques or expertise required to detect invertebrate fauna within the site.

### 5.4 Black cockatoos

A total of six individuals of forest red-tailed black cockatoos were observed flying over the site during the field survey. Foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo was recorded in multiple locations in the site. Records for these species of black cockatoo were anticipated as the site lies within their expected range and suitable habitat occurs within the site and local area.

#### 5.4.1 Habitat

##### 5.4.1.1 Breeding

None of the 46 habitat trees recorded within the site contain hollows suitable for breeding by black cockatoos. Therefore, the site does not currently support breeding habitat for any of the three species of black cockatoo. While all of the habitat trees within the site have the potential to form hollows in the future, based on their age and size, it would likely take many years for hollows to form that are suitable for use by black cockatoos.

##### 5.4.1.2 Roosting

No evidence suggesting that roosting occurs within the site was 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 occurs in the site. Nevertheless, the site contains many tall trees and groups of tall trees that have the potential to provide roosting habitat for black cockatoos.

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#### 5.4.1.3 Foraging

The site contains approximately 1.57 ha of primary foraging habitat for Carnaby's cockatoo (9.82% of the site) and 1.4 ha for Baudin's cockatoo and forest red-tailed black cockatoo (8.76% of the site). The slightly larger area of primary foraging habitat for Carnaby's cockatoo is associated with the banksia woodland vegetation within the northern portion of the site. In the absence of suitable breeding habitat within the site, the foraging resource present would support the highest black cockatoo habitat values within the site. However, the area of primary foraging habitat present is still relatively small when compared to the potential foraging habitat present within 6-12 km of the site.

Even though evidence of foraging was recorded at multiple locations within the site, the frequency with which foraging evidence was recorded was generally low.

#### 5.4.1.4 Overall quality

Overall habitat quality for all three species of black cockatoo was scored highest for foraging value. The higher score for foraging was primarily due to the high proportion of mature primary foraging plants within areas mapped as potential foraging habitat (more than 50%). In addition, the foraging and overall quality score for forest red-tailed black cockatoo (7) was higher than the scores for Baudin's cockatoo (5) and Carnaby's cockatoo (6) due to the presence of a potential forest red-tailed black cockatoo breeding site within less than 6 km of the site, as listed in **Section 2.7.1.1**. A nearby record of a potential breeding site is considered to increase the relative quality of foraging habitat within the site as it indicates that foraging habitat may more likely be used to support breeding.

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## 6 Conclusions

### 6.1 Fauna and fauna habitat

The majority of the site contains turf and bare ground with low fauna habitat values. The site also contains small patches of native woodland and perennial lake which provides the highest habitat value for native fauna.

A total of 20 native and four introduced fauna species were positively identified to occur within the site, including threatened (endangered) Carnaby's cockatoo and (vulnerable) forest red-tailed black cockatoo.

Additionally, it is possible that eight species of conservation significance not recorded during the field survey may occasionally occur within the site.

### 6.2 Black cockatoos

The site occurs within the modeled distribution of all three species of black cockatoo and within the breeding range for Carnaby's cockatoo and forest red-tailed black cockatoo. Secondary foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo was recorded in multiple locations in the site.

A total of 46 habitat trees were recorded within the site, of which none contain hollows that are suitable for breeding by black cockatoos. Therefore, the site does currently not provide breeding habitat for any of the three species of black cockatoo. The site lies outside of the known and predicted breeding range of Baudin's cockatoo and so the site is unlikely to provide breeding habitat for this species even if suitable hollows were present.

No evidence of black cockatoo roosting activity was observed within the site. Roosting habitat for all three species of black cockatoo occurs within the site in the form of large trees.

Foraging habitat for black cockatoos occurs within the site as scattered trees and relatively small patches of vegetation. A total of 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo was recorded within the site.

The overall black cockatoo habitat quality score for the site was determined to be seven (high to moderate) for forest red-tailed black cockatoo, six (moderate) for Baudin's cockatoo and five (moderate) for Baudin's cockatoo.

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# Figures



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*Figure 2: Hydrological Features and Topography*

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*Figure 6: Potential Baudin's Cockatoo Foraging Habitat*

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

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





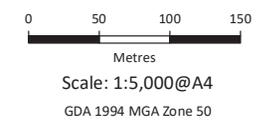
**Figure 1: Site Location**

**Project:** Basic Fauna and Targeted Black Cockatoo Assessment  
State Football Centre

**Client:** Department of Finance - Building, Management and Works

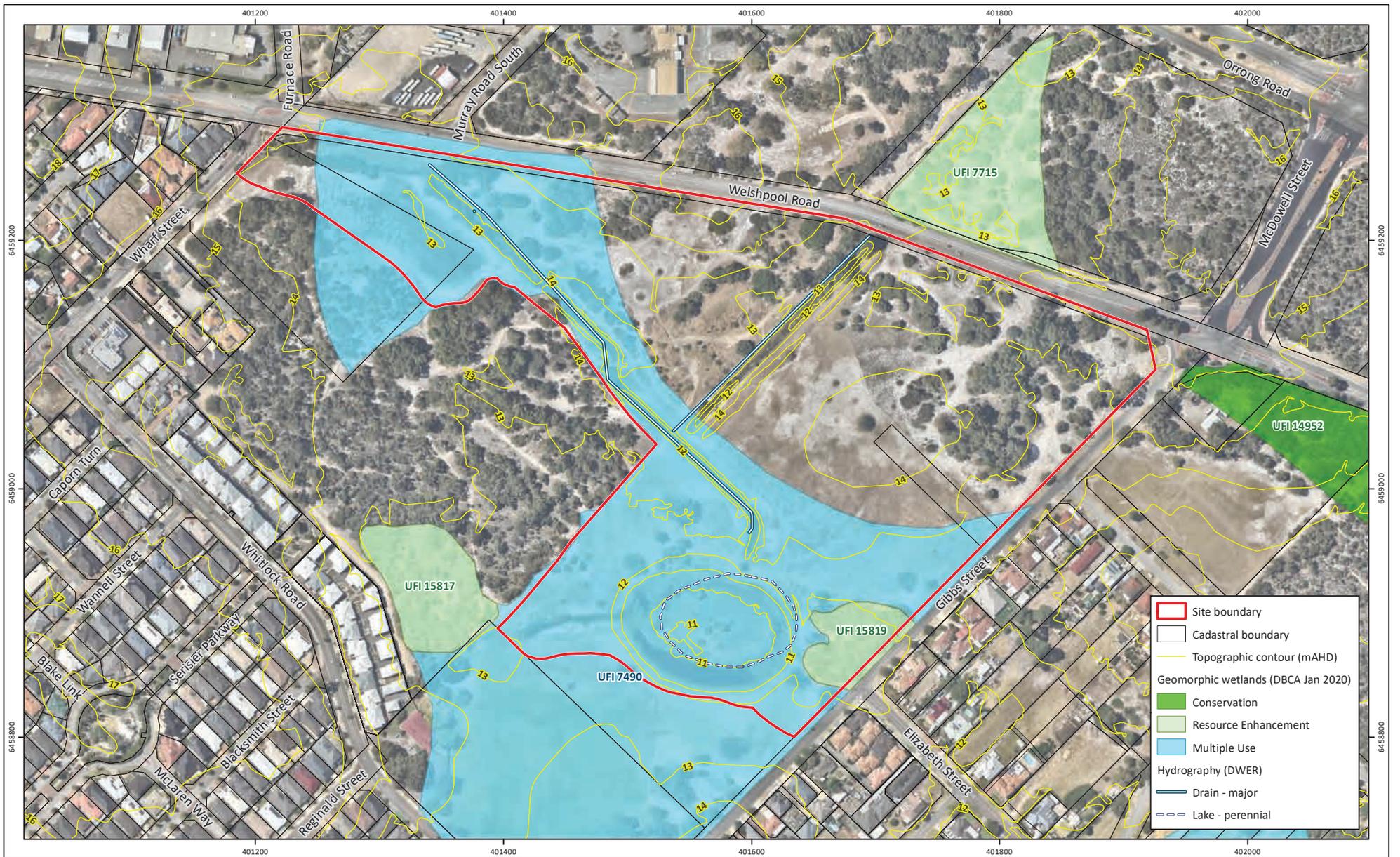
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EP20-012(14)-F18

Drawn: GAR  
Date: 14/08/2020  
Checked: MS  
Approved: TAA  
Date: 24/08/2020



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**Figure 2: Geomorphic Wetlands**

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**Plan Number:** EP20-012(14)-F19  
**Drawn:** GAR  
**Date:** 14/08/2020  
**Checked:** MS  
**Approved:** TAA  
**Date:** 24/08/2020

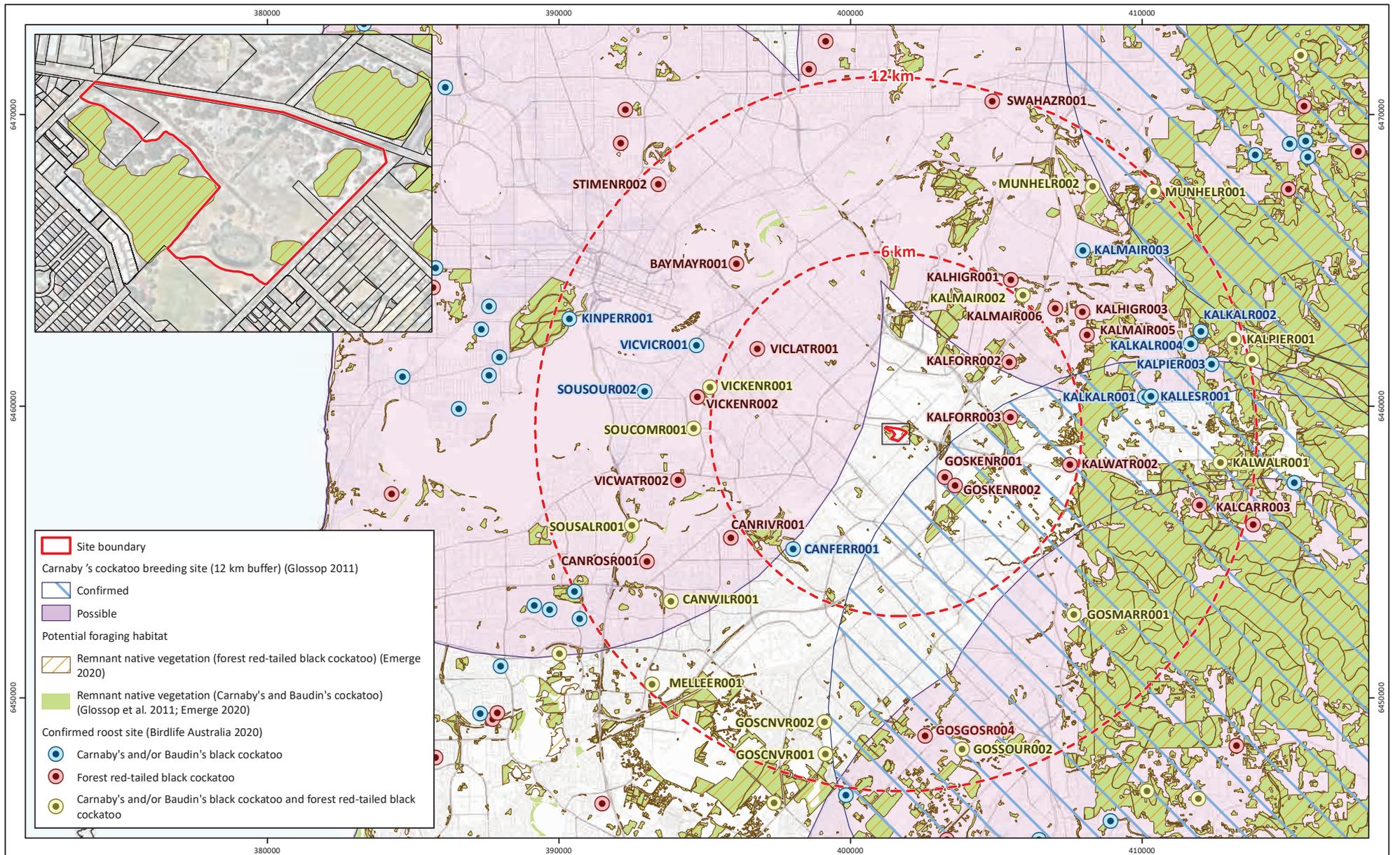


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Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50



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**Figure 3: Black Cockatoo Habitat Context**

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State Football Centre

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**Plan Number:** EP20-012(14)-F20  
**Drawn:** GAR  
**Date:** 14/08/2020  
**Checked:** MS  
**Approved:** TAA  
**Date:** 24/08/2020



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GDA 1994 MGA Zone 50



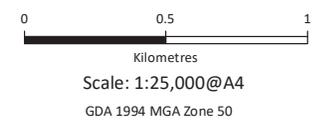




**Figure 4: Environmental Features**

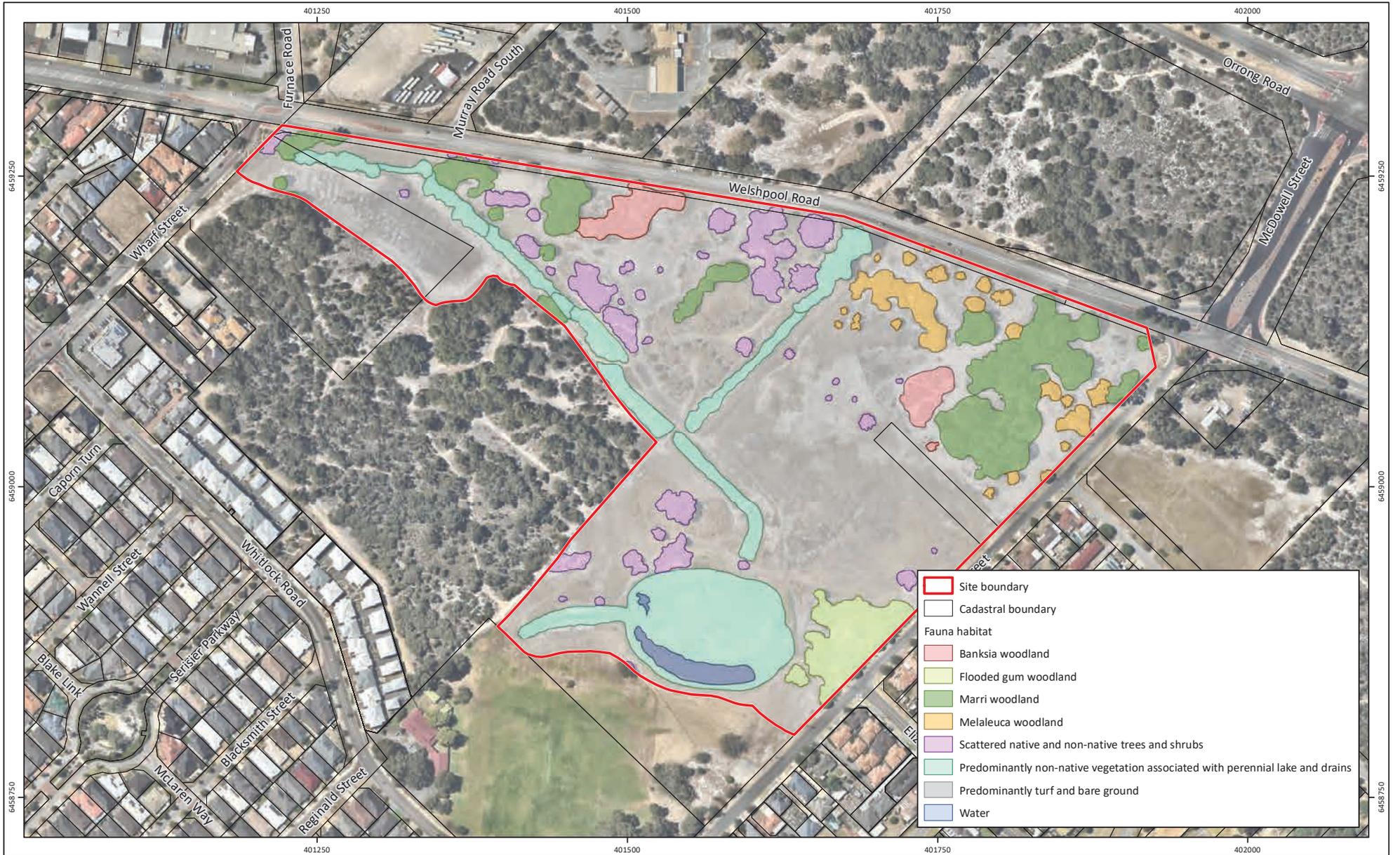
**Project:** Basic Fauna and Targeted Black Cockatoo Assessment  
State Football Centre  
**Client:** Department of Finance - Building, Management and Works

**Plan Number:** EP20-012(14)-F21  
**Drawn:** GAR  
**Date:** 14/08/2020  
**Checked:** MS  
**Approved:** TAA  
**Date:** 24/08/2020



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**Figure 5: Fauna Habitat**

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**Plan Number:** EP20-012(14)-F22  
**Drawn:** GAR  
**Date:** 14/08/2020  
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**Figure 6: Black Cockatoo Habitat Trees**

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State Football Centre

**Client:** Department of Finance - Building, Management and Works

**Plan Number:**  
EP20-012(14)-F23

Drawn: GAR  
Date: 14/08/2020  
Checked: MS  
Approved: TAA  
Date: 24/08/2020



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GDA 1994 MGA Zone 50







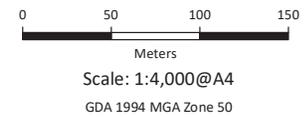
**Figure 7: Potential Baudin's Cockatoo Foraging Habitat**

**Project:** Basic Fauna and Targeted Black Cockatoo Assessment  
State Football Centre

**Client:** Department of Finance - Building, Management and Works

**Plan Number:**  
EP20-012(14)-F24

Drawn: GAR  
Date: 14/08/2020  
Checked: MS  
Approved: TAA  
Date: 24/08/2020



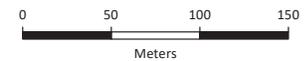




**Figure 8: Potential Carnaby's Cockatoo Foraging Habitat**

**Project:** Basic Fauna and Targeted Black Cockatoo Assessment  
State Football Centre  
**Client:** Department of Finance - Building, Management and Works

**Plan Number:** EP20-012(14)-F25  
**Drawn:** GAR  
**Date:** 14/08/2020  
**Checked:** MS  
**Approved:** TAA  
**Date:** 24/08/2020



Meters  
Scale: 1:4,000@A4  
GDA 1994 MGA Zone 50



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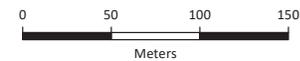


**Figure 9: Potential Forest Red-tailed Black Cockatoo Foraging Habitat**

**Project:** Basic Fauna and Targeted Black Cockatoo Assessment  
State Football Centre

**Client:** Department of Finance - Building, Management and Works

**Plan Number:** EP20-012(14)-F26  
**Drawn:** GAR  
**Date:** 14/08/2020  
**Checked:** MS  
**Approved:** TAA  
**Date:** 24/08/2020



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GDA 1994 MGA Zone 50





# 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 There is no reasonable doubt that the last member of the species has died.
EW <sup>#</sup>	Threatened Fauna –Extinct in the Wild 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 <sup>#</sup>	Threatened Fauna – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN <sup>#</sup>	Threatened Fauna – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU <sup>#</sup>	Threatened Fauna – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
Migratory <sup>#</sup>	Migratory Fauna All migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and 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 Species in the list established under s248 of the EPBC Act

<sup>#</sup>matters of national environmental significance (MNES) under the EPBC Act

## Additional Background Information



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 fauna categories listed under the BC Act (DBCA 2019a)

Category	Conservation Code	Definition
Threatened	CR	Critically endangered Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
	EN	Endangered Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
	VU	Vulnerable Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Extinct	EX	Extinct Species where there is no reasonable doubt that the last member of the species has died.
	EW	Extinct in the wild 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. Note that no species are currently listed as EW.
Specially protected	MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth  Includes birds that 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) 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 Fauna otherwise in need of special protection to ensure their conservation.

## Additional Background Information



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	<p>Priority 1 – Poorly known</p> <p>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.</p>
P2	<p>Priority 2 – Poorly known</p> <p>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.</p>
P3	<p>Priority 3 – Poorly known</p> <p>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.</p>
P4	<p>(a) Priority 4 – Rare species</p> <p>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.</p> <p>(b) Priority 4 – Near Threatened</p> <p>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.</p> <p>(c) Priority 4 – Other</p> <p>Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

## Additional Background Information



### 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

## Additional Background Information



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 Baudin's 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

## Additional Background Information



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.

## 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

## Additional Background Information



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

## Additional Background Information



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

Category	Description
C1	Exclusion 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 Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management 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.

## Literature

The main literature used for identifying fauna and fauna habitats is listed in **Table 7** below.

*Table 7: Standard literature used for identifying fauna species and habitats.*

Conservation Code	Category
Birds	Johnstone and Storr (1998b), Johnstone and Storr (1998a), Pizzey and Knight (2012), Slater <i>et al.</i> (2003)
Mammals	Menkhorst and Knight (2011), Triggs (2003)
Amphibia	Tyler and Doughty (2009), Bush <i>et al.</i> (2002)
Reptiles	Bush <i>et al.</i> (2002)

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# Appendix B

Black Cockatoo Foraging Plants





Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Acacia baileyana</i>	Cootamundra wattle	Secondary			Groom 2011
<i>Acacia pentadenia</i>	Karri wattle	Secondary			Groom 2011
<i>Acacia saligna</i>	Orange wattle	Secondary			Groom 2011
<i>Agonis flexuosa</i>	Peppermint tree	Secondary			Groom 2011
<i>Allocasuarina fraseriana</i>	Sheoak		Secondary	Secondary	Johnstone & Storr 1998; Johnstone et al. 2010; Johnstone 2017
<i>Allocasuarina spp.</i>		Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Anigozanthos flavidus</i>	Tall kangaroo paw		Secondary		Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Araucaria heterophylla</i>	Norfolk island pine	Secondary			Groom 2011
<i>Banksia ashbyi</i>	Ashby's banksia	Primary			Saunders 1980; Groom 2011
<i>Banksia attenuata</i>	Slender banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia baxteri</i>	Baxter's banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia carlinoides</i>	Pink dryandra	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia coccinea</i>	Scarlet banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia dallanneyi</i>	Couch honeypot dryandra	Primary			Groom 2011
<i>Banksia ericifolia</i>	Heath-leaved banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia fraseri</i>		Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia gardneri</i>	Prostrate banksia	Primary			Groom 2011
<i>Banksia grandis</i>	Bull banksia	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia hookeriana</i>	Hooker's banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia ilicifolia</i>	Holly banksia	Primary	Primary		Johnstone et al. 2010; Groom 2011; Johnstone & Storr 1998
<i>Banksia kippistiana</i>		Primary			Groom 2011
<i>Banksia leptophylla</i>		Primary			Groom 2011
<i>Banksia lindleyana</i>	Porcupine banksia	Primary	Primary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Banksia littoralis</i>	Swamp banksia	Primary	Primary		Saunders 1980; Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
<i>Banksia menziesii</i>	Firewood banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia mucronulata</i>	Swordfish dryandra	Primary			Groom 2011
<i>Banksia nivea</i>	Honeypot dryandra	Primary			Saunders 1980; Groom 2011
<i>Banksia nobilis</i>	Golden dryandra	Primary			Saunders 1980; Groom 2011
<i>Banksia praemorsa</i>	Cut-leaf banksia	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia prionotes</i>	Acorn banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia prolata</i>		Primary			Johnstone et al. 2010
<i>Banksia quercifolia</i>	Oak-leaved banksia	Primary	Primary		Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia sessilis</i>	Parrot bush	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia speciosa</i>	Showy banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia spp.</i>		Primary	Primary		Saunders 1979; DSEWPac 2012; DoEE 2017
<i>Banksia squarrosa</i>	Pingle	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Banksia tricuspis</i>	Pine banksia	Primary			Groom 2011
<i>Banksia undata</i>	Urchin dryandra	Primary			Groom 2011
<i>Banksia verticillata</i>	Granite banksia	Primary			Saunders 1980; Groom 2011
<i>Brassica campestris</i>	Canola	Secondary			Groom 2011; DoEE 2017
<i>Callistemon spp.</i>		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
<i>Callistemon viminalis</i>	Captain cook bottlebrush	Secondary			Groom 2011
<i>Callitris sp.</i>		Secondary			Johnstone et al. 2010; Groom 2011
<i>Carya illinoensis</i>	Pecan	Primary	Secondary		Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017
<i>Casuarina cunninghamiana</i>	River sheoak	Secondary			Groom 2011
<i>Citrullus lanatus</i>	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	
<i>Corymbia calophylla</i>	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
<i>Corymbia citriodora</i>	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
<i>Corymbia ficifolia</i>	Red flowering gum	Secondary			Groom 2011
<i>Corymbia haematoxylon</i>	Mountain marri	Secondary		Secondary	Groom 2011; DoEE 2012; DoEE 2017
<i>Darwinia citriodora</i>	Lemon-scented darwinia	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
<i>Diospyros sp.</i>	Sweet persimmon	Secondary	Secondary		Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eremophila glabra</i>	Tarbush	Secondary			Groom 2011
<i>Erodium aureum</i>		Secondary			Groom 2011
<i>Erodium botrys</i>	Long storksbill	Secondary	Secondary		Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
<i>Erodium spp.</i>		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
<i>Eucalyptus caesia</i>	Silver princess	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
<i>Eucalyptus camaldulensis</i>	River red gum			Secondary	DoEE 2012; DoEE 2017
<i>Eucalyptus decipiens</i>	Red heart/moit			Secondary	Johnstone 2017
<i>Eucalyptus diversicolor</i>	Karri			Primary	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
<i>Eucalyptus erythrocorys</i>	Illyarrie	Secondary		Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010
<i>Eucalyptus gomphocephala</i>	Tuart	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus grandis</i>	Flooded gum, rose gum			Secondary	DoEE 2012; DoEE 2017
<i>Eucalyptus lehmannii</i>	Bushy yate			Secondary	Johnstone 2017
<i>Eucalyptus leucoxylon</i>	Yellow gum	Secondary			Groom 2014

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Eucalyptus loxophleba</i>	York gum	Secondary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus marginata</i>	Jarrah	Primary	Primary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017
<i>Eucalyptus patens</i>	Blackbutt	Primary		Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011
<i>Eucalyptus pleurocarpa</i>	Tallerack	Secondary			Groom 2011
<i>Eucalyptus preissiana</i>	Bell-fruited mallee	Secondary			Groom 2011
<i>Eucalyptus robusta</i>	Swamp mahogany	Secondary			Johnstone et al. 2010; Groom 2011
<i>Eucalyptus salmonophloia</i>	Salmon gum	Primary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus staeri</i>	Albany blackbutt			Secondary	Johnstone & Storr 1998
<i>Eucalyptus todtiana</i>	Coastal blackbutt	Secondary			Saunders 1980; Johnstone et al. 2010; Groom 2011; Johnstone & Kirkby 2008
<i>Eucalyptus wandoo</i>	Wandoo	Primary	Secondary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Ficus sp.</i>	Fig	Secondary			Groom 2011
<i>Grevillea armigera</i>	Prickly toothbrushes	Primary			Groom 2011
<i>Grevillea bipinnatifida</i>	Fuschia grevillea	Primary			Groom 2011
<i>Grevillea hookeriana</i>	Red toothbrushes	Primary			Groom 2011
<i>Grevillea hookeriana subsp. api</i>	Black toothbrushes	Primary			Groom 2011
<i>Grevillea paniculata</i>	Kerosene bush	Primary			Groom 2011
<i>Grevillea paradoxa</i>	Bottlebrush grevillea	Primary			Groom 2011
<i>Grevillea petrophiloides</i>	Pink poker	Primary			Groom 2011
<i>Grevillea robusta</i>	Silky oak	Primary			Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Grevillea spp.</i>		Primary			Saunders 1979; Johnstone et al. 2010; DSEWPac 2012; DoEE 2017
<i>Grevillea wilsonii</i>	Native fuchsia		Primary		Johnstone et al. 2010
<i>Hakea auriculata</i>		Primary			Saunders 1980; Groom 2011
<i>Hakea candolleana</i>		Primary			Groom 2011
<i>Hakea circumalata</i>	Coastal hakea	Primary			Groom 2011
<i>Hakea commutata</i>		Primary			Groom 2011
<i>Hakea conchifolia</i>	Shell-leaved hakea	Primary			Groom 2011
<i>Hakea costata</i>	Ribbed hakea	Primary			Groom 2011
<i>Hakea cristata</i>	Snail hakea	Primary	Primary		Groom 2011; Johnstone et al. 2010
<i>Hakea cucullata</i>	Snail hakea	Primary			Groom 2011
<i>Hakea cyclocarpa</i>	Ramshorn	Primary			Saunders 1980; Groom 2011
<i>Hakea eneabba</i>		Primary			Groom 2011
<i>Hakea erinacea</i>	Hedgehog hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea falcata</i>	Sickle hakea	Primary			Groom 2011
<i>Hakea flabellifolia</i>	Fan-leaved hakea	Primary			Groom 2011
<i>Hakea gilbertii</i>		Primary			Saunders 1980; Groom 2011
<i>Hakea incrassata</i>	Golfball or marble hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lasiantha</i>	Woolly flowered hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lasianthoides</i>		Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea laurina</i>	Pin-cushion hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lissocarpha</i>	Honeybush	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea marginata</i>			Primary		Johnstone et al. 2010
<i>Hakea megalosperma</i>	Lesueur hakea	Primary			Groom 2011
<i>Hakea multilineata</i>	Grass leaf hakea	Primary			Groom 2011
<i>Hakea neospathulata</i>		Primary			Groom 2011
<i>Hakea obliqua</i>	Needles and corks	Primary			Saunders 1980; Groom 2011
<i>Hakea oleifolia</i>	Dungyn	Primary			Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Hakea pandanica</i> subsp. <i>crassifolia</i>	Thick-leaved hakea	Primary			Groom 2011
<i>Hakea petiolaris</i>	Sea urchin hakea	Primary			Groom 2011
<i>Hakea polyanthema</i>		Primary			Groom 2011
<i>Hakea preissii</i>	Needle tree	Primary			Groom 2011
<i>Hakea prostrata</i>	Harsh hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea psilorrhyncha</i>		Primary			Groom 2011
<i>Hakea ruscifolia</i>	Candle hakea	Primary	Primary		Saunders 1980; Groom 2011; Johnstone et al. 2010
<i>Hakea scoparia</i>	Kangaroo bush	Primary			Groom 2011
<i>Hakea smilacifolia</i>		Primary			Groom 2011
<i>Hakea</i> spp.		Primary	Primary		Saunders 1979; DSEWPac 2012; DoEE 2017
<i>Hakea stenocarpa</i>	Narrow-fruited hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea sulcata</i>	Furrowed hakea	Primary			Groom 2011
<i>Hakea trifurcata</i>	Two-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea undulata</i>	Wavy-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea varia</i>	Variable-leaved hakea	Primary	Primary		Saunders 1980; Groom 2011
<i>Harpephyllum caffrum</i>	Kaffir plum			Secondary	Johnstone 2017
<i>Helianthus annuus</i>	Sunflower	Secondary			Johnstone et al. 2010; Groom 2011
<i>Hibiscus</i> sp.	Hibiscus	Secondary			Groom 2011
<i>Isopogon scabriusculus</i>		Secondary			Groom 2011
<i>Jacaranda mimosifolia</i>	Jacaranda	Secondary	Secondary		Johnstone et al. 2010; Groom 2011
<i>Jacksonia furcellata</i>	Grey stinkwood	Secondary			Groom 2011
<i>Kingia australis</i>	Kingia		Secondary		Johnstone et al. 2010
<i>Lambertia inermis</i>	Chittick	Secondary			Johnstone & Storr 1998; Groom 2011
<i>Lambertia multiflora</i>	Many-flowered honeysuckle	Secondary			Saunders 1980; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Liquidamber styraciflua</i>	Liquid amber	Primary		Secondary	Johnstone et al. 2010; Groom 2011; Groom 2014; Personal observation
<i>Lupinus sp.</i>	Lupin	Secondary			Saunders 1980; Groom 2011
<i>Macadamia integrifolia</i>	Macadamia	Primary	Secondary		Johnstone et al. 2010; Grooms 2011; Groom 2014
<i>Malus domestica</i>	Apple	Secondary	Secondary		Johnstone et al. 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011
<i>Melaleuca leuropoma</i>		Secondary			Saunders 1980; Groom 2011
<i>Melia azedarach</i>	Cape lilac or white cedar	Secondary		Primary	Johnstone et al. 2010; Groom 2011
<i>Mesomeleana spp.</i>		Secondary			Johnstone et al. 2010; Groom 2011
<i>Olea europea</i>	Olive			Secondary	Johnstone 2017
<i>Persoonia longifolia</i>	Snottygobble			Secondary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Pinus canariensis</i>	Canary island pine	Primary			Johnstone et al. 2010; Groom 2011
<i>Pinus caribea</i>	Caribbean pine	Primary			Johnstone et al. 2010; Groom 2011
<i>Pinus pinaster</i>	Pinaster or maritime pine	Primary			Groom 2011
<i>Pinus radiata</i>	Radiata pine	Primary	Secondary		Johnstone et al. 2010; Groom 2011
<i>Pinus spp.</i>		Primary	Secondary		Johnstone & Storr 1998; Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Protea 'Pink Ice'</i>		Secondary			Groom 2011
<i>Protea repens</i>		Secondary			Groom 2011
<i>Protea spp.</i>		Secondary			Johnstone et al. 2010
<i>Prunus amygdalus</i>	Almond tree	Secondary			Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
<i>Pyrus communis</i>	European pear		Secondary		Johnstone & Storr 1998; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Quercus spp.</i>	Oak		Secondary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Raphanus raphanistrum</i>	Wild radish	Secondary			Groom 2011; DoEE 2017
<i>Reedia spathacea</i>			Secondary		Johnstone et al. 2010
<i>Rumex hypogaeus</i>	Doublegee	Secondary			Saunders 1980
<i>Stenocarpus sinuatus</i>		Secondary			Johnstone et al. 2010
<i>Syzygium smithii</i>	Lilly pilly	Secondary			Groom 2014
<i>Tipuana tipu</i>	Tipu or rosewood tree	Primary			Groom 2011, Groom 2014
<i>Xanthorrhoea preissii</i>	Grass tree	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
<i>Xylomelum occidentale</i>	Woody pear	Secondary			Groom 2014

CBC=Carnaby's cockatoo, BBC=Baudin's cockatoo and FRTBC=Forest red-tailed black

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# Appendix C

Black Cockatoo Habitat Quality Assessment (Emerge 2020)





## 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 black 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.

## Black Cockatoo Habitat Quality Assessment



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 Quality Scale* provided as **Plate 1** outlines the attributes measured within each habitat category and quality component. It also shows the associated quality classification (low, moderate or high) and score (1-10).

As shown in the *Habitat Quality Scale*, the highest scores are reserved for habitat that has active or historical roosts or nests as it is considered that the presence of black cockatoos provides the best indication of the quality of habitat. Foraging habitat is weighted lower than breeding and roosting habitat as the occurrence of roost or nests provides the best confirmation that foraging habitat surrounding a site is adequate and therefore worthy of a higher quality score. Therefore, a maximum

## Black Cockatoo Habitat Quality Assessment



total of ten is achievable for breeding habitat and a total of eight is achievable for both roosting and foraging habitat (refer **Plate 1**).

The *Habitat Scoring Tool* provided as **Plate 2** 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. 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 7 or 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



## Emerge Black Cockatoo Habitat Quality Assessment - Scale

Quality Component		Habitat Quality Score											
		Low		Moderate				Moderate - High		High			
		1	2	3	4	5	6	7	8	9	10		
Breeding habitat	Site condition	Habitat trees with suitable hollows occur within the site <b>AND / OR</b> habitat trees without suitable hollows occur within the site					Habitat trees with suitable hollows occur within the site						
	Site context	No nest has been recorded within 12 km of the site <b>AND</b> <100 ha of potential foraging habitat occurs within 6 km of the site		A nest(s) (active, historical or potential) has been recorded within 12 km of the site <b>AND / OR</b> >100 ha of potential native foraging habitat occurs within 6 km of the site			A nest(s) (active, historical or potential) has been recorded within 6 km of the site <b>AND / OR</b> >1000 ha of potential native foraging habitat occurs within 6 km of the site			N/A			
	Species stocking rate	No evidence of black cockatoos nesting has been recorded within the site						A potential nest(s) occurs within the site <b>OR</b> a historical nest(s) has been recorded within the site		A Potential nest(s) occurs within the site <b>AND</b> a historical nest(s) has been recorded within the site		An active nest(s) occurs within the site <b>AND</b> a historical nest(s) has been recorded within the site	
Roosting habitat	Site condition	Trees potentially suitable for roosting occur within the site											
	Site context	No water source occurs within or nearby the site		A water source occurs within or nearby the site <b>OR</b> no water source occurs within or nearby the site									
	Species stocking rate	No roost has been recorded within the site				A small roost (active or historical) has been recorded within the site		A large roost (active or historical) has been recorded within the site		An active small roost occurs within the site		An active large roost occurs within the site	
Foraging habitat	Site condition	Foraging habitat with 1-10% primary foraging plants occurs within the site		Foraging habitat with 1-50% primary foraging plants occurs within the site		Foraging habitat with 1-100% primary foraging plants occurs within the site		Foraging habitat with 10-100% primary foraging plants occurs within the site		Foraging habitat with 50-100% primary foraging plants occurs within the site			
	Site context	No nest or roost has been recorded within 12 km of the site		A nest(s) (active, potential or historical) <b>AND / OR</b> a roost(s) (active or historical) has been recorded within 12 km of the site						A nest(s) (active, potential or historical) has been recorded within 6 km of the site		N/A	
	Species stocking rate	No evidence of foraging by black cockatoos has been recorded within the site		Evidence of foraging by black cockatoos may have been recorded within the site (limited or abundant)				Abundant evidence of foraging by black cockatoos has been recorded in the site					

Note that breeding, roosting and foraging habitat are assessed separately and the highest score is the overall quality score.

### Black Cockatoo Habitat Scale definitions

'Habitat tree' is 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  $\geq 50$  cm or DBH  $\geq 30$  cm for wandoo or salmon gum (DSEWPaC 2012).

'Nest' is a hollow in which black cockatoo breeding has been recorded. A nest is 'active' if breeding was recorded within the last 2 years and 'historical' if breeding was recorded more than 2 years ago. A hollow with potential secondary signs of breeding (e.g. chew marks) or a hollow with potential signs of breeding that could not be attributed to a bird species is a 'potential' nest.

'Roost' is a black cockatoo roost site confirmed by a roost survey (e.g. BirdLife Australia Great Cocky Count). A roost is considered 'large' if more than 150 individuals were recorded and 'small' if less than 150 individuals were recorded (BirdLife Australia 2019). A roost is 'active' if roosting was

'Primary foraging plants' are plants with historical and/or contemporary records of regular consumption by black cockatoos, including native and non-native plant species.

Plate 1: Black Cockatoo Habitat Quality Scale

## Black Cockatoo Habitat Quality Assessment



## Black Cockatoo Habitat Quality Assessment - Scoring Tool (Carnaby's cockatoo)

&lt;insert site name&gt;

		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)		2.0	0.0	0.0
			habitat tree(s) without suitable hollow(s)		1.0	0.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)		1.0	0.0	
		6-12 km from a nest(s) (active, historical or potential)		0.5	0.0		
		1.3	The site is located within 6 km of:				0.0
	>1000 ha of potential foraging habitat			3.0	0.0		
			100 to 1000 ha of potential foraging habitat		1.0	0.0	
	Species stocking rate	1.4	The site contains:				0.0
historical nest(s)				1.0	0		
The site contains:						0.0	
active nest(s)				3.0	0		
potential nest(s)				1.0	0		
<b>Score</b>		0	10.0				

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting		1.0	0.0	0.0
		2.2	The site contains a water source or one exists nearby		1.0	0.0	
	Site context	2.3	The site is located:				0.0
			within 1 km of a large roost (≥150 individuals) (active or historical)		1.0	0.0	
			within 500 m of a small roost (< 150 individuals) (active or historical)		1.0	0.0	
	Species stocking rate	2.4	The site contains:				0.0
			a historical record of a large roost (≥150 individuals)		2.0	0	
			a historical record of a small roost (<150 individuals)		1.0	0	
The site contains:						0.0	
an active record of a large roost (≥150 individuals)				2.0	0.0		
an active record of a small roost (<150 individuals)		1.0	0.0				
<b>Score</b>		0	7.0				

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				0.0
			≥50% primary foraging plants		4.0	0.0	
			≥10% to <50% primary foraging plants		2.0	0.0	
			<10% primary foraging plants		1.0	0.0	
	Site context	3.2	The site is located:				0.0
			within 6 km of a nest(s) (active, historical or potential)		2.0	0.0	
		6-12 km from a nest(s) (active, historical or potential)		1.00	0.0		
		3.3	The site is located:				
	within 6 km of a roost(s) (active or historical)			1.0	0.0		
			6-12 km from a roost(s) (active or historical)		0.5	0.0	
Species stocking rate	3.4	The site contains:				0.0	
		abundant evidence of foraging		2.0	0.0		
		limited evidence of foraging		1.0	0.0		
<b>Score</b>		0	8.0				

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	0	No habitat
Roosting	0	No habitat
Foraging	0	No habitat
<b>Overall habitat quality score</b>	<b>0</b>	<b>No habitat</b>

## Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical 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 small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

Plate 2: Black Cockatoo Habitat Scoring Tool

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# Appendix D

Database Search Results





# NatureMap Species Report

Created By Guest user on 14/08/2020

<b>Kingdom</b>	Animalia
<b>Current Names Only</b>	Yes
<b>Core Datasets Only</b>	Yes
<b>Method</b>	'By Circle'
<b>Centre</b>	115° 57' 25" E, 32° 00' 01" S
<b>Buffer</b>	10km
<b>Group By</b>	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	572	83815
Other specially protected fauna	3	39
Priority 2	1	1
Priority 3	7	57
Priority 4	6	842
Protected under international agreement	16	926
Rare or likely to become extinct	15	3062
<b>TOTAL</b>	<b>620</b>	<b>88742</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Rare or likely to become extinct</b>				
1.	24162 <i>Bettongia penicillata subsp. ogilbyi</i> (Woylie, Brush-tailed Bettong)		T	
2.	24345 <i>Botaurus poiciloptilus</i> (Australasian Bittern)		T	
3.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
4.	24790 <i>Calidris tenuirostris</i> (Great Knot)		T	
5.	24731 <i>Calyptorhynchus banksii subsp. naso</i> (Forest Red-tailed Black Cockatoo)		T	
6.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)		T	
7.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
8.	48400 <i>Calyptorhynchus sp.</i> (white-tailed black cockatoo)		T	
9.	24092 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
10.	33983 <i>Leioproctus douglasiellus</i> (a short-tongued bee)		T	
11.	24146 <i>Myrmecobius fasciatus</i> (Numbat, Walpurti)		T	
12.	33984 <i>Neopasiphae simplicior</i> (a short-tongued bee)		T	
13.	24798 <i>Numenius madagascariensis</i> (Eastern Curlew)		T	
14.	25345 <i>Pseudemys umbrina</i> (Western Swamp Tortoise, Western Swamp Turtle)		T	
15.	34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel)		T	
<b>Protected under international agreement</b>				
16.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
17.	25554 <i>Apus pacificus</i> (Fork-tailed Swift, Pacific Swift)		IA	
18.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
19.	24786 <i>Calidris melanotos</i> (Pectoral Sandpiper)		IA	
20.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
21.	24789 <i>Calidris subminuta</i> (Long-toed Stint)		IA	
22.	48587 <i>Hydroprogne caspia</i> (Caspian Tern)		IA	
23.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)		IA	
24.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
25.	48591 <i>Pandion cristatus</i> (Osprey, Eastern Osprey)		IA	
26.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
27.	24383 <i>Pluvialis squatarola</i> (Grey Plover)		IA	
28.	24716 <i>Puffinus pacificus</i> (Wedge-tailed Shearwater)		IA	
29.	48597 <i>Thalasseus bergii</i> (Crested Tern)		IA	
30.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
31.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
<b>Other specially protected fauna</b>				
32.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
33.	24475 <i>Falco peregrinus subsp. macropus</i> (Australian Peregrine Falcon)		S	
34.	48070 <i>Phascogale tapoatafa subsp. wambenger</i> (South-western Brush-tailed Phascogale,		S	

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
Wambenger)				
<b>Priority 2</b>				
35.	48581 <i>Glossurocolletes bilobatus</i> (a short-tongued bee (southwest), short-tongued bee)		P2	
<b>Priority 3</b>				
36.	25242 <i>Acanthopis antarcticus</i> (Southern Death Adder)		P3	
37.	48574 <i>Australotomurus morbidus</i> (cemetery springtail, Guildford springtail)		P3	
38.	41641 <i>Ctenotus ora</i> (Coastal Plains Skink)		P3	
39.	48935 <i>Idiosoma sigillatum</i> (Swan Coastal Plain shield-backed trapdoor spider)		P3	
40.	25147 <i>Lerista lineata</i> (Perth Slider, Lined Skink)		P3	
41.	25249 <i>Neelaps calonotos</i> (Black-striped Snake, black-striped burrowing snake)		P3	
42.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i> (Masked Owl (southwest))		P3	
<b>Priority 4</b>				
43.	25035 <i>Ctenotus delli</i> (Dell's skink, Darling Range southwest Ctenotus)		P4	
44.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
45.	48588 <i>Isoodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
46.	47975 <i>Ixobrychus dubius</i> (Australian Little Bittern)		P4	
47.	48022 <i>Notamacropus irma</i> (Western Brush Wallaby)		P4	
48.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
<b>Non-conservation taxon</b>				
49.	??			
50.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
51.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
52.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
53.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
54.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
55.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
56.	24281 <i>Accipiter cirrocephalus</i> subsp. <i>cirrocephalus</i> (Collared Sparrowhawk)			
57.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
58.	24283 <i>Accipiter fasciatus</i> subsp. <i>didimus</i> (Brown Goshawk)			
59.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i> (Brown Goshawk)			
60.	<i>Acercella falcipes</i>			
61.	42368 <i>Acritoscincus trilineatus</i> (Western Three-lined Skink)			
62.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
63.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
64.	<i>Afurcagobius suppositus</i>			
65.	<i>Agapornis</i> sp.			Y
66.	<i>Akamptogonus novarae</i>			
67.	<i>Aldrichetta forsteri</i>			
68.	<i>Allotheruea maculata</i>			
69.	<i>Amblyomma albolimbatum</i>			
70.	<i>Amblyomma triguttatum</i>			
71.	<i>Aname mainae</i>			
72.	<i>Aname tepperi</i>			
73.	24310 <i>Anas castanea</i> (Chestnut Teal)			
74.	24311 <i>Anas clypeata</i> (Northern Shoveler)			Y
75.	24312 <i>Anas gracilis</i> (Grey Teal)			
76.	24313 <i>Anas platyrhynchos</i> (Mallard)			
77.	<i>Anas platyrhynchos</i> subsp. <i>domesticus</i>			
78.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
79.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
80.	<i>Anas superciliosa</i> subsp. <i>x platyrhynchos</i>			Y
81.	<i>Ancylidae</i> sp.			
82.	<i>Anguilla australis</i>			
83.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
84.	<i>Anisops hyperion</i>			
85.	<i>Anoplocapros lenticularis</i>			
86.	<i>Anser anser</i>			
87.	25241 <i>Antaresia stimsoni</i> subsp. <i>stimsoni</i> (Stimson's Python)			
88.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
89.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
90.	25670 <i>Anthus australis</i> (Australian Pipit)			
91.	24599 <i>Anthus australis</i> subsp. <i>australis</i> (Australian Pipit)			
92.	<i>Apogon rueppellii</i>			
93.	<i>Apogon victoriae</i>			
94.	24990 <i>Aprasia pulchella</i> (Granite Worm-lizard)			
95.	24991 <i>Aprasia repens</i> (Sand-plain Worm-lizard)			
96.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
97.	<i>Ara ararauna</i>			Y

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
98.	<i>Aracana aurita</i>			
99.	<i>Arachnura higginsii</i>			
100.	<i>Araneus cyphoxis</i>			
101.	<i>Araneus eburniventris</i>			
102.	<i>Araneus eburnus</i>			
103.	<i>Araneus senicaudatus</i>			
104.	<i>Araneus talipedatus</i>			
105.	25557 <i>Ardea garzetta</i> (Little Egret)			
106.	24337 <i>Ardea garzetta</i> subsp. <i>nigripes</i> (Little Egret)			
107.	25558 <i>Ardea ibis</i> (Cattle Egret)			
108.	25559 <i>Ardea intermedia</i> (Intermediate Egret)			
109.	41324 <i>Ardea modesta</i> (great egret, white egret)			
110.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
111.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
112.	25560 <i>Ardea sacra</i> (Eastern Reef Egret, Eastern Reef Heron)			
113.	24610 <i>Ardeotis australis</i> (Australian Bustard)			
114.	<i>Arenigobius bifrenatus</i>			
115.	<i>Argiope trifasciata</i>			
116.	<i>Argyrosomus japonicus</i>			
117.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
118.	24352 <i>Artamus cinereus</i> subsp. <i>melanops</i> (Black-faced Woodswallow)			
119.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
120.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
121.	<i>Artema atlanta</i>			
122.	<i>Artoria linnaei</i>			
123.	<i>Artoria taeniifera</i>			
124.	<i>Artoriopsis eccentrica</i>			
125.	<i>Artoriopsis expolita</i>			
126.	<i>Artoriopsis joergi</i>			
127.	<i>Asadipus kunderang</i>			
128.	<i>Atherinosoma wallacei</i>			
129.	<i>Aureocrypta lugubris</i>			
130.	<i>Austracantha minax</i>			
131.	<i>Austrammo harveyi</i>			
132.	24318 <i>Aythya australis</i> (Hardhead)			
133.	<i>Backobourkia heroine</i>			
134.	<i>Badumna insignis</i>			
135.	<i>Ballarra longipalpus</i>			
136.	<i>Barmardius zonarius</i>			
137.	24319 <i>Biziura lobata</i> (Musk Duck)			
138.	24251 <i>Bos taurus</i> (European Cattle)	Y		
139.	42380 <i>Brachyurophis fasciolatus</i> subsp. <i>fasciolatus</i> (Narrow-banded Shovel-nosed Snake)			
140.	42381 <i>Brachyurophis semifasciatus</i> (Southern Shovel-nosed Snake)			
141.	24359 <i>Burhinus grallarius</i> (Bush Stone-curlew)			
142.	25713 <i>Cacatua galerita</i> (Sulphur-crested Cockatoo)			
143.	25714 <i>Cacatua pastinator</i> (Western Long-billed Corella)			
144.	25715 <i>Cacatua roseicapilla</i> (Galah)			
145.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
146.	24729 <i>Cacatua tenuirostris</i> (Eastern Long-billed Corella)	Y		
147.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
148.	24427 <i>Cacomantis flabelliformis</i> subsp. <i>flabelliformis</i> (Fan-tailed Cuckoo)			
149.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
150.	<i>Caenidae</i> sp.			
151.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
152.	<i>Carassius auratus</i>			
153.	25625 <i>Carduelis carduelis</i> (Goldfinch, European Goldfinch)	Y		
154.	24480 <i>Carduelis carduelis</i> subsp. <i>britannica</i> (Goldfinch)	Y		
155.	<i>Ceinidae</i> sp.			
156.	<i>Celaenia excavata</i>			
157.	<i>Ceratopogonidae</i> sp.			
158.	<i>Cercophonius granulatus</i>			
159.	<i>Cercophonius sulcatus</i>			
160.	<i>Ceryerda cursitans</i>			
161.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
162.	24187 <i>Chalinolobus morio</i> (Chocolate Wattled Bat)			
163.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
164.	<i>Cheilodactylus gibbosus</i>			
165.	<i>Chelmonops curiosus</i>			
166.	43380 <i>Chelodina colliei</i> (South-western Snake-necked Turtle)			
167.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
168.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
169.	33939 <i>Cherax cainii</i> (Marron)			
170.	<i>Cherax destructor</i>			
171.	<i>Cherax preissii</i>			
172.	<i>Cherax quinquecarinatus</i>			
173.	<i>Chironominae</i> sp.			
174.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
175.	<i>Chroicocephalus novaehollandiae</i>			
176.	24431 <i>Chrysococcyx basalis</i> (Horsfield's Bronze Cuckoo)			
177.	<i>Chrysococcyx lucidus</i> (Shining Bronze Cuckoo)			
178.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i> (Shining Bronze Cuckoo)			
179.	24288 <i>Circus approximans</i> (Swamp Harrier)			
180.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
181.	<i>Cleidopus gloriamaris</i>			
182.	<i>Cnidoglanis macrocephalus</i>			
183.	<i>Coenagrionidae</i> sp.			
184.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
185.	24613 <i>Colluricincla harmonica</i> subsp. <i>rufiventris</i> (Grey Shrike-thrush)			
186.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
187.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
188.	24362 <i>Coracina novaehollandiae</i> subsp. <i>novaehollandiae</i> (Black-faced Cuckoo-shrike)			
189.	<i>Coris auricularis</i>			
190.	<i>Corixidae</i> sp.			
191.	<i>Cormocephalus aurantiipes</i>			
192.	<i>Cormocephalus novaehollandiae</i>			
193.	<i>Cormocephalus rubriceps</i>			
194.	<i>Cormocephalus strigosus</i>			
195.	<i>Cormocephalus turneri</i>			
196.	24416 <i>Corvus bennetti</i> (Little Crow)			
197.	25592 <i>Corvus coronoides</i> (Australian Raven)			
198.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i> (Australian Raven)			
199.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
200.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
201.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
202.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
203.	24423 <i>Cracticus tibicen</i> subsp. <i>tibicen</i> (Black-backed Magpie)			
204.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
205.	24424 <i>Cracticus torquatus</i> subsp. <i>torquatus</i> (Grey Butcherbird)			
206.	<i>Craterocephalus mugiloides</i>			
207.	25398 <i>Crinia georgiana</i> (Quacking Frog)			
208.	25399 <i>Crinia glauerti</i> (Clicking Frog)			
209.	25400 <i>Crinia insignifera</i> (Squelching Froglet)			
210.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
211.	<i>Crustulina bicrucata</i>			
212.	30893 <i>Cryptoblepharus buchananii</i>			
213.	25020 <i>Cryptoblepharus plagioccephalus</i>			
214.	<i>Cryptoerithus quobba</i>			
215.	30899 <i>Ctenophorus adalaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
216.	24883 <i>Ctenophorus ornatus</i> (Ornate Crevice-Dragon)			
217.	25027 <i>Ctenotus australis</i>			
218.	25039 <i>Ctenotus fallens</i>			
219.	25040 <i>Ctenotus gemmula</i> (Jewelled South-west Ctenotus (Swan Coastal Plain subpop P3), skink)			
220.	25047 <i>Ctenotus impar</i>			
221.	25049 <i>Ctenotus labillardieri</i>			
222.	<i>Cyclosa trilobata</i>			
223.	24322 <i>Cygnus atratus</i> (Black Swan)			
224.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
225.	30902 <i>Dacelo novaeguineae</i> subsp. <i>novaeguineae</i> (Laughing Kookaburra)	Y		
226.	<i>Dactylopus dactylopus</i>			
227.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
228.	24606 <i>Daphoenositta chrysoptera</i> subsp. <i>pileata</i> (Varied Sittella, Black-capped Sittella)			
229.	<i>Deinopis unicolor</i>			Y
230.	<i>Delena cancerides</i>			
231.	25766 <i>Delma fraseri</i> (Fraser's Legless Lizard)			
232.	24999 <i>Delma grayii</i>			
233.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i> (Yellow-faced Whipsnake)			
234.	25325 <i>Dendrelaphis punctulata</i> (Green Tree Snake)			
235.	24325 <i>Dendrocynna eytoni</i> (Plumed Whistling Duck)			
236.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			

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237.	<i>Dingosa murata</i>			
238.	<i>Dingosa serrata</i>			
239.	<i>Dinocambala ingens</i>			
240.	<i>Diodon nichthemerus</i>			
241.	44654 <i>Diplodactylus lateroides</i> (Speckled Stone Gecko)			
242.	24939 <i>Diplodactylus polyophthalmus</i>			
243.	<i>Dytiscidae</i> sp.			
244.	25251 <i>Echiopsis curta</i> (Bardick)			
245.	<i>Edelia vittata</i>			
246.	25096 <i>Egernia kingii</i> (King's Skink)			
247.	25100 <i>Egernia napoleonis</i>			
248.	<i>Egretta garzetta</i>			
249.	<i>Egretta novaehollandiae</i>			
250.	<i>Elanus axillaris</i>			
251.	25540 <i>Elanus caeruleus</i> (Black-shouldered Kite)			
252.	24290 <i>Elanus caeruleus</i> subsp. <i>axillaris</i> (Australian Black-shouldered Kite)			
253.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
254.	47937 <i>Eiseyornis melanops</i> (Black-fronted Dotterel)			
255.	<i>Engraulis australis</i>			
256.	<i>Enoplosus armatus</i>			
257.	<i>Eodelena lapidicola</i>			
258.	<i>Eolophus roseicapillus</i>			
259.	24651 <i>Eopsaltria australis</i> subsp. <i>griseogularis</i> (Western Yellow Robin)			
260.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
261.	<i>Epinephelides armatus</i>			
262.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
263.	<i>Eriophora biapicata</i>			
264.	24379 <i>Erythronyx cinctus</i> (Red-kneed Dotterel)			
265.	<i>Ethmostigmus rubripes</i>			
266.	<i>Eucyrtops latior</i>			
267.	<i>Eulimnadia</i> sp.			
268.	<i>Eupograptus kottae</i>			
269.	<i>Eurytion incisunguis</i>			Y
270.	25621 <i>Falco berigora</i> (Brown Falcon)			
271.	24471 <i>Falco berigora</i> subsp. <i>berigora</i> (Brown Falcon)			
272.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
273.	24472 <i>Falco cenchroides</i> subsp. <i>cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
274.	25623 <i>Falco longipennis</i> (Australian Hobby)			
275.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i> (Australian Hobby)			
276.	24041 <i>Felis catus</i> (Cat)	Y		
277.	25727 <i>Fulica atra</i> (Eurasian Coot)			
278.	24761 <i>Fulica atra</i> subsp. <i>australis</i> (Eurasian Coot)			
279.	30916 <i>Funambulus pennanti</i> (Indian Palm Squirrel)	Y		
280.	34028 <i>Galaxias occidentalis</i> (Western Minnow)			
281.	<i>Gallinula jobiensis</i>			
282.	25729 <i>Gallinula tenebrosa</i> (Dusky Moorhen)			
283.	24763 <i>Gallinula tenebrosa</i> subsp. <i>tenebrosa</i> (Dusky Moorhen)			
284.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
285.	24765 <i>Gallirallus philippensis</i> subsp. <i>mellori</i> (Buff-banded Rail)			
286.	<i>Gallus gallus</i>			
287.	<i>Gambusia affinis</i>			
288.	42314 <i>Gavialis vireescens</i> (Singing Honeyeater)			
289.	<i>Gea theridioides</i>			
290.	24959 <i>Gehyra variegata</i>			
291.	<i>Geogarypus taylori</i>			
292.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
293.	<i>Gerres subfasciatus</i>			
294.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
295.	47962 <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater)			
296.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
297.	<i>Griopterygidae</i> sp.			
298.	<i>Gymnapistes marmoratus</i>			
299.	<i>Gyrinidae</i> sp.			
300.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
301.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
302.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
303.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
304.	24296 <i>Hamirostra isura</i> (Square-tailed Kite)			
305.	<i>Hebridae</i> sp.			
306.	25409 <i>Heleioporus barycragus</i> (Hooting Frog)			

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307.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
308.	25412 <i>Heleioporus psammophilus</i> (Sand Frog)			
309.	<i>Hemicloea</i> sp.			Y
310.	<i>Hemicordulidae</i> sp.			
311.	25232 <i>Hemidactylus frenatus</i> (Asian House Gecko)	Y		
312.	25115 <i>Hemiergis initialis</i> subsp. <i>initialis</i>			
313.	25475 <i>Hemiergis peronii</i>			
314.	25119 <i>Hemiergis quadrilineata</i>			
315.	<i>Henicops dentatus</i>			
316.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
317.	47965 <i>Hieraetus morphnoides</i> (Little Eagle)			
318.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
319.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
320.	<i>Histrio histrio</i>			
321.	<i>Hogna crispipes</i>			
322.	<i>Hogna immansueta</i>			
323.	<i>Holasteron perth</i>			
324.	<i>Holasteron wamuseum</i>			Y
325.	<i>Holconia westralia</i>			
326.	<i>Holocnemus pluchei</i>			
327.	<i>Hydrophilidae</i> sp.			
328.	<i>Hydropsychidae</i> sp.			
329.	<i>Hydroptilidae</i> sp.			
330.	<i>Hypoblemum</i> sp.			Y
331.	<i>Hyporhamphus regularis</i>			
332.	<i>Idiommata blackwalli</i>			
333.	<i>Idiosoma hirsutum</i>			Y
334.	<i>Isopeda leishmanni</i>			
335.	<i>Isopeda magna</i>			
336.	<i>Isopedella cana</i>			
337.	<i>Ixodes australiensis</i>			
338.	<i>Kangarosa properipes</i>			
339.	<i>Karaops ellena</i>			
340.	<i>Karaops jarrit</i>			
341.	24367 <i>Lalage tricolor</i> (White-winged Triller)			
342.	<i>Lampona brevipes</i>			
343.	<i>Lampona cylindrata</i>			
344.	25637 <i>Larus novaehollandiae</i> (Silver Gull)			
345.	24511 <i>Larus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Silver Gull)			
346.	<i>Latrodectus hasselti</i>			
347.	<i>Latrodectus hasseltii</i>			
348.	<i>Leptoceridae</i> sp.			
349.	25131 <i>Lerista distinguenda</i>			
350.	25133 <i>Lerista elegans</i>			
351.	25148 <i>Lerista lineopunctulata</i>			
352.	25165 <i>Lerista praepedita</i>			
353.	25005 <i>Lialis burtonis</i>			
354.	<i>Libellulidae</i> sp.			
355.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
356.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
357.	24582 <i>Lichmera indistincta</i> subsp. <i>indistincta</i> (Brown Honeyeater)			
358.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
359.	42413 <i>Lissolepis luctuosa</i> (Western Swamp Skink)			
360.	25378 <i>Litoria adelaidensis</i> (Slender Tree Frog)			
361.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
362.	<i>Longepi woodman</i>			
363.	<i>Lophoictinia isura</i>			
364.	42414 <i>Lucasium alboguttatum</i>			
365.	<i>Lycosa ariadnae</i>			
366.	<i>Lycosa godeffroyi</i>			
367.	<i>Lynceus</i> sp.			
368.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
369.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
370.	25650 <i>Malurus elegans</i> (Red-winged Fairy-wren)			
371.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
372.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
373.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
374.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
375.	<i>Maratus pavonis</i>			
376.	<i>Masasteron maini</i>			

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377.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
378.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
379.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
380.	24586 <i>Melithreptus brevirostris subsp. leucogenys</i> (Brown-headed Honeyeater)			
381.	24587 <i>Melithreptus chloropsis</i> (Western White-naped Honeyeater)			
382.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
383.	25184 <i>Menetia greyii</i>			
384.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
385.	<i>Microcanthus strigatus</i>			
386.	<i>Microcarbo melanoleucos</i>			
387.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
388.	<i>Missulena granulosa</i>			
389.	<i>Missulena occatoria</i>			
390.	<i>Mituliodon tarantulinus</i>			
391.	<i>Mitzoruga insularis</i>			
392.	25240 <i>Morelia spilota subsp. imbricata</i> (Carpet Python)			
393.	25191 <i>Morethia lineoocellata</i>			
394.	25192 <i>Morethia obscura</i>			
395.	24223 <i>Mus musculus</i> (House Mouse)	Y		
396.	24042 <i>Mustela putorius</i> (European Polecat, Ferret)	Y		
397.	<i>Myandra bicincta</i>			
398.	<i>Myandra cambridgei</i>			
399.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
400.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
401.	<i>Nannoperca vittata</i>			
402.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
403.	25686 <i>Neochmia temporalis</i> (Red-browed Finch)	Y		
404.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
405.	24739 <i>Neophema petrophila</i> (Rock Parrot)			
406.	<i>Nephila edulis</i>			
407.	<i>Nicodamus mainae</i>			
408.	25747 <i>Ninox connivens</i> (Barking Owl)			
409.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
410.	<i>Notiasemus glauerti</i>			
411.	<i>Notolabrus parilus</i>			
412.	<i>Notonectidae sp.</i>			
413.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
414.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
415.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
416.	<i>Occiperipatoides gilesii</i>			
417.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
418.	<i>Oecobius navus</i>			
419.	<i>Oligochaeta sp.</i>			
420.	<i>Ommatoiulus moreleti</i>			
421.	<i>Ommatoiulus moreletii</i>			
422.	<i>Ophisurus serpens</i>			
423.	<i>Opopaea sp.</i>			Y
424.	<i>Oratemnus curtus</i>			
425.	<i>Orectolobus ornatus</i>			
426.	<i>Orthoclaadiinae sp.</i>			
427.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
428.	<i>Ostearius melanopygius</i>			
429.	<i>Oxidus gracilis</i>			
430.	<i>Oxyopes gracilipes</i>			
431.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
432.	24624 <i>Pachycephala rufiventris subsp. rufiventris</i> (Rufous Whistler)			
433.	24693 <i>Pachyptila desolata</i> (Antarctic Prion)			
434.	<i>Palaemonidae sp.</i>			
435.	<i>Papillogobius punctatus</i>			
436.	<i>Paralampona marangaroo</i>			
437.	<i>Parastacidae sp.</i>			
438.	25253 <i>Parasuta gouldii</i>			
439.	25255 <i>Parasuta nigriceps</i>			
440.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
441.	24625 <i>Pardalotus punctatus subsp. punctatus</i> (Spotted Pardalote)			
442.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
443.	24630 <i>Pardalotus striatus subsp. westraliensis</i> (Striated Pardalote)			
444.	<i>Parma microlepis</i>			
445.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
446.	<i>Pediana occidentalis</i>			

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447.	<i>Pegasus volitans</i>			
448.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
449.	<i>Pempheris klunzingeri</i>			
450.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
451.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
452.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
453.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
454.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
455.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
456.	24666 <i>Phalacrocorax melanoleucos</i> subsp. <i>melanoleucos</i> (Little Pied Cormorant)			
457.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
458.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
459.	<i>Phalacrocorax varius</i> (Pied Cormorant)			
460.	<i>Phalacrocorax varius</i> (Pied Cormorant)			
461.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			Y
462.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
463.	<i>Phenasteron longiconductor</i>			
464.	<i>Pholcus phalangioides</i>			
465.	<i>Phreatoicidae</i> sp.			
466.	<i>Phryganoporus candidus</i>			
467.	<i>Phryganoporus gausapatus</i> subsp. <i>occidentalis</i>			Y
468.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			
469.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
470.	<i>Phyllopteryx taeniolatus</i>			
471.	<i>Physidae</i> sp.			
472.	<i>Physocyclus globosus</i>			
473.	<i>Pinkfloydia harveii</i>			
474.	<i>Planorbidae</i> sp.			
475.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
476.	24842 <i>Platalea regia</i> (Royal Spoonbill)			
477.	<i>Platalea regia</i> (Royal Spoonbill)			
478.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
479.	24745 <i>Platycercus icterotis</i> subsp. <i>icterotis</i> (Western Rosella)			
480.	24747 <i>Platycercus spurius</i> (Red-capped Parrot)			
481.	25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
482.	24750 <i>Platycercus zonarius</i> subsp. <i>semitorquatus</i> (Twenty-eight Parrot)			
483.	24751 <i>Platycercus zonarius</i> subsp. <i>zonarius</i> (Port Lincoln Parrot)			
484.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i> (Keeled Legless Lizard)			
485.	<i>Plotosus unicolor</i>			Y
486.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
487.	24679 <i>Podargus strigoides</i> subsp. <i>brachypterus</i> (Tawny Frogmouth)			
488.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
489.	24680 <i>Podiceps cristatus</i> subsp. <i>australis</i> (Great Crested Grebe)			
490.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
491.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
492.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
493.	<i>Polytelus anthopeplus</i> subsp. <i>westralis</i> (Regent Parrot)			
494.	<i>Polygonarea repanda</i>			Y
495.	30854 <i>Polytelus anthopeplus</i> subsp. <i>westralis</i> (Regent Parrot)			
496.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
497.	24767 <i>Porphyrio porphyrio</i> subsp. <i>bellus</i> (Purple Swamphen)			
498.	24769 <i>Porzana fluminea</i> (Australian Spotted Crane)			
499.	25732 <i>Porzana pusilla</i> (Baillon's Crane)			
500.	24770 <i>Porzana pusilla</i> subsp. <i>palustris</i> (Baillon's Crane)			
501.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
502.	<i>Psephotus dissimilis</i>			Y
503.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
504.	<i>Pseudocaranx dentex</i>			
505.	<i>Pseudogobius olorum</i>			
506.	24234 <i>Pseudomys delicatulus</i> (Delicate Mouse)			
507.	25511 <i>Pseudonaja affinis</i> (Dugite)			
508.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
509.	42416 <i>Pseudonaja mengdeni</i> (Western Brown Snake)			
510.	25264 <i>Pseudonaja nuchalis</i> (Gwardar, Northern Brown Snake)			
511.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
512.	<i>Psittacus erithacus</i>			Y
513.	24702 <i>Pterodroma brevirostris</i> (Kerguelen Petrel)			
514.	24703 <i>Pterodroma lessonii</i> (White-headed Petrel)			
515.	25710 <i>Pterodroma macroptera</i> (Great-winged Petrel)			
516.	24173 <i>Pteropus scapulatus</i> (Little Red Flying-fox)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
517.	24711 <i>Puffinus assimilis</i> subsp. <i>assimilis</i> (Little Shearwater)			
518.	<i>Purpureicephalus spurius</i>			
519.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
520.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
521.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
522.	<i>Raveniella cirrata</i>			
523.	<i>Raveniella peckorum</i>			
524.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
525.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
526.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
527.	24454 <i>Rhipidura leucophrys</i> subsp. <i>leucophrys</i> (Willie Wagtail)			
528.	<i>Scolopendra laeta</i>			
529.	<i>Scolopendra morsitans</i>			
530.	<i>Scorpius aequipinnis</i>			
531.	<i>Scorpius georgianus</i>			
532.	24199 <i>Scotorepens balstoni</i> (Inland Broad-nosed Bat)			
533.	<i>Scytodes thoracica</i>			
534.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
535.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
536.	<i>Simuliidae</i> sp.			
537.	<i>Smeringopus natalensis</i>			
538.	<i>Smeringopus natalensis</i> ?			Y
539.	30948 <i>Smicromis brevirostris</i> (Weebill)			
540.	<i>Sminthopsis murina</i>			
541.	<i>Solaenodolichopus pruvoti</i>			
542.	<i>Sphaerotrachelopus ramosus</i>			
543.	24645 <i>Stagonopleura oculata</i> (Red-eared Firetail)			
544.	<i>Steatoda capensis</i>			
545.	<i>Steatoda grossa</i>			
546.	24522 <i>Sterna bergii</i> (Crested Tern)			
547.	24525 <i>Sterna fuscata</i> subsp. <i>nubilosa</i> (Sooty Tern)			
548.	48594 <i>Sternula nereis</i> (Fairy Tern)			
549.	24329 <i>Stictonetta naevosa</i> (Freckled Duck)			
550.	25655 <i>Stipiturus malachurus</i> (Southern Emu-wren)			
551.	<i>Storena formosa</i>			
552.	<i>Storena sinuosa</i>			
553.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
554.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
555.	30951 <i>Streptopelia chinensis</i> subsp. <i>tigrina</i> (Spotted Turtle-Dove)	Y		
556.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
557.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i> (Laughing Turtle-Dove)	Y		
558.	24943 <i>Strophurus spinigerus</i> subsp. <i>inornatus</i>			
559.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
560.	<i>Supunna funerea</i>			
561.	<i>Supunna picta</i>			
562.	24259 <i>Sus scrofa</i> (Pig)	Y		
563.	<i>Sutorectus tentaculatus</i>			
564.	<i>Synothele durokoppin</i>			
565.	<i>Synothele rastelloides</i>			
566.	<i>Tabanidae</i> sp.			
567.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
568.	24682 <i>Tachybaptus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
569.	24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
570.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
571.	<i>Tamopsis facialis</i>			
572.	<i>Tamopsis perthensis</i>			
573.	<i>Tanypodinae</i> sp.			
574.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
575.	<i>Tasmanicosa leuckartii</i>			
576.	<i>Tegenaria atrica</i>			Y
577.	<i>Tetragnatha demissa</i>			
578.	<i>Threpterus maculosus</i>			
579.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
580.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
581.	25519 <i>Tiliqua rugosa</i>			
582.	25204 <i>Tiliqua rugosa</i> subsp. <i>aspera</i>			
583.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
584.	<i>Tilodon sexfasciatum</i>			
585.	<i>Tipulidae</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
586.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
587.	24309 <i>Todiramphus sanctus</i> subsp. <i>sanctus</i> (Sacred Kingfisher)			
588.	<i>Torquigener pleurogramma</i>			
589.	48141 <i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
590.	<i>Trichocyclus balladong</i>			
591.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
592.	24755 <i>Trichoglossus haematodus</i> subsp. <i>moluccanus</i> (Rainbow Lorikeet)	Y		
593.	25521 <i>Trichosurus vulpecula</i> (Common Brushtail Possum)			
594.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
595.	<i>Trygonoptera ovalis</i>			
596.	48147 <i>Turnix varius</i> (Painted Button-quail)			
597.	24851 <i>Turnix velox</i> (Little Button-quail)			
598.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
599.	25762 <i>Tyto alba</i> (Barn Owl)			
600.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i> (Barn Owl)			
601.	24983 <i>Underwoodisaurus millii</i> (Barking Gecko)			
602.	<i>Urocampus carinirostris</i>			
603.	<i>Urodacus novaehollandiae</i>			
604.	<i>Urodacus planimanus</i>			
605.	<i>Urodacus woodwardii</i>			
606.	25577 <i>Vanellus miles</i> (Masked Lapwing)			
607.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
608.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
609.	25225 <i>Varanus rosenbergi</i> (Heath Monitor)			
610.	25526 <i>Varanus tristis</i> (Racehorse Monitor)			
611.	<i>Venator immansueta</i>			
612.	<i>Venatrix arenaris</i>			
613.	<i>Venatrix pullastra</i>			
614.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
615.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
616.	<i>Westrarchaea spinosa</i>			
617.	<i>Zachria flavicoma</i>			
618.	<i>Zebraplatys fractivittata</i>			
619.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silveryeye)			
620.	<i>unknown unknown</i>			Y

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.



# EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/06/20 17:42:02

## [Summary](#)

## [Details](#)

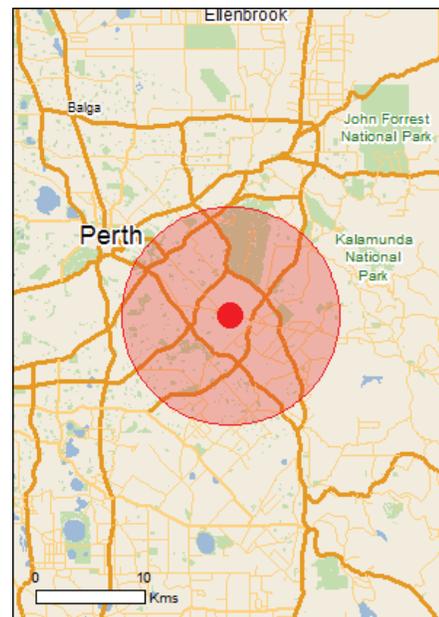
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

## [Caveat](#)

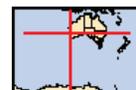
## [Acknowledgements](#)



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[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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	1
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	5
<a href="#">Listed Threatened Species:</a>	62
<a href="#">Listed Migratory Species:</a>	25

## 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.

<a href="#">Commonwealth Land:</a>	4
<a href="#">Commonwealth Heritage Places:</a>	1
<a href="#">Listed Marine Species:</a>	32
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	15
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Invasive Species:</a>	46
<a href="#">Nationally Important Wetlands:</a>	3
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[ Resource Information ]
Name		Proximity
<a href="#">Forrestdale and thomsons lakes</a>		Within 10km of Ramsar

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
<a href="#">Banksia Woodlands of the Swan Coastal Plain ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Clay Pans of the Swan Coastal Plain</a>	Critically Endangered	Community likely to occur within area
<a href="#">Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain</a>	Endangered	Community known to occur within area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area
<a href="#">Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community</a>	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Calyptorhynchus baudinii</a> Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Roosting known to occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<b>Insects</b>		
<a href="#">Leioproctus douglasiellus</a> a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
<b>Mammals</b>		
<a href="#">Bettongia penicillata ogilbyi</a> Woylie [66844]	Endangered	Species or species habitat may occur within area
<a href="#">Dasyurus geoffroi</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
<a href="#">Setonix brachyurus</a> Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
<b>Other</b>		
<a href="#">Westralunio carteri</a> Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
<b>Plants</b>		
<a href="#">Acacia anomala</a> Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Andersonia gracilis</a> Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
<a href="#">Anigozanthos viridis subsp. terraspectans</a> Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
<a href="#">Anthocercis gracilis</a> Slender Tailflower [11103]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Austrostipa bronwenae</a> [87808]	Endangered	Species or species habitat known to occur within area
<a href="#">Banksia mimica</a> Summer Honeypot [82765]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
<a href="#">Calytrix breviseta subsp. breviseta</a> Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area
<a href="#">Chamelaucium sp. Gingin (N.G.Marchant 6)</a> Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
<a href="#">Conospermum undulatum</a> Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Darwinia apiculata</a> Scarp Darwinia [8763]	Endangered	Species or species habitat known to occur within area
<a href="#">Diplolaena andrewsii</a> [6601]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diuris drummondii</a> Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diuris purdiei</a> Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer Orchid, Glossy-leaved	Endangered	Species or species

Name	Status	Type of Presence
Hammer Orchid, Warty Hammer Orchid [16753]		habitat known to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Eleocharis keigheryi</a> Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Eremophila glabra subsp. chlorella</a> [84927]	Endangered	Species or species habitat known to occur within area
<a href="#">Eucalyptus x balanites</a> Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
<a href="#">Goodenia arthrotricha</a> [12448]	Endangered	Species or species habitat likely to occur within area
<a href="#">Grevillea curviloba subsp. incurva</a> Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
<a href="#">Grevillea thelemanniana</a> Spider Net Grevillea [32835]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Lasiopetalum pterocarpum</a> Wing-fruited Lasiopetalum [64922]	Endangered	Species or species habitat may occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
<a href="#">Macarthuria keigheryi</a> Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
<a href="#">Ptilotus pyramidatus</a> Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Synaphea sp. Fairbridge Farm (D. Papenfus 696)</a> Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Thelymitra dedmaniarum</a> Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
<a href="#">Thelymitra stellata</a> Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
<b>Listed Migratory Species</b> [ Resource Information ]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a>		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a>		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora</a>		
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea exulans</a>		
Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea sanfordi</a>		
Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a>		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a>		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta</a>		
Shy Albatross [89224]	Vulnerable*	Species or species habitat likely to occur within area
<a href="#">Thalassarche impavida</a>		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a>		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a>		
White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Caretta caretta</a>		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a>		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a>		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Manta alfredi</a>		
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
<a href="#">Manta birostris</a>		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Nator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely 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 - Defence - AIRTC CANNINGTON Defence - HOLDFAST BARRACKS Defence - PALMER BARRACKS - SOUTH GUILDFORD

Commonwealth Heritage Places		<a href="#">[ Resource Information ]</a>
Name	State	Status
<b>Historic</b>		
<a href="#">Victoria Park Post Office</a>	WA	Listed place

Listed Marine Species		<a href="#">[ Resource Information ]</a>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		within area Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat likely to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Vulnerable*	Species or species

Name	Threatened	Type of Presence
<a href="#">Thalassarche impavida</a>		habitat likely to occur within area
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a>		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a>		
White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
<a href="#">Thinornis rubricollis</a>		
Hooded Plover [59510]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a>		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

#### Mammals

<a href="#">Neophoca cinerea</a>		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area

#### Reptiles

<a href="#">Caretta caretta</a>		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a>		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dermochelys coriacea</a>		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Natator depressus</a>		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

#### Extra Information

##### State and Territory Reserves [\[ Resource Information \]](#)

Name	State
Canning River	WA
Dundas Road	WA
Kenwick Wetlands	WA
Korung	WA
Lesmurdie Falls	WA
Swan River	WA
Unnamed WA23076	WA
Unnamed WA24657	WA
Unnamed WA29815	WA
Unnamed WA36440	WA
Unnamed WA37997	WA
Unnamed WA49079	WA
Unnamed WA49299	WA
Unnamed WA49362	WA
Unnamed WA49363	WA

##### Regional Forest Agreements [\[ Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
<a href="#">South West WA RFA</a>	Western Australia

**Invasive Species**[\[ Resource Information \]](#)

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

Name	Status	Type of Presence
<b>Birds</b>		
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
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Anredera cordifolia 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 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 Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla 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 Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla 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
<b>Reptiles</b>		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[ Resource Information ]
Name	State	
<a href="#">Brixton Street Swamps</a>	WA	
<a href="#">Perth Airport Woodland Swamps</a>	WA	
<a href="#">Swan-Canning Estuary</a>	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

-32.0004 115.95698

## 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.



# Appendix E

Conservation Significant Species and Likelihood of  
Occurrence Assessment





Species	Common name	Level of		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<b>Birds</b>					
<i>Anous tenuirostris melanops</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Apus pacificus</i>	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).	<b>Possible</b> Potential habitat present. May opportunistically occur in or fly over the site on commute or while searching for prey.
<i>Botaurus poiciloptilus</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Calidris acuminata</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Calidris ferruginea</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Calidris melanotos</i>	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).	<b>Unlikely</b> No suitable habitat present.

		WA	EPBC Act		
<i>Calidris ruficollis</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Calidris subminuta</i>	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 sapphire flats around estuaries and saltlakes.	<b>Unlikely</b> No suitable habitat present.
<i>Calidris tenuirostris</i>	Great knot	CR	CR (MI)	Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds.	<b>Unlikely</b> No suitable habitat present.
<i>Calyptorhynchus banksii naso</i>	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.	<b>Recorded</b> Suitable foraging and roosting habitat present. Species observed flying over the site during the field survey. Foraging debris attributed to this species was also observed.
<i>Calyptorhynchus baudinii</i>	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).	<b>Possible</b> Potential foraging and roosting habitat present but the site is located at the outer limits of species known distribution range. Opportunistic occurrence possible.

		WA	EPBC Act		
<i>Calyptorhynchus latirostris</i>	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of <i>Pinus</i> spp. Attracted to seeding <i>Banksia</i> spp., <i>Dryandra</i> spp., <i>Hakea</i> spp., <i>Eucalyptus</i> spp., <i>Corymbia calophylla</i> , <i>Grevillea</i> spp., and <i>Allocasuarina</i> spp. (Johnstone and Storr 1998).	<b>Recorded</b> Suitable foraging and roosting habitat present. Foraging debris attributed to this species was also observed. Extensive records located adjacent to and within the wider area of the site.
<i>Diomedea amsterdamensis</i>	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)	<b>Unlikely</b> No suitable habitat present.
<i>Diomedea epomophora</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Diomedea exulans</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Diomedea sanfordi</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	<b>Possible</b> Potential habitat present. Opportunistic fly over possible.

		WA	EPBC Act		
<i>Ixobrychus dubius</i>	Australian little bittern	P4	-	Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of <i>Typha</i> spp., <i>Baumea</i> spp. and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998).	<b>Unlikely</b> No suitable habitat present.
<i>Leipoa ocellata</i>	Mallefowl	VU	VU	Scrubs and thickets of <i>Eucalyptus</i> spp., <i>Melaleuca lanceolata</i> and <i>Acacia linophylla</i> ; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998).	<b>Unlikely</b> Species locally extinct.
<i>Limosa lapponica</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Macronectes giganteus</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Macronectes halli</i>	Northern giant petrel	MI	VU (MI)	Breeds on subantarctic islands. May visit Western Australian water from February to September (Johnstone and Storr 1998).	<b>Unlikely</b> No suitable habitat present.

		WA	EPBC Act		
<i>Motacilla cinerea</i>	Grey wagtail	MI	MI	In Australia mostly near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields and airfields (Pizzey & Knight 2012).	<b>Unlikely</b> Marginal habitat present (perennial lake, flooded gum and marri woodland). The site is located within the species distribution range but it rarely occurs in south-western Australia. Incidental occurrence possible but unlikely.
<i>Numenius madagascariensis</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Oxyura australis</i>	Blue-billed duck	P4	-	Mainly deeper freshwater swamps and lakes; occasionally saltlakes and estuaries freshened by flood waters (Johnstone and Storr 1998).	<b>Unlikely</b> No suitable habitat present.
<i>Pachyptila turtur subantarctica</i>	Fairy prion	-	VU	Breeds on subantarctic islands and is presumed to frequent subtropical waters during non-breeding period (TSSC 2015).	<b>Unlikely</b> No suitable habitat present.
<i>Pandion haliaetus</i>	Osprey	MI	MI	Coasts, estuaries, bays, inlets, islands, and surrounding waters; coral atolls, reefs, lagoons, rock cliffs, stacks (Pizzey & Knight 2012).	<b>Unlikely</b> No suitable habitat present.
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI	Well-vegetated wetlands, wet pasture, ricefields, floodwaters, floodplains, brackish or occasionally saline wetlands, mangroves, mudflats and occasionally dry grassland (Pizzey & Knight 2012).	<b>Unlikely</b> No suitable habitat present.
<i>Pluvialis squatarola</i>	Grey Plover	MI	MI	Mudflats, saltmarsh, tidal reefs and estuaries, rarely inland (Pizzey and Knight 2012).	<b>Unlikely</b> No suitable habitat present.

		WA	EPBC Act		
<i>Puffinus pacificus</i>	Wedge-tailed shearwater	MI	MI	Pelagic, marine bird known from tropical and subtropical waters. Tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 ‰ (sprat 2020).	<b>Unlikely</b> No suitable habitat present.
<i>Rostratula australis</i>	Australian painted snipe	EN	EN	Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993).	<b>Unlikely</b> No suitable habitat present.
<i>Sterna bergii</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Sterna caspia</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Sternula nereis nereis</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Thalassarche cauta cauta</i>	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).	<b>Unlikely</b> No suitable habitat present.

		WA	EPBC Act		
<i>Thalassarche cauta steadi</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Thalassarche melanophris</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Thalassarche melanophris impavida</i>	Campbell albatross	VU	VU (MI)	Scarce visitor to south western and western seas. Breeds on Campbell island.	<b>Unlikely</b> No suitable habitat present.
<i>Tringa glareola</i>	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 (Pizzey & Knight).	<b>Unlikely</b> No suitable habitat present.
<i>Tringa hypoleucos</i>	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 where low perches are available (Johnstone & Storr 1998).	<b>Unlikely</b> No suitable habitat present.
<i>Tringa nebularia</i>	Common greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh and saline), commercial saltfields, sewage ponds (Pizzey & Knight 2012).	<b>Unlikely</b> No suitable habitat present.

		WA	EPBC Act		
<i>Tringa stagnatilis</i>	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.	<b>Unlikely</b> No suitable habitat present.
<i>Tyto novaehollandiae novaehollandiae</i>	Australian masked owl (southwest)	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).	<b>Unlikely</b> Marginal habitat (marri and flooded gum woodland) present, if any. Species is rarely recorded in the general vicinity of the site.
<b>Invertebrates</b>					
<i>Australotomurus morbidus</i>	Cemetery springtail	P3	-	Unknown.	<b>Unlikely</b> Species poorly understood and only known from a few records. The closest known record to the site is associated with native bushland located adjacent to the Perth airport. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.

		WA	EPBC Act		
<i>Glossurocolletes bilobatus</i>	a short-tongued bee	P2	-	Unknown.	<b>Unlikely</b> Species poorly understood and only known from a few records. The closest known record to the site is located within the Brixton Street Wetlands. Vegetation within the site considered too disturbed to support this species.
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003).	<b>Possible</b> Potential habitat present (sandy soils) and multiple historical records located near the site.
<i>Leioproctus douglasiellus</i>	a short-tongued bee	EN	CR	Life history and habits are poorly documented/unknown. It has been recorded only on the flowers of <i>Goodenia filiformis</i> and <i>Anthotium junctiforme</i> (Houston 2000).	<b>Unlikely</b> Species only known from a few records. The closest known record to the site is located near the Canning river and within Brixton Street Wetlands. No records are known from near the site. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.

		WA	EPBC Act		
<i>Neopasiphae simplicior</i>	a short-tongued bee	EN	CR	This species of native bee has been collected on flowers of <i>Goodenia filiformis</i> , <i>Lobelia tenuior</i> , <i>Angianthus preissianus</i> and <i>Velleia</i> sp. (Houston 2000).	<b>Unlikely</b> Species only known from a few records. The closest one to the site is located near the Canning river. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.
<i>Westralunio carteri</i>	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).	<b>Unlikely</b> No suitable habitat present.
<b>Mammals</b>					
<i>Bettongia penicillata ogilbyi</i>	Woylie	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly <i>Gastrolobium</i> spp. (TSSC 2018).	<b>Unlikely</b> Species locally extinct.
<i>Dasyurus geoffroii</i>	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).	<b>Unlikely</b> Very marginal habitat present (banksia and marri woodland) but too small in extent and no recent records occur near the site. Species now primarily associated with the Jarrah Forest.

		WA	EPBC Act		
<i>Hydromys chrysogaster</i>	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).	<b>Unlikely</b> No suitable habitat present.
<i>Isoodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	<b>Possible</b> Marginal habitat present (perennial lake, marri and banksia woodland) and site located within the species known range. Multiple recent records from near the site.
<i>Myrmecobius fasciatus</i>	Numbat	EN	EN	Generally dominated by Eucalyptus spp. that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008).	<b>Unlikely</b> Species locally extinct.
<i>Notamacropus irma</i>	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).	<b>Unlikely</b> Very marginal habitat present (banksia and marri woodland) but too small in extent and no historical or recent records occur near the site or wider area.

		WA	EPBC Act		
<i>Phascogale tapoatafa wambenger</i>	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	<b>Possible</b> Marginal habitat present (perennial lake, marri and banksia woodland) but very limited in extent. The site is located within the species known range. Recent records located within the wider area of the site.
<i>Setonix brachyurus</i>	Quokka	VU	VU	On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007).	<b>Unlikely</b> Species locally extinct.
<b>Reptiles</b>					
<i>Acanthopis antarcticus</i>	Southern death adder	P3	-	Mostly in woodlands, grasslands and heaths. In the Darling Range this species is typically found within Eucalyptus marginata woodlands adjacent to granite outcrops and along densely vegetated creeks (Bush et al. 2007). Locally confined to an aerea between Mount Helena and Jarrahdale (Bush et al. 1995).	<b>Unlikely</b> Very marginal habitat (marri and banksia woodland) present but the site is located outside of the species distribution range.
<i>Ctenotus delli</i>	Dell's skink	P4	-	Jarrah and marri woodland with a shrub dominated understorey, sheltering in dense vegetation, inside grass trees and beneath rocks, sometimes in burrows (Nevill 2005). Species absent from the Swan Coastal Plain (Bush et al. 1995)	<b>Unlikely</b> Marginal habitat (marri and banksia woodland) present. Site located outside of the species known distribution range.

		WA	EPBC Act		
<i>Ctenotus ora</i>	Coastal plains skink	P3	-	Sandy substrates with low vegetation (including heath) in open Eucalyptus spp. and Corymbia calophylla woodland over Banksia spp.. Species occurs between Pinjarra and Yallingup in Western Australia (Kay and Keogh 2012).	<b>Unlikely</b> Marginal habitat present (marri and banksia woodland) but very limited in extent. The site is located outside of the species known distribution range.
<i>Lerista lineata</i>	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). Occurs from Perth's southern suburbs to Mandurah (Bush et al. 1995).	<b>Possible</b> Marginal habitat present (marri and banksia woodland) but limited in extent. Site is located on northern limit of the species range.
<i>Neelaps calonotos</i>	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002).	<b>Possible</b> Marginal habitat present (banksia woodland) but very limited in extent. The site is located within the species known distribution range.
<i>Pseudemydura umbrina</i>	Western swamp tortoise	CR	CR	Clay based ephemeral swamps (Bush et al. 2002).	<b>Unlikely</b> No suitable habitat present and species locally extinct.

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.

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# Appendix F

Species List





Category	Status	Species name	Common name	Record type
<b>Amphibia</b>				
		<i>Crinia glauerti</i>	Clicking froglet	Call
		<i>Crinia insignifera</i>	Squelching froglet	Call
		<i>Limnodynastes dorsalis</i>	Western banjo frog	Call
<b>Birds</b>				
		<i>Acrocephalus australis</i>	Australian reed warbler	Sight
		<i>Anas superciliosa</i>	Pacific black duck	Sight
		<i>Anthochaera carunculata</i>	Red wattlebird	Sight, call
		<i>Cacatua roseicapilla</i>	Galah	Sight
	VU	<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	Sight, call, foraging evidence
	EN	<i>Calyptorhynchus latirostris</i>	Carnaby's cockatoo	Foraging evidence
		<i>Chenonetta jubata</i>	Woodduck	Sight
		<i>Corvus coronoides</i>	Australian raven	Sight
		<i>Cracticus tibicen</i>	Australian magpie	Sight
	*	<i>Dacela novaeguineae</i>	Laughing kookaburra	Sight, call
	*	<i>Fulica atra</i>	Eurasian coot	Sight
		<i>Hirundo neoxena</i>	Welcome swallow	Sight
		<i>Phaps chalcoptera</i>	Common bronzewing	Sight, call
		<i>Phylidonyris novaehollandiae</i>	New Holland honey eater	Sight
		<i>Porphyrio porphyrio</i>	Purple swamphen	Sight
		<i>Rhipidura albiscapa</i>	Grey fantail	Sight
		<i>Rhipidura leucophrys</i>	Willie wagtail	Sight
	* DP	<i>Trichoglossus moluccanus</i>	Rainbow lorikeet	Sight, call
<b>Mammals</b>				
	* DP	<i>Oryctolagus cuniculus</i>	Rabbit	Scats
<b>Reptiles</b>				
		<i>Chelodina colliei</i>	Ooblong turtle	Turtle shell
		<i>Menetia greyii</i>	Common dwarf skink	Sight

Note: \* denotes introduced fauna species, DP=declared pest under the BAM Act, EN=Endangered under the EPBC Act, VU=Vulnerable under the EPBC Act



# Appendix G

Black Cockatoo Habitat Tree Data







Black Cockatoo Habitat Tree Inventory  
State Football Centre

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
419	401657.93	6458889.92	52	<i>Eucalyptus rudis</i>	No suitable hollows	
421	401706.79	6458887.84	68	<i>Eucalyptus rudis</i>	No suitable hollows	
422	401716.22	6458889.81	74	<i>Eucalyptus rudis</i>	No suitable hollows	
423	401665.20	6458831.01	119	<i>Eucalyptus rudis</i>	No suitable hollows	
424	401716.83	6458894.81	61	<i>Eucalyptus rudis</i>	No suitable hollows	
425	401765.72	6459037.07	87	<i>Corymbia calophylla</i>	No suitable hollows	
426	401783.45	6459059.41	93	<i>Corymbia calophylla</i>	No suitable hollows	
428	401797.05	6459040.36	97	<i>Corymbia calophylla</i>	No suitable hollows	
429	401804.61	6459030.57	50	<i>Corymbia calophylla</i>	No suitable hollows	
430	401813.99	6459027.34	59	<i>Corymbia calophylla</i>	No suitable hollows	
432	401824.48	6459076.21	70	<i>Corymbia calophylla</i>	No suitable hollows	
433	401806.59	6459089.46	72	<i>Corymbia calophylla</i>	No suitable hollows	
434	401805.07	6459090.99	69	<i>Corymbia calophylla</i>	No suitable hollows	
435	401784.44	6459094.79	79	<i>Corymbia calophylla</i>	No suitable hollows	
436	401792.54	6459106.17	51	<i>Corymbia calophylla</i>	No suitable hollows	
437	401804.92	6459116.05	67	<i>Corymbia calophylla</i>	No suitable hollows	
438	401808.74	6459102.34	86	<i>Corymbia calophylla</i>	No suitable hollows	
439	401830.09	6459122.17	66	<i>Corymbia calophylla</i>	No suitable hollows	
440	401827.23	6459124.24	57	<i>Corymbia calophylla</i>	No suitable hollows	
441	401826.48	6459124.02	58	<i>Corymbia calophylla</i>	No suitable hollows	
442	401828.75	6459133.24	91	<i>Corymbia calophylla</i>	No suitable hollows	
443	401860.43	6459100.62	82	<i>Corymbia calophylla</i>	No suitable hollows	
444	401863.52	6459093.22	75	<i>Corymbia calophylla</i>	No suitable hollows	
445	401862.94	6459094.54	52	<i>Corymbia calophylla</i>	No suitable hollows	
446	401895.10	6459071.02	67	<i>Corymbia calophylla</i>	No suitable hollows	
447	401899.36	6459070.50	52	<i>Corymbia calophylla</i>	No suitable hollows	
448	401906.01	6459076.55	62	<i>Corymbia calophylla</i>	No suitable hollows	
449	401921.15	6459122.49	74	<i>Corymbia calophylla</i>	No suitable hollows	Small hollow present but not suitable for breeding by black cockatoos.
450	401874.41	6459130.35	84	<i>Corymbia calophylla</i>	No suitable hollows	Small hollow present but not suitable for breeding by black cockatoos.



Black Cockatoo Habitat Tree Inventory  
State Football Centre

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
452	401844.62	6459123.08	63	<i>Corymbia calophylla</i>	No suitable hollows	
455	401782.46	6459132.68	86	<i>Corymbia calophylla</i>	No suitable hollows	
456	401781.79	6459134.01	92	<i>Corymbia calophylla</i>	No suitable hollows	
457	401778.22	6459131.75	52	<i>Corymbia calophylla</i>	No suitable hollows	
458	401775.19	6459122.41	56	<i>Corymbia calophylla</i>	No suitable hollows	
459	401220.78	6459245.22	58	<i>Corymbia calophylla</i>	No suitable hollows	
460	401226.50	6459269.00	63	<i>Corymbia calophylla</i>	No suitable hollows	
463	401384.84	6459250.02	71	<i>Corymbia calophylla</i>	No suitable hollows	
464	401378.24	6459258.38	79	<i>Corymbia calophylla</i>	No suitable hollows	
465	401355.67	6459256.95	50	<i>Corymbia calophylla</i>	No suitable hollows	
466	401358.09	6459251.31	79	<i>Corymbia calophylla</i>	No suitable hollows	
467	401440.01	6459210.64	57	<i>Corymbia calophylla</i>	No suitable hollows	
468	401444.34	6459221.55	51	<i>Corymbia calophylla</i>	No suitable hollows	
469	401444.43	6459231.86	55	<i>Corymbia calophylla</i>	No suitable hollows	
470	401451.05	6459231.92	55	<i>Corymbia calophylla</i>	No suitable hollows	
471	401451.01	6459216.07	51	<i>Corymbia calophylla</i>	No suitable hollows	
472	401545.79	6459145.15	66	<i>Corymbia calophylla</i>	No suitable hollows	

# Appendix H

Overall Habitat Quality Assessment





		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N/A	2.0	0.0	0.0
			habitat tree(s) without suitable hollow(s)	N/A	1.0	0.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N/A	1.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	N/A	0.5	0.0	
	1.3	The site is located within 6 km of:					0.0
		>1000 ha of potential foraging habitat	N/A	3.0	0.0		
		100 to 1000 ha of potential foraging habitat	N/A	1.0	0.0		
	Species stocking rate	1.4	The site contains:				0.0
historical nest(s)			N/A	1.0	0		
The site contains:							
active nest(s)			N/A	3.0	0		
potential nest(s)			N/A	1.0	0		
<b>Score</b>				0	10.0		

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				0.0
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0	
	Species stocking rate	2.4	The site contains:				0.0
			a historical record of a large roost (≥150 individuals)	N	2.0	0	
			a historical record of a small roost (<150 individuals)	N	1.0	0	
The site contains:							
an active record of a large roost (≥150 individuals)			N	2.0	0.0		
an active record of a small roost (<150 individuals)	N	1.0	0.0				
<b>Score</b>				2	7.0		

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				4.0
			≥50% primary foraging plants	Y	4.0	4.0	
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				1.0
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
			The site is located:				
	3.3	within 6 km of a roost(s) (active or historical)	Y	1.0	1.0		
		6-12 km from a roost(s) (active or historical)	Y	0.5	0.5		
Species stocking rate	3.4	The site contains:				0.0	
		abundant evidence of foraging	N	2.0	0.0		
		limited evidence of foraging	N	1.0	0.0		
<b>Score</b>				5	8.0		

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	N/A	N/A
Roosting	2	Low
Foraging	5	Moderate

<b>Overall habitat quality score</b>	<b>5</b>	<b>Moderate</b>
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical 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 small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N	2.0	0.0	1.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	Y	1.0	1.0	
			6-12 km from a nest(s) (active, historical or potential)	Y	0.5	0.5	
	1.3	The site is located within 6 km of:					1.0
		>1000 ha of potential foraging habitat	N	3.0	0.0		
		100 to 1000 ha of potential foraging habitat	Y	1.0	1.0		
	Species stocking rate	1.4	The site contains:				0.0
historical nest(s)			N	1.0	0		
The site contains:						0.0	
active nest(s)			N	3.0	0		
potential nest(s)			N	1.0	0		
<b>Score</b>			<b>3</b>	<b>10.0</b>			

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				0.0
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0	
	Species stocking rate	2.4	The site contains:				0.0
			a historical record of a large roost (≥150 individuals)	N	2.0	0	
			a historical record of a small roost (<150 individuals)	N	1.0	0	
The site contains:						0.0	
an active record of a large roost (≥150 individuals)			N	2.0	0.0		
an active record of a small roost (<150 individuals)	N	1.0	0.0				
<b>Score</b>			<b>2</b>	<b>7.0</b>			

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				4.0
			≥50% primary foraging plants	Y	4.0	4.0	
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				1.0
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
	within 6 km of a roost(s) (active or historical)	Y	1.0	1.0			
	6-12 km from a roost(s) (active or historical)	Y	0.5	0.5			
Species stocking rate	3.4	The site contains:				1.0	
		abundant evidence of foraging	N	2.0	0.0		
		limited evidence of foraging	Y	1.0	1.0		
<b>Score</b>			<b>6</b>	<b>8.0</b>			

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	3	Low
Roosting	2	Low
Foraging	6	Moderate

<b>Overall habitat quality score</b>	<b>6</b>	<b>Moderate</b>
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical 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 small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N	2.0	0.0	
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
				within 6 km of a nest(s) (active, historical or potential)	Y	1.0	1.0
				6-12 km from a nest(s) (active, historical or potential)	Y	0.5	0.5
		1.3	The site is located within 6 km of:				
	>1000 ha of potential foraging habitat			N	3.0	0.0	
	Species stocking rate	1.4	The site contains:				
				historical nest(s)	N	1.0	0
active nest(s)				N	3.0	0	
potential nest(s)				N	1.0	0	
<b>Score</b>			<b>3</b>	<b>10.0</b>			

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				
				within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0
				within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0
	Species stocking rate	2.4	The site contains:				
				a historical record of a large roost (≥150 individuals)	N	2.0	0
				a historical record of a small roost (<150 individuals)	N	1.0	0
<b>Score</b>			<b>2</b>	<b>7.0</b>			

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				
				≥50% primary foraging plants	Y	4.0	4.0
				≥10% to <50% primary foraging plants	N	2.0	0.0
				<10% primary foraging plants	N	1.0	0.0
	Site context	3.2	The site is located:				
				within 6 km of a nest(s) (active, historical or potential)	Y	2.0	2.0
				6-12 km from a nest(s) (active, historical or potential)	Y	1.00	1.0
		3.3	The site is located:				
	within 6 km of a roost(s) (active or historical)			Y	1.0	1.0	
Species stocking rate	3.4	The site contains:					
			abundant evidence of foraging	N	2.0	0.0	
			limited evidence of foraging	Y	1.0	1.0	
<b>Score</b>			<b>7</b>	<b>8.0</b>			

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	3	Low
Roosting	2	Low
Foraging	7	Moderate - High

<b>Overall habitat quality score</b>	<b>7</b>	<b>Moderate - High</b>
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical 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 small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category