

APPENDIX D
Flora and Vegetation Assessment
Report



City of Rockingham
Proposed Baldivis District Sporting Complex
Flora and Vegetation Assessment

January 2018

Executive summary

The City of Rockingham ('the City') proposes to develop a District Sporting Complex at Lots 4, 103, 104 and 105 Eighty Road, Baldivis (the 'survey area'). The Baldivis District Sporting Complex is necessary to meet the current and future demand for organised sporting spaces in the locality. The project will include four large playing fields, two club rooms, 18 outdoor hard courts, and indoor recreation centre and outdoor youth space. The survey area is approximately 19.39 hectares (ha) in total.

GHD Pty Ltd (GHD) was commissioned by the City to undertake a single season (spring) detailed flora and vegetation survey of the future Baldivis District Sporting Complex to define key flora and vegetation values within the survey area. The outcomes of the assessment will be used to inform the project design and viability and for environmental approvals process.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout this report.

Key Findings

Vegetation

- Broad scale vegetation mapping of the area undertaken by Beard (1979) identified vegetation association 998: Medium woodland; tuart (*Eucalyptus gomphocephala*) within the survey area. The current extent remaining of vegetation association 998 is greater than 30 per cent (%) of the pre-European extent at all mapped scales (e.g. State, IBRA Bioregion, IBRA Sub-region and Local Government Area (LGA)).
- Regional vegetation mapped by Heddlé *et al.* (1980) indicates there are two vegetation complexes within the survey area: Karrakatta complex – central and south and the Herdsman complex. The current extent of the Karrakatta complex – central and south within the Swan Coastal Plain IBRA bioregion is 24.86% of the calculated pre-European extent and 27.97% within the City of Rockingham. The current extent of the Herdsman complex within the Swan Coastal Plain and City of Rockingham remains above 30%.
- The western half of the survey area is mapped as an Environmentally Sensitive Area due to the presence of a Conservation Category wetland located south and west of the survey area.
- Three vegetation types were identified from the survey area in the field:
 - Tuart/Jarraah woodland (4.22 ha)
 - *Grevillea* shrubland (0.19 ha)
 - Parkland cleared (14.98)
- Lot 105 is completely cleared. Lots 103, 104 and half of Lot 4 are parkland cleared, consisting mostly of scattered individual trees/shrubs (both native and planted/introduced) over introduced grasses and herbs. This vegetation type has been assessed as completely degraded. The other half of Lot 4 consists of remnant Tuart/Jarraah woodland and a small patch of *Grevillea* shrubland. The natural structure of these vegetation types are not intact with very limited floristic diversity and are in degraded condition.
- The survey area is highly modified due to historical clearing, logging, grazing, fencing, tracks and weed invasion. The vegetation structure has been significantly altered with an understorey completely dominated by common herbaceous and grassy weeds.

- Dominant trees across the site consisted of *Eucalyptus gomphocephala* (Tuart), *E. marginata* (Jarrah), *Corymbia calophylla* (Marri), *Banksia grandis*, *B. attenuata* and *Allocasuarina fraseriana*. A combination of planted native and introduced eucalypts as well as other native and non-native trees and garden shrubs were concentrated around where the recently demolished houses were located on Lots 103 and 104.
- Based on an assessment of the vegetation types, dominant species, soils, landform features and field observation, GHD identified the likely occurrence of the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain Priority 3 PEC. The Tuart/Jarrah woodland vegetation type also showed some similarities with the Southern *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands (25) Priority 3 PEC.

Flora

- Eighty seven (87) native and non-native flora taxa (including subspecies and varieties) representing 41 families and 71 genera were recorded from the survey area during the field survey.
- Forty five (45) introduced flora taxa were recorded in the survey area. Of the introduced taxa, one is listed as a Declared Pest under the *Biosecurity and Management Act 2007*: **Gomphocarpus fruticosus* (Narrowleaf Cottonbush) – Declared Pest
- No *Environment Protection and Biodiversity Conservation Act 1999* or *Wildlife Conservation Act 1950* listed flora were recorded within the survey area. Additionally, no Department of Biodiversity Conservation and Attractions Priority-listed flora species were recorded within the survey area during the field survey.
- A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment as potentially occurring within the survey area. This assessment concluded that all conservation significant species identified are unlikely or highly unlikely to occur within the survey area.

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1. Introduction

1.1 Background

The City of Rockingham (“the City”) proposes to develop a District Sporting Complex at Lots 4, 103, 104 and 105 Eighty Road, Baldivis (the ‘survey area’). The Baldivis District Sporting Complex is necessary to meet the current and future demand for organised sporting spaces in the locality. The project will include four large playing fields, two club rooms, 18 outdoor hard courts, and indoor recreation centre and outdoor youth space.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by the City to undertake a flora and vegetation survey of the future Baldivis District Sporting Complex to define key flora and vegetation values within the survey area. The outcomes of the assessment will be used to inform the project design and viability and to support environmental approvals.

1.3 Location

1.3.1 Survey area

The survey area is located on Eighty Road, Baldivis in the City of Rockingham. The total study area is 19.39 hectares (ha). The survey area is located on the following Lots, as shown in Figure 1, Appendix A:

Lot 4 on Diagram 31062 – No street address

Lot 103 on Diagram 50627 – 531 Eighty Road, Baldivis

Lot 104 on Diagram 50627 – 541 Eighty Road, Baldivis

Lot 105 on Diagram 50627 – 553 Eighty Road, Baldivis

1.3.2 Study area

The desktop assessment included a 5 km buffer of the survey area which defines the study area.

1.4 Scope of works

The scope of works, was to undertake a desktop assessment and single season detailed flora and vegetation survey for the future Baldivis District Sporting Complex.

The following actions were completed to fulfil the scope:

- A desktop assessment of relevant literature, databases and spatial datasets was completed to determine the environmental values and potential issues
- The vegetation complex of the area was referenced to determine the pre-European extent remaining to assess the significance of the proposed native vegetation clearing
- A field survey of the area was completed during Spring, using quadrats where possible
- Vegetation communities, condition, and conservation significant species were mapped where present
- The vegetation types were described and classified to determine their conservation significance

- The significance of any Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC) was identified, mapped and discussed based on the results of the field survey
- An inventory of plant taxa (including weed species) was compiled
- Conservation significant flora species were actively searched for based on habitat requirements, and the population extent or locations of any Threatened flora, priority flora and any other flora of local or taxonomic significance were mapped
- A concise technical report was produced (this document), with relevant photographs and figures included for context

1.5 Relevant legislation, conservation codes and background information

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

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

1.6 Report limitations and assumptions

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

GHD otherwise disclaims responsibility to any person other than the City 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. 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 the City 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, and testing undertaken at or in connection with, 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 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 this Report. 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 and vegetation within the survey area (Figure 1, Appendix A). Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

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

- The Department of the Environment and the Energy (DotEE) Protected Matters Search Tool (PMST) to identify species and communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the study area (DotEE 2017a) (Appendix C)
- The Department of Biodiversity Conservation and Attractions (DBCA) TEC and PEC database to determine the potential for TECs or PECs to be present within the study area (DBCA 2017b)
- The DBCA *NatureMap* database for flora species previously recorded within the study area (DBCA 2007–) (Appendix C)
- The DBCA Threatened (Declared Rare) and Priority Flora (TPFL) database and the WA Herbarium (WAHerb) database for Threatened flora species listed under the *Wildlife Conservation Act 1950* (WC Act) and listed as Priority by DBCA, previously recorded within the survey area (DBCA 2017c).
- Previous vegetation mapping of the survey area (e.g. Beard 1979, Heddle *et al.* 1980) and the pre-European extent remaining
- Aerial photography, geology/soils and hydrology information to provide background information on the variability of the environment and likely vegetation types
- Environmentally Sensitive Areas (ESAs) and DBCA managed conservation estates and reserves in the vicinity
- Wetlands and hydrological features in the vicinity.

2.2 Field survey

A single season detailed flora and vegetation survey of the survey area was undertaken by GHD ecologist Erin Lynch (Flora Licence No. SL012110) on the 11 October 2017. The purpose of the survey was to identify and describe the dominant vegetation units, assess vegetation condition and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant or other significant ecological communities and flora taxa were undertaken.

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

2.2.1 Data collection

Field survey methods involved a combination of sampling quadrats located in identified vegetation units and traversing the survey area by foot and vehicle. Six non-permanent quadrats were described throughout the survey area.

Quadrats (measuring 10 metres (m) x 10 m – area of 100 m²) were located within key native vegetation units where space allowed. For areas either too small to establish a quadrat or too degraded to warrant one, a relevé was conducted. Field data at each quadrat was recorded on

a pro-forma data sheet and included the parameters detailed in Table 1. Quadrat and relevé data are provided in Appendix D.

Table 1 Quadrat data collected during the flora and vegetation field survey

Aspect	Measurement
Collection attributes	Personnel/recorder; date, quadrat dimensions, photograph of the quadrat.
Physical features	Aspect, soil attributes, ground surface cover, leaf and wood litter.
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale devised by EPA (2016) (adapted from Keighery 1994).
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, infrastructure works).
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, relevés and from opportunistic floristic records throughout the survey area.

2.2.2 Vegetation units

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

Vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat data and field observations. Vegetation unit descriptions follow the National Vegetation Information System (NVIS) and are consistent with NVIS Level V (Association), and are grouped within NVIS Level III (Broad Floristic Formation). At Level V up to three taxa per stratum are used to describe the association (Executive Steering Committee for Australian Vegetation Information (ESCAVI 2003).

2.2.3 Vegetation condition

The vegetation condition of the survey area was assessed and mapped in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016). This scale recognises the intactness of vegetation, which is defined by the following:

- Completeness of structural levels.
- Extent of weed invasion.
- Historical disturbance from tracks and other clearing or dumping of rubbish.
- The potential for natural or assisted regeneration.

The scale consists of six rating levels as outlined in Appendix B.

2.2.4 Flora identification

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 plant specimens collected during the field assessment were dried and processed in accordance with the requirements of the WA Herbarium. Plant 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–) and the EPBC Act Threatened species database provided by DotEE (2017b).

Nomenclature used in this report follows that used by the WA Herbarium (WAHERB) as reported on *FloraBase* (WA Herbarium 1998–).

2.2.5 Surveys for conservation significant flora

Prior to the field survey, information obtained from the desktop assessments (e.g. aerial photography, geology, soils and topography data, EPBC Act PMST, *NatureMap*) was reviewed to determine conservation significant flora taxa potentially present within the survey area. Additionally, ecological information (e.g. habitat, associated flora taxa and phenology) was sourced from *FloraBase* (WA Herbarium 1998–) and other relevant publications where available, to provide further details.

Potential habitats were searched by opportunistic sampling. Locations within the survey area with differing hydrology, fire or disturbance history to the surrounding areas were also searched where identified.

The following data was recorded when any known or potential threatened, priority or significant flora was located: GPS location, height in metres (m), number of plants and corresponding area of population, reproductive state and plant condition.

2.3 Limitations

2.3.1 Desktop limitations

Desktop investigations use a variety of online resources such as the DBCA *NatureMap* database (DBCA 2007–), and the EPBC Act PMST (DotEE 2017a). 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 flora provide more accurate information for the general area. However, some records of collections or sightings cannot be dated and often misrepresent the current range of threatened species.

2.3.2 Field survey limitations

The EPA (2016) Technical Guidelines state that flora and vegetation 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 affected the thoroughness of the assessment and the conclusions which have been formed.

Table 2 Field survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information	Nil	<p>Adequate information is available for the survey area, this includes:</p> <ul style="list-style-type: none"> Broad scale (1:250,000) mapping by Beard (1979) and digitised by Shepherd <i>et al.</i> (2002) Regional biogeography (Mitchell <i>et al.</i> 2002)
Scope (what life forms were sampled etc)	Nil	Vascular flora were sampled during the survey. Non-vascular flora were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity)	Minor	The detailed vegetation and flora survey was undertaken in spring 2017. The flora recorded from the field survey is detailed in section 4.1 and a full flora species list is provided in Appendix D. The portion of flora collected and identified was considered high; however it is likely the survey under-recorded some grass species (Poaceae) and annuals due to poor flowering material during the field assessment.
Flora determination	Minor	Flora determination was undertaken by the GHD botanist in the field and at the WA Herbarium. Species were identified to species level where possible. Some species, particularly grasses, sedges and herbs, may have been overlooked due to lack of material. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time report development, but it should be noted this may change in response to ongoing research and review of International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	Access to the survey area was made by vehicle tracks/driveways which entered the site. The majority of the survey area was traversed on foot over the course of the field survey.
Mapping reliability	Minor	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 (e.g. Nomad Juno and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ± 5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/season/cycle	Nil	<p>The field survey was conducted during spring on 11 October 2017.</p> <p>The closest weather recording station to the survey area is Medina Research Centre (No. 009194), located approximately 10 km from the survey area. In the three months prior to the survey (July-September), the Medina weather recording station recorded a total of 426.3 mm of rainfall (Bureau of Meteorology (BoM) 2017). This total is approximately 30% higher than the long-term average for the same period (July-September; 338.6 mm) (BoM 2017).</p>

Aspect	Constraint	Comment
		<p>The weather conditions during the spring field survey included:</p> <ul style="list-style-type: none"> • Daily maximum temperature 18.9 °C • Daily minimum temperature 10.1 °C • Daily rainfall 2.4 mm. <p>The weather conditions recorded during the survey periods are considered unlikely to have impacted upon the vegetation and flora survey.</p> <p>The survey timing was considered appropriate for the flora survey.</p>
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	The entire survey area has been subject to historical disturbances with a large proportion previously cleared. Houses previously located on site had recently been demolished and machinery were on site during the survey to clean up these areas. These disturbances did not impact the survey.
Intensity (in retrospect, was the intensity adequate)	Nil	The vascular flora of the survey area was sampled in accordance with EPA (2016); a minimum of three quadrats per vegetation type were established along with relevés to supplement the data. The survey area was sufficiently covered by the GHD ecologist during the survey.
Resources	Nil	Adequate resources were employed during the field survey. One person day was spent undertaking the survey using an ecologist.
Access restrictions	Nil	No access problems were encountered during the survey.
Experience levels	Nil	The ecologist who executed the survey is a practitioner suitably qualified and experienced in their respective fields. Erin Lynch has over 10 years' experience undertaking flora and fauna surveys within WA.

3. Desktop assessment

3.1 Climate

The study area experiences a warm-summer Mediterranean climate with cold, wet winters and warm, dry summers.

The Bureau of Meteorology (BoM) Medina station (site number 009194) is the nearest weather station to the survey area with continuous long-term data (approximately 10 km from Baldivis). Climate data from this site indicates the mean maximum temperature of the area ranges from 18.3 °C in July to 31.5 °C in February and the mean minimum temperature ranges from 8.2 °C in July and August and 17.6 °C in February. The mean annual rainfall is 745.5 mm with an average of 88.9 rain days per year (BoM 2017).

3.2 Regional biogeography

The survey 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 2017c).

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).

3.3 Landforms, geology and soils

The Department of Primary Industries and Regional Development (previously Department of Agriculture and Food Western Australia (DAFWA)) soil mapping (DAFWA 2007) indicates there are three different soil subsystems within the survey area:

- Spearwood S4a phase: Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.
- Spearwood S1b: Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
- Spearwood S2a: Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.

Churchwood and McArthur (1980) identify the soils within the survey area as consisting of the following soil units:

- Karrakatta; undulating landscape with deep yellow sands over limestone
- Herdsman; Peaty swamps associated with Bassendean and Karrakatta units.

3.4 Hydrology

The *Rights in Water and Irrigation Act 1914* (RIWI Act) provides for the regulation, management, use and protection of water resources. A search of the Government of Western Australia (GoWA) Open Data (GoWA 2017a) database for areas within the survey area proclaimed under the RIWI Act is provided in Table 3.

Table 3 Hydrology queries for the survey area

Aspect	Details	Result
Groundwater area	Groundwater areas proclaimed under the RIWI Act.	Stakehill Groundwater Area
Groundwater subareas	Groundwater subareas proclaimed under the RIWI Act.	Outridge Groundwater Subarea
Surface water areas	Surface water areas proclaimed under the RIWI Act.	None present
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 (PDWSA)	PDWSAs 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
Waterway Management Areas	Areas proclaimed under the Waterway Conservation Act 1976.	None present

3.4.1 Watercourses

There are no watercourses or drainage lines within the survey area.

3.4.2 Wetlands

The EPBC Act PMST identified one Australian Government-listed Wetland of International Importance (Ramsar wetland) that occurs within 10 km of the survey area and one located 10 – 20 km south (upstream). It did not identify any nationally important wetlands within the study area.

- **Becher Point Wetlands:** The Becher Point Wetlands Ramsar site is a system of about sixty small wetlands located near Rockingham in south-west WA. The wetlands are made up of chains of small linear, ovoid or irregular shaped basins arranged in five groups, each roughly parallel to the coast and separated by sand ridges. The wetlands in the site are shallow and fill seasonally (DotEE 2017d). The Becher Point Wetlands is situated approximately 5 km south west of the survey area (DBCA 2007–).
- **Peel-Yalgorup System:** The Peel-Yalgorup System is a large and diverse system of shallow estuaries, coastal saline lakes and freshwater marshes. The site includes the Peel Inlet, Harvey Estuary, Lake McLarty, Lake Mealup and ten Yalgorup National Park wetlands (DotEE 2017c). The Peel-Yalgorup System is situated approximately 25 km south of the survey area (DBCA 2007–).

The Geomorphic Wetlands Swan Coastal Plain dataset (Hill *et al.* 1996) identified numerous wetlands with 5 km of the survey area. There are eight wetlands within 1 km of the survey area; none of these are located within/intersect the survey area (Table 4 and Figure 2, Appendix A).

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

Name	Unique feature identifier	Category	Location relative to survey area
Walungup Lake	6230	Conservation	500 m west of Lot 4
Outridge Swamp	6394	Conservation	27 m southwest of Lot 105
Outridge Swamp	6396	Multiple Use	400 m south of Lot 105

Name	Unique feature identifier	Category	Location relative to survey area
Outridge Swamp	6397	Multiple Use	500 m S of Lot 105
Outridge Swamp	6398	Multiple Use	650 m S of Lot 105
Outridge Swamp	6399	Multiple Use	750 m S of Lot 105
Unknown	6404	Resource Enhancement	700 m north of Lot 4
Fount Swamp	6393	Conservation	80 m north of Lot 4

3.5 Land use

3.5.1 Conservation areas and reserves

There are no reserves or conservation areas located within or immediately adjacent to the survey area. Bush Forever (bush forever) site 356 (Lake Cooloongup, Lake Walyungup and adjacent bushland, Hillman to Port Kennedy) is located approximately 400 m west of the survey area.

3.5.2 Environmentally sensitive areas

The western half of the survey area is mapped as an ESA. The ESA is likely to be associated with Conservation Category wetlands occurring south and west of the survey area.

3.6 Vegetation and flora

3.6.1 Broad vegetation mapping

Broad scale vegetation mapping of the area undertaken by Beard (1979) identified the following vegetation association within the survey area:

- Medium woodland; tuart (*Eucalyptus gomphocephala*) (association 998).

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extents of the vegetation associations have been determined by the State-wide vegetation remaining extent calculations maintained by the DBCA (latest update October 2016 – Government of Western Australia (GoWA) 2016). As shown in Table 5, the current extent remaining of vegetation association 998 is greater than 30 per cent (%) of its pre-European extent at all scales (e.g. State, IBRA Bioregion, IBRA Sub-region and Local Government Area (LGA)).

Regional vegetation has been mapped by Heddle et al. (1980) based on major geomorphic units on the Swan Coastal Plain. The mapping by Heddle et al. (1980) identified the following vegetation complexes on Aeolian Deposits of the Swan Coastal Plain within the survey area:

- Karrakatta complex- central and south: Predominantly open forest of *E. gomphocephala* - *E. marginata* - *E. calophylla* and woodland of *E. marginata* - *Banksia* spp.
- Herdsman complex: is dominated by sedgeland and a woodland of *E. rudis* - *Melaleuca* spp., with the species of *Melaleuca* depending on the local drainage and adjacent soils.

GoWA (2017a) has assessed the vegetation complexes described and mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain IBRA bioregion and the City of Rockingham. As shown in Table 6 and Table 6, the current extent of the Karrakatta complex – central and south within the Swan Coastal Plain IBRA bioregion and City of Rockingham is below 30% of its calculated pre-European extent. The current extent of the Herdsman complex within the Swan Coastal Plain and City of Rockingham remains above 30%.

Table 5 Extent of vegetation association 998 within the survey area (Beard 1979, GoWA 2016)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent remaining in all DBCA managed lands
Swan Coastal Plain IBRA Bioregion		1,501,221.93	578,432.17	38.53	37.85
Perth IBRA Subregion		1,117,757.03	464,855.95	41.59	38.68
998	State: Western Australia	51,015.33	18,523.50	36.31	45.91
	IBRA bioregion: Swan Coastal Plain	50,867.50	18,523.20	36.41	45.91
	IBRA subregion: Perth	50,867.50	18,523.20	36.41	45.91
	LGA: City of Rockingham	5,319.33	1,742.72	32.76	-

Table 6 Extent of vegetation complexes mapped within the survey area on the Swan Coastal Plain (Heddle et al. 1980, GoWA 2017b)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	% Remaining	Current % remaining within all DBCA managed land
Karrakatta complex – central and south	53,080.99	12,531.67	24.86	7.41
Herdsmen Complex	9,665.15	3,069.70	31.76	10.96

Table 7 Extent of vegetation complexes mapped within the survey area in the City of Rockingham (Heddle et al. 1980, GoWA 2017b)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Proportion of the vegetation complex within the LGA (%)
Karrakatta complex – central and south	4,275.59	1,195.73	27.97	8.05
Herdsmen Complex	531.85	294.86	55.44	5.5

3.6.2 Conservation significant ecological communities

The EPBC Act PMST identified two TECs potentially occurring within the study area. These TECs were also identified in a search of the DBCA TEC/PEC database along with an additional five PECs within the study area.

The DBCA TEC/PEC database identified the buffer zone of two TECs and a Priority 1 PEC within survey area:

- Woodlands over Sedgelands in Holocene Dune Swales of the southern Swan Coastal Plain (SCP19b) TEC (Endangered – EPBC Act and Critically Endangered – DBCA)
- Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Endangered – EPBC Act and Priority 3 – DBCA)
- Microbial community of a coastal saline lake (Lake Walyungup) (Priority 1 – DBCA)

Details on all of these communities are provided in Table 8.

Table 8 Threatened and Priority Ecological Communities identified in the desktop searches

Community type	EPBC Act	DBC	Description	Location ¹
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain – SCP19a (TEC)	Endangered	Critically Endangered	The community occurs in linear damplands and occasionally sumplands, between Holocene dunes. Typical and common native species are the shrubs <i>Acacia rostellifera</i> , <i>A. saligna</i> , <i>Xanthorrhoea preissii</i> , the sedges <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , and the grass <i>Poa porphyroclados</i> . Several exotic weeds are found in this community but generally at low cover values. The typical wetland in which this community type occurs is a dampland that becomes water logged in winter, and retains relatively high moisture near the surface of the soil profile in summer. The plant community occasionally occurs in sumplands, which have shallow surface water - generally less than 20 cm for up to 2 months of the year (DEC 2011).	Within 5 km
Woodlands over sedgelands in Holocene dune swales of the southern Swan Coastal Plain (original description; Gibson et al. (1994) - SCP19b (TEC)	Endangered	Critically Endangered	Same as above but usually with a tree overstorey	Intersects the survey area
Banksia woodlands of the Swan Coastal Plain (TEC)	Endangered	Priority 3	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).	Intersects the survey area
Banksia dominated woodlands of the Swan Coastal Plain IBRA region (PEC)				
Microbial community of a coastal saline lake (Lake Walyungup) (PEC)		Priority 1	Microbial community formed in Lake Walyungup, Rockingham. Data required about status and composition (DBCA 2017a)	Intersects the survey area

¹ Some TECs and PECs identified occur further than the study area. However since they were identified in the DBCA database searches they have been included.

Community type	EPBC Act	DBCA	Description	Location ¹
Low lying <i>Banksia attenuata</i> woodlands or shrublands - SCP21c (PEC)*	Endangered TEC (part)	Priority 3	This type occurs sporadically between Gingin and Bunbury, and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by <i>Melaleuca preissiana</i> , <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Regelia ciliata</i> , <i>Eucalyptus marginata</i> or <i>Corymbia calophylla</i> . Structurally, this community type may be either a woodland or occasionally shrubland (DBCA 2017a)	Within 5 km
Northern Spearwood shrublands and woodlands - SCP24 (PEC)*	Endangered TEC (part)	Priority 3	Heaths with scattered <i>Eucalyptus gomphocephala</i> occurring on deeper soils north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include <i>Dryandra sessilis</i> , <i>Calothamnus quadrifidus</i> , and <i>Schoenus grandiflorus</i> (DBCA 2017a)	Within 5 km
Southern <i>Eucalyptus gomphocephala</i> - <i>Agonis flexuosa</i> woodlands - SCP25 (PEC)*	Endangered TEC (part)	Priority 3	Woodlands of <i>Eucalyptus gomphocephala</i> - <i>Agonis flexuosa</i> south of Woodman Point. Recorded from the Karrakatta, Cottesloe and Vasse units. Dominants other than tuart were occasionally recorded, including <i>Corymbia calophylla</i> at Paganoni block and <i>Eucalyptus decipiens</i> at Kemerton. Banksias found in this community include <i>Banksia attenuata</i> , <i>B. grandis</i> and <i>B. littoralis</i> . Tuarts form the overstorey nearby (DBCA 2017a)	Closest occurrence is approximately 6 km north east
Tuart (<i>Eucalyptus gomphocephala</i>) woodlands of the Swan Coastal Plain (PEC)	Currently being considered for listing as a TEC under the EPBC Act	Priority 3	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 2017a)	Data not available

3.6.3 Flora diversity

The *NatureMap* database identified 180 flora taxa, representing 60 families and 128 genera previously recorded within the study area. This total comprised 140 native flora taxa and 40 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (18 taxa), Poaceae (14 taxa) and Asparagaceae (13 taxa). The *NatureMap* database search is provided in Appendix C.

3.6.4 Conservation significant flora

The EPBC Act PMST, *NatureMap* and DBCA Threatened and Priority Flora databases identified the presence/potential presence of 23 conservation significant flora taxa within the study area (Appendix C). The desktop searches recorded:

- 11 Threatened flora taxa listed under the EPBC Act and/or WC Act
- One Priority 1 taxon
- Two Priority 2 taxa
- Five Priority 3 taxa
- Four Priority 4 taxa

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

4. Field survey results

4.1 Vegetation types

Three vegetation types were mapped and described for the survey area (Table 9 and Figure 3, Appendix A). Lot 103, 104 and half of Lot 4 have predominantly been cleared and can be described as 'Parkland Cleared', consisting mostly of scattered individual trees/shrubs (both native and planted/introduced) over introduced grasses and herbs. The other half of Lot 4 consists of Tuart/Jarrah woodland and a small patch of *Grevillea* shrubland. However the natural structure of these vegetation types is not intact with very limited floristic diversity. Lot 105 is completely cleared with no native vegetation remaining.

Dominant trees across the site consisted of *Eucalyptus gomphocephala* (Tuart), *E. marginata* (Jarrah), *C. calophylla* (Marri), *Banksia grandis*, *B. attenuata* and *Allocasuarina fraseriana*. A combination of planted native and introduced eucalypts as well as other native and non-native trees and garden shrubs were concentrated around where the recently demolished houses were located on Lots 103 and 104.

The Tuart/Jarrah woodland vegetation type is considered to align with association 998 (Beard 1979) and Karrakatta – central and south (Heddlé et al. 1980) vegetation complex.

4.2 Vegetation condition

The vegetation condition within the survey area was rated from Degraded to Completely Degraded. The vegetation condition is mapped in Figure 4, Appendix A, in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016).

The survey area is highly modified due to clearing, grazing, fencing, tracks and weed invasion. The vegetation structure has been significantly altered with an understorey completely dominated by common herbaceous and grassy weeds.

There is 3.07 ha (15.83%) of vegetation mapped as Degraded whilst the remaining 16.32 ha (84.17%) is considered Completely Degraded.

Table 9 Vegetation types within the survey area

Vegetation type	Vegetation type description (NVIS)	Extent (ha), vegetation condition and sample locations	Representative Photograph
Tuart/Jarraah woodland	<p><i>Eucalyptus gomphocephala</i>, <i>E. marginata</i> and <i>Banksia attenuata</i> woodland over <i>Macrozamia riedlei</i> and <i>Xanthorrhoea gracilis</i> isolated shrubs over Iridaceae sp. and <i>Lupinus</i> spp. open herbland over <i>Ehrharta calycina</i>, <i>Briza maxima</i> and <i>Bromus diandrus</i> grassland. Occurs on sandy slope.</p>	<p>4.22 ha Degraded: 2.88 ha Completely Degraded: 1.34 ha Quadrats: 4, 5 and 6</p>	 <p>Q4, Degraded</p>
Grevillea shrubland	<p><i>Banksia sessilis</i> isolated shrubs over <i>Grevillea crithmifolia</i>, <i>Macrozamia riedlei</i> and <i>Acacia lasiocarpa</i> shrubland over <i>Conostylis candidans</i>, <i>Ursinia anthemoides</i> and <i>Trifolium campestre</i> herbland over <i>Ehrharta calycina</i>, <i>Briza maxima</i> and <i>Avena barbata</i> grassland. Occurs on sandy plain.</p>	<p>0.19 ha Degraded: 0.19 ha Quadrats: 1, 2 and 3</p>	 <p>Q1, Degraded vegetation</p>

Vegetation type	Vegetation type description (NVIS)	Extent (ha), vegetation condition and sample locations	Representative Photograph
Parkland cleared	Cleared paddocks where the understorey has been completely cleared of native vegetation. Consists of scattered individual or clumps of trees (mix of native, introduced and planted species) and/or tall shrubs over introduced grasses and herbs. The natural structure of the vegetation is no longer intact.	14.98 ha Completely Degraded: 14.98 ha	

4.3 Conservation significant ecological communities

The vegetation types identified within the survey area were highly disturbed with limited native species present and large amounts of weed incursion were observed. Given the degraded nature of the vegetation within the survey area and high number of introduced species recorded, a Floristic Community Type (FCT) analysis was deemed redundant. A FCT analysis is based on all species recorded in quadrats (a present/absence matrix) and doesn't take into account species dominance. Often where there are high numbers of introduced species compared with those present in the Swan Coastal Plain dataset (a collation of Gibson et al. (1994), and other unpublished data collected as part of the System 6 and Part System 1 Update program and from various sources (collected to be directly comparable with Gibson et al. (1994), incorporated into Bush Forever (GoWA 2000), these bias the results.

GHD undertook a comparison between identified vegetation types and described FTCs, focussing on FCTs listed as TECs and PECs identified in the desktop searches. Based on dominant species, soils, landform features and field observations, GHD identified the likely occurrence of the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain Priority 3 PEC. The Tuart/Jarrah woodland vegetation type also showed some similarities with the Southern *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands (25) Priority 3 PEC.

A description of each conservation significant ecological community and its possible occurrence within the survey area is described below.

Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC

This community is 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 with a variable understory. Within the Quindalup Dunes the Tuart woodlands of the Swan Coastal Plain community is related to FCT 17 and 19b in wetland areas and FCTs 29a and 30a2 in upland areas (Keighery 2002). Flora commonly occurring with Tuart include *Agonis flexuosa*, *Banksia attenuata*, *B. grandis*, *Allocasuarina fraseriana*, *Xylomelum occidentale*, *Macrozamia riedlei*, *Xanthorrhoea preissii*, *Spyridium globulosum*, *Templetonia retusa* and *Diplolaena dampieri*.

The survey area is situated on the Spearwood dune system, with Tuart forming the dominant canopy species. The Tuart/Jarrah woodland vegetation type is considered to represent the Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC. There is 4.22 ha of the Tuart/Jarrah woodland vegetation type in the survey area, and it ranges from degraded (2.88 ha) to completely degraded (1.34 ha) in condition.

The Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community of WA is currently being considered and assessed for listing as a TEC under the EPBC Act. Based on draft conservation advice currently available, the TEC will differ from the PEC in that it has minimum condition classes and patch size thresholds. The Tuart/Jarrah woodland vegetation type may be classified as a patch that meets the key diagnostic characteristics for this TEC (based on draft conservation advice currently available). Further assessment will be required to confirm this TEC occurs within the survey area if this community is listed in the future.

Southern *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands PEC

The Southern *Eucalyptus gomphocephala* and/ or *Agonis flexuosa* woodlands (SCP 25) PEC is generally found south of Woodman Point. Recorded from the Karrakatta, Cottesloe and Vasse units. The community is characterised by *E. gomphocephala*, with other dominants, occasionally records include *Corymbia calophylla* and *E. decipiens*. Other common species are *A. flexuosa*,

Hibbertia hypericoides, *Macrozamia riedlei*, *Acacia willdenowiana* and *Hardenbergia comptoniana*. One occurrence of this PEC is known to occur approximately 6 km north of the survey area (DBCA TEC/PEC database).

The flora assessment conducted by GHD recorded *E. gomphocephala* dominated community within the survey area. The survey area is situated south of Woodman Point and occurs on the Karrakatta unit. The Tuart/Jarraah woodland community recorded in the survey area contains a number of the key species characteristic of this PEC including *E. gomphocephala*, *Banksia attenuata*, *B. grandis*, *M. riedlei*, *H. hypericoides* and *H. comptoniana*. The Tuart/Jarraah woodland vegetation type may represent this PEC.

4.4 Flora diversity

Eighty seven (87) flora taxa (including subspecies and varieties) representing 41 families and 71 genera were recorded from the survey area during the field survey. This total included 42 native taxa and 45 introduced taxa. Dominant families recorded from the survey area included:

- Asparagaceae (8 taxa)
- Fabaceae (8 taxa)
- Poaceae (8 taxa)

The survey area is not considered representative of the floristic diversity in the area due to the highly degraded nature of the site. A flora list for the survey area is provided in Appendix D.

4.5 Introduced flora

Forty five (45) introduced flora taxa were recorded in the survey area. Of the introduced taxa, one is listed as a Declared Pest under the *Biosecurity and Management Act 2007*:

- **Gomphocarpus fruticosus* (Narrowleaf Cottonbush) – Declared Pest

The remaining introduced taxa are considered environmental weeds and all have been previously recorded on the Swan Coastal Plain.

4.6 Conservation significant flora

No EPBC Act or WC Act listed flora were recorded within the survey area. Additionally, no DBCA Priority-listed flora species were recorded within the survey area during the field survey.

4.6.1 Likelihood of occurrence

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

The likelihood of occurrence assessment post-field survey concluded that all significant species identified in the desktop searches are unlikely or highly unlikely to occur within the survey area.

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Appendices

Appendix A – Figures

Figure 1 Site Location

Figure 2 Environmental constraints

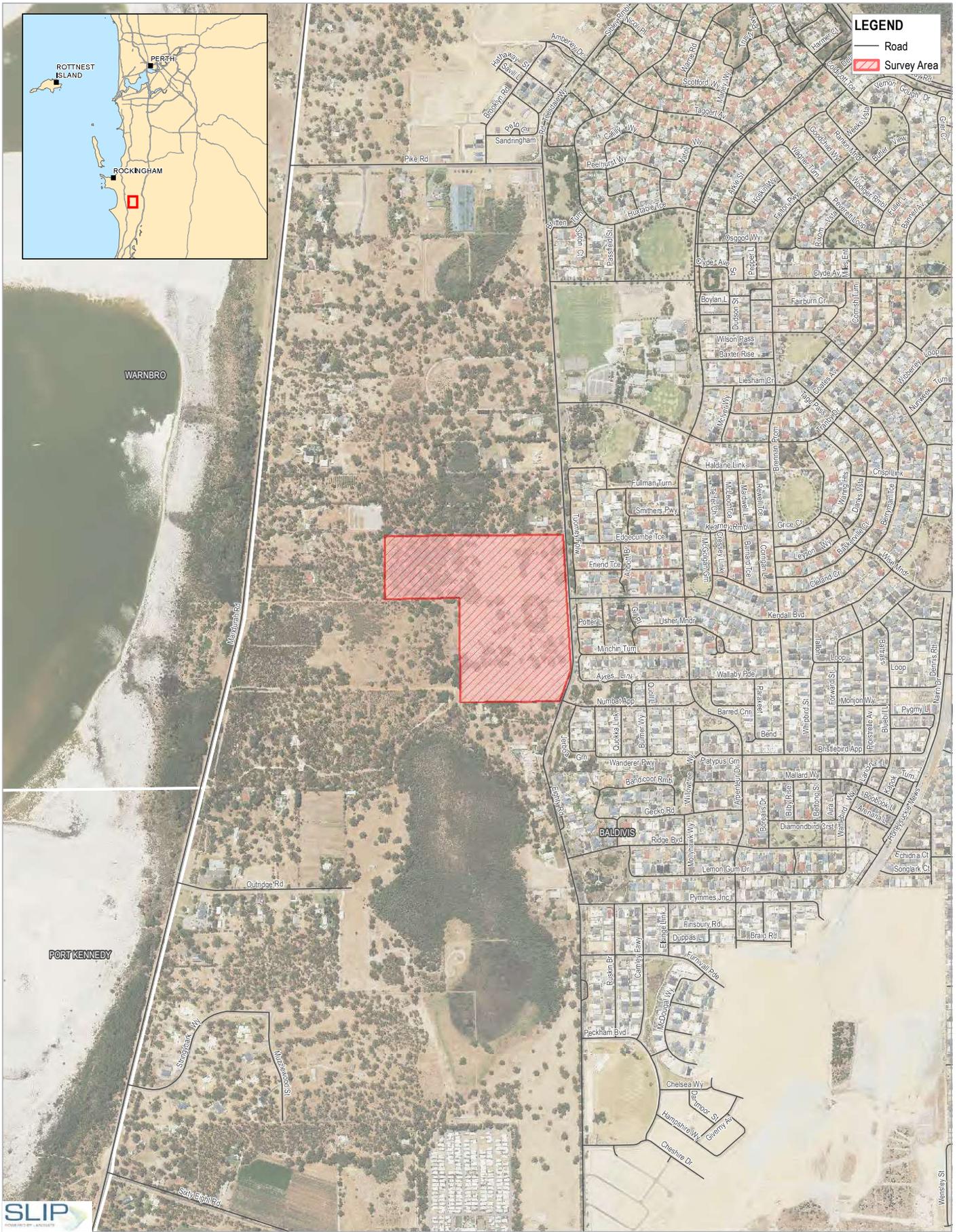
Figure 3 Vegetation types

Figure 4 Vegetation condition



LEGEND

- Road
- ▨ Survey Area



City of Rockingham
Proposed Baldvis District Sporting Complex
Flora and Vegetation Assessment

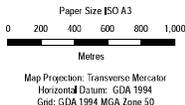
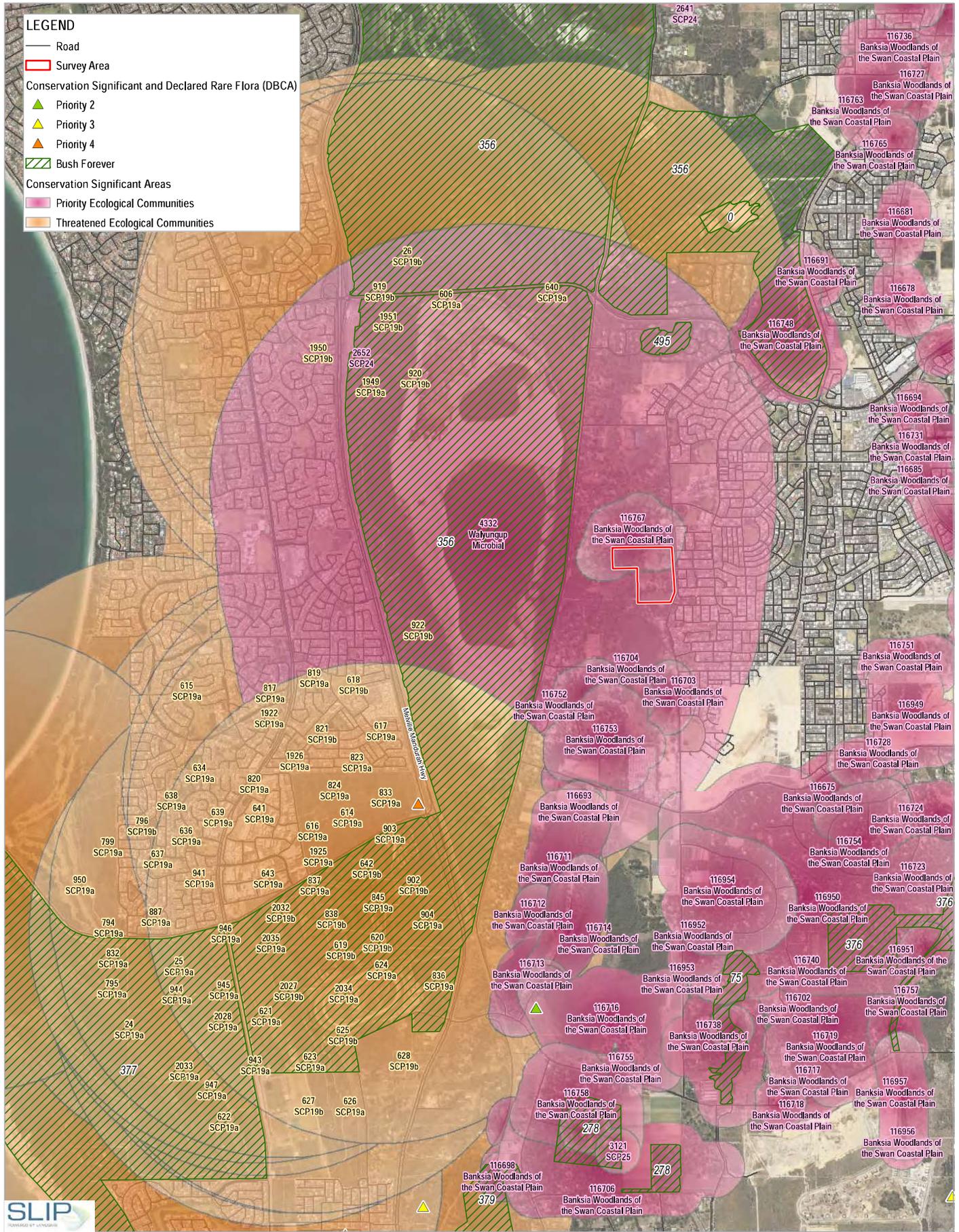
Project No. **61-36223**
 Revision No. **0**
 Date **17/11/2017**

Site Location

FIGURE 1

LEGEND

- Road
- ▭ Survey Area
- Conservation Significant and Declared Rare Flora (DBCAs)
 - ▲ Priority 2
 - ▲ Priority 3
 - ▲ Priority 4
- ▨ Bush Forever
- Conservation Significant Areas
 - ▭ Priority Ecological Communities
 - ▭ Threatened Ecological Communities



City of Rockingham
Proposed Baldiwin District Sporting Complex
Flora and Vegetation Assessment

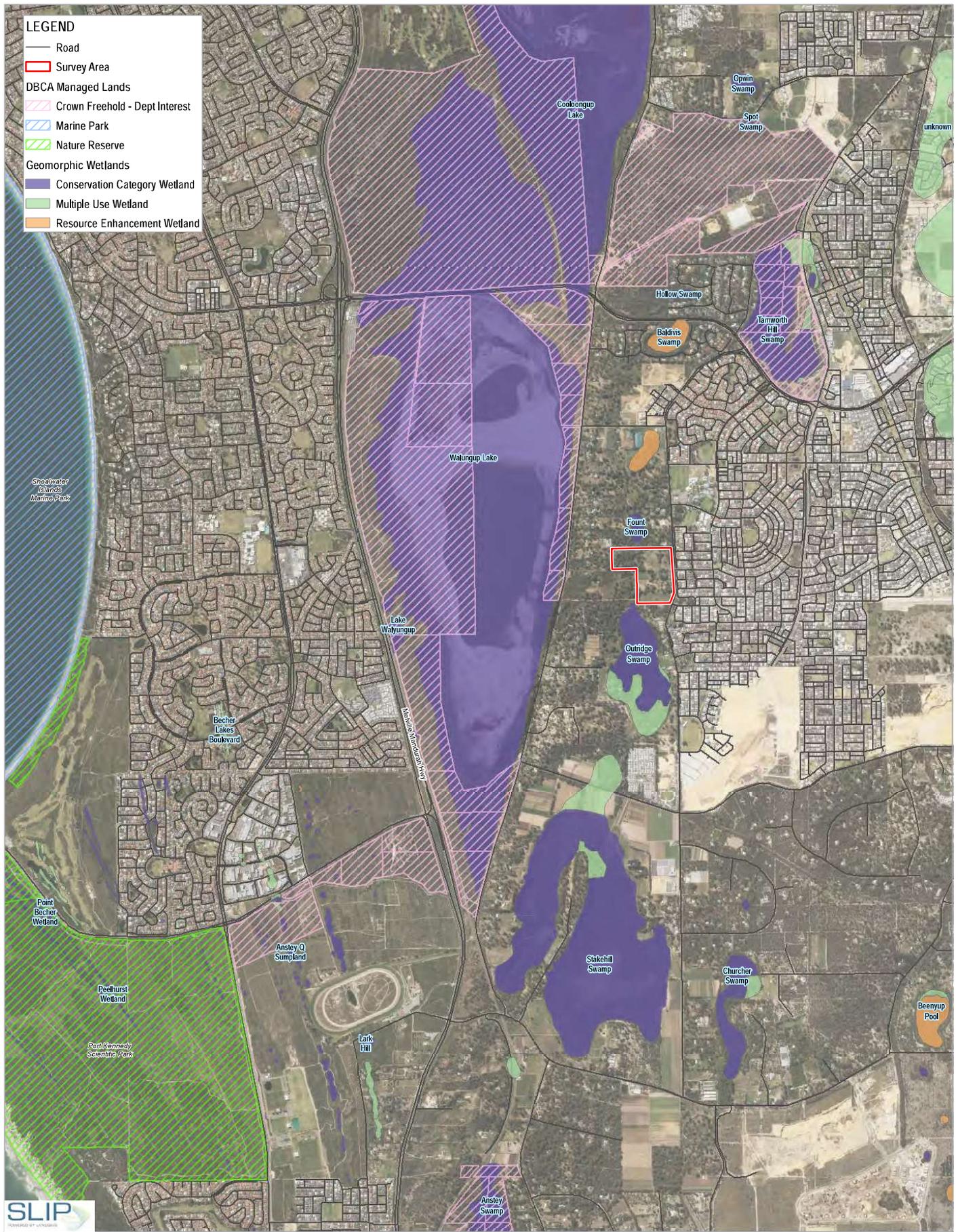
Environmental Constraints

Project No. 61-36223
Revision No. 0
Date 17/11/2017

FIGURE 2a

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Print date: 10 Jan 2018 - 15:08

Data source: DBCA: Threatened and Priority Flora, TECPEC - 2011/116, DoF: Bush Forever, Landgate: Imagery, Roads - 2011/116. Created by: jtenney



LEGEND

- Road
- ▭ Survey Area
- DBCA Managed Lands
 - ▨ Crown Freehold - Dept Interest
 - ▨ Marine Park
 - ▨ Nature Reserve
- Geomorphic Wetlands
 - ▨ Conservation Category Wetland
 - ▨ Multiple Use Wetland
 - ▨ Resource Enhancement Wetland



Paper Size ISO A3
 0 200 400 600 800 1,000
 Metres

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



City of Rockingham
 Proposed Baldvis District Sporting Complex
 Flora and Vegetation Assessment

Environmental Constraints

Project No. 61-36223
 Revision No. 0
 Date 17/11/2017

FIGURE 2b



Legend

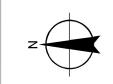
- Quadrat
- Road
- Survey Area

Vegetation Type

- Grevillea shrubland - *Banksia sessilis* isolated shrubs over *Grevillea crithmifolia*, *Macrozamia riedlei* and *Acacia lasiocarpa* shrubland over *Conostylis candidans*, *Ursinia anthemoides* and *Trifolium camppestre* herbland over *Ehrharta calycina*, *Biza maxima* and *Avena barbata* grassland. (0.19 ha)
- Parkland cleared/Planted - Cleared paddocks where the understorey has been completely cleared of native vegetation. Consists of scattered individual or clumps of trees (mix of native, introduced and planted species) and/or tall shrubs over introduced grasses and herbs. The natural structure of the vegetation is no longer intact. (14.98 ha)
- Tuart/Jarah Woodland - *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Banksia attenuata* woodland over *Macrozamia riedlei* and *Xanthorrhoea gracilis* isolated shrubs over *Urtica* sp. and *Lupinus* spp. Open herbland over *Ehrharta calycina*, *Biza maxima* and *Bromus diandrus* grassland. (4.22 ha)

Project No. 61-36223
 Revision No. 0
 Date 16/11/2017

City of Rockingham
 Proposed Badwin's District Sporting Complex
 Flora and Vegetation Assessment

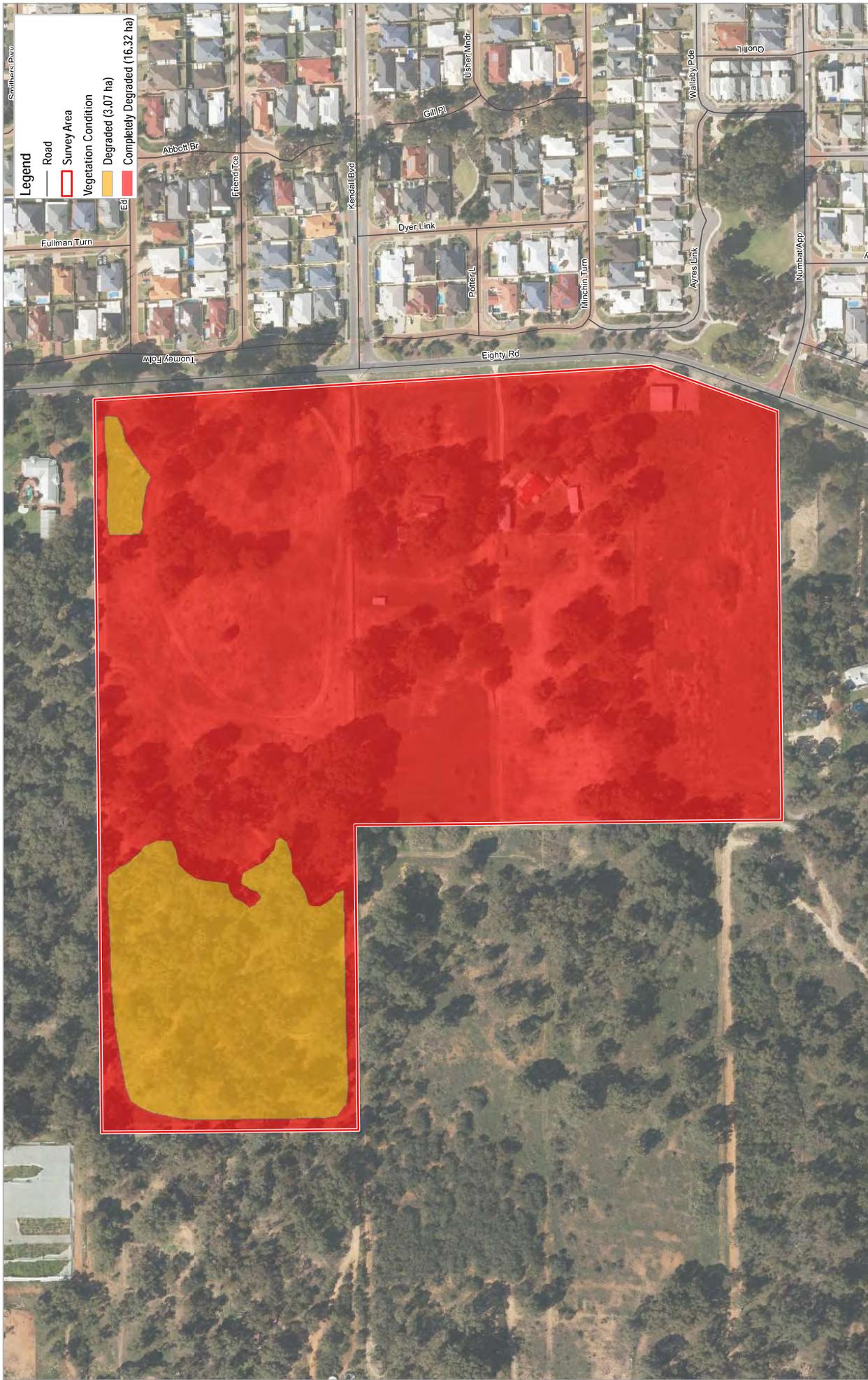


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 Grid: GDA 1984 MGA Zone 50
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 Print date: 16 Jun 2018 1:48 PM



FIGURE 3

Data source: GHD, Site Boundary, Vegetation Assessment - 2017/11/16, Longitude, Height, Photos - 2017/11/16, Country, Boundary



Legend

— Road

▭ Survey Area

■ Degraded (3.07 ha)

■ Completely Degraded (16.32 ha)

Fullman Turn

Eighty Rd

Abbott Br

Friendice

Kendall Blvd

Usher Mndr

Gill Pl

Dyer Link

Walker L

Wincham Turn

Ayres Link

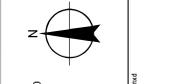
Wallaby Pde

Quill

Number 4pp

Project No. 61-36223
 Revision No. 0
 Date 16/11/2017

City of Rockingham
 Proposed Balcovis District Sporting Complex
 Flora and Vegetation Assessment



Scale: 1:1000
 Paper Size ISO A3
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1984
 Grid: GDA 1984 MGA Zone 50
 Print Date: 16 Nov 2017 11:47

City of Rockingham
 Planning Department

FIGURE 4

Data source: GHD Site Boundary Vegetation Assessment - 20171116; Google, Imagery Photos - 20171116; City of Rockingham, City of Rockingham



Appendix B – Relevant legislation, conservation codes and background information

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

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

The biological aspects listed as MNES include:

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

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

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

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. It is hoped the new Regulations will be completed and ready to commence by late 2017.

State Wildlife Conservation Act 1950

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

State Biosecurity and Agriculture Management Act 2007

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

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

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

DPIRD Categories for Declared Pests under the BAM Act

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

Background information

Environmentally Sensitive Areas

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

Aspects of ESAs

Aspects of Environmentally Sensitive Areas

A declared World Heritage property as defined in Section 13 of the EPBC Act.

An area that is included on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).

A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.

The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.

The area covered by a Threatened Ecological Community.

A Bush Forever Site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.

The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.

The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.

The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) applies.

Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Reserves and conservation areas

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” (DoEE 2017b). 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” (DoEE 2017b).

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 (DoEE 2017a):

- 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

Lakes covered under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*

The *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) protects the environmental values of selected lakes/wetlands on the Swan Coastal Plain.

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 (2016), 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.

Within the Swan Coastal Plain, EPA Position Statement No. 9 (EPA 2006) identifies vegetation complexes with 30 percent or less or their pre-clearing extent remaining in a bioregion, or 10 percent or less of their pre-clearing extent remaining in constrained areas (i.e. areas of urban development in cities and major town) on the Swan Coastal Plain, to be critical assets.

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.

Condition	South West and Interzone Botanical Provinces description
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 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 and

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Categories	Definition
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	<p>Poorly known ecological communities.</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
Priority 2	<p>Poorly known ecological communities.</p> <p>Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</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>

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

Conservation significant flora

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 DoEE and/or the EPA.

The Federal conservation level of flora 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 State conservation level of Threatened flora has been published as Specially Protected under the WC Act, and listed 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 Flora List. 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 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.
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 species

Conservation category	Schedule and definition
Threatened species (T)	<p>Published as Specially Protected under the WC Act, and listed under Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice for Threatened Flora.</p> <p>Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the WC Act.</p>
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.

Conservation codes for DBCA listed Priority flora species

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 category	Definition
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

Declared Pests

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

Weeds of National Significance

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

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

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

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Appendix C – Desktop searches

EPBC Act PMST Report (5 km buffer)

NatureMap Flora Report (5 km buffer)



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: 30/08/17 16:40:39

[Summary](#)

[Details](#)

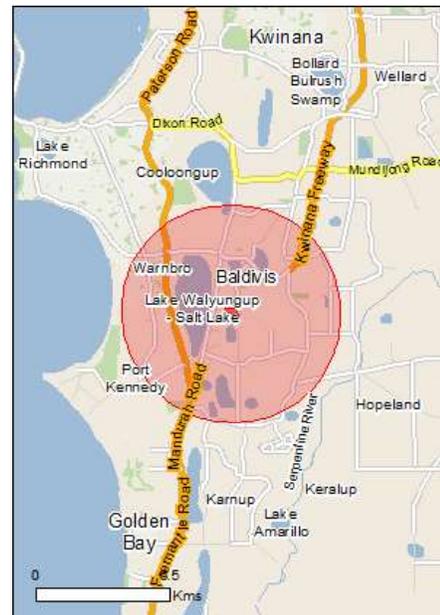
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

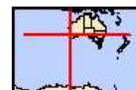
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	26
Listed Migratory Species:	20

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	30
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	36
Nationally Important Wetlands:	None
Key Ecological Features (Marine):	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Becher point wetlands	Within 10km of Ramsar
Peel-yalgorup system	10 - 20km upstream

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Sedgeland in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area

Listed Threatened Species	[Resource Information]
---------------------------	--------------------------

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Mammals		
Bettongia penicillata Brush-tailed Bettong, Woylie [213]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leafed Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat likely to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		habitat known to occur within area Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

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

Name
Commonwealth Land -

Listed Marine Species [\[Resource Information \]](#)

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Calidris subminuta Long-toed Stint [861]		within area Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Extra Information

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

Name	Status	Type of Presence
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
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
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
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
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		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		Species or species habitat likely to occur

Name	Status	Type of Presence
Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum African Boxthorn, Boxthorn [19235]		within area 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
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
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.345491 115.792512,-32.345518 115.792501,-32.345545 115.798059,-32.34908 115.798273,-32.349932 115.797898,-32.349941 115.794797,-32.347186 115.794787,-32.347186 115.79248,-32.3455 115.792491,-32.3455 115.792491,-32.345491 115.792512

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.

NatureMap Species Report - Flora

Created By Guest user on 30/08/2017

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 47' 51" E, 32° 20' 51" S
Buffer	5km
Group By	Family

Family	Species	Records
Anarthriaceae	1	1
Apiaceae	2	2
Apocynaceae	1	1
Araliaceae	4	4
Asparagaceae	13	16
Asteraceae	10	14
Brassicaceae	1	1
Campanulaceae	2	2
Caryophyllaceae	3	3
Centrolepidaceae	1	1
Chenopodiaceae	5	7
Colchicaceae	1	1
Crassulaceae	2	2
Cyperaceae	12	21
Dennstaedtiaceae	1	2
Dilleniaceae	3	3
Droseraceae	3	4
Ericaceae	2	2
Euphorbiaceae	3	7
Fabaceae	18	29
Gentianaceae	1	1
Geraniaceae	1	2
Goodeniaceae	4	5
Haemodoraceae	2	3
Hemerocallidaceae	2	5
Iridaceae	2	3
Juncaceae	1	1
Juncaginaceae	1	1
Lauraceae	1	2
Linaceae	1	1
Loganiaceae	2	2
Myrtaceae	9	12
Onagraceae	1	1
Orchidaceae	4	5
Orthotrichaceae	1	1
Phyllanthaceae	1	1
Plantaginaceae	2	2
Poaceae	14	14
Polygalaceae	1	1
Polygonaceae	1	2
Portulacaceae	1	1
Pottiaceae	1	1
Primulaceae	2	2
Proteaceae	11	14
Ranunculaceae	1	1
Restionaceae	3	4
Rhamnaceae	3	3
Rubiaceae	2	2
Santalaceae	1	2
Sapindaceae	1	1
Scrophulariaceae	2	2
Sematiophyllaceae	1	1
Solanaceae	3	3
Stylidiaceae	2	2
Tamaricaceae	1	2
Thymelaeaceae	1	1
Urticaceae	1	1
Violaceae	1	1
Xanthorrhoeaceae	1	2
Zamiaceae	1	1
TOTAL	180	235

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Anarthriaceae				
1.	1097 <i>Lyginia barbata</i>			

Apiaceae

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
2.	6211 <i>Apium prostratum</i> (Sea Celery)			
3.	6222 <i>Homalosciadium homalocarpum</i>			
Apocynaceae				
4.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
Araliaceae				
5.	6229 <i>Hydrocotyle diantha</i>			
6.	6232 <i>Hydrocotyle hispidula</i>			
7.	6266 <i>Trachymene coerulea</i> (Blue Lace Flower)			
8.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
Asparagaceae				
9.	1208 <i>Acanthocarpus preissii</i>			
10.	1280 <i>Chamaescilla corymbosa</i> (Blue Squill)			
11.	1287 <i>Dichopogon capillipes</i>			
12.	13562 <i>Lachenalia aloides</i>	Y		
13.	1370 <i>Lachenalia reflexa</i>	Y		
14.	1309 <i>Laxmannia squarrosa</i>			
15.	1223 <i>Lomandra caespitosa</i> (Tufted Mat Rush)			
16.	1231 <i>Lomandra maritima</i>			
17.	1232 <i>Lomandra micrantha</i> (Small-flower Mat-rush)			
18.	1319 <i>Thysanotus arenarius</i>			
19.	1338 <i>Thysanotus manglesianus</i> (Fringed Lily)			
20.	1339 <i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
21.	1351 <i>Thysanotus sparteus</i>			
Asteraceae				
22.	7821 <i>Ambrosia psilostachya</i> (Perennial Ragweed)	Y		
23.	7851 <i>Asteridea pulverulenta</i> (Common Bristle Daisy)			
24.	20074 <i>Conyza sumatrensis</i>	Y		
25.	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
26.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
27.	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			
28.	20161 <i>Senecio pinnatifolius</i>			
29.	9367 <i>Sonchus hydrophilus</i> (Native Sowthistle)			
30.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
31.	8255 <i>Ursinia anthemoides</i> (Ursinia)	Y		
Brassicaceae				
32.	3016 <i>Heliophila pusilla</i>	Y		
Campanulaceae				
33.	9289 <i>Lobelia anceps</i> (Angled Lobelia)			
34.	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
Caryophyllaceae				
35.	2909 <i>Silene gallica</i> (French Catchfly)	Y		
36.	2918 <i>Stellaria media</i> (Chickweed)	Y		
37.	20397 <i>Stellaria pallida</i>	Y		
Centrolepidaceae				
38.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
Chenopodiaceae				
39.	2480 <i>Atriplex suberecta</i>			
40.	2483 <i>Chenopodium album</i> (Fat Hen)	Y		
41.	2490 <i>Chenopodium glaucum</i> (Glaucous Goosefoot)	Y		
42.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
43.	11930 <i>Rhagodia baccata</i> subsp. <i>dioica</i> (Sea Berry Saltbush)			
Colchicaceae				
44.	1383 <i>Burchardia bairdiae</i>			
Crassulaceae				
45.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
46.	3140 <i>Crassula glomerata</i>	Y		
Cyperaceae				
47.	743 <i>Baumea juncea</i> (Bare Twigrush)			
48.	744 <i>Baumea laxa</i>			
49.	748 <i>Baumea vaginalis</i> (Sheath Twigrush)			
50.	907 <i>Gahnia trifida</i> (Coast Saw-sedge)			
51.	20200 <i>Isolepis cernua</i> var. <i>setiformis</i>			
52.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
53.	925 <i>Lepidosperma angustatum</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
54.	933 <i>Lepidosperma gladiatum</i> (Coast Sword-sedge, Kerbin)			
55.	937 <i>Lepidosperma longitudinale</i> (Pithy Sword-sedge)			
56.	944 <i>Lepidosperma scabrum</i>			
57.	973 <i>Schoenus asperocarpus</i> (Poison Sedge)			
58.	978 <i>Schoenus brevisetis</i>			
Dennstaedtiaceae				
59.	13758 <i>Histiopteris incisa</i>			
Dilleniaceae				
60.	5117 <i>Hibbertia cuneiformis</i> (Cutleaf Hibbertia)			
61.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
62.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
Droseraceae				
63.	3095 <i>Drosera erythrorhiza</i> (Red Ink Sundew)			
64.	3106 <i>Drosera macrantha</i> (Bridal Rainbow)			
65.	13216 <i>Drosera menziesii</i> subsp. <i>penicillaris</i>			
Ericaceae				
66.	6427 <i>Leucopogon parviflorus</i> (Coast Beard-heath)			
67.	6436 <i>Leucopogon propinquus</i>			
Euphorbiaceae				
68.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
69.	4594 <i>Beyeria cinerea</i>			
70.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
Fabaceae				
71.	3237 <i>Acacia benthamii</i>		P2	
72.	3409 <i>Acacia lasiocarpa</i> (Panjang)			
73.	3525 <i>Acacia rostellifera</i> (Summer-scented Wattle)			
74.	3527 <i>Acacia saligna</i> (Orange Wattle, Kudjong)			
75.	30032 <i>Acacia saligna</i> subsp. <i>saligna</i>			
76.	3688 <i>Aotus gracillima</i>			
77.	3710 <i>Bossiaea eriocarpa</i> (Common Brown Pea)			
78.	20482 <i>Gastrolobium nervosum</i>			
79.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
80.	3961 <i>Hardenbergia comptoniana</i> (Native Wisteria)			
81.	12859 <i>Hovea trisperma</i> var. <i>trisperma</i>			
82.	4012 <i>Jacksonia furcellata</i> (Grey Stinkwood)			
83.	4027 <i>Jacksonia sericea</i> (Waldjumi)		P4	
84.	4037 <i>Kennedia coccinea</i> (Coral Vine)			
85.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
86.	4085 <i>Mellilotus indicus</i>	Y		
87.	4256 <i>Templetonia retusa</i> (Cockies Tongues)			
88.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
Gentianaceae				
89.	6542 <i>Centaurium tenuiflorum</i>	Y		
Geraniaceae				
90.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
Goodeniaceae				
91.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
92.	7595 <i>Scaevola anchusifolia</i>			
93.	7626 <i>Scaevola nitida</i> (Shining Fanflower)			
94.	13182 <i>Scaevola repens</i> var. <i>repens</i>			
Haemodoraceae				
95.	1418 <i>Conostylis aculeata</i> (Prickly Conostylis)			
96.	1478 <i>Phlebocarya ciliata</i>			
Hemerocallidaceae				
97.	1259 <i>Dianella revoluta</i> (Blueberry Lily)			
98.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
Iridaceae				
99.	1550 <i>Patersonia occidentalis</i> (Purple Flag, Koma)			
100.	1556 <i>Romulea rosea</i> (Guildford Grass)	Y		
Juncaceae				
101.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
Juncaginaceae				
102.	147 <i>Triglochin mucronata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Lauraceae				
103.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
Linaceae				
104.	4362 <i>Linum marginale</i> (Wild Flax)			
Loganiaceae				
105.	6515 <i>Logania vaginalis</i> (White Spray)			
106.	16177 <i>Phyllangium paradoxum</i>			
Myrtaceae				
107.	20283 <i>Astartea scoparia</i> (Common Astartea)			
108.	5649 <i>Eucalyptus foecunda</i> (Narrow-leaved Red Mallee)			
109.	5659 <i>Eucalyptus gomphocephala</i> (Tuart, Duart)			
110.	20808 <i>Eucalyptus petiolaris</i>	Y		
111.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
112.	5952 <i>Melaleuca preissiana</i> (Moonah)			
113.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
114.	5978 <i>Melaleuca teretifolia</i> (Banbar)			
115.	20135 <i>Taxandria linearifolia</i>			
Onagraceae				
116.	6131 <i>Epilobium billardioreanum</i> (Glabrous Willow Herb)			
Orchidaceae				
117.	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
118.	15361 <i>Caladenia longicauda</i> subsp. <i>calcigena</i>			
119.	11156 <i>Drakaea livida</i>			
120.	15419 <i>Microtis media</i> subsp. <i>media</i>			
Orthotrichaceae				
121.	36218 <i>Zygodon menziesii</i>			
Phyllanthaceae				
122.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
Plantaginaceae				
123.	7085 <i>Misopates orontium</i> (Lesser Snapdragon)	Y		
124.	7303 <i>Plantago lanceolata</i> (Ribwort Plantain)	Y		
Poaceae				
125.	202 <i>Anthoxanthum odoratum</i> (Sweet Vernal Grass)	Y		
126.	17240 <i>Austrostipa flavescens</i>			
127.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
128.	234 <i>Avena fatua</i> (Wild Oat)	Y		
129.	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
130.	245 <i>Briza minor</i> (Shivery Grass)	Y		
131.	283 <i>Cynodon dactylon</i> (Couch)	Y		
132.	285 <i>Cynosurus echinatus</i> (Rough Dogstail)	Y		
133.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
134.	467 <i>Lagurus ovatus</i> (Hare's Tail Grass)	Y		
135.	476 <i>Lolium perenne</i> (Perennial Ryegrass)	Y		
136.	478 <i>Lolium rigidum</i> (Wimmera Ryegrass)	Y		
137.	635 <i>Sporobolus virginicus</i> (Marine Couch)			
138.	724 <i>Vulpia myuros</i> (Rat's Tail Fescue)	Y		
Polygalaceae				
139.	4552 <i>Comesperma confertum</i>			
Polygonaceae				
140.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
Portulacaceae				
141.	2856 <i>Calandrinia liniflora</i> (Parakeelya)			
Pottiaceae				
142.	32445 <i>Tortula muralis</i>			
Primulaceae				
143.	6483 <i>Samolus junceus</i>			
144.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
Proteaceae				
145.	1800 <i>Banksia attenuata</i> (Slender Banksia, Piara)			
146.	1830 <i>Banksia littoralis</i> (Swamp Banksia, Pungura)			
147.	1834 <i>Banksia menziesii</i> (Firewood Banksia)			
148.	32077 <i>Banksia sessilis</i> var. <i>cygnorum</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
149.	32080 <i>Banksia sessilis</i> var. <i>sessilis</i>			
150.	1982 <i>Grevillea crithmifolia</i>			
151.	15839 <i>Grevillea preissii</i> subsp. <i>preissii</i>			
152.	2175 <i>Hakea lissocarpha</i> (Honey Bush)			
153.	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
154.	2299 <i>Petrophile linearis</i> (Pixie Mops)			
155.	2329 <i>Synaphea spinulosa</i>			
Ranunculaceae				
156.	10804 <i>Clematis linearifolia</i>			
Restionaceae				
157.	17663 <i>Desmocladius asper</i>			
158.	16595 <i>Desmocladius flexuosus</i>			
159.	1080 <i>Leptocarpus scariosus</i>			
Rhamnaceae				
160.	4802 <i>Cryptandra mutila</i>			
161.	4828 <i>Spyridium globulosum</i> (Basket Bush)			
162.	11665 <i>Trymalium ledifolium</i> var. <i>ledifolium</i>			
Rubiaceae				
163.	7348 <i>Opercularia hispidula</i> (Hispid Stinkweed)			
164.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
Santalaceae				
165.	10765 <i>Exocarpos sparteus</i> (Broom Ballart, Djuk)			
Sapindaceae				
166.	18541 <i>Diplopeltis huegelii</i> subsp. <i>huegelii</i>			
Scrophulariaceae				
167.	7054 <i>Dischisma arenarium</i>	Y		
168.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
Sematiophyllaceae				
169.	32433 <i>Sematophyllum homomallum</i>			
Solanaceae				
170.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
171.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
172.	7037 <i>Solanum symonii</i>			
Stylidiaceae				
173.	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
174.	7756 <i>Stylidium longitubum</i> (Jumping Jacks)		P4	
Tamaricaceae				
175.	15741 <i>Tamarix aphylla</i> (Athei Tree)	Y		
Thymelaeaceae				
176.	18117 <i>Pimelea rosea</i> subsp. <i>rosea</i>			
Urticaceae				
177.	1762 <i>Parietaria debilis</i> (Pellitory)			
Violaceae				
178.	5218 <i>Hybanthus debilissimus</i>			
Xanthorrhoeaceae				
179.	1256 <i>Xanthorrhoea preissii</i> (Grass tree, Palga)			
Zamiaceae				
180.	85 <i>Macrozamia riedlei</i> (Zamia, Djiridji)			

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

¹ For NatureMap's purposes, species flagged as endemic are those whose records are 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.

Appendix D – Flora data

Flora species list

Quadrat data

Site Photographs

Flora likelihood of occurrence assessment guidelines

Flora likelihood of occurrence assessment

Flora species list

Family	Genus	Species	Status
Aizoaceae	* <i>Carpobrotus</i>	<i>edulis</i>	
Amaranthaceae	<i>Ptilotus</i>	<i>polystachyus</i>	
Apocynaceae	* <i>Gomphocarpus</i>	<i>fruticosus</i>	Declared Pest
Arecaceae	* <i>Washingtonia</i>	<i>filifera</i>	Planted
Asparagaceae	<i>Acanthocarpus</i>	<i>preissii</i>	
Asparagaceae	<i>Lomandra</i>	<i>caespitosa</i>	
Asparagaceae	<i>Lomandra</i>	<i>maritima</i>	
Asparagaceae	<i>Lomandra</i>	<i>micrantha</i>	
Asparagaceae	<i>Lomandra</i>	<i>sp.</i>	
Asparagaceae	<i>Sowerbaea</i>	<i>laxiflora</i>	
Asparagaceae	<i>Thysanotus</i>	<i>arenarius</i>	
Asparagaceae	<i>Thysanotus</i>	<i>manglesianus</i>	
Asphodelaceae	<i>Xanthorrhoea</i>	<i>gracilis</i>	
Asteraceae	* <i>Arctotheca</i>	<i>calendula</i>	
Asteraceae	* <i>Conyza</i>	<i>sumatrensis</i>	
Asteraceae	* <i>Hypochaeris</i>	<i>glabra</i>	
Asteraceae	* <i>Hypochaeris</i>	<i>radicata</i>	
Asteraceae	* <i>Sonchus</i>	<i>oleraceus</i>	
Asteraceae	* <i>Ursinia</i>	<i>anthemoides</i>	
Brassicaceae	* <i>Heliophila</i>	<i>pusilla</i>	
Caryophyllaceae	* <i>Cerastium</i>	<i>glomeratum</i>	
Caryophyllaceae	* <i>Petrorhagia</i>	<i>dubia</i>	
Caryophyllaceae	* <i>Silene</i>	<i>gallica</i>	
Casuarinaceae	<i>Allocasuarina</i>	<i>fraseriana</i>	
Chenopodiaceae	<i>Rhagodia</i>	<i>baccata</i>	
Cyperaceae	<i>Schoenus</i>	<i>grandiflorus</i>	
Dasygogonaceae	<i>Dasygogon</i>	<i>bromeliifolius</i>	
Dilleniaceae	<i>Hibbertia</i>	<i>hypericoides</i>	
Droseraceae	<i>Drosera</i>	<i>macrantha</i>	
Ericaceae	<i>Leucopogon</i>	<i>propinquus</i>	
Euphorbiaceae	* <i>Euphorbia</i>	<i>terraccina</i>	
Euphorbiaceae	* <i>Ricinus</i>	<i>communis</i>	
Fabaceae	* <i>Lupinus</i>	<i>angustifolius</i>	
Fabaceae	* <i>Lupinus</i>	<i>cosentinii</i>	
Fabaceae	* <i>Lupinus</i>	<i>luteus</i>	
Fabaceae	* <i>Trifolium</i>	<i>campestre</i>	
Fabaceae	* <i>Vicia</i>	<i>sativa</i>	
Fabaceae	<i>Acacia</i>	<i>lasiocarpa</i>	
Fabaceae	<i>Hardenbergia</i>	<i>comptoniana</i>	
Fabaceae	<i>Jacksonia</i>	<i>furcellata</i>	
Geraniaceae	* <i>Geranium</i>	<i>molle</i>	
Geraniaceae	* <i>Pelargonium</i>	<i>capitatum</i>	
Gyrostemonaceae	<i>Codonocarpus</i>	<i>cotinifolius</i>	
Haemodoraceae	<i>Conostylis</i>	<i>candicans</i>	

Family	Genus	Species	Status
Hemerocallidaceae	<i>Dianella</i>	<i>revoluta</i>	
Iridaceae	* <i>Romulea</i>	<i>rosea</i>	
?Iridaceae	<i>sp.</i>		
Loranthaceae	<i>Nuytsia</i>	<i>floribunda</i>	
Moraceae	* <i>Ficus</i>	<i>carica</i>	
Myrtaceae	* <i>Callistemon</i>	<i>citrinus</i>	Planted
Myrtaceae	<i>Agonis</i>	<i>flexuosa</i>	Planted
Myrtaceae	<i>Corymbia</i>	<i>calophylla</i>	?Planted
Myrtaceae	* <i>Corymbia</i>	<i>maculata</i>	Planted
Myrtaceae	* <i>Eucalyptus</i>	<i>erythrocorys</i>	Planted
Myrtaceae	<i>Eucalyptus</i>	<i>gomphocephala</i>	
Myrtaceae	<i>Eucalyptus</i>	<i>marginata</i>	
Myrtaceae	* <i>Eucalyptus</i>	<i>sp.</i>	Planted
Orchidaceae	<i>Caladenia</i>	<i>latifolia</i>	
Oxalidaceae	* <i>Oxalis</i>	<i>pes-caprae</i>	
Papaveraceae	* <i>Fumaria</i>	<i>capreolata</i>	
Phyllanthaceae	<i>Phyllanthus</i>	<i>calycinus</i>	
Phytolaccaceae	* <i>Phytolacca</i>	<i>octandra</i>	
Pinaceae	* <i>Pinus</i>	<i>sp.</i>	Planted
Poaceae	* <i>Avena</i>	<i>barbata</i>	
Poaceae	* <i>Briza</i>	<i>maxima</i>	
Poaceae	* <i>Bromus</i>	<i>diandrus</i>	
Poaceae	* <i>Ehrharta</i>	<i>calycina</i>	
Poaceae	* <i>Lagurus</i>	<i>ovatus</i>	
Poaceae	* <i>Lolium</i>	<i>perenne</i>	
Poaceae	* <i>Sonchus</i>	<i>oleraceus</i>	
Poaceae	<i>Austrostipa</i>	<i>flavescens</i>	
Polygonaceae	* <i>Rumex</i>	<i>acetosella</i>	
Primulaceae	* <i>Lysimachia</i>	<i>arvensis</i>	
Proteaceae	<i>Banksia</i>	<i>dallanneyi</i>	
Proteaceae	<i>Banksia</i>	<i>menziesii</i>	
Proteaceae	<i>Banksia</i>	<i>attenuata</i>	
Proteaceae	<i>Banksia</i>	<i>grandis</i>	
Proteaceae	<i>Banksia</i>	<i>sessilis</i>	
Proteaceae	<i>Grevillea</i>	<i>crithmifolia</i>	
Proteaceae	<i>Hakea</i>	<i>prostrata</i>	
Ranunculaceae	<i>Clematis</i>	<i>linearifolia</i>	
Restionaceae	<i>Desmocladius</i>	<i>fasciculatus</i>	
Restionaceae	<i>Desmocladius</i>	<i>flexuosus</i>	
Rutaceae	* <i>Citrus</i>	<i>limon</i>	Planted
Solanaceae	* <i>Physalis</i>	<i>peruviana</i>	
Solanaceae	* <i>Solanum</i>	<i>nigrum</i>	
Zamiaceae	<i>Macrozamia</i>	<i>riedlei</i>	

Quadrat species list

Site ID	Family	Taxon	Status	Stratum	Cover (%)	Ht (m)
Q1	Proteaceae	<i>Banksia sessilis</i>		U2	<10	4
Q1	Fabaceae	<i>Acacia lasiocarpa</i>		M2	<10	1.6
Q1	Proteaceae	<i>Grevillea crithmifolia</i>		M2	30-70	1.5
Q1	Haemodoraceae	<i>Conostylis candicans</i>		G1	<2N	0.2
Q1	Fabaceae	* <i>Lupinus cosentinii</i>		G1	<2T	0.4
Q1	Poaceae	* <i>Ehrharta calycina</i>		M2	30-70	1.2
Q1	Asteraceae	* <i>Ursinia anthemoides</i>		G1	<10	0.2
Q1	Dilleniaceae	<i>Hibbertia hypericoides</i>		G1	<2T	0.5
Q1	?Iridaceae	? <i>Iridaceae sp.</i>		G1	<2T	0.4
Q1	Hemerocallidaceae	<i>Dianella revoluta</i>		G1	<2T	0.6
Q1	Poaceae	* <i>Lagurus ovatus</i>		G1	<2N	0.2
Q1	Asteraceae	* <i>Hypochaeris radicata</i>		G1	<2N	0.15
Q1	Zamiaceae	<i>Macrozamia riedlei</i>		M2	<2T	1.1
Q1	Geraniaceae	* <i>Pelargonium capitatum</i>		G1	<2T	0.7
Q1	Asteraceae	* <i>Sonchus oleraceus</i>		G1	<2T	0.15
Q1	Poaceae	* <i>Lolium perenne</i>		G1	<2N	0.15
Q1	Brassicaceae	* <i>Heliophila pusilla</i>		G1	<10	0.3
Q2	Proteaceae	<i>Grevillea crithmifolia</i>		M1	30-70	1.8
Q2	Poaceae	* <i>Ehrharta calycina</i>		M1	70-100	1.8
Q2	Poaceae	* <i>Avena barbata</i>		M1	10-30	1.2
Q2	Poaceae	* <i>Lagurus ovatus</i>		G1	<10	0.4
Q2	Fabaceae	* <i>Trifolium campestre</i>		G2	<2N	0.1
Q2	Asteraceae	* <i>Sonchus oleraceus</i>		G2	<2N	0.15
Q2	Zamiaceae	<i>Macrozamia riedlei</i>		M2	<2T	0.15
Q2	Poaceae	* <i>Briza maxima</i>		G1	<2N	0.4
Q2	Poaceae	* <i>Sonchus oleraceus</i>		G1	<2T	0.2
Q2	Geraniaceae	* <i>Pelargonium capitatum</i>		G1	<2T	0.8
Q2	Asteraceae	* <i>Hypochaeris glabra</i>		G1	<2N	0.1
Q2	?Iridaceae	? <i>Iridaceae sp.</i>		G1	<2T	0.4
Q2	Fabaceae	* <i>Lupinus luteus</i>		G1	<2T	0.4
Q2	Poaceae	* <i>Bromus diandrus</i>		G1	<10	1.1
Q2	Polygonaceae	* <i>Rumex acetosella</i>		G1	<2T	0.6
Q2	Fabaceae	* <i>Lupinus cosentinii</i>		G1	<2T	0.5
Q2	Euphorbiaceae	* <i>Euphorbia terracina</i>		G1	<2T	0.5
Q3	Proteaceae	<i>Grevillea crithmifolia</i>		M1	30-70	1.2
Q3	Fabaceae	<i>Acacia lasiocarpa</i>		M1	<2T	1.7
Q3	Poaceae	* <i>Ehrharta calycina</i>		M2	70-100	1.5
Q3	Ranunculaceae	<i>Clematis linearifolia</i>		M1	10-30	creeper
Q3	Haemodoraceae	<i>Conostylis candicans</i>		G1	<10	0.25
Q3	Asteraceae	* <i>Hypochaeris radicata</i>		G1	<2N	0.15
Q3	Fabaceae	* <i>Trifolium campestre</i>		G1	<2N	0.1

Site ID	Family	Taxon	Status	Stratum	Cover (%)	Ht (m)
Q3	Asteraceae	<i>*Ursinia anthemoides</i>		G1	<2N	0.15
Q3	Fabaceae	<i>*Lupinus luteus</i>		G1	<2N	0.3
Q3	?Iridaceae	<i>Iridaceae sp.</i>		G1	<2T	0.3
Q3	Primulaceae	<i>*Lysimachia arvensis</i>		G1	<2T	0.25
Q3	Fabaceae	<i>*Lupinus cosentinii</i>		G1	<2T	0.4
Q3	Asparagaceae	<i>Thysanotus arenarius</i>		G1	<2T	0.4
Q3	Caryophyllaceae	<i>*Cerastium glomeratum</i>		G1	<2N	0.1
Q3	Asteraceae	<i>*Arctotheca calendula</i>		G1	<2T	0.2
Q3	Zamiaceae	<i>Macrozamia riedlei</i>		G1	<2T	0.8
Q3	Asparagaceae	<i>Lomandra caespitosa</i>		G1	<2T	0.3
Q3	Poaceae	<i>*Briza maxima</i>		G1	<2N	0.3
Q3	Dilleniaceae	<i>Hibbertia hypericoides</i>		G1	<2T	0.25
Q3	Poaceae	<i>*Lagurus ovatus</i>		G1	<2T	0.2
Q4	Myrtaceae	<i>Eucalyptus gomphocephala</i>		U1	10-30	18
Q4	Myrtaceae	<i>Eucalyptus marginata</i>		U1	10-30	10
Q4	Zamiaceae	<i>Macrozamia riedlei</i>		M1	<2T	1.1
Q4	?Iridaceae	<i>?Iridaceae sp.</i>		G1	<10	0.2
Q4	Poaceae	<i>*Briza maxima</i>		G1	30-70	0.4
Q4	Poaceae	<i>*Ehrharta calycina</i>		G1	10-30	1
Q4	Asteraceae	<i>*Hypochaeris radicata</i>		G1	<2N	-
Q4	Poaceae	<i>Austrostipa flavescens</i>		G1	<10	0.7
Q4	Poaceae	<i>*Lagurus ovatus</i>		G1	<2T	0.3
Q4	Fabaceae	<i>Hardenbergia comptoniana</i>		G1	<2T	creeper
Q4	Fabaceae	<i>*Trifolium campestre</i>		G1	<2N	0.1
Q4	Primulaceae	<i>*Lysimachia arvensis</i>		G1	<2N	0.1
Q4	Asphodelaceae	<i>Xanthorrhoea gracilis</i>		M1	<10	1.4
Q4	Haemodoraceae	<i>Conostylis candicans</i>		G1	<2T	0.2
Q4	Restionaceae	<i>Desmocladus flexuosus</i>		G1	<10	0.15
Q4	Geraniaceae	<i>*Geranium molle</i>		G2	<2T	0.3
Q5	Myrtaceae	<i>Eucalyptus marginata</i>		U1	<10	17
Q5	Myrtaceae	<i>Eucalyptus gomphocephala</i>		U1	10-30	17
Q5	Proteaceae	<i>Banksia attenuata</i>		U1	<10	4
Q5	Zamiaceae	<i>Macrozamia riedlei</i>		M1	<10	1.3
Q5	Poaceae	<i>*Ehrharta calycina</i>		M1	30-70	1
Q5	Poaceae	<i>*Briza maxima</i>		G1	10-30	0.4
Q5	?Iridaceae	<i>?Iridaceae sp.</i>		G1	10-30	0.3
Q5	Fabaceae	<i>*Trifolium campestre</i>		G1	<2N	0.1
Q5	Fabaceae	<i>*Lupinus angustifolius</i>		G1	<2N	0.4
Q5	Casuarinaceae	<i>Allocasuarina fraseriana</i>		U1	<10	7
Q5	Asparagaceae	<i>Sowerbaea laxiflora</i>		G1	<2T	0.3

Site ID	Family	Taxon	Status	Stratum	Cover (%)	Ht (m)
Q5	Fabaceae	<i>Hardenbergia comptoniana</i>		G1	<2T	0.1
Q5	Primulaceae	* <i>Lysimachia arvensis</i>		G1	<2T	0.1
Q5	Asteraceae	* <i>Hypochaeris radicata</i>		G1	<2N	-
Q5	Asparagaceae	<i>Thysanotus manglesianus</i>		G1	<2T	0.4
Q5	Poaceae	* <i>Bromus diandrus</i>		G1	<10	0.3
Q6	Myrtaceae	<i>Eucalyptus marginata</i>		U1	10-30	15
Q6	Proteaceae	<i>Banksia grandis</i>		U1	30-70	8
Q6	Proteaceae	<i>Banksia attenuata</i>		U1	<10	7
Q6	Casuarinaceae	<i>Allocasuarina fraseriana</i>		U1	<10	5
Q6	Zamiaceae	<i>Macrozamia riedlei</i>		M1	<10	1.1
Q6	Asphodelaceae	<i>Xanthorrhoea gracilis</i>		M1	<2T	1.1
Q6	Poaceae	* <i>Ehrharta calycina</i>		G1	30-70	0.8
Q6	Poaceae	* <i>Briza maxima</i>		G1	30-70	0.4
Q6	?Iridaceae	? <i>Iridaceae sp.</i>		G1	30-70	0.3
Q6	Iridaceae	* <i>Romulea rosea</i>		G1	<2N	0.1
Q6	Asparagaceae	<i>Sowerbaea laxiflora</i>		G1	<2T	0.4
Q6	Papaveraceae	* <i>Fumaria capreolata</i>		G1	<2T	0.1
Q6	Asteraceae	* <i>Arctotheca calendula</i>		G1	<2T	0.15
Q6	Poaceae	* <i>Lolium perenne</i>		G1	<2T	0.2

Site Photographs



Quadrat 1 – *Grevillea* Shrubland (Degraded condition)



Quadrat 2 – *Grevillea* Shrubland (Degraded condition)



Quadrat 3 – *Grevillea* Shrubland (Degraded condition)



Quadrat 4 – Tuart/Jarraah Woodland (Degraded condition)



Quadrat 5 – Tuart/Jarraah Woodland (Degraded condition)



Quadrat 6 – Tuart/Jarraah Woodland (Degraded condition)



Parkland cleared (Completely Degraded condition)



Parkland cleared (Completely Degraded condition)

Flora Likelihood of occurrence guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within survey area from field survey results.
Likely	Species previously recorded within 40 km and large areas of suitable habitat occur in the survey area.
Possible	Species previously recorded within 40 km and areas of suitable habitat occur/may occur in the survey area
Unlikely	Species previously recorded within 40 km and areas of suitable habitat occur/may occur in the survey area
Highly unlikely	Species previously recorded within 40 km and areas of suitable habitat occur/may occur in the survey area
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Flora Likelihood of Occurrence Assessment

Family	Taxon	Status			Habitat description	Likelihood of Occurrence	Source
		WC Act	EPBC Act	DBCA			
Fabaceae	<i>Acacia benthamii</i>			P2	Shrub, ca 1 m high. Fl. yellow, Aug to Sep. Sand. Typically on limestone breakaways. Known to occur in jarrah and tuart woodland.	Unlikely – suitable habitat present within the survey area. However given the survey area was thoroughly surveyed for significant flora and given the degraded nature of the site it is considered unlikely.	Naturemap, WAHerb, TPFL_DBCA
Fabaceae	<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)			P1	Occurs on grey sand over clay in <i>Eucalyptus calophylla</i> (marr) woodland.	Unlikely – no suitable habitat within the survey area. Closest known record is approximately 10 km east.	WAHerb, TPFL_DBCA
Ericaceae	<i>Andersonia gracilis</i>	T	En		Slender erect or open straggly shrub, 0.1-0.5 m high. Flowers white-pink-purple from September to November. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Highly Unlikely - closest known record is ~38 km north east of the survey area. No suitable habitat present.	PMST
Euphorbiaceae	<i>Beyeria cinerea</i> subsp. <i>cinerea</i>			P3	Spreading open twiggly shrub, 30 cm high x 30 cm wide. Flowers green/yellow.	Unlikely – suitable habitat present within the survey area. However given the survey area was	WAHerb

Family	Taxon	Status			Habitat description	Likelihood of Occurrence	Source
		WC Act	EPBC Act	DBCA			
Orchidaceae	<i>Caladenia huegelii</i>	T	En		Occurs in sand over limestone with low scrub. Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green & cream & red, Sep to Oct. Grey or brown sand, clay loam.	thoroughly surveyed for significant flora and given the degraded nature of the site it is considered unlikely. Highly unlikely – the closest known record is approximately 10 km east of the survey area. Given the degraded nature of the site it is considered highly unlikely.	TPFL_DBCA, PMST
Montiaceae	<i>Calandrinia oraria</i>			P3	Annual herb, pink flowers. brown/white/grey sand over limestone. Known to occur in open heath/grassland, characteristic species <i>Melaleuca systena</i> and <i>Lomandra maritima</i> .	Unlikely – closest known record is approximately 7 km south west of the survey area. Typically recorded along the coastline.	WAHerb
Brassicaceae	<i>Cardamine paucijuga</i>			P2	Slender erect annual, herb, to 0.4 m high. Flowers in September to October. Occurs in winter-wet, damp flats. Calcareous clay over limestone and black peaty sand over mud. Associated with <i>Melaleuca</i> shrubland.	Highly unlikely – no suitable habitat present within the survey area.	WAHerb, TPFL_DBCA
Fabaceae	<i>Dillwynia dillwynioides</i>			P3	Decumbent or erect, slender shrub, 0.3-1.2 m high. Fl. red & yellow/orange, Aug to Dec. Sandy soils. Winter-wet depressions. Associated with <i>Melaleuca</i> and <i>Eucalyptus rudis</i> woodlands/forest.	Highly unlikely – no suitable habitat within the survey area.	WAHerb, TPFL_DBCA
Orchidaceae	<i>Diuris micrantha</i>	T	Vu		Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow & brown, Sep to Oct. Brown loamy clay. Winter-wet swamps, in shallow water.	Highly unlikely – no suitable habitat within the survey area.	PMST
Orchidaceae	<i>Diuris purdiei</i>	T	En		Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow, Sep to Oct. Grey-black sand, moist. Winter-wet swamps.	Highly unlikely – no suitable habitat within the survey area.	PMST

Family	Taxon	Status			Habitat description	Likelihood of Occurrence	Source
		WC Act	EPBC Act	DBCA			
Sapindaceae	<i>Dodonaea hackettiana</i>			P4	Erect shrub or tree. 1-5 m high. Fl. yellow-green/red, mainly Jul to Oct. Sand. Outcropping limestone.	Unlikely – closest known record is approximately 9 km north east of the survey area.	WAHerb, TPFL_DBCA
Orchidaceae	<i>Drakaea elastica</i>	T	En		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.	Highly Unlikely – no suitable habitat within the survey area.	TPFL_DBCA, PMST
Orchidaceae	<i>Drakaea micrantha</i>	T	Vu		Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct. White-grey sand.	Highly Unlikely – closest known records is over 20 km north-east of the survey area.	PMST
Myrtaceae	<i>Eucalyptus x balanites</i>	T	En		Mallee, to 5 m high. Flowers in October to December or January to February. Occurs on sandy soils with lateritic gravel.	High Unlikely - known records of this species are north of Perth. Preferred habitat not present within the survey area.	PMST
Fabaceae	<i>Jacksonia sericea</i>			P4	Low spreading shrub, to 0.6 m high. Fl. orange, usually Dec or Jan to Feb. Calcareous & sandy soils.	Unlikely – The closest known record is less than 2 km south west of the survey area. Suitable habitat is present however the survey area was extensively surveyed by foot and is therefore considered unlikely.	Naturemap, WAHerb
Cyperaceae	<i>Lepidosperma rostratum</i>	T	En		Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown. Jul, Sep – Nov. Peaty sand, clay.	Highly Unlikely – no suitable habitat within the survey area.	PMST
Apocynaceae	<i>Parsonsia diaphanophleba</i>			P4	Woody climber. Flowers Jan to Feb or April to June or Sep. Occurs on alluvial soils along rivers.	Highly Unlikely – no suitable habitat within the survey area.	WAHerb
Cyperaceae	<i>Schoenus capillifolius</i>			P3	Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green, Oct to Nov. Brown mud. Claypans.	Highly Unlikely – no suitable habitat within the survey area.	WAHerb, TPFL_DBCA
Fabaceae	<i>Sphaerolobium calcicola</i>			P3	Slender, multi-stemmed, scandent or erect shrub, to 1.5 m high. Fl. orange-red,	Highly Unlikely – no suitable habitat within the survey area.	WAHerb

Family	Taxon	Status			Habitat description	Likelihood of Occurrence	Source
		WC Act	EPBC Act	DBCA			
Stylidiaceae	<i>Stylidium longitubum</i>			P4	Jun or Sep to Nov. White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas. Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink, Oct to Dec. Sandy clay, clay. Seasonal wetlands.	Highly Unlikely – no suitable habitat within the survey area.	Naturemap, WAHerb, TPFL_DBCA
Proteaceae	<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	T	CR		Dense, clumped shrub to 0.3 m high to 0.4 m wide. Flowers in October. Occurs on sandy soil with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Highly Unlikely – no suitable habitat within the survey area. No records within 10 km of the survey area.	PMST
Proteaceae	<i>Synaphea</i> sp. Serpentine (G.R. Brand 103)	T			Nearby records are known from coastal plain wetland reserve and Pinjarra plain, sumpland. Occurs on red brown loam and brown clay soil. Vegetation associated with Marri woodland and low shrubland including <i>Hakea ceratophylla</i> .	Highly Unlikely – no suitable habitat within the survey area. Records are over 8 km east of the survey area.	WAHerb
Proteaceae	<i>Synaphea stenoloba</i>	T	En		Caespitose shrub, 0.3-0.45 m high. Flowers August to October. Occurs on sandy or sandy clay soils. In winter-wet flats, granite.	Highly Unlikely – no suitable habitat within the survey area.	PMST

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		Name	Signature	Name	Signature	Date
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