



intelligent outcomes | respected experience

## Capricorn foreshore reserve

### Detailed flora and vegetation survey

Prepared for  
Acumen Development Solutions  
by Strategen

December 17

# Capricorn foreshore reserve

## Flora and vegetation survey

Strategen is a trading name of  
Strategen Environmental Consultants Pty Ltd  
Level 1, 50 Subiaco Square Road Subiaco WA 6008  
ACN: 056 190 419

December 17

## ***Limitations***

### **Scope of services**

This report ("the report") has been prepared by Strategen Environmental Consultants Pty Ltd (Strategen) in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

### **Reliance on data**

In preparing the report, Strategen has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen has also not attempted to determine whether any material matter has been omitted from the data. Strategen will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen. The making of any assumption does not imply that Strategen has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

### **Environmental conclusions**

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

## **Client: Acumen Development Solutions**

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	A	Client review	C Courtauld / D Panickar / D Newsome	Electronic	22 Dec 2016
Final Report	B	Issue to CoW / DoP	C Courtauld / T Bowra	Electronic	31 July 2017
Final Report	C	Issue to DWER	A Dalton / T sleigh	Electronic	21 Dec 2017

Filename: ADS16585\_01 R001 Rev 0 - 21 December 2017

## Table of contents

<b>1. Introduction</b>	<b>1</b>
1.1 Background	1
1.2 Scope	1
<b>2. Context</b>	<b>5</b>
2.1 Legislative context	5
2.1.1 Conservation significant flora and ecological communities	5
2.1.2 Environmentally Sensitive Areas	5
2.1.3 Protection of native vegetation	5
2.1.4 Introduced species	6
2.2 Environmental setting	6
2.2.1 Soils and topography	6
2.2.2 Climate	7
2.2.3 Regional vegetation	7
<b>3. Methods</b>	<b>10</b>
3.1 Desktop assessment	10
3.2 Field assessment	10
3.3 Data analysis and vegetation mapping	11
3.4 Weed density mapping	11
3.5 Survey limitations and constraints	11
<b>4. Results</b>	<b>13</b>
4.1 Desktop assessment results	13
4.1.1 Threatened and Priority flora	13
4.1.2 Threatened and Priority Ecological Communities	15
4.1.3 Wetlands	18
4.1.4 Bush Forever	18
4.2 Field survey results	18
4.2.1 Native flora	18
4.2.2 Threatened and Priority flora	18
4.2.3 Introduced (exotic) taxa	18
4.2.4 Vegetation types	20
4.2.5 Threatened and Priority Ecological Communities	24
<b>5. Discussion</b>	<b>25</b>
<b>6. Conclusion</b>	<b>26</b>
<b>7. References</b>	<b>27</b>

## List of tables

Table 1: Personnel	10
Table 2: Flora and vegetation survey potential limitations and constraints	12
Table 3: Threatened and Priority flora potentially occurring within the survey area	14
Table 4: Vegetation Types	20
Table 5: Area (ha) covered by each VT within the survey area	20
Table 6: Vegetation condition scale (Keighery 1994)	23
Table 7: Area (ha) covered by each vegetation condition category within the survey area	23

## List of figures

Figure 1: The survey area	3
Figure 2: Mean monthly climatic data (temperature and rainfall) for Gingin Aero	7
Figure 3: Regional vegetation mapping	9
Figure 4: Location of TECs and PECs within 5 km of the survey area	17
Figure 5: Weed mapping of the survey area	19
Figure 6: Vegetation Types (VTs) mapped within the survey area	21
Figure 7: Vegetation condition within the survey area	22

## List of appendices

Appendix 1 Conservation significant flora and ecological community definitions
Appendix 2 Desktop assessment results (DBCA 2017-, DEE 2015b)
Appendix 3 Photographic record of site and vegetation types
Appendix 4 Vascular plant taxa recorded from quadrats within the survey area
Appendix 5 Supplementary flora and vegetation survey

# 1. Introduction

This report presents the findings of a detailed flora and vegetation survey undertaken to support the proposed development of the Capricorn foreshore reserve that forms part of the Coastal Village and Coastal Node, Yanchep (the survey area; Figure 1).

This flora and vegetation assessment will support the Foreshore Management Plan for the proposed foreshore development. The survey area will be created as a 'Parks and Recreation' reserve and vested to the Crown as agreed by Capricorn Village Joint Venture (CVJV) and the Western Australian Planning Commission (WAPC). Upon the transfer of the foreshore to the Crown, the foreshore will be vested to the City of Wanneroo (CoW). The flora survey was undertaken in November 2016, with an additional portion of the Capricorn foreshore reserve (Figure 1) surveyed in November 2017. This report presents the findings from the November 2016 and November 2017 surveys.

## 1.1 Background

Capricorn Village Joint Venture (CVJV) is proposing to develop the Capricorn Coastal Village and Coastal Node, located in Yanchep, Western Australia, approximately 51 km north-northwest of the Perth Central Business District (CBD). The Capricorn Coastal Village and Coastal Node (the Project), incorporates Part Lot 312 and Lots 2, 303 and 304, Two Rocks Road, Yanchep, in the City of Wanneroo (CoW, Figure 1).

The foreshore reserve provides a link between the Indian Ocean and urban development and as such provides opportunity for both conservation and development purposes. The proposed foreshore development will require clearing of native vegetation and as such, a flora and vegetation survey was deemed necessary to determine the environmental values of the proposed clearing area. The survey area was designed based on the draft concept plan, focussing on areas of proposed disturbance and a buffer area (Figure 1).

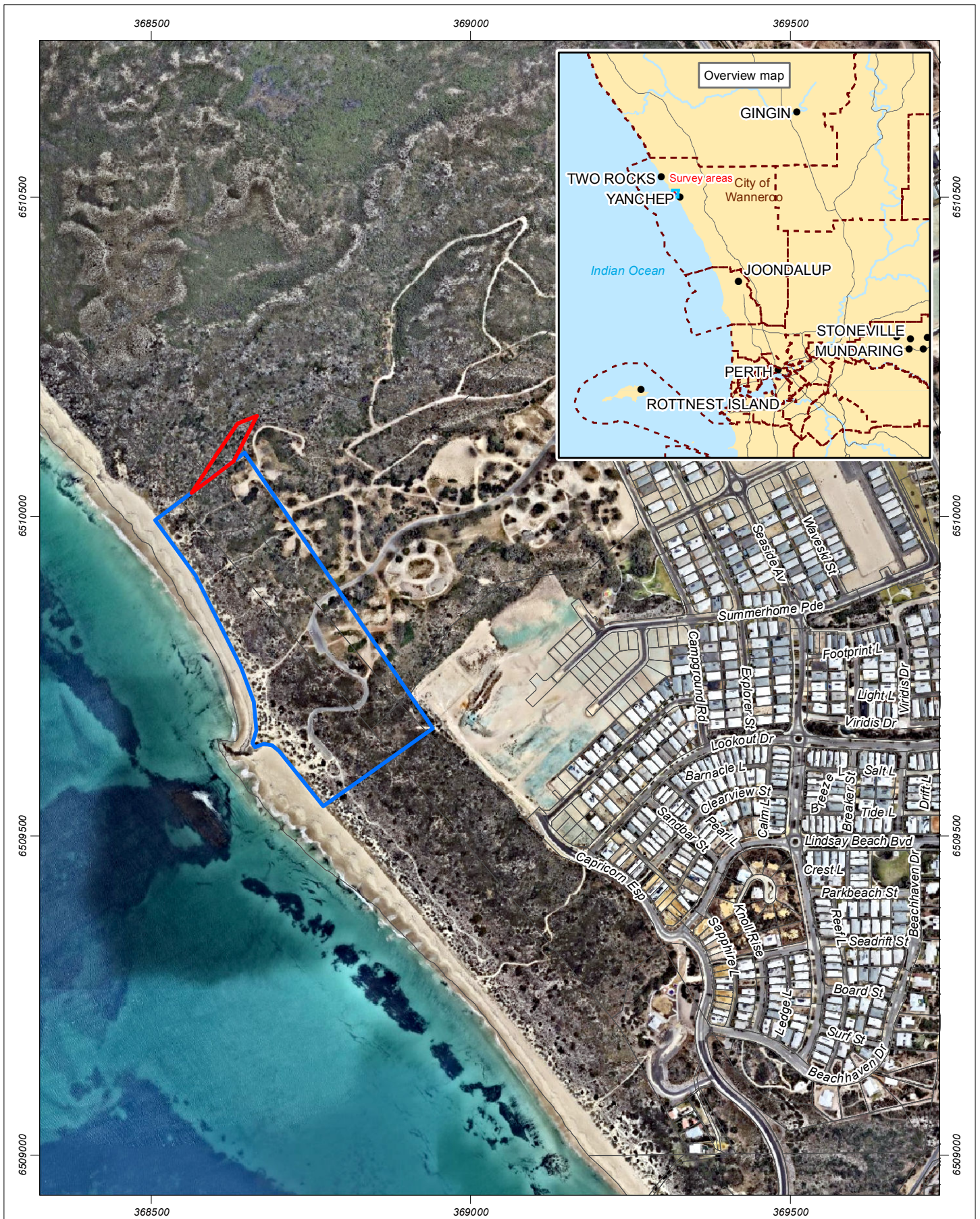
## 1.2 Scope

The scope of this flora and vegetation survey was to undertake a desktop assessment and field assessment within the survey area consistent with the requirements of *Guidance Statement 51 Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia* and *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and meeting the definition of a detailed survey as described by the guidance.

The objectives were to:

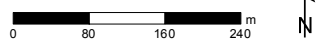
- conduct a desktop survey for Threatened and Priority flora which have been identified as being present in or around the survey area during historic surveys
- collect and identify the vascular plant species present within the survey area
- search areas of suitable habitat for Threatened and/or Priority flora
- define and map the native vegetation communities present within the survey area
- map vegetation condition within the survey area
- map the densities of weeds in the survey
- provide recommendations on the local and regional significance of the vegetation communities
- prepare a report summarising the findings.

A supplementary survey was undertaken within the southern portion of the foreshore reserve in October 2017 (Appendix 5), which included detailed quadrat analysis. This field survey was conducted according to standards set out in *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).



**Figure 1: The survey area**

Scale 1:8,000 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 21/12/2017  
 Author: JCrute  
 Source: Aerial image: Nearmap, flown 12/2017. Existing cadastre, Landgate 2017.

**Legend**

- November 2017 survey area
- November 2016 survey area
- Existing cadastre



info@strategen.com.au  
 www.strategen.com.au

## 2. Context

### 2.1 Legislative context

This biological survey has been conducted with reference to the following Australian and Western Australian legislation and guidance:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Wildlife Conservation Act 1950* (WC Act) – State
- *Environmental Protection Act 1986* (EP Act) – State
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State
- *Guidance Statement 51 Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia and Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

#### 2.1.1 Conservation significant flora and ecological communities

Conservation significant flora and ecological communities are determined at a state and federal legislative level. Threatened species are listed under the EPBC Act at the Australian Government level and under the WC Act at the State level (Appendix 1). Priority species are listed by the Department of Biodiversity, Conservation and Attractions (DBCA [formerly Department of Parks and Wildlife]) and include species of 'significant conservation value' (Appendix 1).

Threatened Ecological Communities (TECs) are listed under both the EPBC Act and EP Act (Appendix 1). Priority Ecological Communities (PECs) are listed by DBCA and include species of significant conservation value (Appendix 1).

#### 2.1.2 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are protected under the EP Act, and include the following:

- World Heritage areas
- areas included on the National Estate Register
- defined wetlands and associated buffers
- vegetation within 50 m of a listed Threatened species
- TECs.

#### 2.1.3 Protection of native vegetation

Native vegetation is defined under the EP Act as “indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation”.

This definition of native vegetation does not include vegetation that was intentionally sown, planted or propagated unless either of the following applies:

- (a) the vegetation was sown, planted or propagated as required under the EP Act or another written law
- (b) the vegetation is declared to be native under Regulation 4 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.



Regulation 4 prescribes the kinds of intentionally planted indigenous vegetation that are “native vegetation” and which therefore require a clearing permit or exemption to clear and includes:

- (a) planting that was funded (fully or partly)
  - i. by a person who was not the owner of the land
  - ii. for the purpose of biodiversity conservation or land conservation
- (b) intentionally planted vegetation that has one of the following:
  - i. a conservation covenant or agreement to reserve under section 30B of the *Soil and Land Conservation Act 1945*
  - ii. a covenant to conserve under section 21A of the *National Trust of Australia (WA) Act 1964*
  - iii. restrictive covenant to conserve under section 129B of the *Transfer of Land Act 1983*
  - iv. some other form of binding or undertaking to establish and maintain, or maintain, the vegetation.

Native vegetation can only be cleared with a clearing permit, unless for some circumstances where exemptions apply pursuant to the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (the Regulations). Clearing permits issued pursuant to the Regulations may be issued as area permits or purpose permits. Exemptions for clearing under Regulation 5 of the Regulations do not apply within ESAs.

#### 2.1.4 Introduced species

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility
- C3 Management: Pests assigned under this category 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 that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

## 2.2 Environmental setting

### 2.2.1 Soils and topography

The survey area is located within the Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) of Western Australia (Mitchell et al. 2002). The Swan Coastal Plain comprises five major geomorphologic systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward & McArthur 1980; Gibson *et al.* 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson *et al.* 1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils.

## 2.2.2 Climate

The Yanchep locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BoM) weather station at Gingin Aero (Station No. 009178) provides average monthly climate statistics for the Yanchep locality (Figure 2). Average annual rainfall recorded at Gingin Aero since 1996 is 620.2 mm (BoM 2017). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between December and February, with average monthly maximums ranging from 30.6°C in December to 33.3°C in February (BoM 2017). Lowest temperatures occur between June and September, with average monthly minimums ranging from 6.2°C in July to 7.4°C in September (BoM 2017).

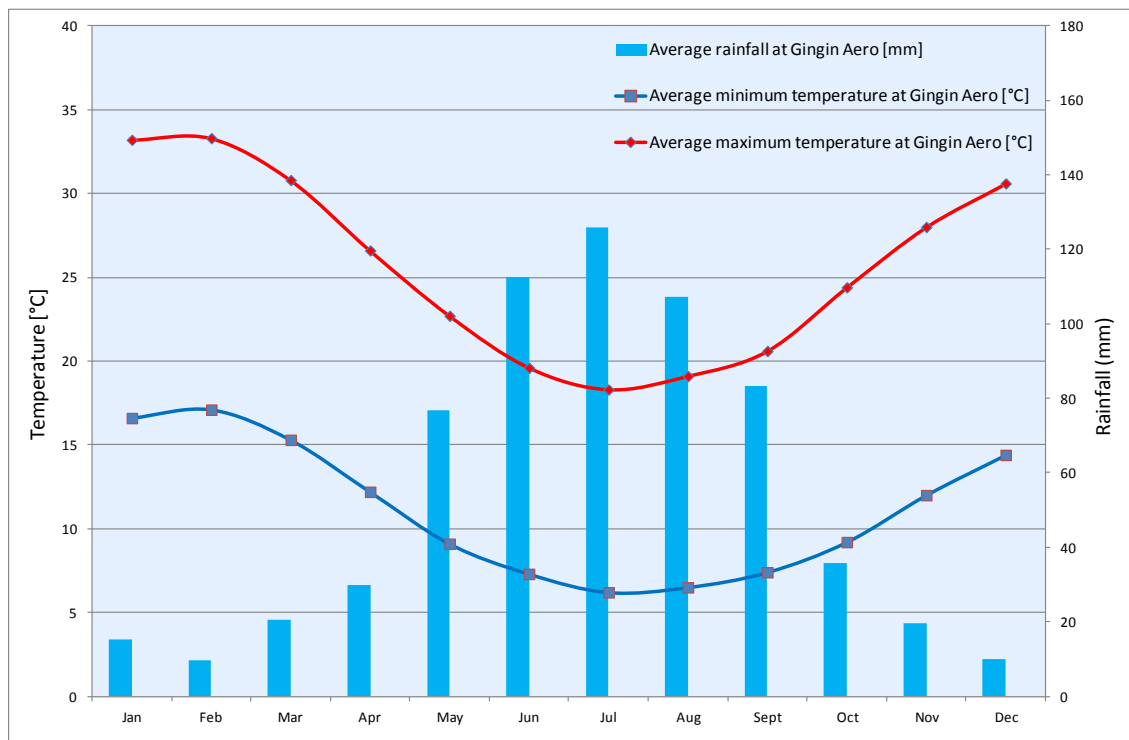


Figure 2: Mean monthly climatic data (temperature and rainfall) for Gingin Aero

## 2.2.3 Regional vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981) which led to the delineation of botanical districts as described in Beard (1990); the biogeographical region dataset (Interim Biogeographical Regionalisation for Australia, IBRA) for Western Australia (DEE 2015a) and System 6 Vegetation Complex mapping undertaken by Heddle et al. (1980).

### *Beard (1990) Botanical Subdistrict*

The survey area occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; *Melaleuca* swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990).

### ***IBRA subregion***

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.

The survey area occurs within the Swan Coastal Plain 2 IBRA subregion which is dominated by *Banksia* spp. or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark (*Melaleuca* spp.) in swampy areas (Mitchell et al. 2002).

### ***System 6 and vegetation system association mapping***

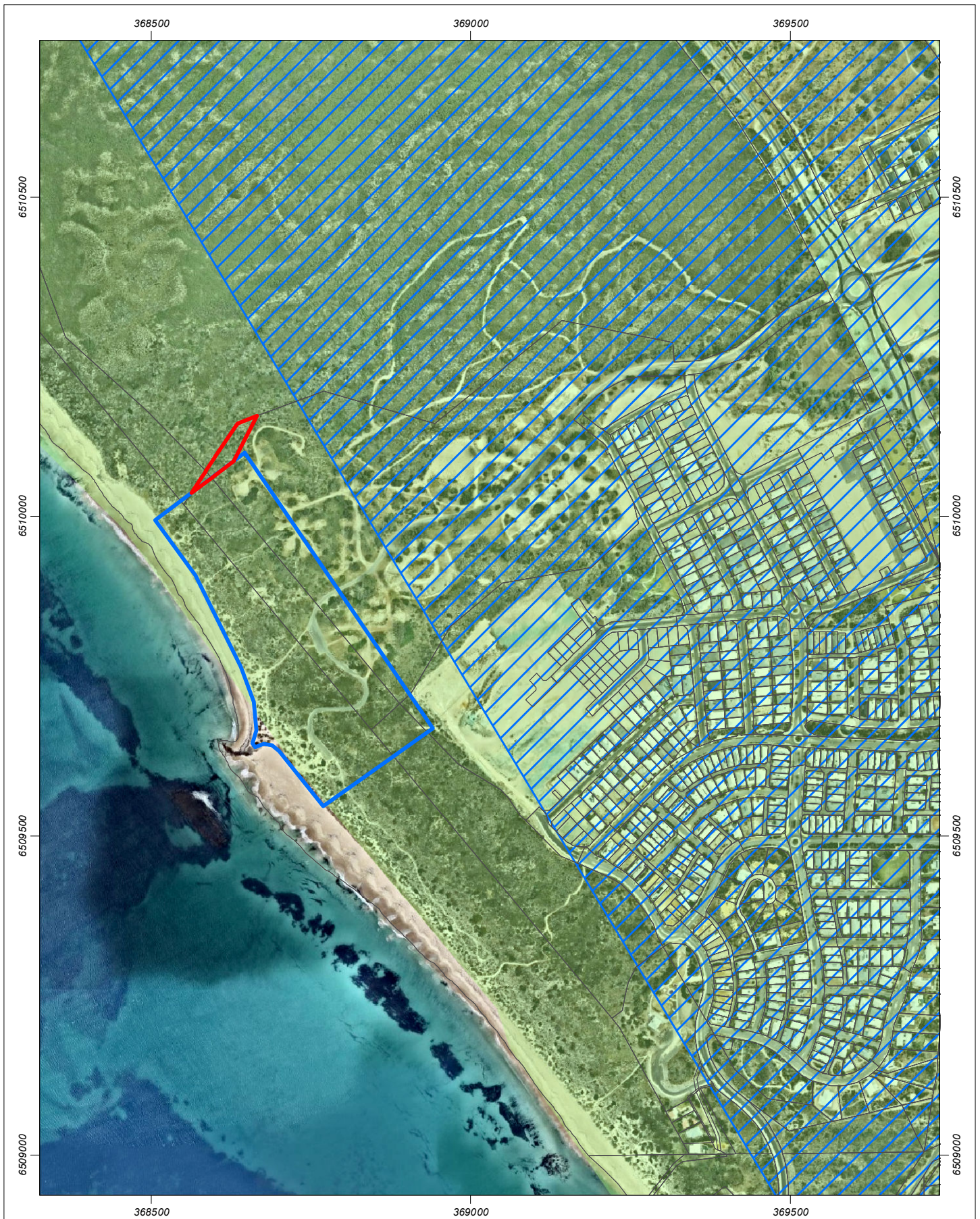
System 6 mapping refers to vegetation mapping undertaken at a Vegetation Complex scale by Heddlé *et al.* (1980). This is the primary source of information used to calculate potential impacts of proposals to clear native vegetation on the Swan Coastal Plain. The survey area occurs within the Quindalup Complex (Figure 3) which is described as:

- Coastal dune complex consisting mainly of two alliances – the strand and fore dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* – *Callitris preissii* and the closed scrub of *Acacia rostellifera*.

At a finer scale, the survey area likely<sup>1</sup> falls within the Guilderton 1007 vegetation system association (i.e. Mosaic: Shrublands; *Acacia lasiocarpa* and *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* and *Acacia cyclops* thicket) as defined in Government of Western Australia (2016).

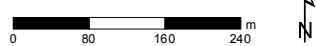
---

<sup>1</sup> The survey area falls outside of the extent mapped by Government of Western Australia (2016). This is likely attributable to a georeferencing error associated with the mapped dataset and as such, the system association within the survey area has been inferred through a comparison of vegetation descriptions and location in the landscape.



**Figure 3: Regional vegetation mapping**

Scale 1:8,000 at A4



Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 21/12/2017

Author: JCrute

Source: Aerial image: Nearmap, flown 12/2017. Existing cadastre, Landgate 2017.



**Legend**

- November 2017 survey area
- November 2016 survey area
- Existing cadastre
- Pre-European vegetation
- Guilderton 1007
- Heddle Vegetation Complex
- Quindalup Complex



info@strategen.com.au  
www.strategen.com.au

## 3. Methods

### 3.1 Desktop assessment

A desktop assessment was conducted using FloraBase, DBCA, and Department of the Environment and Energy (DEE) databases to identify the possible occurrence of TECs, PECs and Threatened and Priority flora potentially occurring within the survey area. Reports that document regional flora, vegetation and fauna within the surrounds of the survey area were also reviewed prior to the field assessment.

A database search request was also submitted to the Threatened Communities Branch of DBCA to identify any potential TECs or PECs within 5 km of the survey area.

### 3.2 Field assessment

The field survey was conducted according to standards set out in *Guidance Statement 51 Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia* and *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). The assessment of flora and vegetation within the survey area was undertaken by one ecologist from Strategen on 25 November 2016, with a subsequent survey of an additional northern section of the survey area undertaken by one ecologist on the 27 November 2017. Table 1 identifies staff involved in the field surveys, their roles and qualifications. The survey area was traversed on foot to record changes in vegetation structure and type and 16 vegetation quadrats were surveyed to identify vegetation types (Figure 1; Appendix 3).

Table 1: Personnel

Name	Role
Ms. C. Courtauld Strategen (Ecologist)	Planning, fieldwork, plant identification, data interpretation and report preparation.
Ms. A. Dalton Strategen (Botanist)	Planning, fieldwork, plant identification, data interpretation and report preparation.

Site selection for vegetation mapping was based on differences in structure and species composition of the communities present within the survey area. Vegetation mapping sites were determined from aerial photographs. The survey area was traversed on foot, allowing for opportunistic sites to be placed where a change in vegetation structure or composition was observed.

Flora and vegetation was described and sampled systematically at each quadrat and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. At each site the following floristic and environmental parameters were noted:

- GPS location
- topography
- soil type and colour
- outcropping rocks and their type
- percentage cover and average height of each vegetation stratum.

For each vascular plant species, the average height, number of plants and percent cover were recorded.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

### 3.3 Data analysis and vegetation mapping

Due to the degraded nature and uniform distribution of vegetation within the survey area; quadrat data were grouped into a species by site matrix to delineate individual vegetation types (VTs) present within the survey area. Aerial photography interpretation and field notes taken during the survey were then used to develop VT mapping polygon boundaries over the survey area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

VT descriptions (though floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide. For the purposes of this report, a VT is considered equivalent to a NVIS sub-association as described in ESCAVI (2003).

Vegetation condition was recorded at all quadrats, and also opportunistically within the survey area during the field assessment where required. Vegetation condition was described using the vegetation condition scale for the South West Botanical Province (Keighery 1994). Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation, and were digitised as for vegetation type mapping polygon boundaries.

The degraded nature of the survey area did not allow for statistically valid multivariate analyses to be undertaken to determine resemblance of sites to Floristic Community Types (FCTs) as mapped and defined by Gibson *et al.* (1994). Therefore, inferences between recorded VTs and FCT and DBCA descriptions of TECs/PECs were used to determine any potential occurrence of a conservation significant vegetation community where necessary. The Bush Forever list of FCTs per vegetation complex was also used as a guide to infer potential occurrence of conservation significant FCTs within the survey area (GoWA 2000).

### 3.4 Weed density mapping

Weed density in the survey area was mapped using the guidelines for mapping weed distribution in Western Australia (DEC 2011). The entire survey area was traversed and the percentage cover of individual weed species was recorded. Broad cover classes of less than 5% cover (low density), 6-75% cover (medium density) and 76-100% (high density) were used to map the density of weeds in the survey area (DEC 2011).

### 3.5 Survey limitations and constraints

Table 2 displays the evaluation of the flora and vegetation assessment against a range of potential limitations that may have an effect on that assessment. Based on this evaluation, the assessment has not been subject to constraints that would affect the thoroughness of the assessment and the conclusions reached.

Table 2: Flora and vegetation survey potential limitations and constraints

Potential limitation	Impact on assessment	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	<b>Not a constraint.</b>	The survey has been undertaken in the Drummond Botanical Subdistrict on the Swan Coastal Plain which has been well studied and documented with ample literature available (Beard 1990).
Scope (i.e. what life forms, etc., were sampled).	<b>Not a constraint.</b>	Due to the degraded nature and uniform distribution of vegetation within the survey area and timing of the survey (i.e. spring); most life forms are likely to have been sampled adequately during the time of the survey.
Proportion of flora/fauna collected and identified (based on sampling, timing and intensity).	<b>Not a constraint.</b>	The proportion of flora surveyed was adequate. The entire survey area was traversed and flora species were recorded systematically.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	<b>Not a constraint</b>	The information collected during the survey was sufficient to assess the vegetation that was present during the time of the survey.
Mapping reliability.	<b>Not a constraint.</b>	Aerial photography of a suitable scale was used to map the survey area and identify changes in vegetation. Sites were chosen from these aerials to reflect changes in community structure. Opportunistic sites were also used if differences were observed during on ground reconnaissance. Vegetation types were assigned to each site based on topography, soil type and presence/absence and percent foliage cover of vegetation.
Timing, weather, season, cycle.	<b>Not a constraint.</b>	Flora and vegetation surveys are normally conducted following winter rainfall in the South-West Botanical Province of Western Australia, ideally during spring (EPA 2016). The field assessment was conducted in November (i.e. spring) in fine weather conditions and therefore these factors are not deemed to be constraints.
Disturbances (fire flood, accidental human intervention, etc.).	<b>Not a constraint.</b>	The survey area and regional surrounds have been subject to disturbance over a significant period of time. Given the wide range of this disturbance, this is not considered to be a limitation within the survey area.
Intensity (in retrospect, was the intensity adequate).	<b>Not a constraint.</b>	The survey area was traversed on foot and all differences in vegetation structure were recorded appropriately.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	<b>Not a constraint.</b>	The available resources were adequate to complete the survey.
Access problems (i.e. ability to access survey area).	<b>Not a constraint.</b>	Existing tracks enabled adequate access to survey the vegetation within the survey area. Where access was not available by car, the area was easily traversed by foot.
Experience levels (e.g. degree of expertise in species identification to taxon level).	<b>Not a constraint.</b>	All survey personnel have the appropriate training in sampling and identifying the flora of the region.

## 4. Results

### 4.1 Desktop assessment results

A total of 176 native vascular plant taxa from 66 plant families have the potential to occur within the survey area (DBCA 2017-; DEE 2015b). The majority of taxa were from within the Asteraceae (14 taxa) and Fabaceae (14 taxa) families.

#### 4.1.1 Threatened and Priority flora

A desktop survey for Threatened and Priority flora that may potentially occur within the survey area was undertaken using NatureMap (DBCA 2007-), the Western Australian Herbarium (Western Australian Herbarium 1998-), and the DEE Protected Matters Search Tool (DEE 2015b).

Flora within Western Australia that is considered to be under threat may be classed as either Threatened flora or Priority flora. Where flora has been gazetted as Threatened flora under the WC Act, the taking of such flora without the written consent of the Minister is an offence. The WC Act defines “to take” flora as to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means. DBCA (2016) contains the current list of Threatened flora in Western Australia.

Priority flora are considered to be species which are potentially under threat, but for which there is insufficient information available concerning their distribution and/or populations to make a proper evaluation of their conservation status. DBCA categorises Priority flora according to their conservation priority using five categories, P1 (highest conservation significance) to P5 (lowest conservation significance), to denote the conservation priority status of such species. Priority flora species are regularly reviewed and may have their priority status changed when more information on the species becomes available. Appendix 1 defines levels of Threatened and Priority flora (Western Australian Herbarium 1998-).

At the national level, the EPBC Act lists Threatened species as extinct, extinct in the wild, critically endangered, endangered, vulnerable, or conservation dependent. Appendix 1 defines each of these categories of Threatened species. The EPBC Act prohibits an action that has or will have a significant impact on a listed Threatened species without approval from the Australian Government Minister for the Environment. The current EPBC Act list of Threatened flora may be found on the DEE (2015c) website.

Table 3 shows the Threatened and Priority flora potentially occurring within the survey area. The desktop assessment identified one Threatened flora and three Priority flora species that have been recorded in the regional area. Of these, based on specific habitat requirements, no Threatened flora species and two Priority flora species were considered to have the potential to occur within the survey area:

- *Leucopogon maritimus* (P1)
- *Leucopogon* sp. Yanchep (P3).



Table 3: Threatened and Priority flora potentially occurring within the survey area

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
<i>Eucalyptus argutifolia</i> (Wabbling Hill Mallee)	<b>Threatened – Vulnerable</b>	Threatened	Mallee to 4 m tall with smooth bark. Flowers are white and visible March to April. Habitat for this species occurs within shallow soils over limestone, on slopes or gullies of limestone ridges and outcrops (Western Australian Herbarium 1998-).	<b>Unlikely</b> – Preferred soil type/habitat does not occur within the survey area.
<i>Leucopogon maritimus</i>	Not listed	Priority 1	A low, spreading shrubs to 40 cm tall and 60 cm wide, often multi-stemmed close to the base but single-stemmed at ground level with a fire-sensitive rootstock. <i>Leucopogon maritimus</i> is restricted to near-coastal Quindalup dunes, from a small area of coastline about 40–70 km north of Perth. It occurs in deep, calcareous sands, on the mid to upper slopes of dunes or in shallow sand over limestone, but avoiding the thicker vegetation of the swales. It grows in low heathland communities often dominated by <i>Melaleuca systema</i> , <i>Acanthocarpus preissii</i> , <i>Acacia lasiocarpa</i> and <i>Olearia axillaris</i> , sometimes in close proximity to the common coastal epacrids <i>Leucopogon parviflorus</i> and <i>L. insularis</i> (Hislop 2011).	<b>Possible</b> – Preferred habitat exists within the survey area.
<i>Leucopogon sp. Yanchep</i>	Not listed	Priority 3	An erect shrub, 0.15-1 m tall, to 0.6 m wide. Flowers are white/pink, occurring from April to June or September. This species occurs in light grey-yellow sand, brown loam, limestone, laterite or granite on coastal plain, breakaways, valley slopes or low hills (Western Australian Herbarium 1998-).	<b>Unlikely</b> – Preferred soil type/habitat does not occur within the survey area.
<i>Stylidium maritimum</i>	Not listed	Priority 3	Caespitose perennial herb to 70 cm tall. Leaves tufted, linear to narrowly oblanceolate. Flowers are white or purple and visible September to November. Habitat for this species is sandy soils over limestone on dune slopes and flats, typically growing within coastal heath and shrubland or open Banksia woodland (Western Australian Herbarium 1998-).	<b>Possible</b> – Preferred habitat exists within the survey area.

#### 4.1.2 Threatened and Priority Ecological Communities

A TEC is defined under the EP Act as an ecological community listed, designated or declared under a written law or a law of the Australian Government as Threatened, Endangered or Vulnerable. There are four State categories of TECs (DEC 2010)<sup>2</sup>:

- presumed totally destroyed (PD)
- critically endangered (CR)
- endangered (EN)
- vulnerable (VU).

A description of each of these TEC categories is presented in Appendix 1. TECs are gazetted as such (DBCA 2015a) and some Western Australian TECs are listed as Threatened under the EPBC Act.

Ecological communities identified as Threatened, but not listed as TECs, are classified as Priority Ecological Communities (PECs). These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status. DBCA categorises PECs according to their conservation priority, using five categories, P1 (highest conservation significance) to P5 (lowest conservation significance), to denote the conservation priority status of such ecological communities. Appendix 1 defines PECs (DEC 2010). A list of current PECs can be viewed at the DBCA (2015b) website.

Under the EPBC Act, a person must not undertake an action that has or will have a significant impact on a listed TEC without approval from the Australian Government Minister for the Environment, unless those actions are not prohibited under the EPBC Act. A description of each of these categories of TECs is presented in Appendix 1. The current EPBC Act list of TECs can be located on the DEE website (DEC 2010).

Three TECs and one PEC were identified within 5 km of the survey area (Figure 4);

- *Banksia dominated woodlands of the Swan Coastal Plain IBRA region* (Endangered – EPBC Act<sup>3</sup>; Priority 3 PEC)
- SCP01: *Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain* (Endangered – EPBC Act, Critically Endangered – WC Act)
- FCT 26a: *Melaleuca huegelii - Melaleuca acerosa (currently M. systema) shrublands on limestone ridges* (Endangered – WC Act)
- FCT19b: *Woodlands over sedgeland in Holocene dune swales of the southern Swan Coastal Plain* (Endangered – EPBC Act, Critically Endangered – WC Act).

The closest known occurrences of TECs were SCP01 - *Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain*, which is listed as Critically Endangered under the EPBC Act and WC Act and is located approximately 1 km from the survey area, and *Banksia dominated woodlands of the Swan Coastal Plain Bioregion* (Priority 3; now EPBC Act listed TEC), which is located approximately 3 km from the survey area.

All other identified communities are located greater than 5 km from the survey area.

<sup>2</sup>The Department of Environment and Conservation is still listed as the author of all TEC and PEC databases and have been referred to as such in this document instead of the Department of Biodiversity, Conservation and Attractions.

<sup>3</sup>This community was identified during the database search and is also recognised as the recently listed TEC – *Banksia woodlands of the Swan Coastal Plain* (Endangered – EPBC Act). There has not been sufficient time since the listing of the EPBC Act TEC to update State records to reflect the new community name and conservation status.

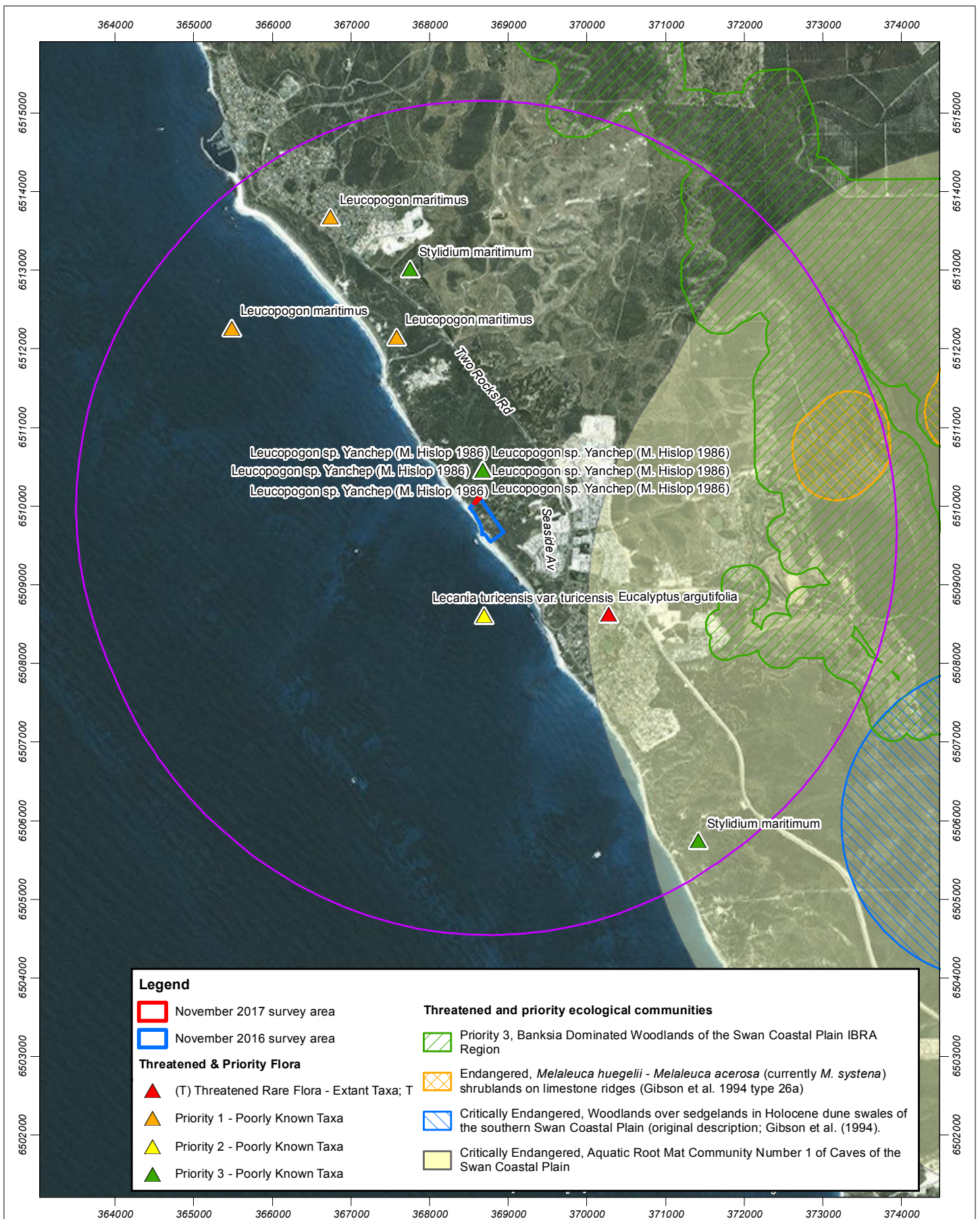


Figure 4: Location of TEC, PEC and Threatened/Priority Flora within 5km of the survey area

Scale 1:65,000 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 21/12/2017  
 Author: JCrute

Source: Aerial image: Nearmap, flown 12/2017. Existing cadastre, Landgate 2017. Flor, TEC/PECs: DBCA 2017.

**strategen**  
 ENVIRONMENTAL

info@strategen.com.au  
 www.strategen.com.au

### Vegetation types

Four native vegetation types (VTs) were previously defined and mapped within the survey area in 2016 (Strategen 2016). The survey area comprised VTs 1, 2, and 3 and cleared areas as summarised in Table 3. All VTs recorded in the 2017 survey area were recorded in the 2016 survey area, except for VT 4 (*Olearia axillaris*, *Scaevola crassifolia*, *Acacia rostellifera*, *Acacia truncata* heath with emergent *Agonis flexuosa* over *Acanthocarpus preissii*, *Spinifex hirsutus*, \**Pelargonium capitatum*, and exotic grasses on sandy soils), comprising only 0.19 ha of the 2016 survey area. Areas containing vegetation in a highly degraded state were not counted as unique native VTs but have been included in Table 3 for area calculation purposes. Total areas occupied within the survey area by each of the identified VTs are set out in Table 4.

Table 3: Vegetation Types

Vegetation Type	Description
1	<i>Olearia axillaris</i> , <i>Atriplex isatidea</i> , <i>Spinifex hirsutus</i> , * <i>Cakile maritima</i> and * <i>Thinopyrum distichum</i> low shrubland on sandy soils.
2	<i>Olearia axillaris</i> , <i>Acacia rostellifera</i> , <i>Rhagodia baccata</i> and <i>Scaevola crassifolia</i> heath over <i>Spinifex longifolius</i> , <i>Acanthocarpus preissii</i> , <i>Cassutha flava</i> , * <i>Pelargonium capitatum</i> and exotic grasses including on sandy soils.
3	<i>Scaevola crassifolia</i> , <i>Olearia axillaris</i> , <i>Acacia rostellifera</i> , and <i>Spyridium globulosum</i> heath on dune crests and <i>Lepidosperma gladiatum</i> closed heath in dune swales over <i>Acanthocarpus preissii</i> , * <i>Pelargonium capitatum</i> * <i>Arctotis stoechadifolia</i> and exotic grasses on sandy soils.
C	Cleared areas.

### **Vegetation type coverage**

The total area mapped within the survey area was 14.46 ha which includes highly degraded and fully cleared areas (Table 4). The dominant native VT within the survey area was VT 3 which can be described as a *Scaevola crassifolia*, *Olearia axillaris*, *Acacia rostellifera*, and *Spyridium globulosum* heath on dune crests and *Lepidosperma gladiatum* closed heath in dune swales over *Acanthocarpus preissii*, \**Pelargonium capitatum* \**Arctotis stoechadifolia* and exotic grasses on sandy soils.

Table 4: Area (ha) covered by each VT within the survey area

VT	Area (ha)	Percentage of the Survey area
1	2.13	14.73
2	3.81	26.35
3	8.33	57.61
Cleared	0.19	1.31
<b>TOTAL</b>	<b>14.46</b>	<b>100</b>

### **Vegetation condition**

The survey area shows signs of having been degraded for a long period of time due to the widespread extent of weeds and human disturbance (e.g. trampling of dune vegetation and use of vehicle tracks for beach access). Other disturbances included the presence of rabbits, with rabbit droppings being found in the survey area. As such, vegetation condition within the survey ranged from Completely Degraded to Very Good and generally aligned with the VT boundaries (Keighery 1994; Figure 4; Table 5). Much of VT 2 is dominated by the weed species \**Pelargonium capitatum* which may be a result of degradation caused by vehicle tracks which run through much of this vegetation type.

Table 6 gives a numerical breakdown of the area occupied by each vegetation condition rating within the survey area.

### 4.1.3 Wetlands

No mapped geomorphic wetlands occur within the survey area (Landgate 2016). The closest such wetland is located approximately 2 km east of the survey area (Wetland UFI: 8010; Conservation Category Wetland).

### 4.1.4 Bush Forever

The survey area occurs within the mapped extent of Bush Forever Site 397: *Coastal Strip from Wilbinga to Mindarie*. Bush Forever Site 397 corresponds to the existing coastal foreshore reserve between Mindarie and Wilbinga and is therefore identified in Bush Forever as a 'Site with some Existing Protection'.

Bush Forever Site 397 comprises part of the Yanchep foreshore reserve. The foreshore reserve boundary was determined in 1996 as part of MRS Amendment 975/33 and is based on the Coastal Planning Strategy prepared for the Yanchep-Two Rocks area (Alan Tingay & Associates, 1993).

## 4.2 Field survey results

### 4.2.1 Native flora

A total of 38 native vascular plant taxa from 34 plant genera and 19 plant families were recorded within the survey area. The majority of taxa were recorded within the Poaceae (9 taxa), Myrtaceae (8 taxa), and Chenopodiaceae (6 taxa) families (Appendix 4). The relatively low number of plant genera recorded reflects the disturbed nature of the survey area.

### 4.2.2 Threatened and Priority flora

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by DBCA (2016) or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area at the time of assessment. The survey was conducted during the prime flowering time for these conservation significant species (spring), therefore during the optimum time for correct identification.

### 4.2.3 Introduced (exotic) taxa

A total of 18 introduced (exotic) taxa were recorded within the survey area (Appendix 4).

\* None of these species are Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2017).

Weed density within the survey area was mapped and is presented in Figure 5.



**Figure 5: High level weed mapping**

\* 2016 area inferred

Scale 1:3,700 at A3  
 0 35 70 105 Metres  
 Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 21/12/2017  
 Author: JCrute  
 Source: Aerial image: Neamap, flown 12/2017.  
 Path: Q:\Consult\2016\ADS\ADS1658501\_GIS\_documents\ArcMap\_documents\ADS16585\_G007\_RevA.mxd

**Legend**

- November 2017 survey area
- November 2016 survey area

**Weed mapping density**

- High
- Medium
- Low

Weed density	Cover
Low	<5%
Medium	6-75%
High	76-100%

#### 4.2.4 Vegetation types

Five native vegetation types (VTs) were defined and mapped within the survey area (Figure 6) and are summarised in Table 4. Areas containing vegetation in parkland cleared or highly degraded state have not been counted as unique native VTs but have been included in Table 4 for area calculation purposes. Total areas occupied within the survey area by each of the identified VTs are set out in Table 5.

Table 4: Vegetation Types

Vegetation Type	Description
1	<i>Olearia axillaris</i> , <i>Atriplex isatidea</i> , <i>Spinifex hirsutus</i> , * <i>Cakile maritima</i> and * <i>Thinopyrum distichum</i> low shrubland on sandy soils.
2	<i>Olearia axillaris</i> , <i>Acacia rostellifera</i> , <i>Rhagodia baccata</i> and <i>Scaevola crassifolia</i> heath over <i>Spinifex longifolius</i> , <i>Acanthocarpus preissii</i> , <i>Cassytha flava</i> , * <i>Pelargonium capitatum</i> and exotic grasses including on sandy soils.
3	<i>Scaevola crassifolia</i> , <i>Olearia axillaris</i> , <i>Acacia rostellifera</i> , and <i>Spyridium globulosum</i> heath on dune crests and <i>Lepidosperma gladiatum</i> closed heath in dune swales over <i>Acanthocarpus preissii</i> , * <i>Pelargonium capitatum</i> * <i>Arctotis stoechadifolia</i> and exotic grasses on sandy soils.
4	<i>Olearia axillaris</i> , <i>Scaevola crassifolia</i> , <i>Acacia rostellifera</i> and <i>Acacia truncata</i> heath with emergent <i>Agonis flexuosa</i> over <i>Acanthocarpus preissii</i> , <i>Spinifex hirsutus</i> , * <i>Pelargonium capitatum</i> , and exotic grasses on sandy soils.
5	<i>Allocasuarina humilis</i> and <i>Spyridium globulosum</i> mid shrubland over <i>Rhagodia baccata</i> , <i>Olearia axillaris</i> and <i>Scaevola crassifolia</i> heath on dune crests over <i>Lepidosperma gladiatum</i> closed heath in dune swales over <i>Acanthocarpus preissii</i> , <i>Cassytha flava</i> and * <i>Pelargonium capitatum</i> on sandy soils.
Planted	Planted palms (* <i>Phoenix</i> sp.) and Japanese Pepper (* <i>Schinus terebinthifolius</i> ).
C	Cleared areas.

#### Vegetation type coverage

The total area mapped within the survey area was 10.22 ha which includes highly degraded and fully cleared areas (Table 5). The dominant native VT within the survey area was VT 3 which can be broadly described as a *Scaevola crassifolia*, *Olearia axillaris*, *Acacia rostellifera*, and *Spyridium globulosum* heath on dune crests and *Lepidosperma gladiatum* closed heath in dune swales over *Acanthocarpus preissii*, \**Pelargonium capitatum* \**Arctotis stoechadifolia* and exotic grasses on sandy soils.

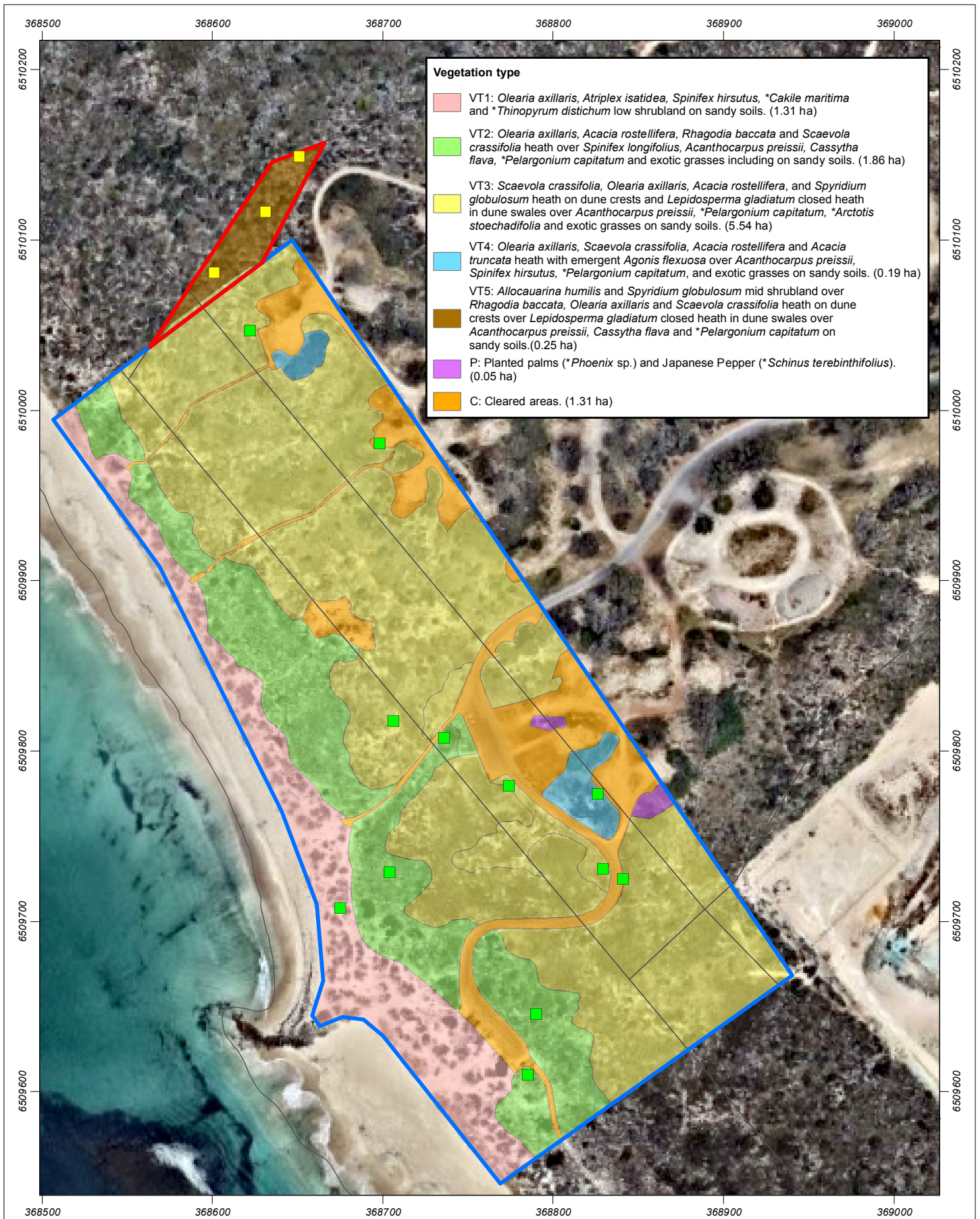
Table 5: Area (ha) covered by each VT within the survey area

VT	Area (ha)	Percentage of the Survey area
1	1.31	12.46
2	1.86	17.70
3	5.54	52.71
4	0.19	1.86
5	0.25	1.81
Planted	0.05	0.48
Cleared	1.31	12.46
<b>TOTAL</b>	<b>10.51</b>	<b>100</b>

#### Vegetation condition

The survey area shows signs of having been degraded for a long period of time due to the widespread extent of weeds and human disturbance (e.g. trampling dune vegetation and vehicle tracks for access to the beach). As such, vegetation condition within the survey ranged from Completely Degraded to Good and generally aligned with the VT boundaries (Keighery 1994; Figure 7; Table 6).

Table 7 gives a numerical breakdown of the area occupied by each vegetation condition rating within the survey area.



**Figure 6: Vegetation types**

Scale 1:3,000 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 21/12/2017  
 Author: JCrute

Source: Aerial image: Nearmap, flown 12/2017. Existing cadastre, Landgate 2017.

**Legend**

**Quadrat locations**

- November 2016 survey
- November 2017 survey
- November 2016 survey area
- November 2017 survey area
- Existing cadastre



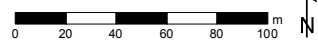
info@strategen.com.au  
 www.strategen.com.au





**Figure 7: Vegetation condition**

Scale 1:3,000 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 21/12/2017  
 Author: JCrute

Source: Aerial image: Nearmap, flown 12/2017. Existing cadastral, Landgate 2017.

**Legend**

**Quadrat locations**

- November 2016 survey
- November 2017 survey
- November 2017 survey area
- November 2016 survey area
- Existing cadastre

**Vegetation condition**

- Very Good (5.53 ha)
- Good to Very Good (2.05 ha)
- Good (1.56 ha)
- Completely Degraded (1.36 ha)



info@strategen.com.au  
 www.strategen.com.au

Table 6: Vegetation condition scale (Keighery 1994)

Condition rating	Description
Pristine (1)	Pristine or nearly so, no obvious sign of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback, grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 7: Area (ha) covered by each vegetation condition category within the survey area

Vegetation Condition	Area (ha)	Percentage of the Survey area
Very Good	5.53	51.62
Good to Very Good	2.05	19.51
Good	1.56	14.84
Completely degraded	1.36	12.94
<b>Total</b>	<b>10.51</b>	<b>100</b>

#### 4.2.5 Threatened and Priority Ecological Communities

Three TECs and one PEC were identified as having the potential to occur within 5 km of the survey area by the desktop survey.

The vegetation within the survey area did not resemble a known TEC, however the vegetation within VT 2 and VT 3 may resemble two Priority 3 PECs; FCTs 29a (Coastal Shrublands on shallow sands) and 29b (Acacia Shrublands on taller dunes), comprising 1.86 ha and 5.54 ha respectively. These FCTs were recorded in the previous vegetation surveys within the region (ATA 2007).

FCT 29 is largely restricted to the Quindalup System and contains two distinct subgroups. FCT 29a comprises mostly heaths on shallow sands over limestone close to the coast and occurs between Seabird and Garden Island. FCT 29a does not have a single dominant species but important species include *Spyridium globulosum*, *Rhagodia baccata* and *Olearia axillaris*. FCT 29b is dominated by Acacia Shrublands or mixed heaths of the larger dunes and ranges from Seabird to south of Mandurah. There is no consistent dominant species in FCT 29b, however species such as *Acacia rostellifera*, *Acacia lasiocarpa* and *Melaleuca systema* are important.

FCT 29a is inferred to potentially occur within VT2 (1.86 ha) based on the dominant species recorded during the survey (e.g. *Rhagodia baccata* and *Olearia axillaris*) while VT3 (5.54 ha) may represent FCT 29b as it comprises *Acacia rostellifera* and *Melaleuca systema*. These FCTs are also restricted to the Quindalup complex within which the survey area occurs (GoWA 2000). Therefore, it is considered likely for FCT 29a and FCT 29b to occur within the survey area based on previous survey results (ATA 2007), the known vegetation complex within the survey area and dominant taxa recorded.

## 5. Discussion

Vegetation within the survey area comprises five VTs and cleared areas. Transitions between VTs were generally discontinuous, though occasionally abrupt with margins representing admixtures of more than one VT. This discontinuity is primarily due to changes in soil profile and topography, and presence of cleared areas. Vegetation condition generally aligned with the VT boundaries and at a broad scale, the majority of the survey area was observed to be in various states of degradation due to coastal erosion and historical clearing within the survey area. The remnant vegetation shows signs of degradation and structural alteration particularly where the parking and beach access tracks are located.

The flora and vegetation assessment conducted within the survey area was undertaken during November 2016 and November 2017, during the prime flowering time for majority of species within the area with field reconnaissance focussing on traversing the entire survey area to delineate broad vegetation types. This is consistent with the requirements of a detailed flora and vegetation survey as specified in the technical guidance for flora and vegetation assessment in Western Australia (EPA 2016).

The number of species recorded within the survey area totalled 38 native vascular plant taxa from 34 plant genera and 19 plant families and 18 introduced taxa. No Declared Plant species pursuant to section 22 of the BAM Act were recorded within the survey area (DAFWA 2017).

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by DBCA (2015) or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area. Given that the survey was conducted during the prime flowering time for majority of the conservation significant species potentially occurring within the survey area, it is unlikely that occurrences of conservation significant species are present within the survey area.

Vegetation condition within the survey area ranged from Completely Degraded to Very Good (Keighery 1994), with majority of the survey area (51.62%) mapped to be in 'Very Good' condition. It is worth noting that a large portion of vegetation within the Survey Area has been historically cleared where the Club Capricorn infrastructure occurred previously.

The vegetation within the survey area did not resemble a known TEC, however, the survey area contains two Priority 3 PECs (FCT 29a – *Coastal Shrublands on shallow sands*, FCT 29b – *Acacia Shrublands on taller dunes*) based on dominant taxa recorded, the known vegetation complex within the survey area and previous survey results (ATA 2007). Whilst the PECs may occur in the survey area, these FCTs are very well represented within surrounding Bush Forever Site 397: *Coastal Strip from Wilbinga to Mindarie* which is under existing protection. Furthermore, these VTs will be retained within the larger foreshore reserve, subject to protection and management measures detailed in the Foreshore Management Plan.

## 6. Conclusion

The detailed flora and vegetation survey (conducted 25 November 2016 and 27 November 2017) was successful in collecting data to define and assess the presence, extent and significance of vegetation types within the survey area.

Approximately 10.51 ha of vegetation ranging from Completely Degraded to Very Good condition was recorded within the survey area. The majority of the survey area is considered to be in 'Very Good' condition (51.62%).

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by DBCA (2017) or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area. Given that the survey was conducted during the prime flowering time for majority of the conservation significant species potentially occurring within the survey area, it is highly unlikely that occurrences of conservation significant species are present within the survey area.

The vegetation within the survey area did not resemble a known TEC; however the vegetation within VT 2 and VT 3 may resemble two Priority 3 PECs; FCT 29a and FCT29b, comprising 1.86 ha and 5.54 ha respectively. These FCTs are well represented within surrounding Bush Forever Site 397: *Coastal Strip from Wilbinga to Mindarie* which is under existing protection.

This flora and vegetation assessment will support the Foreshore Management Plan for the proposed foreshore development which aligns with the *CoW Local Biodiversity Strategy* (2011) and the *CoW Coastal Management Plan* (CoW 2012) for the Capricorn coastal region.

## 7. References

- ATA Environmental (ATA) 2007, *St Andrews District Structure Plan Environmental Assessment*, prepared for Yancheop Sun City, Western Australia.
- Beard JS 1981, *Swan, 1:1000000 vegetation series: explanatory notes to sheet 7: the vegetation of the Swan area*, University of Western Australia Press, Nedlands, Western Australia.
- Beard JS 1990, *Plant Life of Western Australia*. Kangaroo Press, Kenthurst, New South Wales.
- Brown A, Thomson-Dans C & Marchant N 1998, *Western Australia's Threatened Flora*, Department of Conservation and Land Management, Perth.
- Bureau of Meteorology (BOM) 2017, *Climatic Statistics for Australian Locations: Monthly climate statistics for Gingin Aero*, [Online], Australian Government, Available from: [http://www.bom.gov.au/climate/averages/tables/cw\\_009178.shtml](http://www.bom.gov.au/climate/averages/tables/cw_009178.shtml) [20 Nov 2016]. Churchward HM &
- McArthur WM 1980, 'Landforms and Soils of the Darling System', in *Atlas of Natural Resources, Darling System, Western Australia*, eds Department of Conservation and Environment, Perth, pp. 25-33.
- City of Wanneroo (CoW) 2012, *Capricorn Coastal Village Agreed Structure Plan No. 44*, City of Wanneroo, September 2012.
- City of Wanneroo (CoW) 2011, *City of Wanneroo Local Biodiversity Strategy 2011-2016*. City of Wanneroo, September 2011.
- Department of Agriculture and Food (DAFWA) 2017, *Declared Pests (s22) list*, [Online], Government of Western Australia, Available from: <http://www.biosecurity.wa.gov.au/organisms/export/PER-DP> [20 Nov 2017].
- Department of Biodiversity, Conservation and Attractions (DBCA) 2017-, *Naturemap, Mapping Western Australia's Biodiversity*, [Online], Government of Western Australia, Available from: <http://naturemap.dec.wa.gov.au/default.aspx> [20 Nov 2017].
- Department of Biodiversity, Conservation and Attractions (DBCA) 2015, *Wildlife Conservation (Threatened Flora) Notice 2015*, [Online], Government of Western Australia, Available from: [https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/2015\\_flora\\_notice.pdf](https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/2015_flora_notice.pdf) [20 Nov 2017].
- Department of the Environment and Energy (DEE) 2015a, *Interim Biogeographic Regionalisation for Australia, Version 7*, [Online], Australian Government, Available from: <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra> [20 Nov 2017].
- Department of the Environment and Energy (DEE) 2015b, *EPBC Act Protected Matters Search Tool*, [Online], Australian Government. Available from: <http://www.environment.gov.au/epbc/pmst/index.html> [20 Nov 2017].
- Department of the Environment and Energy (DEE) 2015c, *EPBC Act List of Threatened Flora*, [Online], Australian Government, Available from: <http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora> [20 Nov 2017].
- Department of Environment and Conservation (DEC) 2010, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, [Online], Government of Western Australia, Available from: <http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/tecs/tec-definitions-dec2010.pdf> [20 Nov 2017].
- Department of Environment and Conservation (DEC) 2011, *Techniques for mapping weed distribution and cover in bushland and wetlands SOP No.:* DEC Nature Conservation Science Biodiversity. Stand Operating procedure – SOP No: 22.1.

- Environmental Protection Authority (EPA) 2016, *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. Government of Western Australia, Perth.
- Environmental Protection Authority (EPA) 2004, *Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986) No. 51 – Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia*. Government of Western Australia, Perth.
- Executive Steering Committee for Australian Vegetation Information (ESCAVI) 2003, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0*, Department of the Environment and Heritage, Australian Capital Territory.
- Gibson N, Keighery B, Keighery G, Burbidge A & Lyons M 1994, *A Floristic survey of the southern Swan Coastal Plain*, report prepared for the Australian Heritage Commission, 1994.
- Government of Western Australia 2016, *2016 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report), Current as of 20 Nov 2016*, Department of Parks and Wildlife, Perth.
- Government of Western Australia (GoWA) 2000, *Bush Forever Vol. 2: Directory of Bush Forever Sites*, Government of Western Australia, Perth.
- Hedde EM, Loneragan OW & Havel JJ 1980, *Darling System, Vegetation Complexes*, Forest Department, Perth.
- Keighery B 1994, *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*, Wildflower Society, Floreat.
- Landgate 2016, Shared Land Information Platform [Online], Government of Western Australia, Available from: <https://www2.landgate.wa.gov.au/bmvf/app/waatlas/> [20 Nov 2016].
- Mitchell D, Williams K & Desmond A 2002, 'Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion)', in *A biodiversity audit of Western Australia's 53 Biogeographical Subregions in 2002*, eds Department of Conservation and Land Management, Perth, pp. 606-623.
- Semeniuk V 1990, 'The geomorphology and soils of Yoongarillup Plain, in the Mandurah-Bunbury coastal zone, southwestern Australia: a critical appraisal', *Journal of the Royal Society of Western Australia*, vol. 73, pp. 1-7.
- Thackway & Cresswell 1995, *An Interim Biogeographic Regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperative Program Version 4*, Australian Nature Conservation Agency, Canberra.
- Western Australian Herbarium 1998-, *FloraBase – the Western Australian Flora*, [Online], Government of Western Australia, Available from: <http://florabase.dpaw.wa.gov.au/> [20 Nov 2017].

**Appendix 1**  
**Conservation significant flora and**  
**ecological community definitions**



### ***Conservation Codes for Western Australia (Western Australian Herbarium 1998-)***

Under the *Wildlife Conservation Act* (1950), the Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Schedules 1 and 2 deal with those that are threatened and those that are presumed extinct, respectively.

#### **T: Threatened Flora (Declared Rare Flora – Extant)**

Species which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List Criteria:

- CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN: Endangered – considered to be facing a very high risk of extinction in the wild
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild
- X: Presumed Extinct Flora (Declared Rare Flora – Extinct).

Species that have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*).

#### ***Priority Flora***

Species that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List 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 list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

#### **Priority One: Poorly-known Species**

Species that are known from one or a few collections or sight records (generally less than 5), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

#### **Priority Two: Poorly-known Species**

Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

### **Priority Three: Poorly-known Species**

Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities 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 localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

### **Priority Four: Rare, Near Threatened and other species in need of monitoring**

1. Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
2. Near Threatened: Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Species that have been removed from the list of threatened species during the past 5 years for reasons other than taxonomy.

### **Priority 5: Conservation Dependent Species**

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within 5 years.

## ***Definition of Threatened Ecological Communities (DEC 2010)***

### **Presumed Totally Destroyed (PD)**

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies:

- records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or
- all occurrences recorded within the last 50 years have since been destroyed.

### **Critically Endangered (CR)**

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria:

1. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply:
  - (a) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years)
  - (b) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
2. Current distribution is limited, and one or more of the following apply:
  - (a) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years)
  - (b) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
  - (c) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.
3. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

### **Endangered (EN)**

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria:

1. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply:
  - (a) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years)
  - (b) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

2. Current distribution is limited, and one or more of the following apply"
  - (a) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years)
  - (b) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes
  - (c) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
3. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

**Vulnerable (VU)**

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria:

1. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
2. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
3. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

## *Definition of Priority Ecological Communities (DEC 2010)*

### **Priority One: Poorly-known ecological communities**

Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

### **Priority Two: Poorly-known ecological communities**

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

### **Priority Three: Poorly known ecological communities**

- 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
- communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat
- communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

### **Priority Four**

Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. These include:

1. 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.
2. 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.
3. Ecological communities that have been removed from the list of threatened communities during the past five years.

**Appendix 2**  
**Desktop assessment results (DBCA**  
**2017-, DEE 2015b)**



# 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: 24/11/16 17:20:10

[Summary](#)

[Details](#)

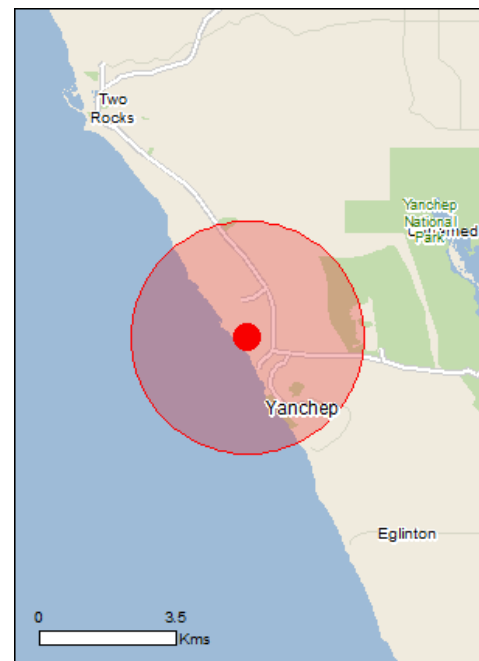
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



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

[Coordinates](#)

Buffer: 3.0Km



# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	1
<a href="#">Listed Threatened Species:</a>	41
<a href="#">Listed Migratory Species:</a>	39

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	65
<a href="#">Whales and Other Cetaceans:</a>	13
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	33
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None



# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities [\[ Resource Information \]](#)

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

Name	Status	Type of Presence
<a href="#">Banksia Woodlands of the Swan Coastal Plain</a>	Endangered	Community likely to occur within area

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

Name	Status	Type of Presence
<b>Birds</b>		

<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calyptorhynchus latirostris</a> Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
<a href="#">Limosa lapponica baueri</a> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
<a href="#">Limosa lapponica menzbieri</a> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pterodroma mollis</a> Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
<b>Plants</b>		
<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
<a href="#">Eucalyptus argutifolia</a> Yanchep Mallee, Wabbling Hill Mallee [24263]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Lepidosperma rostratum</a> Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area

#### Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

#### Sharks

<a href="#">Carcharias taurus (west coast population)</a> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	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
<b>Migratory Marine Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Flesh-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
<a href="#">Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land

[\[ Resource Information \]](#)

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

#### Name

Commonwealth Land -

### Listed Marine Species

[\[ Resource Information \]](#)

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Anous tenuirostris melanops</a> Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Catharacta skua</a> Great Skua [59472]		Species or species habitat may occur within area
<a href="#">Diomedea amsterdamensis</a> Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Larus pacificus</a> Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area

Name	Threatened	Type of Presence
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pterodroma mollis</a> Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus assimilis</a> Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Fish</b>		
<a href="#">Acentronura australe</a> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<a href="#">Campichthys galei</a> Gale's Pipefish [66191]		Species or species habitat may occur within area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area
<a href="#">Hippocampus angustus</a> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Hippocampus subelongatus</a> West Australian Seahorse [66722]		Species or species habitat may occur within area
<a href="#">Lissocampus fatiloquus</a> Prophet's Pipefish [66250]		Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Mitotichthys meraculus</a> Western Crested Pipefish [66259]		Species or species habitat may occur within area
<a href="#">Nannocampus subosseus</a> Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
<a href="#">Phycodurus eques</a> Leafy Seadragon [66267]		Species or species habitat may occur within area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Pugnaso curtirostris</a> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Stigmatopora olivacea</a> a pipefish [74966]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area

### Mammals

<a href="#">Arctocephalus forsteri</a> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

### Reptiles

<a href="#">Aipysurus pooleorum</a> Shark Bay Seasnake [66061]		Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Disteira kingii</a> Spectacled Seasnake [1123]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Pelamis platurus</a> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

### Whales and other Cetaceans

Name	Status	Type of Presence
<a href="#">[ Resource Information ]</a>		
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within

Name	Status	Type of Presence area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may 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
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species

Name	Status	Type of Presence
Carduelis carduelis European Goldfinch [403]		habitat likely to occur within area  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
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
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
<b>Plants</b>		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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 sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large- leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Olea europaea Olive, Common Olive [9160]		Species or species habitat likely to occur within area  Species or species habitat may 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
<b>Reptiles</b>		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		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

-31.54362 115.62209

# 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

Created By Guest user on 24/11/2016

**Kingdom** Plantae  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Circle'  
**Centre** 115° 37' 06" E, 31° 32' 28" S  
**Buffer** 5km  
**Group By** Family

Family	Species	Records
Acrotylaceae	1	1
Aizoaceae	1	1
Amaranthaceae	1	1
Apiaceae	3	3
Araliaceae	3	3
Areschougaceae	1	1
Asparagaceae	5	8
Asphodelaceae	1	2
Asteraceae	14	17
Bangiaceae	1	1
Brassicaceae	3	4
Campanulaceae	4	4
Caprifoliaceae	1	1
Caryophyllaceae	1	1
Casuarinaceae	1	1
Caulerpaceae	3	4
Ceramiaceae	2	2
Chenopodiaceae	2	3
Cladophoraceae	1	1
Convolvulaceae	1	1
Crassulaceae	1	1
Cyperaceae	3	8
Dasyaceae	1	1
Dilleniaceae	4	5
Droseraceae	1	1
Ericaceae	10	27
Euphorbiaceae	2	2
Fabaceae	14	15
Gentianaceae	1	1
Geraniaceae	1	1
Goodeniaceae	6	6
Haemodoraceae	2	3
Hemerocallidaceae	2	2
Iridaceae	3	4
Lamiaceae	3	5
Lauraceae	2	3
Loranthaceae	1	1
Malvaceae	4	4
Myrtaceae	7	9
Olacaceae	1	1
Onagraceae	1	1
Orchidaceae	5	6
Orobanchaceae	2	2
Oxalidaceae	1	1
Papaveraceae	1	1
Phyllanthaceae	1	1
Plantaginaceae	2	2
Plocamiaceae	1	1
Poaceae	5	5
Polygalaceae	3	3
Portulacaceae	1	1
Proteaceae	6	8
Ranunculaceae	2	4
Restionaceae	3	3
Rhamnaceae	4	5
Rhodomelaceae	3	5
Rubiaceae	2	2
Santalaceae	2	2
Scrophulariaceae	2	3
Solanaceae	3	5
Stylidiaceae	2	5
Tamaricaceae	1	1
Thymelaeaceae	1	2
Ulvaceae	1	1
Urticaceae	1	1
Violaceae	1	1
<b>TOTAL</b>	<b>176</b>	<b>232</b>

Name ID Species Name

Naturalised

Conservation Code

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

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Acrotylaceae</b>				
1.	26665 <i>Claviconium ovatum</i>			
<b>Aizoaceae</b>				
2.	2798 <i>Carpobrotus virescens</i> (Coastal Pigface, Kolboko, Bain)			
<b>Amaranthaceae</b>				
3.	40841 <i>Ptilotus stirlingii</i> subsp. <i>stirlingii</i>			
<b>Apiaceae</b>				
4.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
5.	6219 <i>Eryngium pinnatifidum</i> (Blue Devils)			
6.	6221 <i>Foeniculum vulgare</i> (Fennel)	Y		
<b>Araliaceae</b>				
7.	6229 <i>Hydrocotyle diantha</i>			
8.	19041 <i>Trachymene coerulea</i> subsp. <i>coerulea</i>			
9.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
<b>Areschougiaceae</b>				
10.	26534 <i>Callophycus dorsifer</i>			
<b>Asparagaceae</b>				
11.	1208 <i>Acanthocarpus preissii</i>			
12.	1231 <i>Lomandra maritima</i>			
13.	1243 <i>Lomandra sericea</i> (Silky Mat Rush)			
14.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
15.	1343 <i>Thysanotus patersonii</i>			
<b>Asphodelaceae</b>				
16.	1368 <i>Trachyandra divaricata</i>	Y		
<b>Asteraceae</b>				
17.	7838 <i>Arctotheca calendula</i> (Cape Weed, African Marigold)	Y		
18.	7840 <i>Arctotis stoechadifolia</i> (White Arctotis, Silver Arctotis)	Y		
19.	7947 <i>Cotula turbinata</i> (Funnel Weed)	Y		
20.	16311 <i>Gazania linearis</i>	Y		
21.	12741 <i>Hyalosperma cotula</i>			
22.	17852 <i>Leptorhynchus scaber</i> (Lanky Buttons)			
23.	16449 <i>Leucophyta brownii</i>			
24.	8105 <i>Millotia myosotidifolia</i>			
25.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
26.	42281 <i>Pithocarpa cordata</i>			
27.	13300 <i>Rhodanthe citrina</i>			
28.	45146 <i>Roebuckiella oncocarpa</i>			
29.	25884 <i>Senecio pinnatifolius</i> var. <i>latilobus</i>			
30.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
<b>Bangiaceae</b>				
31.	27184 <i>Porphyra lucasii</i>			
<b>Brassicaceae</b>				
32.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
33.	3011 <i>Diploaxis muralis</i> (Wall Rocket)	Y		
34.	3041 <i>Lepidium pseudoruderale</i>			
<b>Campanulaceae</b>				
35.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
36.	7402 <i>Lobelia gibbosa</i> (Tall Lobelia)			
37.	7403 <i>Lobelia heterophylla</i> (Wing-seeded Lobelia)			
38.	7405 <i>Lobelia rarifolia</i>			
<b>Caprifoliaceae</b>				
39.	7368 <i>Scabiosa atropurpurea</i> (Purple Pincushion)	Y		
<b>Caryophyllaceae</b>				
40.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
<b>Casuarinaceae</b>				
41.	13908 <i>Allocasuarina lehmanniana</i> subsp. <i>lehmanniana</i>			
<b>Caulerpaceae</b>				
42.	44539 <i>Caulerpa cylindracea</i>			
43.	27382 <i>Caulerpa longifolia</i> forma <i>crispata</i>			
44.	26571 <i>Caulerpa papillosa</i>			
<b>Ceramiaceae</b>				
45.	26511 <i>Bornetia binderiana</i>			



Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
46.	26599 <i>Ceramium puberulum</i>			
<b>Chenopodiaceae</b>				
47.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
48.	11341 <i>Rhagodia baccata</i> subsp. <i>baccata</i>			
<b>Cladophoraceae</b>				
49.	26607 <i>Chaetomorpha aerea</i>			
<b>Convolvulaceae</b>				
50.	11021 <i>Cuscuta planiflora</i>	Y		
<b>Crassulaceae</b>				
51.	3140 <i>Crassula glomerata</i>	Y		
<b>Cyperaceae</b>				
52.	744 <i>Baumea laxa</i>			
53.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
54.	42742 <i>Lepidosperma calcicola</i>			
<b>Dasyaceae</b>				
55.	26738 <i>Dasya elongata</i>			
<b>Dilleniaceae</b>				
56.	5112 <i>Hibbertia aurea</i>			
57.	5134 <i>Hibbertia huegelii</i>			
58.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
59.	<i>Hibbertia</i> sp.			
<b>Droseraceae</b>				
60.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
<b>Ericaceae</b>				
61.	6295 <i>Acrotriche cordata</i> (Coast Ground Berry)			
62.	6349 <i>Conostephium preissii</i>			
63.	6405 <i>Leucopogon insularis</i>			
64.	40801 <i>Leucopogon maritimus</i>		P1	
65.	6427 <i>Leucopogon parviflorus</i> (Coast Beard-heath)			
66.	6434 <i>Leucopogon polymorphus</i>			
67.	6436 <i>Leucopogon propinquus</i>			
68.	6440 <i>Leucopogon racemulosus</i>			
69.	19460 <i>Leucopogon</i> sp. <i>Yanchep</i> (M. Hislop 1986)		P3	
70.	34736 <i>Lysinema pentapetalum</i>			
<b>Euphorbiaceae</b>				
71.	4636 <i>Euphorbia paralias</i> (Sea Spurge)	Y		
72.	4648 <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Y		
<b>Fabaceae</b>				
73.	3262 <i>Acacia cochlearis</i> (Rigid Wattle)			
74.	11611 <i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>			
75.	3525 <i>Acacia rostellifera</i> (Summer-scented Wattle)			
76.	30032 <i>Acacia saligna</i> subsp. <i>saligna</i>			
77.	20482 <i>Gastrolobium nervosum</i>			
78.	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
79.	3968 <i>Hovea trisperma</i> (Common Hovea)			
80.	14783 <i>Jacksonia calcicola</i>			
81.	4012 <i>Jacksonia furcellata</i> (Grey Stinkwood)			
82.	4042 <i>Kennedia nigricans</i> (Black Kennedia)			
83.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
84.	4256 <i>Templetonia retusa</i> (Cockies Tongues)			
85.	4292 <i>Trifolium campestre</i> (Hop Clover)	Y		
86.	4309 <i>Trifolium scabrum</i> (Rough Clover)	Y		
<b>Gentianaceae</b>				
87.	17800 <i>Centaurium pulchellum</i>	Y		
<b>Geraniaceae</b>				
88.	4339 <i>Geranium molle</i> (Dove's Foot Cranesbill)	Y		
<b>Goodeniaceae</b>				
89.	7606 <i>Scaevola crassifolia</i> (Thick-leaved Fan-flower)			
90.	7614 <i>Scaevola globulifera</i>			
91.	7626 <i>Scaevola nitida</i> (Shining Fanflower)			
92.	13181 <i>Scaevola repens</i> var. <i>angustifolia</i>			
93.	7647 <i>Scaevola thesioides</i>			
94.	13152 <i>Scaevola thesioides</i> subsp. <i>thesioides</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Haemodoraceae</b>				
95.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
96.	12027 <i>Conostylis candicans</i> subsp. <i>calvicola</i>			
<b>Hemerocallidaceae</b>				
97.	1260 <i>Stypandra glauca</i> ( <i>Blind Grass</i> )			
98.	1361 <i>Tricoryne elatior</i> ( <i>Yellow Autumn Lily</i> )			
<b>Iridaceae</b>				
99.	19179 <i>Moraea flaccida</i> ( <i>One-leaf Cape Tulip</i> )	Y		
100.	1552 <i>Patersonia rudis</i> ( <i>Hairy Flag</i> )			
101.	11544 <i>Romulea rosea</i> var. <i>australis</i> ( <i>Guildford Grass</i> )	Y		
<b>Lamiaceae</b>				
102.	16933 <i>Hemiandra glabra</i>			
103.	38320 <i>Hemiandra</i> sp. <i>Jurien</i> (B.J. Conn & M.E. Tozer BJC 3885)			
104.	6939 <i>Westringia dampieri</i>			
<b>Lauraceae</b>				
105.	2956 <i>Cassytha pomiformis</i> ( <i>Dodder Laurel</i> )			
106.	2957 <i>Cassytha racemosa</i> ( <i>Dodder Laurel</i> )			
<b>Loranthaceae</b>				
107.	2401 <i>Nuytsia floribunda</i> ( <i>Christmas Tree, Mudja</i> )			
<b>Malvaceae</b>				
108.	4906 <i>Alyogyne huegelii</i> ( <i>Lilac Hibiscus</i> )			
109.	5011 <i>Guichenotia ledifolia</i>			
110.	5077 <i>Thomasia cognata</i>			
111.	5105 <i>Thomasia triphylla</i>			
<b>Myrtaceae</b>				
112.	13091 <i>Eucalyptus argutifolia</i> ( <i>Wabling Hill Mallee</i> )		T	
113.	5649 <i>Eucalyptus foecunda</i> ( <i>Narrow-leaved Red Mallee</i> )			
114.	13541 <i>Eucalyptus petrensis</i>			
115.	5887 <i>Melaleuca cardiophylla</i> ( <i>Tangling Melaleuca</i> )			
116.	5922 <i>Melaleuca lanceolata</i> ( <i>Rottnest Teatree, Moonah</i> )			
117.	18598 <i>Melaleuca systema</i>			
118.	6101 <i>Verticordia nitens</i> ( <i>Morrison Featherflower, Kodjeningara</i> )			
<b>Olacaceae</b>				
119.	2365 <i>Olax benthamiana</i>			
<b>Onagraceae</b>				
120.	20052 <i>Oenothera jamesii</i>	Y		
<b>Orchidaceae</b>				
121.	1599 <i>Caladenia latifolia</i> ( <i>Pink Fairy Orchid</i> )			
122.	1635 <i>Diuris longifolia</i> ( <i>Common Donkey Orchid</i> )			
123.	15418 <i>Leptoceras menziesii</i>			
124.	15425 <i>Prasophyllum calcicola</i>			
125.	11118 <i>Pterostylis pyramidalis</i> ( <i>Snail Orchid</i> )			
<b>Orobanchaceae</b>				
126.	7122 <i>Orobanche minor</i> ( <i>Lesser Broomrape</i> )	Y		
127.	7089 <i>Parentucellia latifolia</i> ( <i>Common Bartsia</i> )	Y		
<b>Oxalidaceae</b>				
128.	30375 <i>Oxalis exilis</i>			
<b>Papaveraceae</b>				
129.	31532 <i>Fumaria muralis</i> subsp. <i>muralis</i>	Y		
<b>Phyllanthaceae</b>				
130.	4675 <i>Phyllanthus calycinus</i> ( <i>False Boronia</i> )			
<b>Plantaginaceae</b>				
131.	7303 <i>Plantago lanceolata</i> ( <i>Ribwort Plantain</i> )	Y		
132.	7109 <i>Veronica calycina</i> ( <i>Cup Speedwell</i> )			
<b>Plocamiaceae</b>				
133.	27156 <i>Plocamium mertensii</i>			
<b>Poaceae</b>				
134.	247 <i>Bromus arenarius</i> ( <i>Sand Brome</i> )			
135.	249 <i>Bromus diandrus</i> ( <i>Great Brome</i> )	Y		
136.	467 <i>Lagurus ovatus</i> ( <i>Hare's Tail Grass</i> )	Y		
137.	10970 <i>Rostraria cristata</i>	Y		

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
138.	625 <i>Spinifex longifolius</i> (Beach Spinifex)			
<b>Polygalaceae</b>				
139.	4552 <i>Comesperma confertum</i>			
140.	4555 <i>Comesperma integerrimum</i>			
141.	4564 <i>Comesperma virgatum</i> (Milkwort)			
<b>Portulacaceae</b>				
142.	40827 <i>Calandrinia tholiformis</i>			
<b>Proteaceae</b>				
143.	1842 <i>Banksia prionotes</i> (Acorn Banksia)			
144.	15607 <i>Conospermum acerosum</i> subsp. <i>acerosum</i>			
145.	1885 <i>Conospermum triplinervium</i> (Tree Smokebush)			
146.	2146 <i>Hakea costata</i> (Ribbed Hakea)			
147.	2175 <i>Hakea lissocarpha</i> (Honey Bush)			
148.	2214 <i>Hakea trifurcata</i> (Two-leaf Hakea)			
<b>Ranunculaceae</b>				
149.	10804 <i>Clematis linearifolia</i>			
150.	2932 <i>Ranunculus colonorum</i> (Common Buttercup)			
<b>Restionaceae</b>				
151.	1056 <i>Alexgeorgea nitens</i>			
152.	17663 <i>Desmocladus asper</i>			
153.	16595 <i>Desmocladus flexuosus</i>			
<b>Rhamnaceae</b>				
154.	4802 <i>Cryptandra mutila</i>			
155.	4809 <i>Cryptandra pungens</i>			
156.	4828 <i>Spyridium globulosum</i> (Basket Bush)			
157.	11665 <i>Trymalium ledifolium</i> var. <i>ledifolium</i>			
<b>Rhodomelaceae</b>				
158.	26689 <i>Coeloclonium umbellula</i>			
159.	26752 <i>Dasyclonium incisum</i>			
160.	27013 <i>Lenormandia spectabilis</i>			
<b>Rubiaceae</b>				
161.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
162.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
<b>Santalaceae</b>				
163.	10765 <i>Exocarpos sparteus</i> (Broom Ballart, Djuk)			
164.	2344 <i>Leptomeria empetriformis</i>			
<b>Scrophulariaceae</b>				
165.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
166.	7291 <i>Myoporum insulare</i> (Blueberry Tree, boobialla)			
<b>Solanaceae</b>				
167.	11725 <i>Anthocercis ilicifolia</i> subsp. <i>ilicifolia</i>			
168.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
169.	7020 <i>Solanum linnaeanum</i> (Apple of Sodom)	Y		
<b>Stylidiaceae</b>				
170.	7710 <i>Stylidium cygnorum</i>			
171.	13127 <i>Stylidium maritimum</i>		P3	
<b>Tamaricaceae</b>				
172.	15741 <i>Tamarix aphylla</i> (Athel Tree)	Y		
<b>Thymelaeaceae</b>				
173.	5243 <i>Pimelea ferruginea</i>			
<b>Ulvaceae</b>				
174.	27352 <i>Ulva lactuca</i>			
<b>Urticaceae</b>				
175.	1762 <i>Parietaria debilis</i> (Pellitory)			
<b>Violaceae</b>				
176.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			

**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

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
---------	--------------	-------------	-------------------	------------------------------------

3 - Priority 3  
4 - Priority 4  
5 - Priority 5

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

**Appendix 3**  
**Photographic record of site and**  
**vegetation types**



Plate 1: VT1 – *Olearia axillaris*, *Atriplex isatidea*, *Spinifex hirsutus*, \**Cakile maritima* and \**Thinopyrum distichum* low shrubland on sandy soils

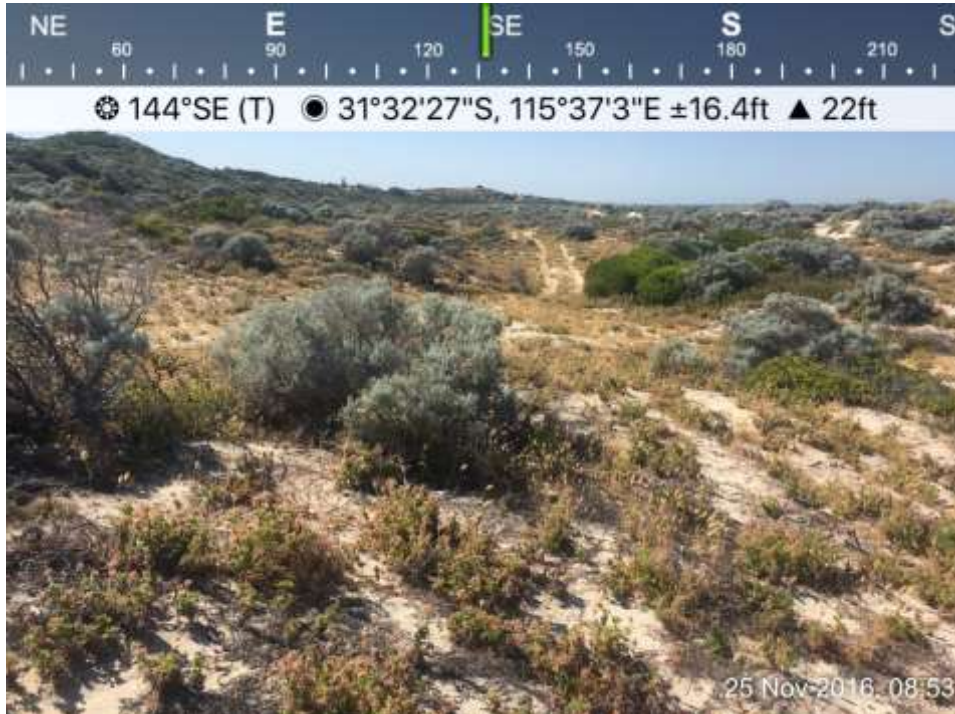


Plate 2: VT2 – *Olearia axillaris*, *Acacia rostelifera*, *Rhagodia baccata* and *Scaevola crassifolia* heath over *Spinifex longifolia*, *Acanthocarpus preissii*, *Cassytha flava*, \**Pelargonium capitatum* and exotic grasses including on sandy soils



Plate 3: VT3 – *Scaevola crassifolia*, *Olearia axillaris*, *Acacia rostelifera*, and *Spyridium globulosum* heath on dune crests and *Lepidosperma gladiatum* closed heath in dune swales over *Acanthocarpus preissii*, \**Pelargonium capitatum* \**Arctotis stoechadifolia* and exotic grasses on sandy soils



Plate 4: VT4 – *Olearia axillaris*, *Scaevola crassifolia*, *Acacia rostelifera* and *Acacia truncata* heath with emergent *Agonis flexuosa* over *Acanthocarpus preissii*, *Spinifex hirsutus*, \**Pelargonium capitatum*, and exotic grasses on sandy soils



Plate 5: VT5 – *Allocauarina humilis* and *Spyridium globulosum* mid shrubland over *Rhagodia baccata*, *Olearia axillaris* and *Scaevola crassifolia* heath on dune crests over *Lepidosperma gladiatum* closed heath in dune swales over *Acanthocarpus preissii*, *Cassytha flava* and \**Pelargonium capitatum* on sandy soils.



Plate 6: Planted \**Schinus terebinthifolius*





Plate 7: Cleared areas and planted palm

**Appendix 4**  
**Vascular plant taxa recorded from**  
**quadrats within the survey area**

Family	Taxa
Aizoaceae	<i>Carpobrotus virescens</i>
Anacardiaceae	* <i>Schinus terebinthifolius</i>
Arecaceae	* <i>Phoenix</i> sp.
Asparagaceae	<i>Acanthocarpus preissii</i>
	<i>Lomandra maritima</i>
Asphodelaceae	* <i>Trachyandra divaricata</i>
Asteraceae	* <i>Arctotis stoechadifolia</i>
	<i>Olearia axillaris</i>
	<i>Senecio pinnatifolius</i>
	* <i>Sonchus oleraceus</i>
	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>
Brassicaceae	* <i>Brassica tournefortii</i>
	* <i>Cakile maritima</i>
	* <i>Raphanus raphanistrum</i>
Casuarinaceae	<i>Allocasuarina humilis</i>
	<i>Casuarina</i> sp.
Crassulaceae	* <i>Crassula glomerata</i>
Chenopodiaceae	<i>Atriplex isatidea</i>
	<i>Atriplex cinerea</i>
	<i>Rhagodia baccata</i>
	<i>Salsola australis</i>
	<i>Threlkeldia diffusa</i>
Cupressaceae	<i>Callitris preissii</i>
Cyperaceae	<i>Ficinia nodosa</i>
	<i>Lepidosperma gladiatum</i>
	<i>Sporobolus virginicus</i>
Ericaceae	<i>Leucopogon parviflorus</i>
Fabaceae	<i>Acacia cyclops</i>
	<i>Acacia rostellifera</i>
	<i>Acacia truncata</i>
	<i>Hardenbergia comptoniana</i>
	* <i>Trifolium arvense</i>
Geraniaceae	* <i>Pelargonium capitatum</i>
Goodeniaceae	<i>Scaevola crassifolia</i>
	<i>Lechenaultia linarioides</i>
Haemodoraceae	<i>Conostylis candicans</i>
Hemerocallidaceae	<i>Dianella revoluta</i>
Lauraceae	<i>Cassytha flava</i>
Myrtaceae	<i>Agonis flexuosa</i>
	<i>Eucalyptus gomphocephala</i>
	<i>Melaleuca nesophila</i>

Family	Taxa
	<i>Melaleuca systena</i>
	<i>Scholtzia involucreta</i>
Poaceae	* <i>Avena barbata</i>
	* <i>Bromus diandrus</i>
	* <i>Cynodon dactylon</i>
	* <i>Ehrharta calycina</i>
	* <i>Lagurus ovatus</i>
	* <i>Poa poiformis</i>
	<i>Spinifex hirsutus</i>
	<i>Spinifex longifolia</i>
	* <i>Thinopyrum distichum</i>
Rhamnaceae	<i>Spyridium globulosum</i>
Santalaceae	<i>Exocarpos sparteus</i>
	<i>Santalum acuminatum</i>
Thymelaeaceae	<i>Pimelea</i> sp.
Scrophulariaceae	<i>Myoporum insulare</i>

**Appendix 5**  
**Supplementary flora and vegetation**  
**survey**

To: Jarrod Rendell

Date: 5 October 2017

Company: Acumen Development Solutions

Project No: ADS16585.01

Fax/email: jarrod@acumends.com.au

Inquiries: Carli Turner

## Capricorn foreshore reserve Supplementary flora and vegetation surveys

### *Background*

Capricorn Village Joint Venture (CVJV) is proposing to develop the Capricorn Coastal Village and Coastal Node, located in Yanchep, Western Australia, approximately 51 km north-northwest of the Perth Central Business District (CBD). The Capricorn Coastal Village and Coastal Node (the Project), incorporates Part Lot 312 and Lots 2, 303 and 304, Two Rocks Road, Yanchep, in the City of Wanneroo (CoW, Figure 1).

The foreshore reserve provides a link between the Indian Ocean and urban development and as such provides opportunity for both conservation and development purposes. The proposed foreshore development will require clearing of native vegetation and as such, a flora and vegetation survey was deemed necessary to determine the environmental values of the proposed clearing area. The original survey area was designed based on the draft Coastal Node concept plan, focussing on areas of proposed disturbance and a buffer area (Figure 1). The balance of the foreshore reserve (comprising the 2017 survey area; Figure 1) was traversed to confirm broad vegetation types on 23 May 2017, and was subject to a detailed Spring survey on 3 October 2017.

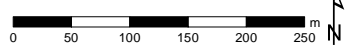
This memo presents the findings of a flora and vegetation survey to be supplemented to a Level 2 flora and vegetation survey conducted within the Project area on 25 November 2016. The supplementary survey was undertaken within the southern portion of the foreshore reserve; to the south of the 2016 survey area, including detailed quadrat analysis to support the proposed development of the Capricorn foreshore reserve that forms part of the Coastal Village and Coastal Node, Yanchep (the survey area; Figure 1).

This flora and vegetation assessment will support the Foreshore Management Plan for the proposed foreshore development.



**Figure 1: The survey area**

Scale 1:6,500 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 6/10/2017

Author: JCrute

Source: Aerial image: nearmap, flown 01/2017. Existing cadastre: SLIP, Landgate 2017. Master plan: Client 03/2017.

**Legend**

- Survey area 2017
- Survey area 2016
- Existing cadastre



info@strategen.com.au  
 www.strategen.com.au

## Methods

The field survey was conducted according to standards set out in Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016). The assessment of flora and vegetation within the survey area was undertaken by one ecologist on 23 May 2017 and one botanist on 3 October 2017 from Strategen. Table 1 identifies the staff involved in the field surveys, their role and qualifications. The survey area was traversed on foot to record changes in vegetation structure and type, with four vegetation quadrats surveyed in May 2017 with an additional six vegetation quadrats surveyed in the Spring October 2017 survey, with two quadrats being placed in each of the three vegetation types occurring in the survey area.

Table 1: Personnel

Name	Role
Ms. C. Courtauld Strategen (Ecologist)	Planning, fieldwork, plant identification, data interpretation and report preparation.
Ms. A. Dalton Strategen (Botanist)	Fieldwork, plant identification, data interpretation and report preparation.

Site selection for vegetation mapping was based on differences in structure and species composition of the communities present within the survey area. Vegetation mapping sites were determined from aerial photographs. The survey area was traversed on foot, allowing for opportunistic sites to be placed where a change in vegetation structure or composition was observed.

Flora and vegetation was described and sampled systematically at each quadrat and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. At each site, the following floristic and environmental parameters were noted:

- GPS location
- topography
- soil type and colour
- outcropping rocks and their type
- percentage cover and average height of each vegetation stratum.

For each vascular plant species, the average height, number of plants and percent cover were recorded.

The entire survey area was traversed to record the density of weed species. The GPS locations and population of each weed species were recorded.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

## Results

### Native flora

A total of 56 native vascular plant taxa from 50 plant genera and 25 plant families were recorded within the survey area. The majority of the taxa were recorded within the Poaceae (8 taxa) and Asteraceae (6 taxa) families (Table 2). The flora species recorded in the survey area were consistent with the 2016 survey.



Table 2: Flora taxa recorded during the 2017 survey

Family	Species
Aizoaceae	<i>Carpobrotus virescens</i>
	* <i>Tetragonia decumbens</i>
Araliaceae	<i>Trachymene pilosa</i>
Asparagaceae	<i>Acanthocarpus preissii</i>
	<i>Lomandra maritima</i>
Asphodelaceae	* <i>Trachyandra divaricata</i>
Asteraceae	* <i>Arctotheca calendula</i>
	* <i>Arctotis stoechadifolia</i>
	<i>Olearia axillaris</i>
	<i>Pithocarpa cordata</i>
	<i>Senecio pinnatifolius</i>
	* <i>Sonchus oleraceus</i>
Brassicaceae	* <i>Brassica tournefortii</i>
	* <i>Cakile maritima</i>
	<i>Raphanus raphanistrum</i>
Chenopodiaceae	<i>Atriplex cinerea</i>
	<i>Atriplex isatidea</i>
	<i>Rhagodia baccata</i>
	<i>Salsola australis</i>
	<i>Threlkeldia diffusa</i>
Crassulaceae	<i>Crassula glomerata</i>
Cupressaceae	<i>Callitris preissii</i>
Cyperaceae	<i>Ficinia nodosa</i>
	<i>Lepidosperma gladiatum</i>
	<i>Sporobolus virginicus</i>
Cupressaceae	<i>Callitris preissii</i>
Fabaceae	<i>Acacia lasiocarpa</i>
	<i>Acacia rostellifera</i>
	<i>Acacia truncata</i>
	<i>Hardenbergia comptoniana</i>
	* <i>Lupinus angustifolius</i>
Geraniaceae	* <i>Pelargonium capitatum</i>
Goodeniaceae	<i>Hibbertia subvaginata</i>
	<i>Scaevola crassifolia</i>
	<i>Scaevola nitida</i>
Haemodoraceae	<i>Conostylis candicans</i>
Lauraceae	<i>Cassytha flava</i>
Myrtaceae	* <i>Leptospermum laevigatum</i>
	<i>Melaleuca systema</i>
	<i>Scholtzia involucreta</i>
Onagraceae	* <i>Oenothera drummondii</i>
Oxalidaceae	* <i>Oxalis exilis</i>
Poaceae	* <i>Avena barbata</i>

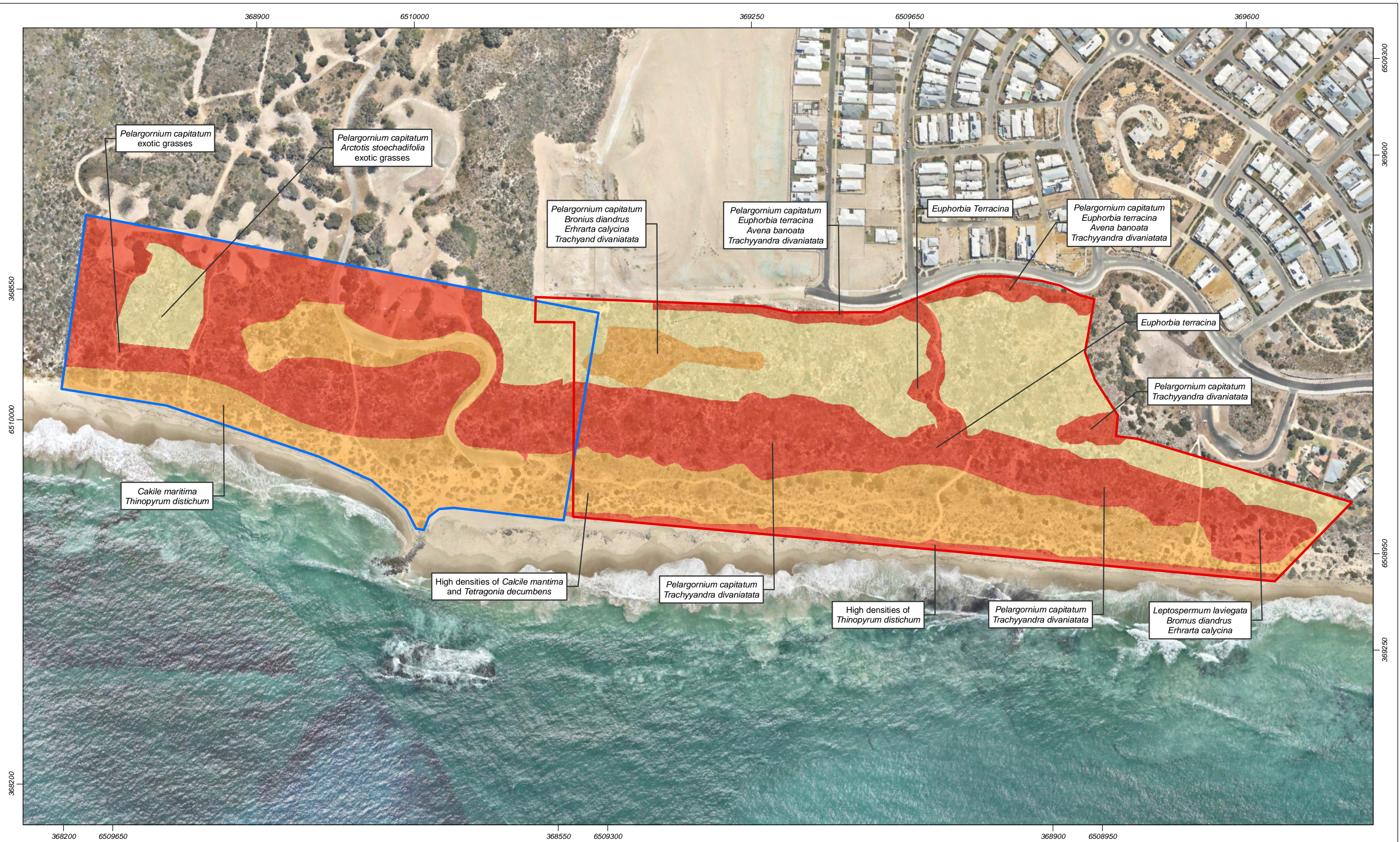
Family	Species
	<i>*Bromus diandrus</i>
	<i>*Ehrharta calycina</i>
	<i>*Lagurus ovatus</i>
	<i>*Poaceae poiformis</i>
	<i>Spinifex hirsutus</i>
	<i>Spinifex longifolius</i>
	<i>*Thinopyrum distichum</i>
Ranunculaceae	<i>Clematis linearifolia</i>
Rhamnaceae	<i>Spyridium globulosum</i>
Santalaceae	<i>Exocarpos sparteus</i>
	<i>Santalum acuminatum</i>
Scrophulariaceae	<i>Myoporum insulare</i>

#### **Threatened and Priority flora**

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015) or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area at the time of assessment. The survey was conducted during the prime flowering time for these conservation significant species (spring), with no rare flora being observed in spring 2016 or 2017 and therefore it is unlikely that Threatened or Priority flora are likely to occur within the survey area.

#### **Introduced (exotic) taxa**

A total of 18 introduced (exotic) taxa were recorded within the survey area (Table 2). None of these species are Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2016). The density of introduced taxa in the survey area is displayed in Figure 2.



**Figure 2: High level weed mapping**

\* 2016 area inferred

Scale 1:3,500 at A3  
 0 35 70 105 Metres  
 Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas  
 Date: 6/10/2017  
 Author: JCrute  
 Source: Topography: Geoscience Australia 2011.  
 Path: Q:\Consult\2017\ADS\ADS17225\ArcMap\_documents\ADS17225\_G002\_RevA.mxd

**Legend**

- 2016 survey area
- 2017 Survey area
- Weed mapping density**
- High
- Medium
- Low

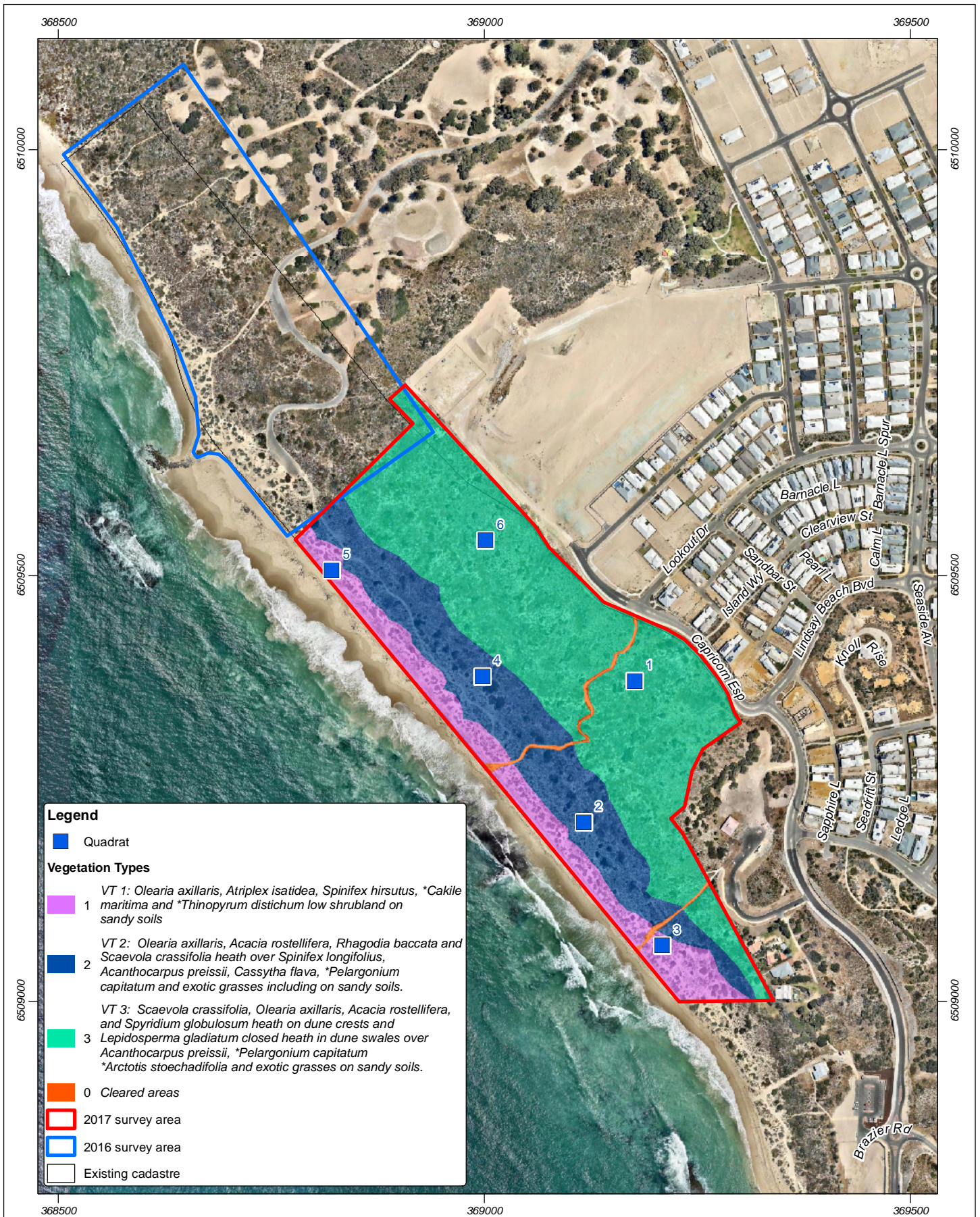
Weed density	Cover
Low	< 5%
Medium	6 - 75 %
High	76 - 100 %

Table 5: Vegetation condition scale (Keighery 1994)

Condition rating	Description
Pristine (1)	Pristine or nearly so, no obvious sign of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback, grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

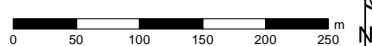
Table 6: Area (ha) covered by each vegetation condition category within the survey area

Vegetation Condition	Area (ha)	Percentage of the Survey area
Very Good	8.33	57.61
Good to Very Good	3.81	26.35
Good	2.13	14.73
Completely degraded	0.19	1.31
<b>Total</b>	<b>14.46</b>	<b>100</b>



**Figure 3: Vegetation Types (VTs) mapped within the survey area**

Scale 1:6,000 at A4



Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 6/10/2017

Author: JCrute

Source: Aerial image: nearmap, flown 01/2017. Existing cadastre: SLIP, Landgate 2017. Master plan: Client 03/2017.

Path: Q:\Consult\2017\ADS\ADS17225\ArcMap\_documents\ADS17225\_G001\_RevA.mxd

**strategen**  
ENVIRONMENTAL

info@strategen.com.au  
www.strategen.com.au



**Figure 4: Vegetation condition mapped within the survey area**

Scale 1:6,000 at A4



Coordinate System: GDA 1994 MGA Zone 50  
 Note that positional errors may occur in some areas

Date: 6/10/2017

Author: JCrute

Source: Nearmap: Aerial 2017.

**Legend**

- |                   |                             |                     |
|-------------------|-----------------------------|---------------------|
| 2017 survey area  | <b>Vegetation condition</b> | Good                |
| 2016 survey area  | Very Good                   | Completely degraded |
| Existing cadastre | Good-Very Good              |                     |



info@strategen.com.au  
 www.strategen.com.au

### ***Threatened and Priority ecological communities***

As recorded within the 2016 report (Strategen 2016), the vegetation within the survey area did not resemble a known TEC, however it contains two Priority 3 PECs (FCT 29a – *Coastal Shrublands on shallow sands*, FCT 29b – *Acacia Shrublands on taller dunes*) based on dominant taxa recorded, the known vegetation complex within the survey area and previous survey results.

### ***Discussion***

Vegetation within the survey area comprises three VTs and cleared areas and was overall consistent with the 2016 vegetation mapping (Strategen 2016). Transitions between VTs were generally discontinuous, though occasionally abrupt with margins representing admixtures of more than one VT. This discontinuity is primarily due to changes in soil profile and topography. Vegetation condition generally aligned with the VT boundaries and at a broad scale, the majority of the survey area was observed to be in various states of degradation due to coastal erosion and historical clearing within the survey area. The remnant vegetation shows signs of degradation and structural alteration particularly where the beach access tracks are located.

A total of 56 native vascular plant taxa from 50 plant genera and 25 plant families, along with 18 introduced species were recorded within the survey area. No Declared Plant species pursuant to section 22 of the BAM Act were recorded within the survey area (DAFWA 2016).

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015) or Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the survey area.

Approximately 14.46 ha of vegetation ranging from Completely Degraded to Very Good condition was recorded within the survey area.

The vegetation within the survey area did not resemble a known TEC. Whilst two Priority 3 PECs (FCT 29a – *Coastal Shrublands on shallow sands*, FCT 29b – *Acacia Shrublands on taller dunes*) may occur in the survey area, these FCTs are very well represented within surrounding Bush Forever Site 397: *Coastal Strip from Wilbinga to Mindarie* which is under existing protection. Furthermore, these VTs will be retained within the foreshore reserve, subject to protection and management measures detailed in the Foreshore Management Plan.

### ***Conclusion***

The Level 2 flora and vegetation survey (conducted May and October 2017) has been successful in collecting data to define and assess the presence, extent and significance of vegetation types within the survey area.

This flora and vegetation assessment will support the Foreshore Management Plan for the proposed foreshore development which aligns with the *CoW Local Biodiversity Strategy* (2011) and the *CoW Coastal Management Plan* (CoW 2012) for the Capricorn coastal region.

### **References**

Department of Agriculture and Food (DAFWA) 2017, *Declared Pests (s22) list*, [Online], Government of Western Australia, Available from: <http://www.biosecurity.wa.gov.au/organisms/export/PER-DP> [May 2017].

Environmental Protection Authority (EPA) 2016, *Technical Guidance (in accordance with the Environmental Protection Act 1986) – Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia*. Government of Western Australia, Perth.

Keighery B 1994, *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*, Wildflower Society, Floreat.

Strategen 2016, *Capricorn Foreshore Reserve flora and vegetation survey*, Prepared for Acumen Development Solutions, Perth WA.

Western Australian Herbarium 1998-, *FloraBase – the Western Australian Flora*, [Online], Government of Western Australia, Available from: <http://florabase.dpaw.wa.gov.au/> [May 2017].



