Attachment 7 - Flora Surveys from Iluka - Burns Beach (2020) and Ocean Reef (2023) Foreshore Reserves (Redacted)

Enclosed in this attachment are:

1. Iluka – Burns Beach Foreshore Reserve Flora Survey and Vegetation Condition Assessment and Fauna Survey Report (2020)

2. Ocean Reef Foreshore Reserve Flora Survey and Vegetation Condition Assessment Report (2023)

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Iluka-Burns Beach Foreshore Reserve flora survey, vegetation condition assessment and fauna survey

City of Joondalup

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
Burns Beach	Burns Beach Foreshore Reserve
CLUSTER	Hierarchical Clustering
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DotEE	Department of the Environment and Energy
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EN	Endangered
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Act 1999*
FCT	Floristic Community Type
ha	hectare
IBRA	Interim Biogeographical Regionalisation for Australia
Iluka	Iluka Foreshore Reserve
km	kilometre
KPI	Key Performance Indicator
m	metre
MDS	Multi-Dimensional Scaling
P	Priority
PEC	Priority Ecological Community
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
SIMPER	Similarity Percentages
TEC	Threatened Ecological Community
the City	City of Joondalup
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium

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Abbreviation	Description
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

Executive Summary

Eco Logical Australia was engaged by the City of Joondalup to undertake a Detailed and Targeted flora survey, vegetation condition assessment and Detailed fauna survey of the Iluka and Burns Beach Foreshore Reserves, areas of approximately 31.3 hectares and 29.3 hectares, respectively, located in the City's suburbs of Iluka and Burns Beach, approximately 30 kilometres north of Perth, Western Australia. This assessment will be used to inform the development of an Iluka-Burns Beach Foreshore Reserve Management Plan.

In addition, the City plans to develop a section of the Burns Beach survey area for a proposed restaurant (herein referred to as the restaurant development area). The restaurant development area is approximately 0.5 hectares and is located in the southern portion of the Burns Beach survey area.

The Detailed and Targeted flora survey and vegetation condition assessment was conducted in spring from 22nd to 25th September and 30th September to 2nd October 2020 in accordance with the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* 2016. The Detailed fauna survey was conducted in spring from 9th to 13th November 2020 in accordance with the Environmental Protection Authority *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* 2020.

As part of the Detailed flora survey, vegetation communities were described through the establishment of 28 10 x 10 metre quadrats (14 in each survey area). A Targeted flora survey was conducted to record occurrences of any conservation significant flora species and/or communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions. Opportunistic flora species were also recorded across the survey areas.

As part of the vegetation condition assessment, a weed survey was conducted to record weed species within the survey areas, including State, Federal (Weed of National Significance, Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007*), City of Joondalup pest plant and/or priority weeds in the City of Joondalup (priority species list provided by the City).

A total of 121 flora species (74 native and 47 introduced) were recorded within the Iluka survey area within quadrats and from opportunistic collections. A total of 106 flora species (63 native and 43 introduced) were recorded within the Burns Beach survey area within quadrats and from opportunistic collections. One flora species listed as Endangered under the EPBC Act and the BC Act was recorded within the Iluka survey area, namely *Marianthus paralius*. Two Priority flora species were recorded in the Iluka survey area; *Hibbertia leptotheca*, listed as Priority 3 by the Department of Biodiversity, Conservation and Attractions and as a Bush Forever significant species, and *Jacksonia sericea*, listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions and as a Bush Forever significant species. A further eight Bush Forever significant species were recorded within the survey areas; *Agonis flexuosa, Callitris preissii, Grevillea preissii* subsp. *preissii* and *Melaleuca lanceolata* within Burns Beach and *Diplopeltis huegelii*, *Grevillea preissii* subsp. *preissii*, *Lechenaultia linarioides*, *Melaleuca cardiophylla,* and *Trymalium ledifolium* within Iluka Foreshore.

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively, with a minimum of three quadrats established within each

vegetation community, as specified in the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016; **Table 1**).

Table 1: Overview of vegetation communities within the survey area

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland		X	3
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland	X	X	3
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland		X	5
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low open shrubland and *Lomandra maritima* low sparse forbland	X	X	4
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland	X	X	3
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland	X	X	4
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland	X	X	6

Vegetation within the Iluka survey area comprised 29 hectares (92.7%), with the remaining 2.3 hectares (7.3%) comprising tracks and open beach/rocks. Vegetation within the Burns Beach survey area comprised 25.3 hectares (86.3%), with the remaining 4 hectares (13.7%) comprising tracks, areas of dunal blowout and open beach/rocks.

One vegetation community was delineated and mapped within the restaurant development area, namely SgSa: *Spyridium globulosum, Santalum acuminatum* tall sparse shrubland. This vegetation community comprised 0.4 hectares (84%), with the remaining 0.1 hectares (16%) comprising tracks.

Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community had a close affiliation with Floristic Community Type 24: Northern Spearwood shrublands and woodlands, which is listed the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 24 is described as 'heaths or heaths with scattered *Eucalyptus*

gomphocephala (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*'. Within the survey area, vegetation community BsArSg has components analogous to this PEC, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland. A total of 4.6 hectares (14.7%) of the Iluka survey area and 0.4 hectares (1.4%) of the Burns Beach survey area is considered as likely representing the Floristic Community Type 24 Priority Ecological Community.

Quadrats within vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa showed close affiliation with Floristic Community Type 29a: Coastal shrublands on shallow sands, which is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 29a is described as mostly heaths on shallow sands over limestone close to the coast. Within the survey area, vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa have components analogous to the 'Coastal shrublands on shallow sands' Priority Ecological Community, including the presence of heaths on shallow sands over limestone close to the coast, *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. A total of 24.4 hectares (77.9%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area is considered as likely representing the Floristic Community Type 29a Priority Ecological Community, including a total of 0.4 hectares (84%) ha of the restaurant development area.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community'. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19. This stand was recorded in the BsArSg vegetation community, comprising of an area of less than 0.5 hectares in size, and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community approved conservation advice in order to determine the presence of the Threatened Ecological Community within the survey areas. Whilst a number of vegetation communities were identified as representing Floristic Community Type 24 and 29a, indicating the potential presence of the Threatened Ecological Community, no tuarts were recorded in either of the survey areas and so vegetation within the survey area is not considered to represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.

Vegetation condition within the Iluka and Burns Beach survey areas ranged from Excellent to Completely Degraded, based on the Keighery (1994) vegetation scale, as outlined in the Environmental Protection Authority *Technical Guidance*: *Flora and Vegetation Surveys for Environmental Impact Assessment* 2016. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

A total of five fauna habitats were identified within the Iluka survey area and four fauna habitats within the Burns Beach survey area. These habitats cover a total of 29 hectares (92.6%) of the Iluka survey area

and 26.6 hectares (90.8%) of the Burns Beach survey area, with tracks and open beach/rocks accounting for the remaining areas.

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. A total of 37 vertebrate fauna species were recorded within the Burns Beach survey area, including seven reptile, 24 bird and six mammal species. No amphibians were recorded in the survey areas. A total of 13 and 12 invertebrate taxa were recorded within the Iluka and Burns Beach survey areas, respectively. Feral fauna species recorded within both survey areas comprised of Red Fox *(*Vulpes Vulpes*), Cat (**Felis catus*) and House Mouse (**Mus musculus*). European Rabbit (**Oryctolagus cuniculus*) was recorded within the Iluka survey area only.

Two conservation significant fauna species were observed during the field survey; including Carnaby's Cockatoo (*Calyptorhynchus latirostris*; listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the State *Biodiversity Conservation Act 2016*) and Quenda (*Isoodon fusciventer*; listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions). Quenda were recorded as occurring within both the Iluka and Burns Beach survey areas; however, Carnaby's Cockatoo was observed at the Iluka survey area only.

No fungi species were recorded in either of the survey areas during the field survey.

Recommendations to conserve native flora, vegetation, fauna and environmental values within the survey areas are as follows:

- Continue long-term monitoring of weed populations within the survey areas. Implement weed control, particularly for the Declared Pest and WoNS species **Asparagus asparagoides* (Bridal Creeper) and the Declared Pest species **Moraea flaccida* (One-leaf Cape Tulip), for City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Continue to monitor populations of *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).
- Ensure that unauthorised access is restricted to defined tracks/paths only to prevent habitat degradation and weed spread i.e. unauthorised walking/vehicle tracks within the survey areas e.g. installation of fencing or formal signage, particularly in areas of access to the northern sections of Burns Beach.
- Continue regular monitoring of Quenda to ensure ongoing health and sustainability of the population.
- Feral animal control must be maintained, particularly in regard to foxes, cats and rabbits.
- It is recommended to continue monitoring for pathogens and to maintain correct hygiene practices.

1. Introduction

1.1 Project background

Eco Logical Australia (ELA) was engaged by the City of Joondalup (the City) to undertake a Detailed and Targeted flora survey and vegetation condition assessment and a Detailed fauna survey of the Iluka Foreshore Reserve (herein referred to as the Iluka survey area) and the Burns Beach Foreshore Reserve (herein referred to as the Burns Beach survey area), areas of approximately 31.3 hectares (ha) and 29.3 ha respectively, located in the City's suburbs of Iluka and Burns Beach, approximately 30 kilometres (km) north of Perth, Western Australia (WA; **Figure 1**).

Iluka and Burns Beach Foreshore Reserves are listed as Bush Forever sites (site 325 and 322, respectively) and are considered as major conservation areas within the City, due to high biodiversity values. Neither of the reserves possess an existing Management Plan, however limited ecological data is available on these sites in the City's Coastal Foreshore Management Plan 2014-2024 (Natural Area 2014). This assessment will be used to inform the development of an Iluka-Burns Beach Foreshore Reserve Management Plan.

In addition, the City plans to develop a section of the Burns Beach survey area for a proposed restaurant (herein referred to as the restaurant development area). The restaurant development area is approximately 0.5 ha and is located in the southern portion of the Burns Beach survey area (**Figure 1**). More specifically, the objectives of this assessment include:

- An assessment of flora and vegetation communities in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016);
- Undertake a vegetation condition assessment using the Keighery (1994) vegetation condition scale;
- A Targeted survey of State, Federal and/or Department of Biodiversity, Conservation and Attractions (DBCA) conservation significant flora, including Bush Forever significant flora and/or vegetation;
- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community', using the four-stage assessment process itemised in the Approved Conservation Advice (Threatened Species Scientific Committee [TSSC] 2016);
- An assessment to verify if the vegetation meets the requirement specified in the Department of Environment and Energy (DotEE) 'Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community' using the assessment process outlines in the Conservation Advice (DotEE 2019);
- Record all weed species encountered including State, Federal (Weed of National Significance [WoNS], Declared Pests under the *Biosecurity and Agriculture Management Act 2007* [BAM Act]) and/or priority weeds in the City of Joondalup (priority species list provided by the City). Weed mapping must be completed in accordance with Department of Environment and Conservation

(DEC) Standard Operation Procedure: Techniques for mapping weed distribution and cover in bushland and wetlands (DEC 2011);

- An assessment of fauna in accordance with the requirements of the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020);
- Establish the occurrence, distribution and population of vertebrate fauna species surveyed;
- To establish the presence, record any declared Threatened, specially protected, priority State or Federal listed (e.g. State *Biodiversity Conservation Act 2016* [BC Act], EPBC Act), or internationally listed fauna including their conservation status;
- A basic habitat assessment (condition/ability to sustain the population) for all observed native fauna, as well as specific information relating to the Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*);
- Record locations where feral fauna and evidence of feral fauna (e.g. beehives, dens, scats) have been identified; and
- Record opportunistic sightings of fungi and invertebrates.

Figure 1-1: Survey area locations



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

0 125 250 500
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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2. Environmental setting

2.1 Regional context

Broad environmental values for the region relevant to the survey areas are presented in **Table 2**.

Table 2: Environmental values of the region

Existing environmental attributes	Survey area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (DAWE 2020)	Swan Coastal Plain (SWA)
IBRA Subregion	Perth (SWA02) – commonly characterised by Tuart and heath on limestone soils and Banksia-Jarrah-Marri woodland on sandy soils. The subregional area is 1,333,901 ha (Mitchell *et al*. 2002).
Geology, landform and soils (DPIRD 2018)	Quindalup Dune System, the youngest of the aeolian dune systems associated with the Swan Coastal Plain. It is characterised by unconsolidated white calcareous sands that form a series of dunes and beach-ridge plains. To the east of the Quindalup Dune System lie the older Spearwood dunes. The survey areas are situated on soil unit B24 which includes undulating dune landscape underlain by aeolianite which is frequently exposed.
FCTs inferred within the survey areas (Government of Western Australia 2000)	**Supergroup 4**: Uplands centred on Spearwood and Quindalup Dunes • **FCT24**: Northern Spearwood shrublands and woodlands • **FCT 27**: Species-poor mallees and shrublands on limestone • **FCT28:** Spearwood *Banksia attenuata* or *B. attenuata* — Eucalyptus Woodlands • **FCT 29a**: Coastal shrublands on shallow sands • **FCT 29b**: Acacia shrublands on taller dunes
Bush Forever (Government of Western Australia 2000)	Burns Beach Foreshore Reserve – Bush Forever site 322 Link from Burns Beach Bushland to Neerabup National Park – Bush Forever site 323 Coastal Strip from Burns Beach to Hillary's – Bush Forever site 325
Beard's (1975) vegetation mapping	Jurien 129: Bare areas; dune sand (94.75% remaining in the Perth sub-region; Government of Western Australia 2019). Jurien 949: Low woodland; banksia (56.45% remaining in the Perth sub-region; Government of Western Australia 2019). Jurien 1007: Mosaic: Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* & *Acacia cyclops* thicket (68.68% remaining in the Perth sub-region; Government of Western Australia 2019).

3. Methodology

3.1 Literature review

The following documents were reviewed to identify to identify species and communities' assemblages recorded within or in the vicinity of the survey area (current and historic):

- AECOM. 2018. *Tamala Park Reserve – Biological Report*. City of Wanneroo.
- Knowles, D and F. 2015-2018. *Macroinvertebrate and Herpetofauna Inventory Surveys*. Prepared in collaboration with Friends of North Ocean Reef – Iluka Foreshore and City of Joondalup.
- Natural Area Consulting Management Services (Natural Area). 2017. *Targeted Flora and Vegetation Survey – Part Lot 11485, 44 Ocean Parade, Burns Beach*. Prepared for the City of Joondalup.
- City of Joondalup. 2014. *Burns Beach Structure Plan No. 10*. Provided by the City of Joondalup.
- Peet. 2014. *Vegetation Plan Burns Beach*. Development Planning Strategies, Subiaco WA.
- GHD. 2013. *Department of Planning Proposed Dual Use Coastal Path between Mindarie and Burns Beach Environmental Study and Topographical Survey Report*. May 2013.
- City of Joondalup. 2009. *Burns Beach Park Natural Area Initial Field Assessment*.
- Cardno BSD Pty Ltd. 2006. *Foreshore Management Plan Burns Beach*. March 2006.
- Beaumaris Land Sales. 2001. *Iluka Flora & Vegetation Survey and Fauna Habitat Assessment*. Final report No: 2000/184.
- Government of Western Australia. 2000. *Bush Forever site description: Burns Beach Bushland*.
- Keighery G. J. and Keighery. B. J. 1992. *Flora of Burns Beach Coastal Reserve*.
- Foulds, W. 1982. *Conservation Area Ocean Reef / Burn's Beach South*. Provided by the City of Joondalup.

3.2 Field survey

3.2.1 Survey team and timing

The Detailed and Targeted flora survey and vegetation condition assessment was conducted by Jeff Cargill (Senior Botanist) and Jeni Morris (Ecologist) from 24th to 25th September and 30th September to 2nd October 2020. The Detailed fauna survey was conducted by Jeni Morris (Ecologist) and Briana Wingfield (Ecologist) from 9th to 13th November 2020. The survey team's relevant qualifications, experience and licences are provided in **Table 3** below.

Rainfall data from the nearby Wanneroo weather station (station number 9105, located approximately 10 km south-east of the survey areas) recorded a total of 4 millimetres (mm) during the flora survey (Bureau of Meteorology [BoM] 2020). In the three months prior to the flora field survey (June – August), a total of 322.1 mm of rainfall was recorded (BoM 2020). This is less than the long-term average for the same time period (446 mm). Despite lower than average rainfall, conditions at the time of survey were considered suitable with the majority of flora species in various reproductive stages (e.g. flowering, fruiting), allowing for positive identification of individuals.

In the three months prior to the fauna field survey (August – October), a total of 184.2 mm of rainfall was recorded. This is less than the long-term average for the same time period (252.9 mm). A total of 29.8 mm of rainfall was recorded during the fauna survey, with 19 mm recorded on one day (BoM 2020).

Table 3: Survey team

Name	Qualification	Relevant experience	Licenses
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has extensive experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted threatened and priority flora surveys, fauna and black cockatoo surveys, MNES surveys and rehabilitation and vegetation monitoring programs.	Flora collection: FB62000138 DRF licence: TFL 48-1920
Jeni Morris	BSc. Conservation and Wildlife Biology	Jeni has completed several flora and vegetation surveys on the Swan Coastal Plain and within the City of Joondalup including at Hepburn Heights, Warwick Open Space, Craigie Bushland Reserve and Yellagonga Regional Park.	Flora collection: FB62000070 DRF licence: TFL 13-1920 Fauna license: 08-004213-1
Briana Wingfield	BSc. Conservation and Wildlife Biology and Environmental Science (Hons)	Briana has over eight years' experience conducting fauna surveys across Western Australia, including Basic fauna surveys and Targeted black cockatoo habitat assessments.	Fauna license: 08-004213-1

3.3 Flora and vegetation survey

A Detailed and Targeted flora survey and vegetation condition assessment was conducted in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

Stainless steel fence droppers were used to mark the north-west corner of each quadrat. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

A total of 28 quadrats were surveyed across the survey areas; 14 in Iluka survey area and 14 in Burns Beach survey area (**Figure 2-1** and **Figure 2-2**). The following data was recorded within each quadrat:

- Site details (site name, site number, observers, date and location);
- Environmental information including landform, soil type and colour, bare ground and leaf litter cover, rock outcropping and time since last fire event; and
- Biological information including vegetation structure, vegetation condition in accordance with Keighery (1994), degree of disturbance, species present and species percentage cover.

A Targeted survey was completed within both survey areas to identify any conservation significant flora or communities potentially occurring, including:

- Threatened flora or Threatened Ecological Communities (TECs) listed under the EPBC Act;
- Threatened (Declared Rare) Flora listed under the latest WA Wildlife Conservation (Rare Flora) Notice under the State *Biodiversity Conservation Act 2016* (BC Act);
- Priority Ecological Communities (PECs) endorsed by the Western Australian Minister for the Environment;

- Priority (P) flora recognised by DBCA; and
- Bush Forever significant flora (Government of Western Australia 2000).

The survey methodology involved personnel walking transects across the survey area, with transects spaced (on average) 5-20 metres (m) apart depending on factors such as habitat type, disturbance (e.g. tracks) and landform (**Figure 2-1** and **Figure 2-2**). Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

3.4 Weed survey and mapping

As part of the vegetation condition assessment, the Iluka and Burns Beach survey areas were surveyed and mapped for State, Federal and/or Priority weeds as specified by the City of Joondalup, including all WoNS and Declared Pests listed under the BAM Act. The City of Joondalup priority weed list for Iluka and Burns Beach Foreshore Reserves is provided in **Table 4**.

For each priority weed species, including WoNS and/or Declared Pest species encountered, a GPS location coordinate was recorded using points for individual plants or polygons for populations. Weed data was collected in accordance to the DBCA (previously Department of Environment and Conservation [DEC]) Standard Operating Procedure 22.1 *Techniques for mapping weed distribution and cover in bushland and wetlands* (DEC 2011).

Table 4: City of Joondalup priority weed species

Species	Common name
**Arctotis* sp.	Arctotis
**Asparagus asparagoides*	Bridal Creeper
**Avena fatua*	Wild Oats
**Carpobrotus edulis*	Pigface
**Chamelaucium uncinatum*	Geraldton Wax
**Conyza* sp.	Fleabane
**Cynodon dactylon*	Couch grass
**Dimorphotheca ecklonis*	Veldt Daisy
**Ehrharta calycina*	Perennial Veldt

Species	Common name
**Ehrharta longiflora*	Annual Veldt
**Euphorbia paralias*	Sea Spurge
**Euphorbia terracina*	Geraldton Carnation Weed
**Fumaria* sp.	Fumitory
**Gazania linearis*	Gazania
**Ipomoea indica*	Morning Glory
**Lactuca serriola*	Prickle Lettuce
**Moraea flaccida*	One-leaf Cape Tulip
**Oxalis pes-caprae*	Soursob
**Pelargonium capitatum*	Rose Pelargonium
**Pennisetum clandestinum*	Kikuyu grass
**Raphanus* sp.	Wild Radish
**Ricinus communis*	Castor Oil Plant
**Schinus terebinthifolia*	Japanese Pepper
**Tetragonia decumbens*	Sea Spinach
**Thinopyrum distichum*	Sea Wheatgrass
**Trachyandra divaricata*	Onion Weed
**Tropaeolum* sp.	Nasturtium
**Urospermum picroides*	False Hawkbit
**Yucca* sp.	Yucca

3.5 Flora data analysis

As vegetation across Burns Beach and Iluka Foreshore is contiguous, vegetation community analysis (as outlined below) was undertaken across both survey areas. Results of this analysis are presented separately for each survey area in Section 4 below.

3.5.1 Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke and Gorley 2006). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.5.2 Vegetation communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). A presence/absence transformation was applied to the dataset to align with Gibson *et al.* (1994). Specimens not identified to species level and singletons (species recorded at a

single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

A Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form was completed and submitted for all TECs and PECs identified within the survey area.

3.5.2.1 Floristic Community Type (FCT) analysis

Species within the Gibson *et al*. (1994) data set were updated to align with current names as specified by FloraBase (DBCA and Western Australian Herbarium [WAH] 2019). Using current records, a number of species in the Gibson *et al*. (1994) data set were shown to be significant range extensions from the Swan Coastal Plain, where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the data set and infra-specific names were reduced. The merged dataset was analysed using a combination of pre-treatments such as the inclusion and/or removal of introduced species and singletons. The removal of singletons from the merged dataset, an accepted pre-treatment for such analysis, produced the best results (e.g. stronger correlations; Clarke and Gorley 2006). Inclusion of such data (i.e. singletons) merely served to confound the dataset by introducing stochastic and 'site' artefact data. Data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (Linkage and Flexible Beta) and Multi-Dimensional Scaling (MDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). To identify the presence of FCT's appropriate multivariate analyses comparing current data to that of Gibson *et al*. (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g. spatial and temporal differences), results and subsequent extrapolations, assigned FCT's within the survey area were inferred and not absolute, i.e. a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al*. (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA and Syrinx Environmental (2014).

3.5.2.2 Assessment of diagnostics to assess presence of TECs

The 'Banksia Woodlands of the Swan Coastal Plain' TEC is listed as Endangered under the EPBC Act (TSSC 2016). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the DotEE Species Profile and Threats Database (TSSC 2016). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations (TSSC 2016).

In order to determine whether the 'Banksia Woodlands of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 2 of the Conservation Advice (TSSC 2016). The four-stage assessment identified by DotEE to ascertain the presence of the Banksia woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

The 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community is listed as Critically Endangered under the EPBC Act (DotEE 2019). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice on the DotEE Species Profile and Threats Database (DotEE 2019). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations.

In order to determine whether the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 3.2 of the Conservation Advice (DotEE 2019). The assessment identified by DotEE to ascertain the presence of the Tuart (*Eucalyptus gomphocephala*) woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

3.6 Flora identification and nomenclature

Flora specimen identification was undertaken by ELA Taxonomist Daniel Brassington, with the Western Australian Herbarium (WAH) also utilised to confirm additional specimens. Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH collection. Where considered appropriate, specimens that meet WAH specimen lodgement requirements (e.g. Threatened and Priority Flora, range extensions), will be submitted along with Threatened and Priority Report forms to DBCA. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2020).

3.7 Fauna survey

A Detailed fauna survey was conducted in accordance with the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020).

3.7.1 Habitat assessment trapping-site selection

Aerial maps of the survey areas were examined prior to the survey to select indicative locations for fauna trapping sites, to ensure that sites were placed in each fauna habitat type. Trap placement to ensure traps were concealed from public view was also taken into consideration.

Trapping sites (transects) were located to sample the habitat (vegetation - soil association) in areas expected to support a relatively high diversity of terrestrial fauna assemblages based on knowledge of faunal habitat preference of the Swan Coastal Plain. Trapping sites were chosen in order to represent all vegetation communities present within the survey area. Habitat characteristics were described primarily on flora and vegetation communities identified during the flora and vegetation survey.

The locations of the fauna trapping sites are provided in **Figure 2-1** and **Figure 2-2** and **Appendix B**, with photos presented in **Appendix C**.

3.7.2 Animal ethics

The Detailed fauna survey was conducted as per EPA (2020), DBCA fauna taking (scientific or other purposes) licence (outlined in **Table 3**) and the following Standard Operating Procedures (SOP):

- *Aluminium box traps for capture of terrestrial vertebrates* (DEC 2018a);
- *Cage traps for live capture of terrestrial vertebrates* (DEC 2018b);

- *Dry pitfall trapping for vertebrates* (DEC 2018c);
- *Funnel trapping for terrestrial fauna* (DEC 2018d);
- *Animal handling and restraint using soft containment* (DEC 2017);

Under these regulations, a set of methods and conditions were adhered to in order to minimise harm or stress to fauna. Animal ethics considerations focus on the following:

- Minimising the duration of time that fauna are in traps;
- Minimising trapped fauna exposure to harmful environmental conditions (i.e. heat and cold);
- Minimising the risk of introducing or spreading known fauna pathogens between populations;
- Appropriate and minimal animal handling; and
- Appropriate release conditions.

All vertebrate fauna captured during the fauna survey were identified in the field and released at the point of capture.

3.7.3 Sampling methods

The fauna survey was undertaken using a variety of sampling techniques, both systematic and opportunistic. Systematic sampling refers to data methodically collected over a fixed time period in a discrete habitat type or location, using an equal or standardised sampling effort across multiple sample locations. This approach provides a range of detection methods that cover the full suite of vertebrate fauna assemblages. Opportunistic sampling includes data collected non-systematically from both fixed sampling sites and as opportunistic records from chance encounters with fauna. This method generally accounts for the majority of bird species and a significant proportion of other fauna groups recorded, including invertebrate species.

3.7.3.1 Trapping

A total of four full trapping sites were established over four nights; two in the Burns Beach survey area (trapping sites 1 and 2) and two in the Iluka survey area (trapping sites 3 and 4; **Figure 2-1** and **Figure 2-2**). At each trapping site, the following were established (trap nights presented in **Table 5**):

- Ten 20 litre pit traps set approximately 20 m intervals and set with flywire mesh drift fence;
- Ten funnel traps set approximately 20 m intervals and set with flywire mesh drift fence;
- Twenty small aluminium box traps set approximately 10-20 m intervals;
- Two cage traps set approximately 10-20 m intervals;
- One Song Meter SM2 ultrasonic recorder; and
- One motion camera.

An additional trapping site (trapping site 5) of seven small aluminium box traps was established in the Iluka survey area in the limestone cliffs habitat (**Figure 2-1** and **Figure 2-2**). All small aluminium box traps, cage traps and motion camera traps were set with universal bait made from a mixture of rolled oats, peanut butter and sardines.

3.7.3.2 Spotlighting

Nocturnal survey involves the use of head torches to detect active nocturnal fauna by eye shine or movement. Searching was conducted by traversing the walk tracks whilst spotlighting into adjacent

bushland within the study areas. The nocturnal survey occurred over a period of approximately two hours between 18:30 and 20:30 hours on 12th November 2020.

3.7.3.3 Observation

Bird surveys were undertaken during peak activity periods, namely after dawn. Birds were identified by visual detection and by call within an approximately 20 m radius of each trapping site. Birds are less active in wet, windy and extremely hot conditions, for example conditions experienced during this survey.

Opportunistic observations were made at all times during the five-day field survey, during both daylight hours and during the spotlighting session. Calls, tracks, diggings, scats, dens, burrows and other signs of fauna activity were recorded where observed.

Active searches involved the use of hand rakes to search within microhabitats for inactive reptiles. Search locations included beneath leaf litter, logs and other ground debris.

3.7.3.4 Acoustic surveys – ultrasonic calls

A SM2 recorder was established at each trapping site in representative habitat. Specialist software is able to visualise ultrasonic bat echolocation calls recorded on the SM2 into corresponding graphical representation for analysis. Most bat species have a unique call which appears as a 'fingerprint' graph output. Bat calls were analysed by comparing recorded calls with reference calls by Bob Bullen at Bat Call WA, who specialises in bat survey and identification.

3.7.3.5 Camera traps

A camera trap was established at each trapping site in representative habitat. A camera trap is a digital camera that captures an image or video using an infrared sensor when an animal moves into a detection zone. Bait stations filled with universal bait was used to attract fauna to the camera traps.

3.8 Fauna identification and nomenclature

Nomenclature used for the vertebrate fauna species within this report follows the Checklist of the Terrestrial Vertebrate Fauna of Western Australia (Western Australian Museum [WAM] 2020). Where the common names were not stated for certain species, the following references were consulted:

- Amphibians: Tyler and Doughty (2009);
- Reptiles: Wilson and Swan (2013);
- Birds: Morcombe (2003); and
- Mammals: Menkhorst and Knight (2011).

Figure 2-1: Survey effort and survey sampling locations - Burns Beach



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Quadrat
- GPS Tracks

Fauna Trapping Sites
- Trapping site 1
- Trapping site 2

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

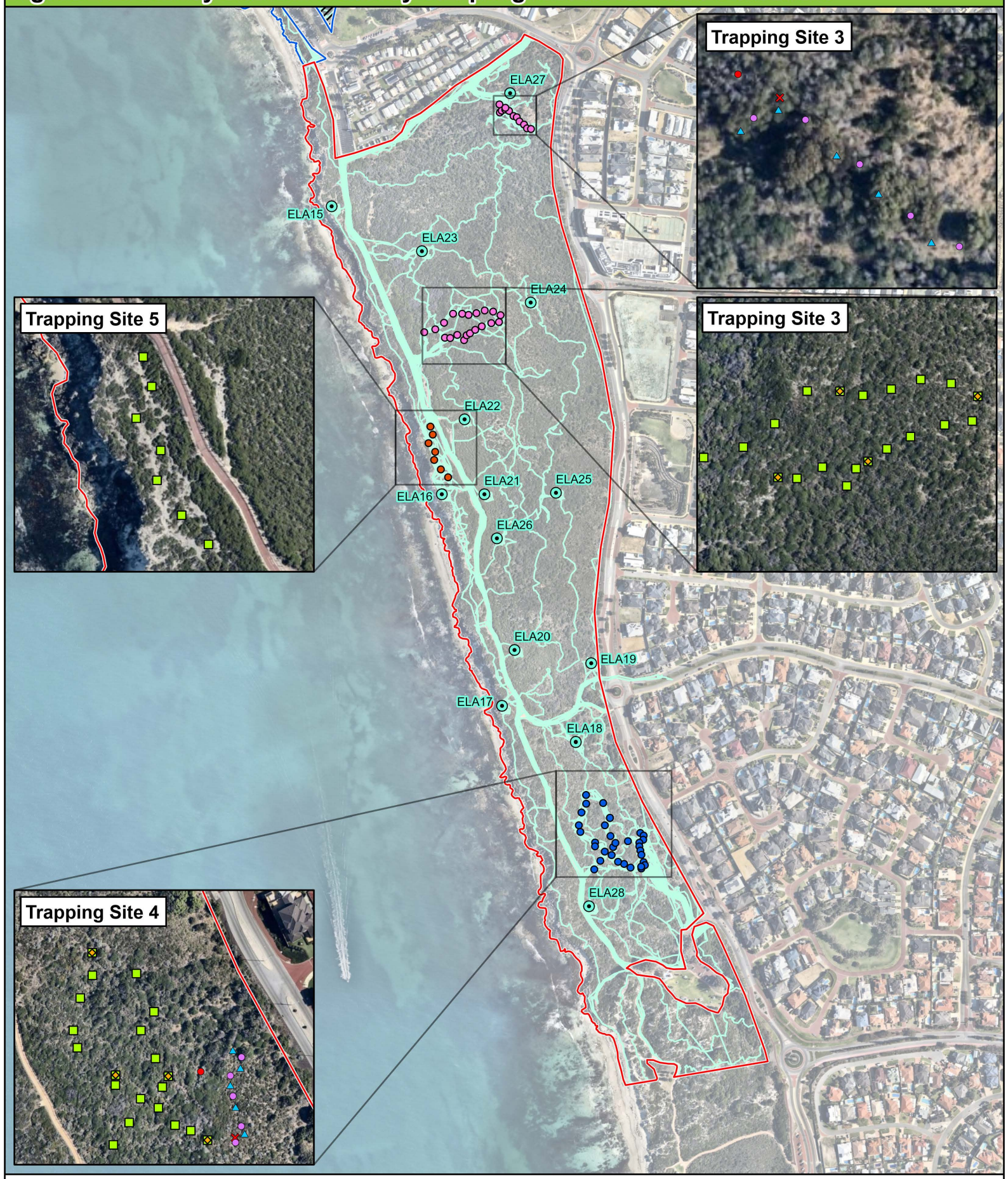
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Figure 2-2: Survey effort and survey sampling locations - Iluka Foreshore



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Quadrat
- GPS Tracks

Fauna Trapping Sites
- Trapping site 3
- Trapping site 4
- Trapping site 5

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

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Table 5: Trapping nights

Trap line	Pit traps	Funnel traps	Small aluminium box traps	Cage traps	Spotlighting	Observation (e.g. bird surveys, active searching, opportunistic)	Acoustic surveys – ultrasonic calls	Camera traps
ELA01	160	160	320	8	Yes	Yes	1	4
ELA02	160	160	320	8	Yes	Yes	1	4
ELA03	160	160	240[2]	6	Yes	Yes	1	4
ELA04	160	160	240[2]	6	Yes	Yes	1	4
ELA05[1]	-	-	21[2]	-	-	Yes	-	-
Total	**640**	**640**	**1,141**	**28**	**-**	**-**	**4**	**28**

[1] Site ELA05 was in the limestone cliffs habitat, therefore only small aluminium box traps were established

[2] Due to high rainfall on the first day of the fauna survey, these sites were unable to be established; therefore, only three trap nights were undertaken.

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3.9 Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the Detailed and Targeted flora survey, vegetation condition assessment and Detailed fauna survey for the survey areas are summarised in **Table 6**. One potential constraint was identified.

Table 6: Survey limitations

Constraint	Limitations
Sources of information	**Not a constraint:** The Swan Coastal Plain has been well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. A number of flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al.* 1994 was a primary source for determination of methods, analysis and results for assessing FCTs. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope of work	**Not a constraint:** The survey requirement for a Detailed and Targeted flora survey and vegetation condition assessment in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met. The survey requirement for a Detailed fauna survey in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) was adequately met.
Completeness of survey	**Not a constraint:** The area was surveyed to the satisfaction of the scope and a Detailed and Targeted flora survey and vegetation condition assessment and Detailed fauna survey as per relevant guidelines.
Intensity of survey	**Not a constraint:** Survey effort was considered adequate to meet objectives of the scope. The area was surveyed for conservation significant flora species and vegetation communities by field staff undertaking transects across the survey area spaced 5-20 m apart on average. This method provided an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation communities present and to identify any vegetation of conservation significance. Adequacy of the current sampling effort was tested via a species accumulation curve; approximately 90% of the flora potentially present within the survey area was recorded. Fauna trapping sites were established in each of the vegetation communities present.
Timing, weather, season, cycle	**Potential constraint:** The survey area is located in the Swan Coastal Plain bioregion of Western Australia. Recommended survey timing for this region is in spring (September – November; EPA 2016). The flora survey was undertaken in September / October and the fauna survey was undertaken in November. Many flora species were flowering at the time of the flora survey or had sufficient material (fruit) available to identify the dominant and target species. Approximately 29.8 mm of rainfall fell during the fauna survey, with 19 mm on one day. This delayed the establishment of three aluminium box trap lines and may have impacted the species diversity and abundance trapped during the fauna survey.

Constraint	Limitations
Disturbances	**Not a constraint:** Disturbances within the survey area included the presence of weeds, unauthorised access (walk trails and bike tracks) and edge effects. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Resources	**Not a constraint:** The personnel conducting this field survey were both suitably qualified to identify specimens, having previously undertaken flora and vegetation assessments on the Swan Coastal Plain, including in several reserves for the City of Joondalup.
Accessibility	**Not a constraint:** All relevant areas of the survey area were easily accessed and able to be surveyed.

4. Results

4.1.1 Previous surveys

A summary of the previous flora and vegetation and fauna surveys undertaken is provided in **Table 7**.

Table 7: Summary of previous surveys

Survey	Summary	Conservation significant species or communities
Tamala Park Reserve – Biological Report (AECOM 2018)	A biological assessment was successfully completed for a defined Survey Area of Tamala Park between Burns Beach and Mindarie and is bound by the Indian Ocean to the west and Marmion Avenue to the east. The field surveys were undertaken in September, October and November 2018. Eleven vegetation communities were mapped within the Survey Area; two woodlands, seven shrublands and one thicket. Four major fauna habitats were recorded in the Survey Area with the most valuable being the Woodland Over Mid to Low Shrubland due to their lower representation within the Survey Area.	Three Department of Biodiversity, Conservation and Attractions (DBCA) listed PECs were recorded within the Survey Area. No Threatened or Priority flora and fauna species were recorded.
Targeted Flora and Vegetation Survey – Part Lot 11485, 44 Ocean Parade, Burns Beach (Natural Area 2017)	The survey recorded 43 species, of which 17 were native and 26 non-native (weed) species, of which none were conservation significant. Vegetation types are representative of modified remnant vegetation that has been the subject to disturbance. Vegetation condition at the site ranged from completely degraded to good, with the majority being rated completely degraded.	The flora survey at Burns Beach found no declared rare flora and no threatened ecological communities.
Macroinvertebrate and Herpetofauna Inventory Surveys (Knowles and Knowles 2015-2018)	The sample history in this report spans from September 2015 to May 2018. Records of over 550 macroinvertebrates and herpetofauna species were gathered over this time.	No Threatened or Priority macroinvertebrates and herpetofauna species were recorded.
Coastal Foreshore Management Plan 2014-2024 (Natural Area 2014)	Four vegetation communities were described in the original plan by Ecoscape in 2002 and vegetation condition was assessed by Syrinx Environmental Pty Ltd in 2010 (48.2% in Good condition). A level 1 fauna survey and Graceful Sun Moth survey was undertaken by Western Wildlife in 2008.	One Threatened flora species, *Marianthus paralius*, and one P3 species, *Hibbertia spicata* subsp. *leptotheca*, under the (then) State *Wildlife Conservation Act 1950* are found in the coastal foreshore reserve.
Department of Planning Proposed Dual Use Coastal Path between Mindarie and Burns Beach Environmental	The Reconnaissance survey found 187 taxa from 41 families, including 47 introduced species. The survey identified eight vegetation types. A level 1 survey identified 28 fauna species, comprising 21 birds and three mammals. No fauna species of conservation significance were recorded.	At the time of the field survey, the moss *Fabronia hampeana* (P2) was the only conservation significant taxon recorded. Since the time of the field survey, *Jacksonia sericea* and Gastrolobium tomentosum have also been listed as Priority 4 species by DBCA.

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Survey	Summary	Conservation significant species or communities
Study and Topographical Survey Report (GHD 2013)		
Iluka Flora and Vegetation Survey and Fauna Assessment (ATA Environmental 2001)	The flora and vegetation survey was undertaken in October and December 2000, whilst the fauna habitat assessment was undertaken in November 2000. Six native vegetation associations were recorded from the study area. Three fauna habitats were defined from the study area; *Banksia* woodland, mixed heath and *Dryandra* heath.	No Declared Rare Flora species or TECs occurred in the study area. Possible signs of Quenda (diggings) were recorded in the study area.

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4.2 Flora and vegetation survey

4.2.1 Flora overview

A total of 121 flora species (74 native and 47 introduced) were recorded across 14 quadrats established in the Iluka survey area and from opportunistic collections. Average flora species richness per quadrat in Iluka survey area was 28.93 species, ranging from a low of 17 species at ELA20 to a high of 42 species at ELA24. Families with the highest number of species included Poaceae (15 species), Fabaceae (14 species) and Asteraceae (10 species). *Acacia*, *Conostylis*, *Hibbertia* and *Melaleuca* were the best represented genera throughout the Iluka survey area with 4, 4, 4 and 3 taxa recorded, respectively.

A total of 106 flora species (63 native and 43 introduced) were recorded across 14 quadrats established in Burns Beach survey area and from opportunistic collections. Average flora species richness per quadrat in Burns Beach survey area was 25.62 species, ranging from a low of 17 species at ELA02 to a high of 40 species at ELA13. Families with the highest number of species included Poaceae (16 species), Fabaceae (14 species) and Asteraceae (6 species). *Acacia*, *Conostylis* and *Melaleuca* were the best represented genera throughout the Burns Beach survey area with 5, 3 and 3 taxa recorded, respectively.

The flora species list is presented in **Appendix D**, flora species matrix in **Appendix E** and quadrat site data in **Appendix F**.

4.2.2 Accumulated species – site surveyed (species-area curve)

A species accumulation curve (**Figure 3**) was used to evaluate the adequacy of sampling (Clarke and Gorley 2006). Only species data recorded from defined quadrats were used; no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 143.1. Based on this value, and the total species recorded within quadrats, approximately 90% of the flora species potentially present within the survey areas were recorded. This result, in addition to opportunistic collections, indicates that the majority of flora potentially present within the survey areas were recorded.

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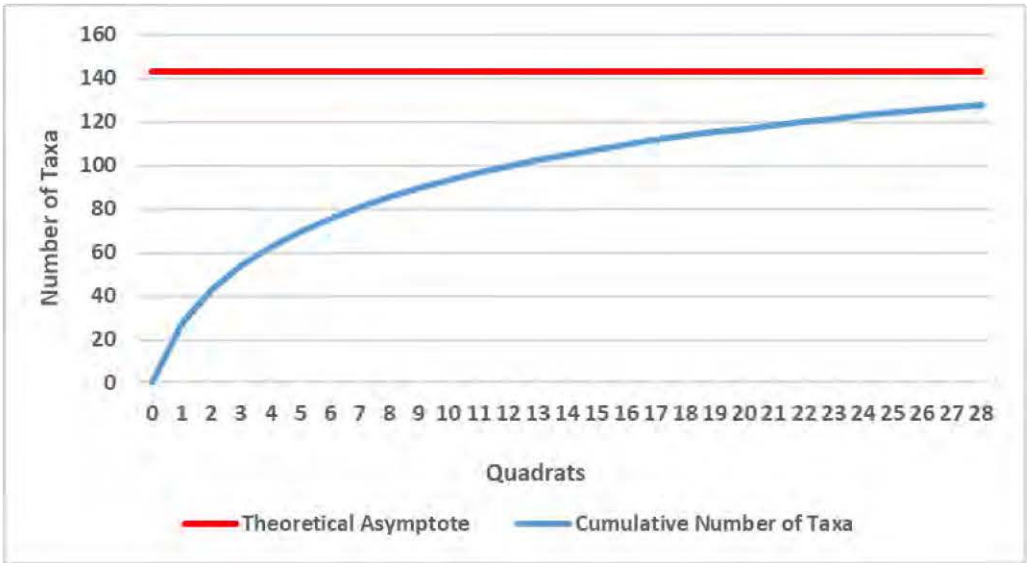


Figure 3: Average randomised species accumulation curve

Note: Only species recorded from quadrats were used to calculate the species accumulation curve and theoretical maximum number of species (asymptotic value).

4.2.3 Conservation significant flora

One flora species listed as Endangered under the EPBC Act and BC Act was recorded within the Iluka survey area, namely *Marianthus paralius* (WA Herbarium ACC/8941/E). [redacted] No Threatened flora species listed under the EPBC Act or BC Act were recorded within the Burns Beach survey area (including the restaurant development area).

Two Priority flora species (listed by DBCA) were recorded in the Iluka survey area; *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4; **Figure 4-1** and **Figure 4-2**). *Hibbertia leptotheca* was found from eight locations near the coast in FpApSc (low limestone heath) vegetation community, whilst *J. sericea* was found in <2% cover in the BsArSg (low coastal heath) vegetation community. Both species are also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of WA 2000). No Priority flora species were recorded within the Burns Beach survey area (including the restaurant development area).

A further eight Bush Forever significant flora species were recorded from within the Iluka and Burns Beach survey areas, as outlined in **Table 8** and presented in **Figure 4-1** and **Figure 4-2** below. *Agonis flexuosa, Callitris preissii, Grevillea preissii* subsp. *preissii, Lechenaultia linarioides* and *Trymalium ledifolium* were all found from quadrats, whilst *Diplopeltis huegelii* and *Melaleuca lanceolata* were found opportunistically from one and two-point locations, respectively. *Melaleuca cardiophylla* was recorded within quadrats and as a dominant species in the McAr vegetation community. *Melaleuca lanceolata* was recorded in the restaurant development area.

Coordinate locations of conservation and Bush Forever significant flora are provided in **Appendix G**. Photos of conservation and Bush Forever significant flora are provided in **Appendix H**.

Table 8: Bush Forever significant flora species recorded within the survey areas

Species name	Burns Beach	Iluka
Agonis flexuosa	X	
Callitris preissii	X	
Diplopeltis huegelii		X
Grevillea preissii subsp. *preissii*	X	X
Lechenaultia linarioides		X
Melaleuca cardiophylla		X
Melaleuca lanceolata	X	
Trymalium ledifolium		X

Figure 4-1: Conservation significant and Bush Forever flora species recorded within Burns Beach survey area



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Conservation significant flora species

- *Agonis flexuosa* (BF)
- *Callitris preissii* (BF)
- *Grevillea preissii* subsp. *preissii* (BF)
- *Melaleuca lanceolata* (BF)

0 50 100 200
Metres

Datum/Projection:
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Figure 4-2: Conservation significant and Bush Forever flora species recorded within Iluka Foreshore survey area



4.2.4 Introduced flora

A total of 47 introduced (weed) species were recorded within the Iluka survey area, representing 38.8% of the total flora species recorded. Of these, 22 species are listed as City of Joondalup priority weeds for the Iluka survey area. **Asparagus asparagoides* (Bridal Creeper) and **Moraea flaccida* (One-leaf Cape Tulip) are listed as Declared Pests s22(2) under the BAM Act. Declared Pests with a legal status of s22(2) "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2020). **Asparagus asparagoides* (Bridal Creeper) is also listed as a WoNS (**Table 9**).

A total of 43 introduced (weed) species were recorded within the Burns Beach survey area, representing 40.6% of the total flora species recorded. Of these, 21 species are listed as City of Joondalup priority weeds for the Burn Beach survey area and **Asparagus asparagoides* (Bridal Creeper) is listed as a Declared Pest under the BAM Act and as a WoNS (**Table 9**).

Weed mapping within the survey areas is presented in **Appendix I**.

Table 9: City of Joondalup Priority weed species, Declared Pests or WoNS recorded within the survey areas

Species name	Common name	Ranking	Burns Beach	Iluka
**Arctotis* sp.	Arctotis	City of Joondalup Priority weed	X	
**Asparagus asparagoides*	Bridal creeper	WoNS and Declared Pest - s22(2), City of Joondalup Priority weed	X	X
**Avena fatua*	Wild Oats	City of Joondalup Priority weed	X	X
**Carpobrotus edulis*	Pigface	City of Joondalup Priority weed	X	X
**Chamelaucium uncinatum*	Geraldton Wax	City of Joondalup Priority weed		X
**Cynodon dactylon*	Couch grass	City of Joondalup Priority weed	X	
**Dimorphotheca ecklonis*	Veldt Daisy	City of Joondalup Priority weed	X	X
**Ehrharta calycina*	Perennial Veldt Grass	City of Joondalup Priority weed	X	X
**Ehrharta longiflora*	Annual Veldt Grass	City of Joondalup Priority weed	X	X
**Euphorbia paralias*	Sea Spurge	City of Joondalup Priority weed	X	X
**Euphorbia terracina*	Geraldton Carnation Weed	City of Joondalup Priority weed	X	X
**Fumaria capreolata*	Fumitory	City of Joondalup Priority weed	X	X

Species name	Common name	Ranking	Burns Beach	Iluka
**Gazania linearis*	Gazania	City of Joondalup Priority weed	X	X
**Lactuca serriola*	Prickle Lettuce	City of Joondalup Priority weed	X	X
**Moraea flaccida*	One-leaf Cape Tulip	Declared Pest - s22(2)		X
**Oxalis pes-caprae*	Soursob	City of Joondalup Priority weed	X	X
**Pelargonium capitatum*	Rose Pelargonium	City of Joondalup Priority weed	X	X
**Pennisetum clandestinum*	Kikuyu grass	City of Joondalup Priority weed	X	X
**Raphanus raphanistrum*	Wild Radish	City of Joondalup Priority weed	X	X
**Ricinus communis*	Castor Oil Plant	City of Joondalup Priority weed	X	X
**Schinus terebinthifolia*	Japanese Pepper	City of Joondalup Priority weed	X	X
**Tetragonia decumbens*	Sea Spinach	City of Joondalup Priority weed	X	X
**Trachyandra divaricata*	Dune Onion Weed	City of Joondalup Priority weed	X	X
**Tropaeolum* sp.	Nasturtium	City of Joondalup Priority weed		X

4.2.5 Vegetation communities

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively (**Appendix J**). Descriptions of all communities are presented in **Table 10** and mapping is presented in **Figure 5-1** and **Figure 5-2**.

Vegetation within the Iluka survey area comprised 29 ha (92.6%), with the remaining 2.3 ha (7.4%) comprising tracks and open beach/rocks. Vegetation within the Burns Beach survey area comprised 26.6 ha (90.8%), with the remaining 2.7 ha (9.2%) comprising tracks, areas of dunal blowout and open beach/rocks.

One vegetation community was delineated and mapped within the restaurant development area, namely SgSa: *Spyridium globulosum, Santalum acuminatum* tall sparse shrubland. This vegetation community comprised 0.4 hectares (84%), with the remaining 0.1 hectares (16%) comprising tracks.

Table 10: Vegetation communities recorded within the survey areas

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland.	**Carpobrotus edulis, *Catapodium rigidum, *Crassula glomerata, Daucus glochidiatus, *Ehrharta longiflora, *Galium murale, Leucopogon parviflorus, *Lysimachia arvensis, *Melilotus indicus, Parietaria cardiostegia, Plantago exilis, Rhodanthe corymbosa, Senecio pinnatifolius* var. *latilobus* and **Stellaria media*.	ELA20, ELA21 & ELA22	N/A	N/A	3.3 ha (10.5%)
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland.	*Acrotriche cordata, *Catapodium rigidum, *Crassula glomerata, Eremophila glabra* subsp. *albicans, Hardenbergia comptoniana, *Hordeum leporinum, *Lysimachia arvensis, *Medicago polymorpha, Melaleuca huegelii, Olearia axillaris, Olax benthamiana, Rhagodia baccata, Senecio pinnatifolius* var. *latilobus, Spyridium globulosum, *Stellaria media* and *Templetonia retusa, Threlkeldia diffusa.*	ELA15, ELA16 & ELA17	0.1 ha (0.3%)	N/A	3.6 ha (11.5%)
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland.	*Acacia cyclops, Calandrinia tholiformis, *Catapodium rigidum, Conostylis setigera, Crassula colorata, *Crassula glomerata, Daucus glochidiatus, Desmocladus flexuosus, Dianella revoluta, *Ehrharta longiflora, *Galium murale, Hardenbergia comptoniana, Leucopogon parviflorus, *Lysimachia arvensis, *Melilotus indicus, Olearia axillaris, Parietaria cardiostegia, Rhodanthe corymbosa, Santalum acuminatum* and **Stellaria media.*	ELA23, ELA24, ELA25, ELA26 & ELA28	N/A	N/A	15.2 ha (48.6%)
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low	*Acacia cyclops, Acanthocarpus preissii, Austrostipa flavescens, Banksia attenuata, *Briza maxima, Calothamnus quadrifidus, Conostylis setigera, Corynotheca micrantha, *Ehrharta calycina, *Euphorbia	ELA13, ELA18, ELA19 & ELA27	0.4 ha (1.4%)	N/A	4.6 ha (14.7%)

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
	open shrubland and *Lomandra maritima* low sparse forbland.	*terracina, *Gladiolus caryophyllaceus, Hardenbergia comptoniana, *Pelargonium capitatum, *Petrorhagia dubia, Phyllanthus calycinus, Rhagodia baccata, Threlkeldia diffusa* and **Trachyandra divaricata.*				
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland.	*Acacia saligna, Atriplex cinerea, *Carpobrotus edulis, Cassytha flava, *Crassula glomerata, Daucus glochidiatus, *Dischisma arenarium, *Ehrharta longiflora, Gastrolobium nervosum, Hardenbergia comptoniana, Hemiandra glabra, *Pelargonium capitatum, Rhagodia baccata, Senecio pinnatifolius* var. *latilobus, *Stellaria media* and *Threlkeldia diffusa.*	ELA07, ELA09 & ELA10	13.4 ha (46.1%)	N/A	1.2 ha (3.8%)
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland.	**Asparagus asparagoides, *Avena barbata, *Bromus diandrus, Callitris preissii, *Crassula glomerata, Daucus glochidiatus, *Ehrharta calycina, Eucalyptus utilis, *Euphorbia terracina, Hardenbergia comptoniana, Kunzea glabrescens, *Lactuca serriola, Lepidosperma gladiatum, *Lysimachia arvensis, Melaleuca lanceolata, *Pelargonium capitatum, *Sonchus oleraceus, *Stellaria media* and **Trachyandra divaricata*.	ELA02, ELA03, ELA04, ELA06	1.9 ha (6.5%)	N/A	0.7 ha (2.2%)
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland.	*Acacia cyclops, Acacia rostellifera, Acanthocarpus preissii, *Bromus diandrus, Calandrinia brevipedata, *Carpobrotus edulis, Cassytha flava, Conostylis candicans* subsp. *calcicola, *Crassula glomerata, Daucus glochidiatus, *Ehrharta calycina, *Ehrharta longiflora, Hardenbergia comptoniana, *Lagurus ovatus, Lomandra maritima, *Lysimachia arvensis, Melaleuca systena, *Pelargonium capitatum, Senecio pinnatifolius* var. *latilobus, Spinifex*	ELA01, ELA05, ELA08, ELA11, ELA12 & ELA14	10.7 ha (36.5%)	0.4 ha (84%)	0.4 ha (1.3%)

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
		longifolius, Threlkeldia diffusa, and **Trachyandra divaricata.*				
			Open beach / rocks	1 ha (3.4%)	N/A	1.2 ha (3.8%)
			Dunal blow out	0.6 ha (2%)	N/A	N/A
			Tracks	1.1 ha (3.8%)	0.1 ha (16%)	1.1 ha (3.5%)
			Total	**29.3 ha**	**0.5 ha**	**31.3 ha**

*Inclusive of restaurant development area

4.2.6 Conservation significant ecological communities

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of this analysis are shown in **Table 11**.

Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community, comprising ELA13, ELA18, ELA19 and ELA27, had a close affiliation with FCT 24. FCT 24: 'Northern Spearwood shrublands and woodlands' is listed by DBCA as a Priority 3 ecological community (DBCA 2017). FCT24 is described as heaths or heaths with scattered *Eucalyptus gomphocephala* (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*. The BsArSg vegetation community, comprising a total of 4.6 ha (14.7%) of the Iluka survey area and 0.4 ha (1.4%) of the Burns Beach survey area, has components analogous to the 'Northern Spearwood shrublands and woodlands' PEC, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland, and is considered as likely representing this community (**Figure 6**).

FCT24 is a known component of the Banksia Woodlands of the Swan Coastal Plain TEC, listed as EN under the EPBC Act (TSSC 2016) and is listed within the Approved Conservation Advice (incorporating listing advice) for the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain TEC as a FCT that includes Tuart (DotEE 2019), indicating the potential presence of these TECs within the BsArSg vegetation community. An assessment against these TECs is presented below.

Quadrats within the remaining vegetation communities showed close affiliation with FCT 29a. FCT 29a: 'Coastal shrublands on shallow sands' is listed by DBCA as a Priority 3 ecological community. FCT 29a is described as mostly heaths on shallow sands over limestone close to the coast. Important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. Vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa, comprising a total of 24.4 ha (77.91%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area. These communities have, to varying extents, components analogous to the 'Coastal shrublands on shallow sands' PEC; including the presence of heaths on shallow sands over limestone close to the coast and dominance of key species such as *Spyridium globulosum*, *Rhagodia baccata* and *Olearia axillaris*.(**Figure 6**). A total of 0.4 ha (84%) of the restaurant development area is considered as representing the 'Coastal shrublands on shallow sands' PEC (**Figure 6**).

FCT 29a is listed within the Approved Conservation Advice (incorporating listing advice) for the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain TEC as a FCT that includes Tuart (DotEE 2019), indicating the potential presence of these TECs within the survey areas. An assessment against the Tuart TEC diagnostic is presented below.

A graphical representation of relationships between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson et al. (1994) is shown in **Appendix K**.

Table 11: Relationships between ELA vegetation communities and FCTs defined by Gibson *et. al.* (1994)

Inferred FCT affiliation	ELA vegetation community	ELA quadrat number	Survey area	Closest affiliated site(s) (Gibson *et al.* 1994)
24	BsArSg	ELA13	Burns Beach	BURN-2 (29a)
		ELA18	Iluka	BOLD-3 (24), BOLD-4 (24), TRIG-5 (24), BOLD-1 (24), BOLD-2 (24)
		ELA19	Iluka	TRIG-1 (29a), BOLD-3 (24), BOLD-4 (24), TRIG-5 (24), BOLD-1 (24), BOLD-2 (24), PWALT-1 (10b)
		ELA27	Iluka	CHIDPT-1 (24), NAVB-3 (24), BOLD-1 (24), BOLD-2 (24), TRIG-5 (24), BOLD-3 (24), BOLD-4 (24), PWALT-1 (10b)
29a	ArAcSg	ELA02	Burns Beach	PRES-1 (29a)
		ELA03	Burns Beach	WOODP-1 (30a), TRIG-2 (29a)
		ELA04	Burns Beach	TRIG-2 (29a), WOODP-2 (30a)
		ELA06	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
	FpApSc	ELA15	Iluka	TRIG-2 (29a), BURN-2 (29a), PRES-1 (29a)
		ELA16	Iluka	BURN-1 (29a), PRES-1 (29a), BURN-2 (29a), TRIG-2 (29a), NAVB-2 (29a)
		ELA17	Iluka	TRIG-2 (29a), BURN-2 (29a)
	McAr	ELA20	Iluka	PRES-1 (29a)
		ELA21	Iluka	TRIG-2 (29a), GARDEN-2 (29a)
		ELA22	Iluka	TRIG-2 (29a), GARDEN-2 (29a), GARDEN-2 (29a)
	SgEsOa	ELA07	Burns Beach	TRIG-2 (29a), BURN-2 (29a), GARDEN-2 (29a)
		ELA09	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA10	Burns Beach	BURN-1 (29a), SEAB-8 (29a), TRIG-2 (29a), BURN-2 (29a), GARDEN-2 (29a)
	SgMhAr	ELA23	Iluka	NAVB-2 (29a), PRES-1 (29a)
		ELA24	Iluka	NAVB-2 (29a), SEAB-4 (29a), SEAB-5 (29a), BURN-1 (29a), SEAB-8 (29a)
		ELA25	Iluka	TRIG-2 (29a), BURN-2 (29a), MTHENRY-1 (30c), MTHENRY-2 (30c)
		ELA26	Iluka	PRES-1 (29a), BURN-2 (29a)
		ELA28	Iluka	TRIG-2 (29a), NAVB-2 (29a), SEAB-4 (29a), SEAB-5 (29a), BURN-1 (29a), SEAB-8 (29a)
	SgSa	ELA01	Burns Beach	TRIG-2 (29a), BURN-2 (29a), PRES-1 (29a)
		ELA05	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA08	Burns Beach	BURN-1 (29a), TRIG-2 (29a), BURN-2 (29a)
		ELA11	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA12	Burns Beach	PRES-1 (29a), NAVB-1 (16)
		ELA14	Burns Beach	BURN-2 (29a), PRES-1 (29a)

4.2.6.1 Banksia Woodlands of the Swan Coastal Plain TEC diagnostic

Vegetation communities were assessed against key diagnostic characteristics outlined in the Banksia Woodlands of the Swan Coastal Plain TEC approved conservation advice (TSSC 2016), in order to determine the presence of this TEC within the survey areas.

The BsArSg vegetation community consists of a *Banksia sessilis* shrubland over low heath. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19 as part of the BsArSg vegetation community. This stand comprised of an area of less than 0.5 hectares in size and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community. The full four-stage assessment against the key diagnostic characteristics for this TEC are presented in **Appendix L**.

4.2.6.2 Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC diagnostic

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC' approved conservation advice (DotEE 2019) in order to determine the presence of the TEC within the survey areas. Whilst vegetation showed close affiliation with FCT 24 and 29a, indicating the potential presence of the TEC, no Tuarts were recorded in either of the survey areas. Therefore, no diagnostic assessment was undertaken.

4.2.7 Vegetation condition

Vegetation within the Iluka and Burns Beach survey areas ranged from Excellent to Completely Degraded, based on Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). Majority of Iluka and Burns Beach survey areas were classed as being in Excellent condition. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

Vegetation condition is presented in **Table 12** and **Figure 7.1** and **Figure 7.2**. Vegetation condition per vegetation community is presented in **Table 13**, **Table 14** and **Figure 8-1** and **Figure 8-2**.

Table 12: Vegetation condition within the survey areas

Vegetation condition	Extent within the Burns Beach survey area	Extent within the restaurant development area	Extent within the Iluka survey area
Pristine	N/A	N/A	N/A
Excellent	19.1 ha (65.2%)	N/A	21.9 ha (70%)
Very Good	2 ha (6.8%)	N/A	3.4 ha (10.9%)
Good	4.2 ha (14.3%)	0.44 ha (81.5%)	3.7 ha (11.8%)
Degraded	N/A	N/A	N/A
Completely Degraded	1.9 ha (6.5%)	N/A	N/A
Open beach / rocks	1 ha (3.4%)	N/A	1.2 ha (3.8%)
Tracks	1.1 ha (3.8%)	0.1 ha (18.5%)	1.1 ha (3.5%)
Total	**29.3 ha**	**0.54 ha**	**31.3 ha**

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Table 13: Vegetation condition per vegetation community within the Burns Beach survey area

Vegetation community	Condition % (ha)						
	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded	Total % (ha)
BsArSg	N/A	N/A	N/A	0.4	N/A	N/A	**0.4 ha (1.5%)**
SgEsOa	N/A	11.8	0.6	N/A	N/A	1	**13.4 ha (50.4%)**
ArAcSg	N/A	0.3	N/A	1.6	N/A	N/A	**1.9 ha (7.1%)**
SgSa	N/A	6.8	1.5	2.1	N/A	0.3	**10.7 ha (40.2%)**
FpApSc	N/A	0.1	N/A	N/A	N/A	N/A	**0.1 ha (0.4%)**
Total ha (%)	**N/A**	**19 ha (71.7%)**	**2.1 ha (7.5%)**	**4.1 ha (15.8%)**	**N/A**	**1.3 (4.9%)**	**26.5 ha (100%)**

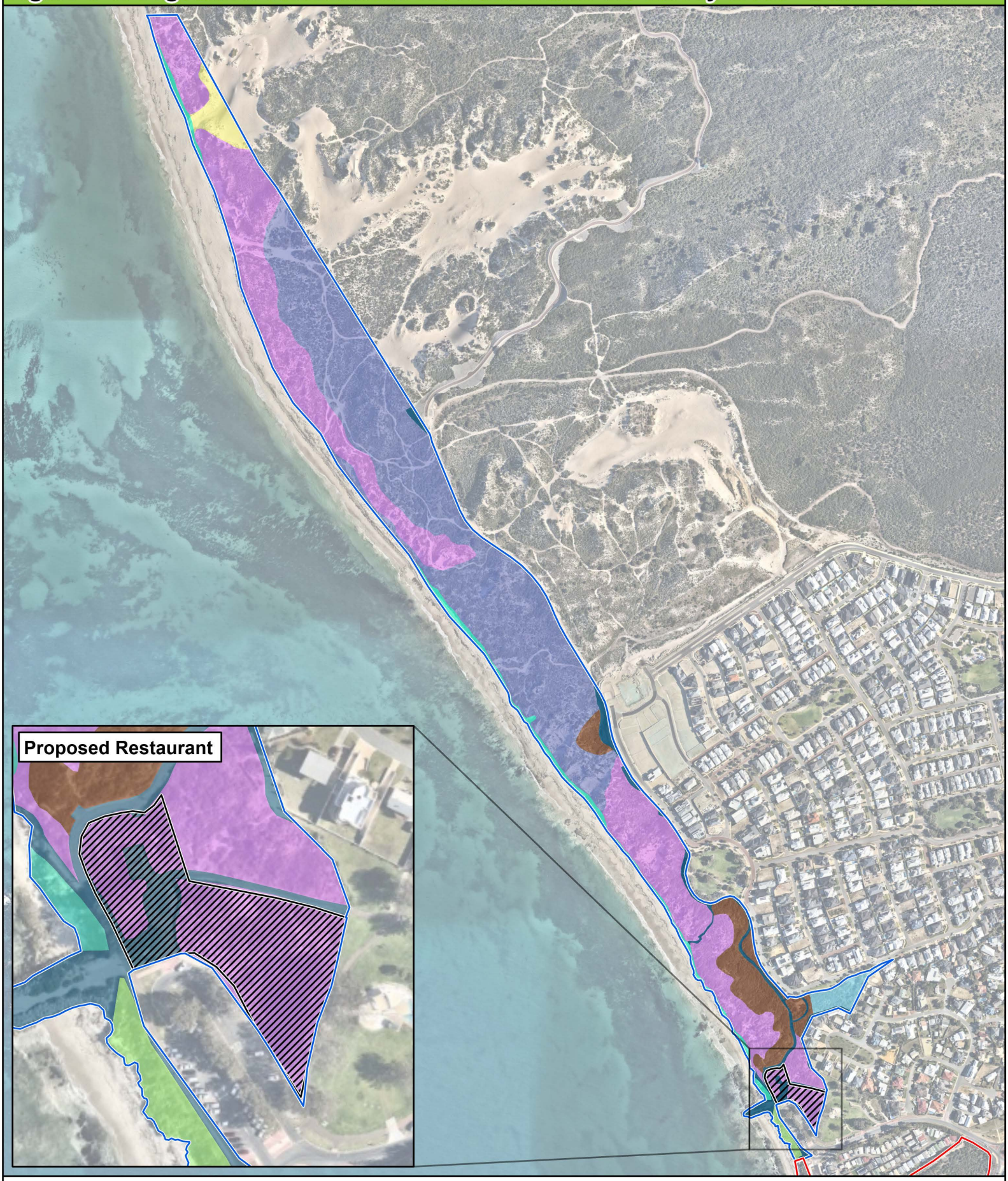
Table 14: Vegetation condition per vegetation community within the Iluka survey area

Vegetation community	Condition % (ha)						
	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded	Total % (ha)
ArAcSg	N/A	N/A	N/A	0.6	N/A	N/A	**0.6 ha (2.1%)**
BsArSg	N/A	1.5	N/A	3.1	N/A	N/A	**4.6 ha (15.9%)**
FpApSc	N/A	3.6	N/A	N/A	N/A	N/A	**3.6 ha (12.4%)**
McAr	N/A	3.3	0.02	N/A	N/A	N/A	**3.3 ha (11.4%)**
SgEsOa	N/A	1.2	N/A	N/A	N/A	N/A	**1.2 ha (4.1%)**
SgMhAr	N/A	11.9	3.4	N/A	N/A	N/A	**15.2 ha (52.4%)**
SgSa	N/A	0.4	N/A	N/A	N/A	N/A	**0.4 ha (1.4%)**
Total ha (%)	**N/A**	**21.9 ha (69.9%)**	**3.4 ha (10.8%)**	**3.7 ha (11.8%)**	**N/A**	**N/A**	**29 ha (92.6%)**

4.2.8 Fungi

No fungi were recorded in either of the survey areas during the field survey.

Figure 5-1: Vegetation communities recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Dunal blowout
- Open Beach/Rocks
- Track/Building

Vegetation Community

- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

0 50 100 200
Metres
Datum/Projection:
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Figure 5-2: Vegetation communities recorded within the survey areas - Iluka Foreshore



Legend

Survey Area

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

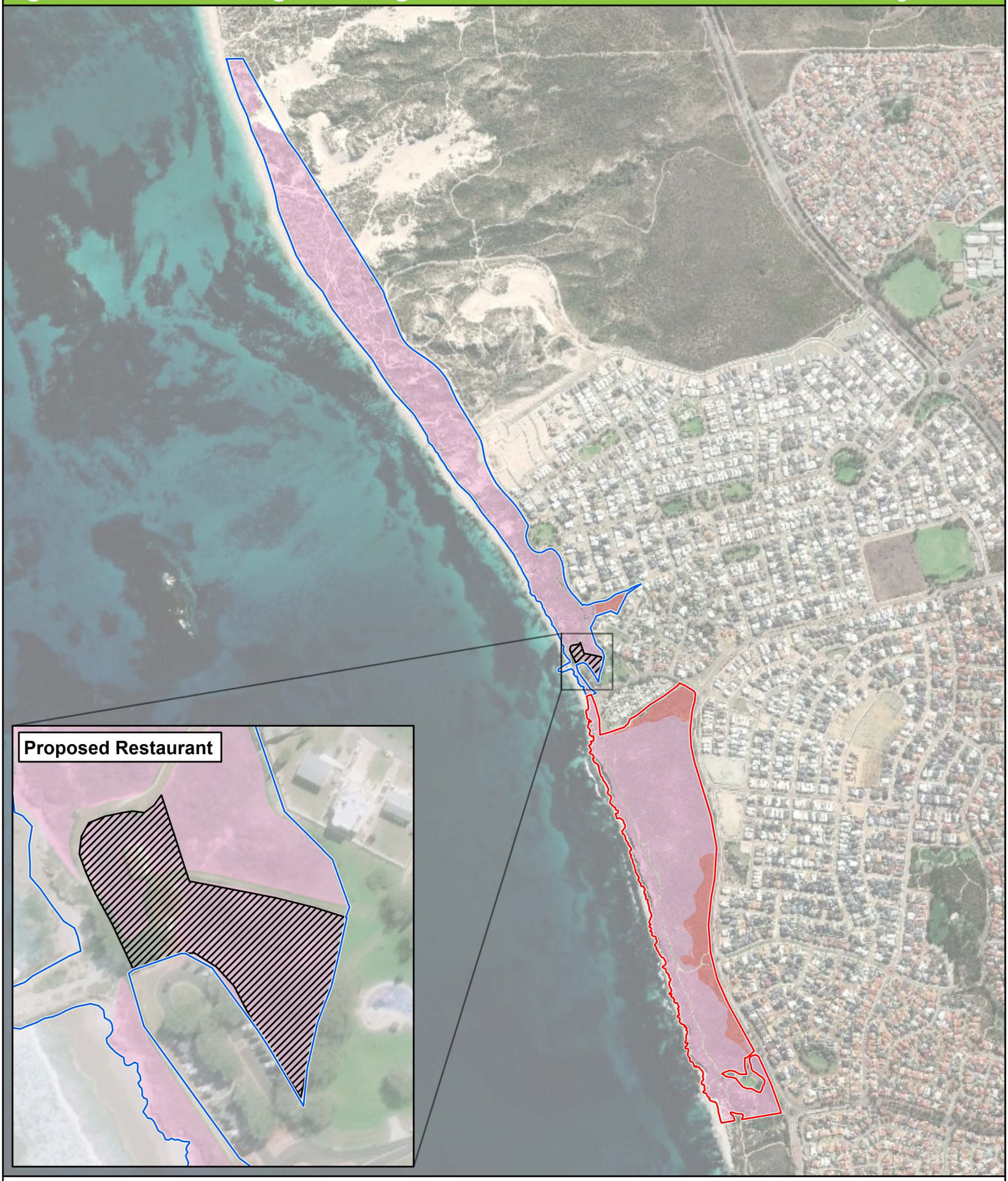
0 50 100 200
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 6: Conservation significant vegetation communities recorded within the survey areas



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Conservation significant vegetation communities

- FCT 24: 'Northern Spearwood shrublands and woodlands' (P3)
- FCT29a: 'Coastal shrublands on shallow sands' (P3)

0 75 150 300
Metres

Datum/Projection:
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Figure 7-1: Vegetation condition recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Open Beach/Rocks
- Track

Vegetation Condition

- Excellent
- Very Good
- Good
- Completely Degraded

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 7-2: Vegetation condition recorded within the survey areas - Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Condition

- Excellent
- Very Good
- Good

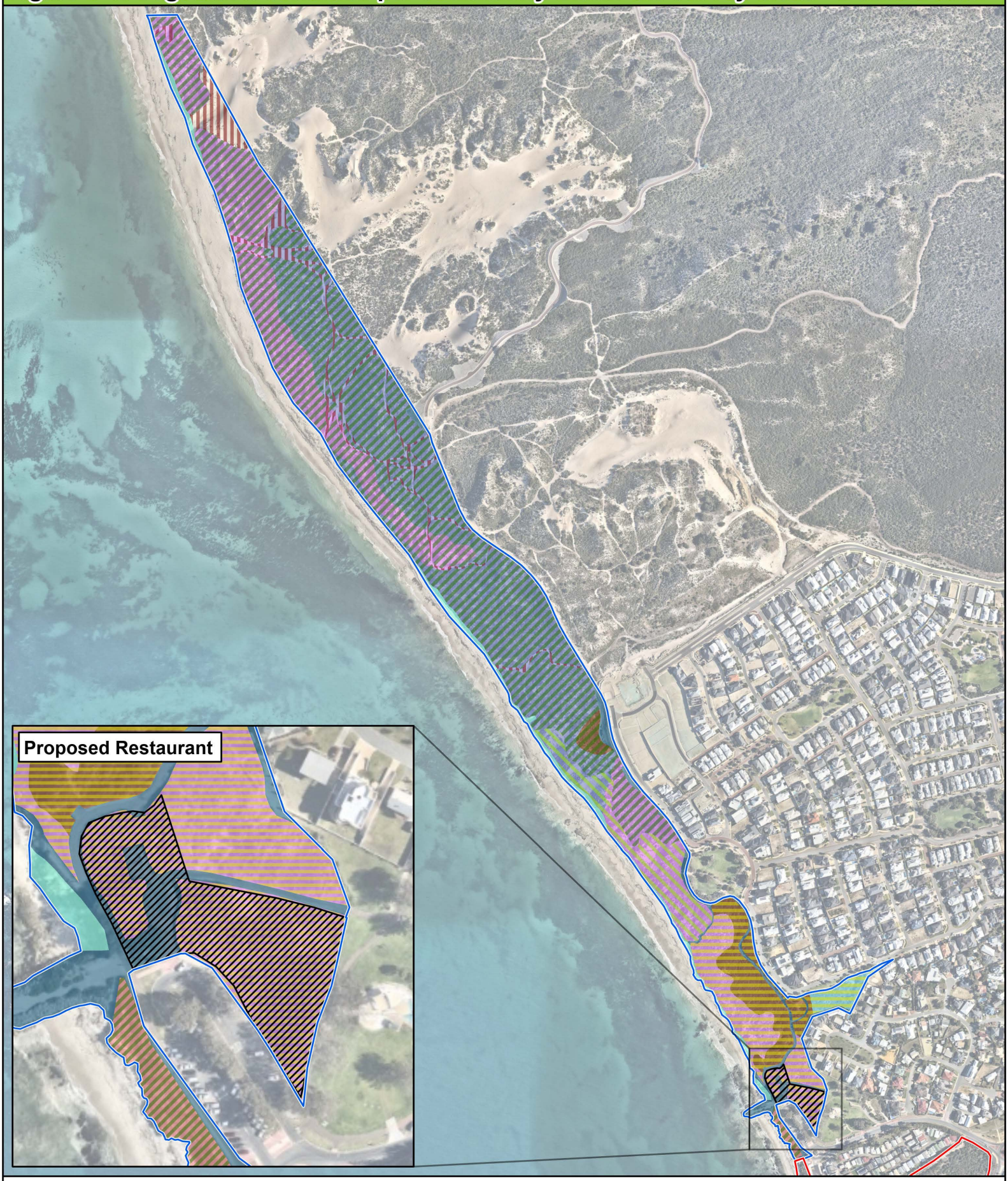
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Metres
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Figure 8-1: Vegetation condition per community within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Vegetation Condition

- Excellent
- Very Good
- Good
- Completely Degraded

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Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 8-2: Vegetation condition per community within the survey areas - Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Vegetation Condition

- Excellent
- Very Good
- Good

0 50 100 200
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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4.3 Fauna

Trapping sites were chosen in order to represent vegetation communities present within the survey area. Location of trap sites per vegetation community is presented in **Figure 9-1** and **Figure 9-2**.

4.3.1 Fauna habitats

A total of five fauna habitats were identified within the Iluka survey area (**Table 15**; **Figure 10-1** and **Figure 10-2**). These habitats cover a total of 29 ha (92.6%), with the remaining 2.3 ha (7.4%) comprising tracks and open beach/rocks. The most commonly occurring fauna habitat was *Melaleuca* shrubland over heath.

A total of four fauna habitats were identified within the Burns Beach survey area (**Table 15**; **Figure 10-1** and **Figure 10-2**). These habitats cover a total of 26.5 ha (90.8%), with the remaining 2.7 ha (9.2%) comprising tracks, areas of dunal blowout and open beach/rocks. The most commonly occurring fauna habitat was dunes and swales. One fauna habitat was identified in the restaurant development area, dunes and swales.

Table 15: Fauna habitats in the survey areas

Fauna habitats	Extent within the Burns Beach survey area	Extent within the restaurant development area	Extent within the Iluka survey area
Dunes and swales	24.1 ha (82.3%)	0.4 ha (84%)	1.6 ha (5.2%)
Tall *Acacia* shrubland	1.9 ha (6.7%)	N/A	0.6 ha (2%)
Low *Banksia* shrubland over low heath	0.4 ha (1.4%)	N/A	4.6 ha (14.7%)
Low limestone coastal heath	0.1 ha (0.5%)	N/A	3.6 ha (11.5%)
Melaleuca shrubland over heath	N/A	N/A	18.5 ha (59.1%)
Open beach / rocks	1.6 ha (5.4%)	N/A	1.2 ha (3.8%)
Tracks	1.1 ha (3.8%)	0.1 ha (16%)	1.1 ha (3.7%)
Total	**29.3 ha**	**0.5 ha**	**31.3 ha**

4.3.2 Fauna species

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. In addition, 13 invertebrate taxa representing eight orders were recorded.

A total of 37 vertebrate fauna species were recorded within the Burns Beach survey area, including seven reptile, 24 bird and six mammal species. In addition, 12 invertebrate taxa representing six orders were recorded.

The vertebrate fauna list is provided in **Appendix M**. A selection of fauna photos taken during the field survey is included in **Appendix N** and raw trapping data are provided in **Appendix O**. A full list of invertebrate taxa opportunistically recorded is provided in **Appendix P**.

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4.3.2.1 Mammals

Seven mammal species were recorded in the Iluka survey area, comprising three native species and four introduced species. Six mammal species were recorded in the Burns Beach survey area, comprising three native species and three introduced species. Introduced (feral) fauna are discussed further in Section 4.3.4.

Quenda (*Isoodon fusciventer*), listed as P4 by DBCA, were recorded in both survey areas (**Appendix Q**). At trapping site 2 in the Burns Beach survey area, six[1] individuals were trapped in cage traps over four trapping nights. An individual was also recorded on motion camera. Trapping site 3 and 4 in the Iluka survey area recorded one individual each. Of the eight trapped individuals, all but one were males, with the female having one unfurred pouch young. The majority of the Quenda observed appeared to be in good condition. Two males were missing the majority of their tail, an injury most likely the result of mating.

The SM2 recorded two bat species, White-striped Free-tailed Bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*).

4.3.2.2 Birds

A total of 27 bird species recorded at Iluka survey area and 24 bird species were recorded at Burns Beach survey area, during the bird census and opportunistically. Birds recorded during the survey include a range of nectar feeders such as Red Wattlebird (*Anthochaera carunculata*), insectivores such as Variegated Fairywren (*Malurus lamberti*) and larger omnivorous species such as Australian Magpie (*Cracticus tibicen*), Black-faced Cuckoo-shrike (*Coracina novaehollandiae*) and Pied Butcherbird (*Cracticus nigrogularis*). Honeyeaters were the most commonly observed birds across the survey areas.

One conservation listed species was recorded in the Iluka survey area; Carnaby's Cockatoo (*Calyptorhynchus latirostris*; **Appendix Q**). This species was observed flying over the survey area during the flora survey.

The remaining bird species are widespread throughout the south-west of WA and are considered locally common on the northern Swan Coastal Plain.

4.3.2.3 Reptiles

Thirteen reptile species were recorded at the Iluka survey area, comprising four snakes, one gecko, seven skinks and one blind snake. Reptile captures were greater at pitfall traps (72%) compared to funnel traps (28%).

Seven reptile species were recorded at the Burns Beach survey area, comprising one dragon, three snakes, and three skinks. Reptile captures were greater at pitfall traps (82%) compared to funnel traps (18%).

The most commonly occurring species trapped across the survey areas was West-coast Laterite Ctenotus (*Ctenotus fallens*). This species favours low coastal vegetation on sandy soils. Skinks were the most

[1] Microchipping was not undertaken for this field survey, therefore recaptures were unable to be determined

commonly observed reptiles across both survey areas. The majority of the reptile specimens were considered to be in good physical condition.

4.3.2.4 Amphibians

No amphibians were recorded during the Detailed fauna survey. Despite the rainfall received during the survey (Section 3.2.1) amphibians were not caught in traps, nor were they heard or observed opportunistically.

4.3.2.5 Invertebrates

A total of 14 invertebrate taxa were recorded across the survey area, with 13 occurring in the Iluka survey area and 12 occurring in the Burns Beach survey area (**Table 16**). Invertebrate species were collected opportunistically or as bycatch during the fauna survey. A list of invertebrate species compared with those recorded during the 2015-2018 study undertaken in collaboration with the Friends of North Ocean Reef to Iluka Foreshore (Knowles and Knowles 2015-2018) is presented in **Appendix P**. One introduced invertebrate species, Portuguese Millipede (**Ommatoiulus moreletii*), occurred in the majority of the pitfall and funnel traps at trapping site 3 (**Appendix R**).

Table 16: Invertebrate species recorded opportunistically or as bycatch during the fauna survey

Family	Genus	Species	Field name	Burns Beach	Iluka Foreshore
Araneidae	Gen.	sp.	Orb weaver sp. 1	X	X
Calliphoridae	Gen.	sp.	Fly sp. 1	X	X
Culicidae	Gen.	sp.	Mosquito sp. 1	X	X
Formicidae	*Iridomyrmex*	sp.	Meat ant sp. 1	X	X
Formicidae	*Myrmecia*	sp.	Bull ant sp. 1	X	X
Ixodidae	*Amblyomma*	*triguttatum*	Common Kangaroo Tick	X	X
Julidae	*^Ommatoiulus*	*moreletii*	Portuguese Millipede		X
Lycosidae	Gen.	sp.	Wolf spider sp.1	X	X
Megachilidae	*Megachile*	sp.	Native bee sp. 1	X	X
Nymphalidae	Gen.	sp.	Butterfly sp. 1	X	X
Phasmatidae	*Acanthomima*	sp.	Stick insect sp. 1		X
Pyrgomorphidae	Gen.	sp.	Grasshopper sp. 1	X	X
Salticidae	Gen.	sp.	Jumping spider sp. 1	X	
Tettigoniidae	Gen.	sp.	Cricket sp. 1	X	X

4.3.3 Conservation significant fauna

Two conservation significant fauna species were observed during the field survey, including Carnaby's Cockatoo (*Calyptorhynchus latirostris;* listed as Endangered under the EPBC Act and BC Act) and Quenda (*Isoodon fusciventer*; listed as P4 by DBCA). Quenda were trapped across Iluka and Burns Beach survey areas; however, Carnaby's Cockatoo was observed only at the Iluka survey area (**Figure 11**). A photo of a trapped Quenda is included in **Appendix N** and coordinate locations of trapping sites are provided in **Appendix Q**.

4.3.4 Feral fauna

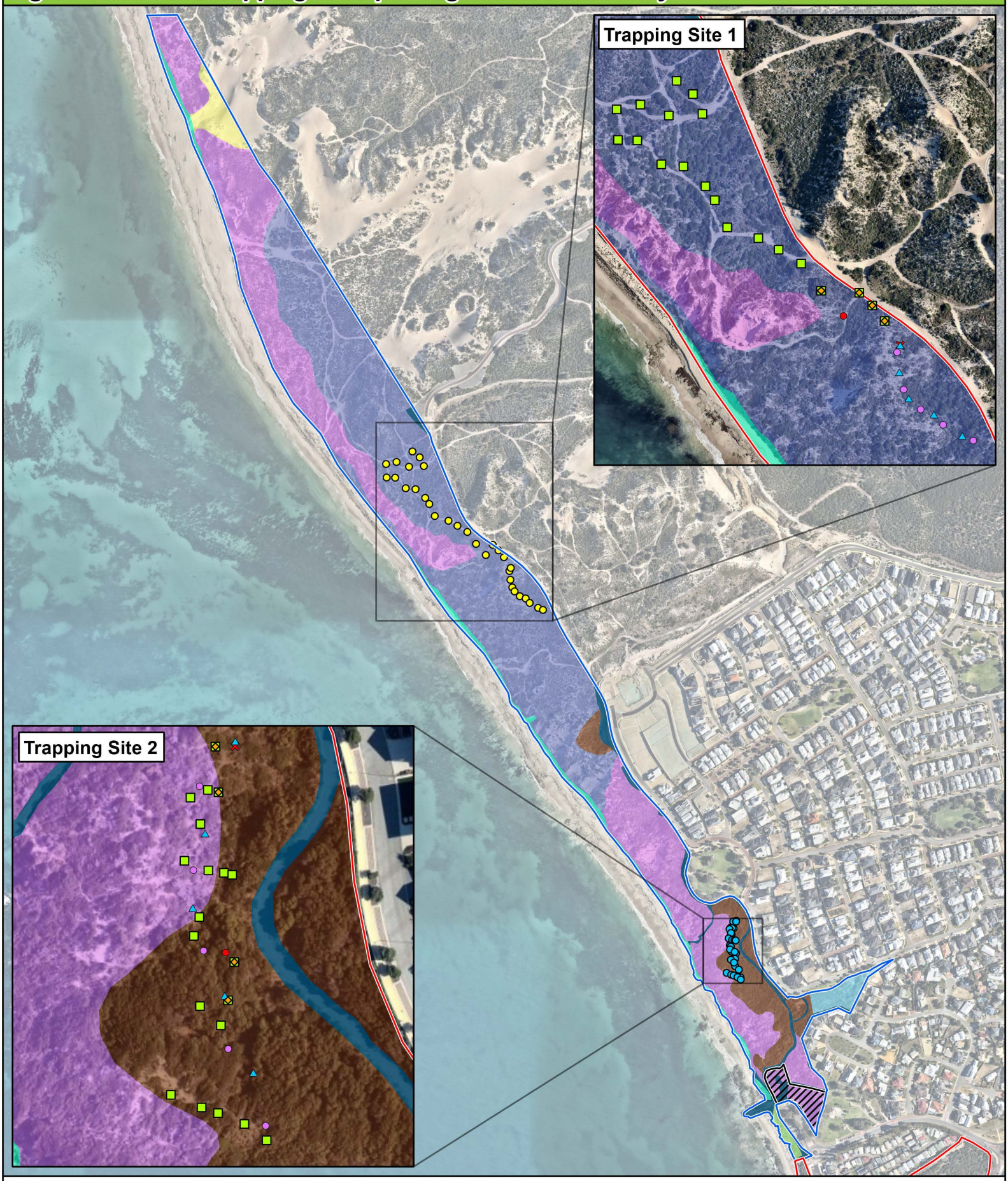
A total of seven introduced (feral) fauna species were recorded across the survey area, five of which were recorded within the Iluka survey area and six of which were recorded within the Burns Beach survey area (**Table 17**; **Figure 12**). Red Fox and Cat were recorded on motion cameras, whilst House Mouse was trapped in small aluminium box traps and Portuguese Millipede within pitfall traps. European Rabbit scats were directly observed within the Iluka survey area. Laughing Kookaburra and Laughing Dove were both heard and observed directly within the survey area. All vertebrate introduced (feral) fauna species recorded within the survey area are listed as 'Naturalised exotic' under the WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia (WAM 2020). The Portuguese Millipede (**Ommatoiulus moreletii*) is listed as Permitted – s11 under the Western Australian organism List (WAOL; DPIRD 2020).

A selection of feral fauna photos taken during the field survey is included in **Appendix N** and coordinates are provided in **Appendix R**.

Table 17: Feral fauna species occurring within the survey area

Type	Species	Common name	Burns Beach	Iluka Foreshore
Bird	**Dacelo novaeguineae*	Laughing Kookaburra	X	
Bird	**Spilopelia senegalensis*	Laughing Dove	X	X
Invertebrate	**Ommatoiulus moreletii*	Portuguese Millipede		X
Mammal	**Felis catus*	Cat	X	X
Mammal	**Mus musculus*	House Mouse	X	X
Mammal	**Oryctolagus cuniculus*	European Rabbit		X
Mammal	**Vulpes vulpes*	Red Fox	X	X

Figure 9-1: Fauna trapping sites per vegetation community - Burns Beach



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Open Beach/Rocks
- Track/Building

Vegetation Community
- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa
- Dunal blowout

Fauna Trapping Sites
- Trapping site 1
- Trapping site 2

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

0 50 100 200
Metres

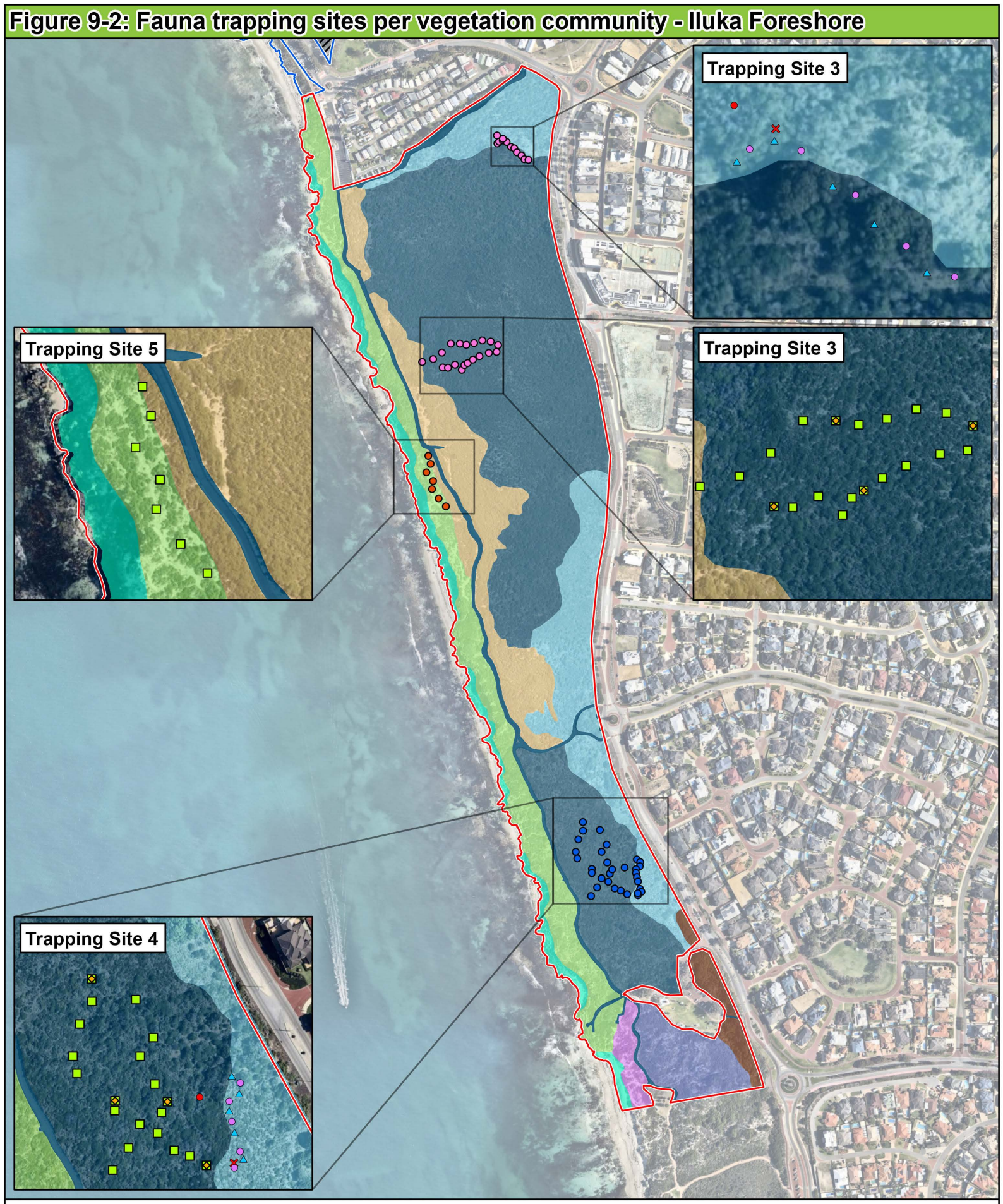
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Figure 9-2: Fauna trapping sites per vegetation community - Iluka Foreshore



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Open Beach/Rocks
- Track/Building

Vegetation Community
- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Fauna Trapping Sites
- Trapping site 3
- Trapping site 4
- Trapping site 5

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

0 50 100 200
Metres

Datum/Projection:
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Figure 10-1: Fauna habitats recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Track

Fauna Habitat

- Dunes and swales
- Low Banksia shrubland over low heath
- Low limestone coastal heath
- Open Beach/Rocks
- Tall Acacia shrubland

0 50 100 200
Metres

Datum/Projection:
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Figure 10-2: Fauna habitats recorded within the survey areas- Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Track

Fauna Habitat

- Dunes and swales
- Low Banksia shrubland over low heath
- Low limestone coastal heath
- Melaleuca shrubland over heath
- Open Beach/Rocks
- Tall Acacia shrubland

0 50 100 200
Metres

Datum/Projection:
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Figure 11: Conservation significant fauna species recorded within the survey areas



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development

Conservation significant fauna species

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo) (EN under EPBC and BC Act)
- *Isoodon fusciventer* (Quenda) (P4)

0 75 150 300
Metres

Datum/Projection:
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Figure 12: Feral fauna observations within the survey area



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Feral fauna

- Laughing Kookaburra (**Dacelo novaeguineae*)
- Cat (**Felis catus*)
- House mouse (**Mus musculus*)
- Fox (**Vulpes vulpes*)
- Portuguese millipede (**Ommatoiulus moreletii*)
- Rabbit (**Oryctolagus cuniculus*)
- Laughing Dove (**Spilopelia senegalensis*)

0 75 150 300
Metres

Datum/Projection:
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5. Discussion and recommendations

5.1 Flora

A total of 121 taxa (74 native and 47 introduced taxa) were recorded across 14 quadrats established in the Iluka survey area and from opportunistic collections. A total of 106 taxa (63 native and 43 introduced taxa) were recorded across 14 quadrats established in the Burns Beach survey area and from opportunistic collections. Average species richness per quadrat in Iluka and Burns Beach survey areas were 28.9 species and 25.6 species, respectively. A species accumulation curve determined that approximately 90% of the flora species potentially present within the survey areas were recorded from quadrats. This result, in addition to opportunistic collections, indicates that the majority of flora potentially present within the survey areas were recorded.

One flora species listed as Endangered under the EPBC Act and BC Act was recorded within the Iluka survey area, namely *Marianthus paralius* (WA Herbarium ACC/8941/E). *Marianthus paralius* is an almost prostrate, woody shrub with distinctive bright green foliage and red flowers from September to November (TSSC 2018; DBCA and WAH 2020). [redacted] At a regional scale, this species is known from 10 records over a range of approximately 60 km from Seabird in the north to Iluka in the South (DBCA 2007-2020). [redacted]

No Threatened flora species listed under the EPBC Act or BC Act were recorded within the Burns Beach survey area (including the restaurant development area). Two DBCA listed flora species were recorded in the Iluka survey area; *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).

Hibbertia leptotheca, listed as P3 by DBCA, was recorded within the Iluka survey area in the FpApSc (low limestone heath) vegetation community. Priority 3 species, such as *Hibbertia leptotheca*, are defined as 'poorly known species that are known from several locations, and the species does not appear to be under imminent threat'. *Hibbertia leptotheca* is also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of Western Australia 2000). *Hibbertia leptotheca* is a spreading shrub 0.2-0.5 m high with yellow flowers which usually flower from July to October (DBCA and WAH 2020). At a regional scale, this species is known from 65 records, over a range of approximately 250 km, from Lancelin in the north to Bunbury in the south (DBCA 2007-2020). Within the Iluka survey area, this species was recorded from eight-point records within 85 m.

Jacksonia sericea, listed as P4 by DBCA, was recorded within the Iluka survey area in the BsArSg (low coastal heath) vegetation community. Priority 4 species, such as *Jacksonia sericea*, are defined as 'rare, near threatened and other species in need of monitoring'. *Jacksonia sericea* is also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of Western Australia 2000). *Jacksonia sericea* is a low, spreading shrub to 0.6 m high with small, orange pea flowers which usually flower in December, or January to February (DBCA and WAH 2020). At a regional scale, this species is known from 88 records, over a range of approximately

107 km, from Carabooda in the north to Furnissdale in the south (DBCA 2007-2020). Within the Iluka survey area, this species was recorded at one location in <5% cover.

A further eight Bush Forever significant flora species were recorded from within the survey areas; *Agonis flexuosa, Callitris preissii, Diplopeltis huegelii, Grevillea preissii* subsp. *preissii, Lechenaultia linarioides, Melaleuca cardiophylla, Melaleuca lanceolata* and *Trymalium ledifolium*. These species are listed as Bush Forever significant species of the Perth Metropolitan Region due to their being endemic to the Swan Coastal Plain. These species are common occur across the Swan Coastal Plain and in the southwest of WA. *Agonis flexuosa* is known from 422 records over a range of approximately 2000 km, from Derby in the north to the whole southwest of WA (DBCA 2007-2020). *Callitris preissii* is known from 626 records over a range of approximately 1300 km, from Shark Bay to Esperance. *Diplopeltis huegelii* is known from 57 records over a range of approximately 1000 km, from Shark Bay in the north to Albany in the south. *Grevillea preissii* subsp. *preissii* is known from 171 records over a range of approximately 450 km, from Lancelin in the north to Mandurah in the south. *Lechenaultia linarioides* is known from 326 records over a range of approximately 950 km, from Carnarvon in the north to Bunbury in the south. *Melaleuca cardiophylla* is known from 307 records over a range of approximately 1500 km, from Exmouth in the north to Esperance in the south. *Melaleuca lanceolata* is known from 515 records over a range of approximately 2000 km, from Shark Bay in the north Eucla in the east. *Trymalium ledifolium* is known from 108 records over a range of approximately 800 km, from Geraldton in the north to Esperance in the south.

Weed species in the Iluka and Burns Beach survey areas comprised 38.8% (47 species) and 40.6% (43 species), respectively, of the total flora taxa recorded. **Asparagus asparagoides* (Bridal Creeper; recorded in both survey areas) is listed as a Declared Pest under the BAM Act and WoNS. **Moraea flaccida* (One-leaf Cape Tulip; recorded in Iluka survey area) is a Declared Pest under the BAM Act. These species have a legal status of S22(2) and "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2020).

5.2 Vegetation

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively (**Table 18**).

Table 18: Overview of vegetation communities within the survey area

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland		X	3
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland	X	X	3
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open		X	5

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
	chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland			
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low open shrubland and *Lomandra maritima* low sparse forbland	X	X	4
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland	X	X	3
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland	X	X	4
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland	X	X	6

To identify TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community, comprising ELA13, ELA18, ELA19 and ELA27, had a close affiliation with Floristic Community Type 24. Floristic Community Type 24: 'Northern Spearwood shrublands and woodlands' is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 24 is described as heaths or heaths with scattered *Eucalyptus gomphocephala* (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*. The BsArSg vegetation community, comprising a total of 4.6 ha (14.7%) of the Iluka survey area and 0.4 ha (1.4%) of the Burns Beach survey area, has components analogous to the 'Northern Spearwood shrublands and woodlands' Priority Ecological Community, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland, and is considered as likely representing this Priority Ecological Community. The inferred presence of FCT 24 is also noted in Bush Forever for Burns Beach Foreshore Reserve.

Quadrats within the remaining vegetation communities showed close affiliation with Floristic Community Type 29a. Floristic Community Type 29a: 'Coastal shrublands on shallow sands' is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 29a is described as mostly heaths on shallow sands over limestone close to the coast. Important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. Vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa, comprising a total of 24.4 ha (77.91%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area, have components analogous to the 'Coastal shrublands on shallow sands' Priority Ecological Community, including the

presence of heaths on shallow sands over limestone close to the coast, *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris* and is considered as likely representing this community. A total of 0.4 ha (84%) ha of the restaurant development area is considered as representing the 'Coastal shrublands on shallow sands' Priority Ecological Community. The inferred presence of FCT 29a is also noted in Bush Forever for Burns Beach Foreshore Reserve and Coastal Strip from Burns Beach to Hillary's.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community'. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19. This stand was recorded in the BsArSg vegetation community, comprising of an area of less than 0.5 hectares in size, and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community approved conservation advice in order to determine the presence of the Threatened Ecological Community within the survey areas. Whilst a number of vegetation communities were identified as representing Floristic Community Type 24 and 29a, indicating the potential presence of the Threatened Ecological Community, no Tuarts were recorded in either of the survey areas and so vegetation within the survey area is not considered to represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.

Vegetation condition recorded within the survey areas ranged from Excellent to Completely Degraded. The majority of Iluka and Burns Beach survey areas were classed as being in Excellent condition. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

5.3 Fauna

A total of five fauna habitats were recorded across the survey area, five within the Iluka survey area (dunes and swales, Tall *Acacia* shrubland, Low *Banksia* shrubland over low heath, Low limestone coastal heath and *Melaleuca* shrubland over heath) and four within the Burns Beach survey area (Dunes and swales, Tall *Acacia* shrubland, Low *Banksia* shrubland over low heath and Low limestone coastal heath). These habitats cover a total of 29 ha (92.6%) of the Iluka survey area and 26.5 ha (90.8%) of the Burns Beach survey area, with tracks and open beach/rocks accounting for the remaining areas. The survey areas provide a significant patch of remnant fauna habitat within a highly modified and urbanised landscape. The vegetation communities, and habitats it contains, support a relatively diverse and species-rich assemblage of native birds, mammals and reptiles. The survey areas provide a valuable linkage to adjacent bushland to the south and east (e.g. Neerabup National Park and Bush Forever site 323).

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. A total of 37 vertebrate fauna species were recorded within Burns Beach survey area, including seven reptile, 24 bird and six mammal species. No amphibians were

recorded in the survey areas. The survey areas appear to support diverse range of vertebrate fauna species, and with more favourable conditions (e.g. less rainfall during the fauna survey), more species may have been recorded. Habitat loss, fragmentation and degradation are likely to be the biggest threats to vertebrate fauna on the Swan Coastal Plain.

A total of 14 invertebrate taxa were recorded across the survey area, with 13 occurring in the Iluka survey area and 12 occurring in the Burns Beach survey area. Invertebrate species were collected opportunistically or as bycatch during the fauna survey. One introduced invertebrate species, Portuguese Millipede (**Ommatoiulus moreletii*), occurred in the majority of the pitfall and funnel traps at trapping site 3. The survey areas appear to support a rich invertebrate diversity, which is reflected by the fairly diverse reptile assemblage present. A macroinvertebrate inventory survey conducted between 2015 and 2018 within the bounds of the Iluka Coastal Foreshore Reserve, between St. Lucia Road in the north and Resolute Way in the south, recorded a total of 548 macroinvertebrate species over this four-year period in one of the most comprehensive macrofaunal biodiversity inventories for any coastal habitat mosaic ever assembled in Western Australia (Knowles and Knowles 2015-2018). It is likely that a targeted invertebrate survey would uncover a much higher number of invertebrate taxa within the Burns Beach and Iluka survey areas.

A total of seven introduced (feral) fauna species were recorded across the survey area, five of which were recorded within the Iluka survey area and six of which were recorded within the Burns Beach survey area. Red Fox (**Vulpes vulpes*) and Cat (**Felis catus*) were recorded on motion cameras, whilst House Mouse (**Mus musculus*) was trapped in small aluminium box traps, and Portuguese Millipede (**Ommatoiulus moreletii*) within pitfall traps. European Rabbit (**Oryctolagus cuniculus*) scats were observed directly within the Iluka survey area. Red Fox and Cat are direct predators to native mammals and reptiles. These species were recorded within both the Iluka Foreshore and Burns Beach survey areas. Of note was an image captured from a motion camera of a cat wearing a pet collar with a tag at trapping site 4 (379084m E; 6487639m N), indicating use of the area by domestic animals. House Mouse and European Rabbit have the potential to introduce and spread disease to native mammal populations and likely compete for food resources with other native fauna species. Laughing Kookaburra and Laughing Dove were both heard and observed directly within the survey area. All vertebrate introduced (feral) fauna species recorded within the survey area are listed as 'Naturalised exotic' under the WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia (WAM 2020). The Portuguese Millipede (**Ommatoiulus moreletii*) is listed as Permitted – s11 under the Western Australian organism List (WAOL; DPIRD 2020).

Two conservation significant fauna species were observed during the field survey; including Carnaby's Cockatoo (*Calyptorhynchus latirostris;* Endangered under the EPBC Act and BC Act) and Quenda (*Isoodon fusciventer*; P4 by DBCA). Quenda were trapped across the Iluka and Burns Beach survey areas, however Carnaby's Cockatoo was observed only at the Iluka survey area. The survey areas fall within the non-breeding range of the Carnaby's Cockatoo (SEWPaC 2012). *Banksia* spp. present in the vegetation community BsArSg could provide foraging habitat for the Carnaby's Cockatoo. Burns Beach survey area trapped six Quenda individuals, and Iluka survey area trapped two individuals. The majority of these were male, and the Iluka survey area recorded one female with pouch young. This indicates successful breeding and recruitment of the Quenda population, despite the threat of predation from red fox and cats.

To ensure the persistence of Quenda and other small vertebrate fauna within the survey areas, predator control must be maintained. Regular monitoring of the Quenda population, including assessment of health and population estimates, is also recommended.

5.4 Recommendations

Based on results of the current survey, the following recommendations have been made to assist in the conservation of native flora, vegetation, fauna and environmental values present within Iluka and Burns Beach Foreshore Reserves:

- Continue long-term monitoring of weed populations within the survey areas. Implement weed control, particularly for the Declared Pest and WoNS species **Asparagus asparagoides* (Bridal Creeper) and the Declared Pest species **Moraea flaccida* (One-leaf Cape Tulip), for City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Continue to monitor populations of *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).
- Ensure that unauthorised access is restricted to defined tracks/paths only to prevent habitat degradation and weed spread i.e. unauthorised walking/vehicle tracks within the survey areas e.g. installation of fencing or formal signage, particularly in areas of access to the northern sections of Burns Beach.
- Continue regular monitoring of Quenda to ensure ongoing health and sustainability of the population.
- Feral animal control must be maintained, particularly in regard to foxes, cats and rabbits.
- It is recommended to continue monitoring for pathogens and to maintain correct hygiene practices.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

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

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.

Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

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

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

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Fauna trap locations

Trap names	Easting	Northing	Sampling method
BURNS BEACH			
Trapping site 1			
TS1 P1	378128	6489766	Pitfall trap
TS1 P2, F1-2	378126	6489760	Pitfall and funnel traps
TS1 P3	378127	6489744	Pitfall trap
TS1 P4, F3-4	378131	6489731	Pitfall and funnel traps
TS1 P5	378135	6489723	Pitfall trap
TS1 P6, F5-6	378144	6489715	Pitfall and funnel traps
TS1 P7	378155	6489711	Pitfall trap
TS1 P8, F7-8	378162	6489703	Pitfall and funnel traps
TS1 P9	378178	6489694	Pitfall trap
TS1 P10, F9-10	378186	6489690	Pitfall and funnel traps
TS1 C1	378116	6489785	Cage trap
TS1 C2	378106	6489798	Cage trap
TS1 C3	378095	6489808	Cage trap
TS1 C4	378065	6489809	Cage trap
TS1 E1	378116	6489785	Small aluminium box trap
TS1 E2	378106	6489798	Small aluminium box trap
TS1 E3	378095	6489808	Small aluminium box trap
TS1 E4	378065	6489809	Small aluminium box trap
TS1 E5	378049	6489831	Small aluminium box trap
TS1 E6	378032	6489842	Small aluminium box trap
TS1 E7	378015	6489851	Small aluminium box trap
TS1 E8	377991	6489860	Small aluminium box trap
TS1 E9	377981	6489882	Small aluminium box trap
TS1 E10	377973	6489893	Small aluminium box trap
TS1 E11	377956	6489908	Small aluminium box trap
TS1 E12	377938	6489910	Small aluminium box trap
TS1 E13	377919	6489929	Small aluminium box trap
TS1 E14	377903	6489930	Small aluminium box trap
TS1 E15	377902	6489954	Small aluminium box trap
TS1 E16	377921	6489958	Small aluminium box trap
TS1 E17	377944	6489949	Small aluminium box trap

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Trap names	Easting	Northing	Sampling method
TS1 E18	377971	6489950	Small aluminium box trap
TS1 E19	377963	6489966	Small aluminium box trap
TS1 E20	377950	6489977	Small aluminium box trap
TS1 CAM	378083	6489789	Camera trap
TS1 SM2	378128	6489766	SM2 ultrasonic recorder
Trapping site 2			
TS2 P1	378536	6489128	Pitfall trap
TS2 P2, F1-2	378526	6489116	Pitfall and funnel traps
TS2 P3	378528	6489103	Pitfall trap
TS2 P4, F3-4	378525	6489094	Pitfall and funnel traps
TS2 P5	378525	6489084	Pitfall trap
TS2 P6, F5-6	378527	6489072	Pitfall and funnel traps
TS2 P7	378533	6489060	Pitfall trap
TS2 P8, F7-8	378534	6489046	Pitfall and funnel traps
TS2 P9	378541	6489040	Pitfall trap
TS2 P10, F9-10	378544	6489025	Pitfall and funnel traps
TS2 C1	378531	6489126	Cage trap
TS2 C2	378531	6489114	Cage trap
TS2 C3	378536	6489069	Cage trap
TS2 C4	378534	6489059	Cage trap
TS2 E1	378531	6489126	Small aluminium box trap
TS2 E2	378531	6489114	Small aluminium box trap
TS2 E3	378529	6489115	Small aluminium box trap
TS2 E4	378524	6489113	Small aluminium box trap
TS2 E5	378527	6489106	Small aluminium box trap
TS2 E6	378522	6489096	Small aluminium box trap
TS2 E7	378529	6489094	Small aluminium box trap
TS2 E8	378533	6489093	Small aluminium box trap
TS2 E9	378535	6489092	Small aluminium box trap
TS2 E10	378526	6489081	Small aluminium box trap
TS2 E11	378525	6489076	Small aluminium box trap
TS2 E12	378536	6489069	Small aluminium box trap
TS2 E13	378534	6489059	Small aluminium box trap
TS2 E14	378527	6489057	Small aluminium box trap
TS2 E15	378532	6489052	Small aluminium box trap

Trap names	Easting	Northing	Sampling method
TS2 E16	378519	6489034	Small aluminium box trap
TS2 E17	378527	6489030	Small aluminium box trap
TS2 E18	378531	6489029	Small aluminium box trap
TS2 E19	378538	6489026	Small aluminium box trap
TS2 E20	378544	6489022	Small aluminium box trap
TS2 CAM	378533	6489072	Camera trap
TS2 SM2	378536	6489127	SM2 ultrasonic recorder
ILUKA			
Trapping site 3			
TS3 P1	378910	6488630	Pitfall trap
TS3 P2, F1-2	378913	6488632	Pitfall and funnel traps
TS3 P3	378917	6488634	Pitfall trap
TS3 P4, F3-4	378923	6488632	Pitfall and funnel traps
TS3 P5	378929	6488625	Pitfall trap
TS3 P6, F5-6	378933	6488623	Pitfall and funnel traps
TS3 P7	378937	6488617	Pitfall trap
TS3 P8, F7-8	378943	6488613	Pitfall and funnel traps
TS3 P9	378947	6488608	Pitfall trap
TS3 P10, F9-10	378952	6488607	Pitfall and funnel traps
TS3 C1	378835	6488323	Cage trap
TS3 C2	378869	6488329	Cage trap
TS3 C3	378911	6488354	Cage trap
TS3 C4	378859	6488356	Cage trap
TS3 E1	378835	6488323	Small aluminium box trap
TS3 E2	378842	6488323	Small aluminium box trap
TS3 E3	378852	6488327	Small aluminium box trap
TS3 E4	378861	6488320	Small aluminium box trap
TS3 E5	378865	6488326	Small aluminium box trap
TS3 E6	378869	6488329	Small aluminium box trap
TS3 E7	378877	6488334	Small aluminium box trap
TS3 E8	378885	6488339	Small aluminium box trap
TS3 E9	378898	6488343	Small aluminium box trap
TS3 E10	378909	6488344	Small aluminium box trap
TS3 E11	378911	6488354	Small aluminium box trap
TS3 E12	378901	6488359	Small aluminium box trap

Trap names	Easting	Northing	Sampling method
TS3 E13	378889	6488360	Small aluminium box trap
TS3 E14	378878	6488356	Small aluminium box trap
TS3 E15	378867	6488354	Small aluminium box trap
TS3 E16	378859	6488356	Small aluminium box trap
TS3 E17	378846	6488356	Small aluminium box trap
TS3 E18	378834	6488343	Small aluminium box trap
TS3 E19	378822	6488335	Small aluminium box trap
TS3 E20	378809	6488331	Small aluminium box trap
TS3 CAM	378909	6488641	Camera trap
TS3 SM2	378918	6488636	SM2 ultrasonic recorder
Trapping site 4			
TS4 P1	379101	6487650	Pitfall trap
TS4 P2, F1-2	379105	6487646	Pitfall and funnel traps
TS4 P3	379105	6487641	Pitfall trap
TS4 P4, F3-4	379100	6487636	Pitfall and funnel traps
TS4 P5	379100	6487631	Pitfall trap
TS4 P6, F5-6	379101	6487626	Pitfall and funnel traps
TS4 P7	379102	6487620	Pitfall trap
TS4 P8, F7-8	379105	6487610	Pitfall and funnel traps
TS4 P9	379107	6487606	Pitfall trap
TS4 P10, F9-10	379102	6487601	Pitfall and funnel traps
TS4 C1	379088	6487603	Cage trap
TS4 C2	379067	6487636	Cage trap
TS4 C3	379027	6487701	Cage trap
TS4 C4	379039	6487637	Cage trap
TS4 E1	379088	6487603	Small aluminium box trap
TS4 E2	379079	6487608	Small aluminium box trap
TS4 E3	379071	6487611	Small aluminium box trap
TS4 E4	379062	6487620	Small aluminium box trap
TS4 E5	379064	6487631	Small aluminium box trap
TS4 E6	379067	6487636	Small aluminium box trap
TS4 E7	379060	6487646	Small aluminium box trap
TS4 E8	379053	6487660	Small aluminium box trap
TS4 E9	379059	6487670	Small aluminium box trap
TS4 E10	379050	6487690	Small aluminium box trap

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Trap names	Easting	Northing	Sampling method
TS4 E11	379027	6487701	Small aluminium box trap
TS4 E12	379027	6487689	Small aluminium box trap
TS4 E13	379021	6487677	Small aluminium box trap
TS4 E14	379017	6487660	Small aluminium box trap
TS4 E15	379019	6487651	Small aluminium box trap
TS4 E16	379039	6487637	Small aluminium box trap
TS4 E17	379039	6487632	Small aluminium box trap
TS4 E18	379052	6487624	Small aluminium box trap
TS4 E19	379046	6487612	Small aluminium box trap
TS4 E20	379038	6487600	Small aluminium box trap
TS4 CAM	379084	6487639	Camera trap
TS4 SM2	379102	6487604	SM2 ultrasonic recorder
Trapping site 5			
TS5 E1	378840	6488133	Small aluminium box trap
TS5 E2	378830	6488144	Small aluminium box trap
TS5 E3	378821	6488157	Small aluminium box trap
TS5 E4	378822	6488168	Small aluminium box trap
TS5 E5	378813	6488180	Small aluminium box trap
TS5 E6	378817	6488191	Small aluminium box trap
TS5 E7	378816	6488202	Small aluminium box trap

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Appendix C Fauna trapping site photos

Trapping site	Photo
BURNS BEACH	
TS1	
TS2	

Trapping site	Photo
ILUKA	
TS3	
TS4	

Trapping site	Photo
TS5	

Appendix D Flora species list

Family	Species	Common name	Conservation status		Previous studies										
			EPBC Act	BC Act / DBCA	Foulds 1982	Keighery 1992	Government of Western Australia 2000	Beaumaris Land Sales 2001	City of Joondalup 2009	GHD 2013	City of Joondalup 2014	Natural Area 2017	AECOM 2018	ELA 2021 Burns Beach	ELA 2021 Iluka
Aizoaceae	**Aizoon pubescens*									X					
Aizoaceae	**Carpobrotus aequilaterus*									X					
Aizoaceae	**Carpobrotus edulis*	Hottentot Fig			X	X		X	X	X		X	X	X	X
Aizoaceae	**Tetragonia decumbens*	Sea Spinach				X			X	X				X	X
Aizoaceae	*Carpobrotus sp.*					X									
Aizoaceae	*Carpobrotus virescens*	Coastal Pigface				X				X		X	X		
Aizoaceae	*Sarcozona bicarinata*			P3											
Amaranthaceae	*Ptilotus sp.*									X					
Amaranthaceae	*Ptilotus polystachyus*	Prince of Wales Feather						X		X					
Anacardiaceae	**Schinus terebinthifolia*	Japanese Pepper												X	X
Anarthriaceae	*Lyginia barbata*							X							
Apiaceae	*Daucus glochidiatus*	Australian Carrot			X	X							X	X	X
Apiaceae	*Xanthosia huegelii*							X							
Araliaceae	*Hydrocotyle diantha*				X										
Araliaceae	*Hydrocotyle intertexta*				X										
Araliaceae	*Trachymene pilosa*	Native Parsnip			X	X				X			X	X	X
Arecaceae	**Washingtonia filifera*									X					
Asparagaceae	**Agave americana*									X					
Asparagaceae	**Asparagus asparagoides*	Bridal Creeper											X	X	
Asparagaceae	**Lachenalia reflexa*	Cape Cowslip/Yellow Soldier													X
Asparagaceae	*Acanthocarpus preissii*				X	X			X	X		X	X	X	X
Asparagaceae	*Dichopogon capillipes*									X					
Asparagaceae	*Lomandra hermaphrodita*									X					
Asparagaceae	*Lomandra maritima*					X	X			X	X		X	X	X
Asparagaceae	*Lomandra preissii*												X		
Asparagaceae	*Lomandra caespitosa*	Tufted Mat Rush						X							
Asparagaceae	*Sowerbaea laxiflora*									X					
Asparagaceae	*Thysanotus dichotomus*	Branching Fringe Lily											X		
Asparagaceae	*Thysanotus manglesianus*	Fringed Lily								X			X		X
Asparagaceae	*Thysanotus patersonii*				X	X		X					X		
Asparagaceae	*Thysanotus multiflorus*	Many-flowered Fringe Lily						X							
Asphodelaceae	**Trachyandra divaricata*	Dune Onion Weed						X	X				X	X	X
Asteraceae	**Arctotheca calendula*	Cape Weed			X			X		X		X	X		X
Asteraceae	**Arctotheca populifolia*									X					

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Asteraceae	**Arctotis stoechadifolia*	African daisy							X			X		X	
Asteraceae	**Carduus pycnocephalus*	Slender Thistle											X		
Asteraceae	**Centaurea melitensis*	Maltese Cockspur								X			X		
Asteraceae	**Erigeron bonariensis*									X					
Asteraceae	**Erigeron sumatrensis*									X					
Asteraceae	**Gazania linearis*	Gazania							X			X		X	
Asteraceae	**Hypochaeris glabra*	Smooth Cats Ear			X			X					X		X
Asteraceae	**Lactuca saligna*									X					
Asteraceae	**Lactuca serriola*	Prickly Lettuce										X		X	X
Asteraceae	**Osteospermum ecklonis*	Cape Marguerite												X	X
Asteraceae	**Sonchus oleraceus*	Common Sowthistle			X	X							X	X	X
Asteraceae	**Sonchus sp.*								X						
Asteraceae	**Urospermum picroides*									X					
Asteraceae	*Actitis megalocarpa*						X								
Asteraceae	*Asteraceae sp.*				X								X		
Asteraceae	*Asteridea pulverulenta*				X					X					
Asteraceae	*Brachyscome sp.*					X									
Asteraceae	*Cotula turbinata*									X					
Asteraceae	*Lagenophora huegelii*				X			X		X					
Asteraceae	*Leucophyta brownii*						X		X	X					
Asteraceae	*Millotia myosotidifolia*				X					X					
Asteraceae	*Olearia axillaris*	Coastal Daisybush			X	X	X	X	X	X	X	X	X	X	X
Asteraceae	*Pithocarpa cordata*												X		
Asteraceae	*Pithocarpa cordata*									X					
Asteraceae	*Podolepis gracilis*									X					
Asteraceae	*Quinetia urvillei*							X							
Asteraceae	*Rhodanthe citrina*									X			X		
Asteraceae	*Senecio hispidulus*	Hispid Fireweed								X			X		
Asteraceae	*Senecio pinnatifolius*									X			X		
Asteraceae	*Waitzia nitida*									X					
Asteraceae	*Waitzia suaveolens*	Fragrant Waitzia						X							
Asteraceae	**Sonchus asper*	Rough Sowthistle								X			X		
Asteraceae	*Gnephosis angianthoides*									X					
Asteraceae	*Hyalosperma cotula*									X					
Asteraceae	**Ursinia anthemoides*	Ursinia			X			X							X
Asteraceae	**Vellereophyton dealbatum*	White Cudweed											X		

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Asteraceae	*Podotheca gnaphalioides*	Golden Longheads								X			X		X
Asteraceae	*Rhodanthe corymbosa*					X									X
Asteraceae	*Senecio pinnatifolius var. latilobus*													X	X
Asteraceae	*Senecio sp.*								X						
Brassicaceae	**Brassica barrelieri*									X					
Brassicaceae	**Brassica tournefortii*	Mediterranean Turnip								X		X	X	X	X
Brassicaceae	**Cakile maritima*	Sea Rocket								X		X	X	X	X
Brassicaceae	**Raphanus raphanistrum*	Wild Radish												X	X
Brassicaceae	*Stenopetalum gracile*									X					
Brassicaceae	**Heliophila pusilla*				X	X		X					X		
Campanulaceae	*Lobelia heterophylla*	Wing-seeded Lobelia											X		
Campanulaceae	*Wahlenbergia capensis*	Cape Bluebell											X		
Campanulaceae	*Wahlenbergia gracilenta*				X										
Campanulaceae	*Wahlenbergia preissii*							X		X					
Caryophyllaceae	**Cerastium glomeratum*	Sticky Mouse-ear Chickweed			X										
Caryophyllaceae	**Petrorhagia dubia*	Hairy Pink			X			X					X	X	X
Caryophyllaceae	**Polycarpon tetraphyllum*	Fourleaf Allseed													X
Caryophyllaceae	**Silene gallica*	Windmill Pink				X									
Caryophyllaceae	**Stellaria media*	Chickweed			X									X	X
Casuarinaceae	*Allocasuarina lehmanniana*						X			X					
Casuarinaceae	*Allocasuarina fraseriana*	Sheoak						X		X	X				
Casuarinaceae	*Allocasuarina humilis*	Dwarf Sheoak			X	X		X		X					
Chenopodiaceae	*Atriplex cinerea*	Grey Saltbush										X		X	
Chenopodiaceae	*Atriplex isatidea*	Coast Saltbush								X			X		
Chenopodiaceae	*Enchylaena tomentosa*	Barrier Saltbush				X				X			X		
Chenopodiaceae	*Rhagodia baccata*	Berry Saltbush			X	X			X	X		X	X	X	X
Chenopodiaceae	*Salicornia quinqueflora*					X									
Chenopodiaceae	*Threlkeldia diffusa*	Coast Bonefruit				X			X	X		X		X	X
Colchicaceae	*Burchardia congesta*							X		X			X		
Colchicaceae	*Wurmbea dioica*				X										
Convolvulaceae	**Cuscuta epithymum*	Lesser Dodder												X	
Convolvulaceae	**Cuscuta planiflora*	Small-seeded Dodder											X		
Crassulaceae	**Crassula glomerata*					X			X			X		X	X
Crassulaceae	*Crassula colorata*	Dense Stonecrop			X	X		X					X	X	X
Crassulaceae	*Crassula extrorsa*									X					
Cupressaceae	*Callitris preissii*	Rottnest Island Pine								X				X	

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Cyperaceae	**Leptospermum laevigatum*									X					
Cyperaceae	*Chaetospora curvifolia*							X							
Cyperaceae	*Ficinia nodosa*	Knotted Club Rush				X			X	X		X	X	X	X
Cyperaceae	*Isolepis marginata*	Coarse Club-rush			X			X					X	X	
Cyperaceae	*Lepidosperma angustatum*					X				X					
Cyperaceae	*Lepidosperma calcicola*													X	X
Cyperaceae	*Lepidosperma costale*									X					
Cyperaceae	*Lepidosperma empetriformis*									X					
Cyperaceae	*Lepidosperma gladiatum*	Coast Sword-sedge				X			X	X		X	X	X	X
Cyperaceae	*Lepidosperma longitudinale*	Pithy Sword-sedge											X		
Cyperaceae	*Lepidosperma squamatum*												X		
Cyperaceae	*Lepidosperma angustatum*							X							
Cyperaceae	*Mesomelaena pseudostygia*							X					X		
Cyperaceae	*Schoenoplectiella lateriflora*							X							
Cyperaceae	*Schoenus clandestinus*												X		
Cyperaceae	*Schoenus grandiflorus*	Large Flowered Bogrush				X									X
Cyperaceae	*Schoenus lanatus*				X										
Dasypogonaceae	*Calectasia narragara*									X					
Dilleniaceae	*Hibbertia cuneiformis*	Cutleaf Hibbertia												X	X
Dilleniaceae	*Hibbertia huegelii*									X					
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups			X	X	X	X		X			X	X	X
Dilleniaceae	*Hibbertia leptotheca*		P3			X	X								X
Dilleniaceae	*Hibbertia polystachya*				X										
Dilleniaceae	*Hibbertia racemosa*	Stalked Guinea Flower			X	X	X								X
Dilleniaceae	*Hibbertia subvaginata*									X					
Droseraceae	*Drosera pallida*									X			X		
Droseraceae	*Drosera erythrorhiza*	Red Ink Sundew						X		X					
Droseraceae	*Drosera macrantha*				X					X					
Ericaceae	*Acrotriche cordata*	Coast Ground Berry				X				X			X	X	X
Ericaceae	*Leucopogon insularis*												X		
Ericaceae	*Leucopogon parviflorus*	Coast Beard-heath			X	X				X			X	X	X
Ericaceae	*Leucopogon polymorphus*									X					
Ericaceae	*Leucopogon sprengelioides*							X							
Ericaceae	*Lysinema ciliatum*	Curry Flower			X			X							
Ericaceae	*Styphelia pallida*				X	X									
Ericaceae	*Styphelia racemulosa*				X										

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Ericaceae	*Styphelia xerophylla*									X					
Ericaceae	*Conostephium pendulum*	Pearl Flower				X		X		X			X		
Euphorbiaceae	**Euphorbia paralias*	Sea Splurge								X			X	X	
Euphorbiaceae	**Euphorbia peplus*	Petty Spurge											X		X
Euphorbiaceae	**Euphorbia sp.*							X							
Euphorbiaceae	**Euphorbia terracina*	Geraldton Carnation Weed								X			X	X	X
Euphorbiaceae	**Ricinus communis*	Castor Oil Plant						X						X	X
Fabaceae	**Medicago polymorpha*	Burr Medic				X			X	X		X		X	X
Fabaceae	**Melilotus indicus*	Annual Yellow Sweetclover			X									X	X
Fabaceae	**Trifolium campestre*	Hop Clover			X									X	
Fabaceae	**Trifolium dubium*	Suckling Clover								X			X		
Fabaceae	**Trifolium tomentosum*									X					
Fabaceae	**Vicia sativa*	Common Vetch													X
Fabaceae	*Acacia cochlearis*	Rigid Wattle				X				X			X	X	
Fabaceae	*Acacia cyclops*	Coastal Wattle			X	X	X			X		X	X	X	X
Fabaceae	*Acacia lasiocarpa var. lasiocarpa*				X		X							X	
Fabaceae	*Acacia rostellifera*	Summer-scented Wattle				X	X	X		X	X	X	X	X	X
Fabaceae	*Acacia saligna*	Orange Wattle				X		X		X		X	X	X	X
Fabaceae	*Acacia truncata*				X	X									X
Fabaceae	*Acacia pulchella*	Prickly Moses			X	X		X		X			X		
Fabaceae	*Acacia xanthina*						X			X					
Fabaceae	*Bossiaea eriocarpa*	Common Brown Pea			X	X		X		X				X	X
Fabaceae	*Chorizema aciculare*				X										
Fabaceae	*Daviesia capitatum*									X					
Fabaceae	*Daviesia decurrens*									X					
Fabaceae	*Daviesia divaricata*	Marno			X			X							
Fabaceae	*Daviesia incrassata*				X										
Fabaceae	*Daviesia triflora*							X							
Fabaceae	*Gastrolobium capitatum*				X										
Fabaceae	*Gastrolobium nervosum*					X	X	X		X				X	X
Fabaceae	*Gastrolobium tomentosum*		P4							X					
Fabaceae	*Gompholobium aristatum*					X									
Fabaceae	*Gompholobium tomentosum*	Hairy Yellow Pea			X			X					X	X	X
Fabaceae	*Hardenbergia comptoniana*	Native Wisteria			X	X		X	X	X		X	X	X	X
Fabaceae	*Hovea pungens*	Devil's Pins			X			X							
Fabaceae	*Hovea stricta*				X										

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Fabaceae	*Hovea trisperma*	Common Hovea						X							
Fabaceae	*Isotropis cuneifolia*	Granny Bonnets						X		X					
Fabaceae	*Jacksonia furcellata*	Grey Stinkwood			X			X		X					
Fabaceae	*Jacksonia sternbergiana*	Stinkwood						X		X					
Fabaceae	*Kennedia coccinea*					X									
Fabaceae	*Kennedia prostrata*	Scarlet Runner			X	X				X			X	X	X
Fabaceae	*Sphaerolobium medium*				X										
Fabaceae	*Sphaerolobium sp.*							X							
Fabaceae	*Templetonia retusa*	Cockies Tongues			X	X				X			X	X	X
Fabaceae	*Jacksonia calcicola*						X								
Fabaceae	*Jacksonia sericea*	Waldjumi		P4		X				X					X
Fabroniaceae	*Fabronia hampeana*			P2						X					
Frankeniaceae	*Frankenia pauciflora*	Seaheath				X			X						X
Geraniaceae	**Erodium botrys*	Long Storksbill								X			X		
Geraniaceae	**Erodium cicutarium*	Common Stork's-bill			X										
Geraniaceae	**Geranium molle*	Dove's-foot Crane's-bill			X										
Geraniaceae	**Pelargonium capitatum*	Rose Pelargonium			X	X	X	X	X	X	X	X	X	X	X
Geraniaceae	*Pelargonium littorale*				X										
Goodeniaceae	*Dampiera linearis*	Common Dampiera			X			X							
Goodeniaceae	*Lechenaultia linarioides*	Yellow Leschenaultia			X		X								X
Goodeniaceae	*Scaevola anchusifolia*									X					
Goodeniaceae	*Scaevola canescens*					X				X					
Goodeniaceae	*Scaevola crassifolia*	Thick-leaved Fan-flower				X	X		X	X	X	X	X	X	X
Goodeniaceae	*Scaevola nitida*				X		X			X			X		
Goodeniaceae	*Scaevola repens*														X
Goodeniaceae	*Scaevola thesioides*												X		
Gyrostemonaceae	*Codonocarpus cotinifolius*												X		
Haemodoraceae	*Anigozanthos humilis*	Catspaw			X			X							X
Haemodoraceae	*Conostylis aculeata*	Prickly Conostylis			X	X		X		X			X		
Haemodoraceae	*Conostylis aculeata subsp. preissii*													X	X
Haemodoraceae	*Conostylis aurea*												X		
Haemodoraceae	*Conostylis candicans subsp. calcicola*													X	
Haemodoraceae	*Conostylis candicans subsp. candicans*									X					X
Haemodoraceae	*Conostylis pauciflora subsp. euryrhipis*			P4			X								
Haemodoraceae	*Conostylis setigera*	Bristly Cottonhead						X		X			X	X	X
Hemerocallidaceae	*Caesia micrantha*	Pale Grass-lily						X							

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Hemerocallidaceae	*Corynotheca micrantha*	Sand Lily			X			X					X		X
Hemerocallidaceae	*Dianella revoluta*	Blueberry Lily				X				X			X		X
Hemerocallidaceae	*Dianella revoluta var. divaricata*	Flax Lily						X							
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily			X	X								X	X
Iridaceae	**Gladiolus caryophyllaceus*	Wild Gladiolus			X			X					X		X
Iridaceae	**Moraea flaccida*	One-leaf Cape Tulip			X								X		X
Iridaceae	**Romulea rosea*	Guildford Grass			X	X							X		X
Iridaceae	**Watsonia meriana var. bulbillifera*	Bugle Lily											X		
Iridaceae	*Orthrosanthus laxus*	Morning Iris						X		X					
Lamiaceae	*Hemiandra glabra*									X				X	
Lamiaceae	*Hemiandra pungens*					X			X	X			X		
Lamiaceae	*Westringia dampieri*											X			
Lauraceae	*Cassytha flava*	Dodder Laurel								X				X	X
Lauraceae	*Cassytha pomiformis*									X					
Lauraceae	*Cassytha sp.*														X
Lauraceae	*Cassytha racemosa*	Dodder Laurel			X	X		X		X			X		
Loranthaceae	*Nuytsia floribunda*	Christmas Tree						X		X			X		
Malvaceae	*Alyogyne huegelii*					X									
Malvaceae	*Thomasia cognata*				X	X									
Malvaceae	*Thomasia triphylla*														X
Montiaceae	*Calandrinia brevipedata*	Short-stalked Purslane												X	X
Montiaceae	*Calandrinia calyptrata*				X										
Montiaceae	*Calandrinia granulifera*					X									
Montiaceae	*Calandrinia liniflora*				X								X		
Montiaceae	*Calandrinia tholiformis*													X	X
Montiaceae	*Calandrinia corrigioloides*	Strap Purslane						X							
Myrtaceae	**Chamelaucium uncinatum*	Geraldton Wax								X					X
Myrtaceae	*Agonis flexuosa*	Peppermint												X	
Myrtaceae	*Calothamnus quadrifidus*	One-sided Bottlebrush				X	X	X		X			X	X	X
Myrtaceae	*Calothamnus sanguineus*				X										
Myrtaceae	*Calytrix fraseri*	Pink Summer Calytrix						X							
Myrtaceae	*Eremaea pauciflora*							X							
Myrtaceae	*Eucalyptus utilis*	Coastal Moort												X	
Myrtaceae	*Eucalyptus decipiens*	Redheart			X			X		X	X				
Myrtaceae	*Eucalyptus foecunda*	Narrow-leaved Red Mallee			X			X		X					
Myrtaceae	*Eucalyptus gomphocephala*						X			X	X		X		

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Myrtaceae	*Eucalyptus marginata*										X				
Myrtaceae	*Eucalyptus todtiana*	Pricklybark						X					X		
Myrtaceae	*Kunzea glabrescens*	Spearwood												X	
Myrtaceae	*Melaleuca cardiophylla*	Tangling Melaleuca				X	X			X			X		X
Myrtaceae	*Melaleuca huegelii*	Chenille Honeymyrtle			X	X	X		X	X	X		X	X	X
Myrtaceae	*Melaleuca lanceolata*	Rottnest Teatree												X	X
Myrtaceae	*Melaleuca systena*				X	X	X	X		X	X		X	X	X
Nitrariaceae	*Nitraria billardierei*					X			X						
Olacaceae	*Olax benthamiana*					X									X
Onagraceae	**Oenothera drummondii*	Beach Evening Primrose								X		X		X	
Onagraceae	**Oenothera stricta*									X					
Orchidaceae	*Caladenia flava*				X					X					
Orchidaceae	*Caladenia latifolia*				X					X					
Orchidaceae	*Caladenia longicauda*	Common White Spider Orchid						X							
Orchidaceae	*Elythranthera brunonis*									X					
Orchidaceae	*Eriochilus dilatatus*				X										
Orchidaceae	*Pheladenia deformis*				X										
Orchidaceae	*Pterostylis aspera*									X					
Orchidaceae	*Pterostylis sp. (nana complex)*													X	
Orchidaceae	*Thelymitra campanulata*									X					
Orobanchaceae	**Bellardia trixago*	Mediterranean Lineseed			X					X					
Orobanchaceae	**Parentucellia latifolia*				X										
Oxalidaceae	**Oxalis pes-caprae*	Soursob												X	X
Papaveraceae	**Fumaria bastardii*									X					
Papaveraceae	**Fumaria capreolata*	Whiteflower Fumitory								X			X	X	X
Papaveraceae	**Fumaria muralis*									X					
Phyllanthaceae	*Phyllanthus calycinus*	False Boronia			X	X		X		X			X	X	X
Phyllanthaceae	*Poranthera microphylla*				X										
Pittosporaceae	*Marianthus paralius*		EN	EN							X				X
Plantaginaceae	**Plantago lanceolata*									X					
Plantaginaceae	*Plantago exilis*					X									X
Poaceae	**Aira caryophyllea subsp. caryophyllea*	Silvery Hairgrass													X
Poaceae	**Aira caryophyllea*	Silvery Hairgrass						X					X		
Poaceae	**Avena barbata*	Bearded Oat								X		X	X	X	X
Poaceae	**Avena fatua*	Wild Oat										X		X	X
Poaceae	**Briza maxima*	Blowfly Grass						X					X	X	X

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Poaceae	**Briza minor*	Shivery Grass			X					X			X		X
Poaceae	**Bromus catharticus*									X					
Poaceae	**Bromus diandrus*	Great Brome						X		X		X	X	X	X
Poaceae	**Bromus rubens*	Red Brome			X										
Poaceae	**Catapodium rigidum*	Rigid Fescue			X	X								X	X
Poaceae	**Cenchrus clandestinus*	Kikuyu Grass							X			X		X	X
Poaceae	**Cynodon dactylon*	Couch										X		X	
Poaceae	**Digitaria ciliaris*									X					
Poaceae	**Ehrharta calycina*	Perennial Veldt Grass								X			X	X	X
Poaceae	**Ehrharta longiflora*	Annual Veldt Grass				X		X	X			X	X	X	X
Poaceae	**Eragrostis curvula*									X					
Poaceae	**Lagurus ovatus*	Hare's Tail Grass				X				X		X	X	X	X
Poaceae	**Pentameris airoides*	False Hairgrass								X			X		
Poaceae	**Rostraria cristata*	MediterraneanHairgrass			X										
Poaceae	**Thinopyrum distichum*									X					
Poaceae	**Vulpia bromoides*	Squirrel-tail Fescue				X									
Poaceae	**Vulpia myuros*	Rat's Tail Fescue				X				X				X	X
Poaceae	*Amphipogon turbinatus*									X			X		
Poaceae	*Austrostipa elegantisssima*												X		
Poaceae	*Austrostipa flavescens*					X		X		X					X
Poaceae	*Austrostipa variabilis*									X					
Poaceae	*Bromus arenarius*				X	X				X					
Poaceae	*Poa drummondiana*				X										
Poaceae	*Poa porphyroclados*							X							
Poaceae	*Poaceae sp.*													X	X
Poaceae	*Rytidosperma occidentale*									X					
Poaceae	*Spinifex hirsutus*	Hairy Spinifex					X			X				X	
Poaceae	*Sporobolus virginicus*					X			X						
Poaceae	*Tetrarrhena laevis*	Forest Ricegrass												X	
Poaceae	**Hordeum leporinum*	Barley Grass								X				X	X
Poaceae	**Lolium perenne*	Perennial Ryegrass											X		
Poaceae	**Lolium rigidum*	Rigid Ryegrass										X			
Poaceae	**Ammophila arenaria*									X					
Poaceae	*Spinifex longifolius*	Beach Spinifex					X		X	X		X		X	
Polygalaceae	*Comesperma confertum*				X					X					
Polygalaceae	*Comesperma integerrimum*												X		X

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Polygalaceae	*Comesperma virgatum*									X					
Primulaceae	**Lysimachia arvensis*	Pimpernel			X			X		X			X	X	X
Proteaceae	*Adenanthos sp.*				X										
Proteaceae	*Banksia attenuata*	Slender Banksia					X	X		X	X		X		X
Proteaceae	*Banksia dallanneyi*	Couch Honeypot									X			X	X
Proteaceae	*Banksia lindleyana*									X					
Proteaceae	*Banksia menziesii*	Firewood Banksia				X	X	X		X			X		
Proteaceae	*Banksia nivea*				X	X									
Proteaceae	*Banksia sessilis*	Parrot Bush			X	X		X			X			X	X
Proteaceae	*Banksia sessilis var. cygnorum*						X			X			X		
Proteaceae	*Banksia dallanneyi subsp. agricola*							X							
Proteaceae	*Conospermum triplinervium*						X								
Proteaceae	*Grevillea crithmifolia*													X	X
Proteaceae	*Grevillea preissii subsp. preissii*						X			X				X	X
Proteaceae	*Grevillea thelemanniana*	Spider Net Grevillea	CR	CR	X	X		X							
Proteaceae	*Grevillea vestita*							X							
Proteaceae	*Hakea costata*	Ribbed Hakea			X			X							
Proteaceae	*Hakea lissocarpha*	Honey Bush				X		X		X			X		
Proteaceae	*Hakea prostrata*	Harsh Hakea			X	X		X							
Proteaceae	*Hakea ruscifolia*	Candle Hakea						X							
Proteaceae	*Hakea trifurcata*	Two-leaf Hakea			X		X	X		X					
Proteaceae	*Persoonia saccata*	Snottygobble						X							
Proteaceae	*Petrophile sp.*									X					
Proteaceae	*Petrophile brevifolia*					X				X					
Proteaceae	*Petrophile linearis*	Pixie Mops						X							
Proteaceae	*Petrophile macrostachya*					X		X							
Proteaceae	*Petrophile media*							X							
Proteaceae	*Petrophile serruriae*				X		X	X							
Proteaceae	*Stirlingia latifolia*	Blueboy						X							
Proteaceae	*Synaphea petiolaris*	Synaphea						X							
Ranunculaceae	*Clematis linearifolia*				X					X			X		X
Restionaceae	*Alexgeorgea nitens*							X							
Restionaceae	*Desmocladus asper*									X			X		
Restionaceae	*Desmocladus flexuosus*				X	X		X		X				X	X
Restionaceae	*Loxocarya cinerea*					X									
Rhamnaceae	*Cryptandra arbutiflora*									X					

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Rhamnaceae	*Cryptandra mutila*				X					X					
Rhamnaceae	*Trymalium ledifolium*				X					X					X
Rhamnaceae	*Trymalium ledifolium subsp. ledifolium*						X								
Rhamnaceae	*Spyridium globulosum*	Basket Bush			X	X	X	X	X	X	X	X	X	X	X
Rosaceae	**Aphanes arvensis*									X					
Rubiaceae	**Galium murale*	Small Goosegrass													X
Rubiaceae	*Opercularia vaginata*	Dog Weed			X			X							
Rutaceae	*Diplolaena dampieri*									X					
Rutaceae	*Philotheca spicata*				X										
Santalaceae	*Exocarpos sp.*				X								X		
Santalaceae	*Exocarpos sparteus*	Broom Ballart				X				X				X	
Santalaceae	*Leptomeria empetriformis*						X								
Santalaceae	*Santalum acuminatum*	Quandong				X				X				X	X
Sapindaceae	*Diplopeltis huegelii*				X										X
Sapindaceae	*Diplopeltis huegelii subsp. huegelii*						X								
Scrophulariaceae	**Dischisma arenarium*													X	
Scrophulariaceae	*Eremophila glabra*				X	X									
Scrophulariaceae	*Eremophila glabra subsp. albicans*														X
Scrophulariaceae	*Myoporum insulare*	Blueberry Tree				X	X		X	X		X	X	X	
Solanaceae	**Solanum linnaeanum*									X					
Solanaceae	**Solanum nigrum*	Black Berry Nightshade				X		X					X	X	
Solanaceae	*Anthocercis ilicifolia*									X					
Stylidiaceae	*Levenhookia pusilla*												X		
Stylidiaceae	*Stylidium brunonianum*	Pink Fountain Triggerplant			X			X							
Stylidiaceae	*Stylidium guttatum*				X										
Stylidiaceae	*Stylidium junceum*	Reed Triggerplant			X			X							
Stylidiaceae	*Stylidium maritimum*		P3				X								
Stylidiaceae	*Stylidium repens*	Matted Triggerplant						X							
Stylidiaceae	*Stylidium schoenoides*	Cow Kicks						X							
Thymelaeaceae	*Pimelea argentea*									X			X		
Thymelaeaceae	*Pimelea calcicola*		P3				X								
Thymelaeaceae	*Pimelea ferruginea*				X										
Thymelaeaceae	*Pimelea leucantha*									X			X		
Thymelaeaceae	*Pimelea sulphurea*	Yellow Banjine				X		X							
Thymelaeaceae	*Pimelea sylvestris*				X										
Thymelaeaceae	*Pimelea villifera*						X								

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Tropaeolaceae	**Tropaeolum sp.*														X
Urticaceae	*Parietaria cardiostegia*														X
Urticaceae	*Parietaria debilis*	Pellitory			X									X	
Violaceae	*Hybanthus angustifolium*									X					
Violaceae	*Hybanthus calycinus*	Wild Violet			X			X		X			X	X	X
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Grass Tree				X		X		X			X		
Zamiaceae	*Macrozamia fraseri*							X		X			X		
Zamiaceae	*Macrozamia riedlei*												X		
		Total			**118**	**95**	**41**	**109**	**29**	**186**	**15**	**36**	**122**	**105**	**121**

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Appendix E Flora species matrix

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Aizoaceae	**Carpobrotus edulis*	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	0	0	1	0	1
Aizoaceae	**Tetragonia decumbens*	1	1	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	*Daucus glochidiatus*	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0
Araliaceae	*Trachymene pilosa*	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0
Asparagaceae	**Asparagus asparagoides*	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asparagaceae	**Lachenalia reflexa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Asparagaceae	*Acanthocarpus preissii*	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	1
Asparagaceae	*Lomandra maritima*	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	0	1	1	0	0	0	1	1	1	0	0	1
Asparagaceae	*Thysanotus manglesianus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
Asphodelaceae	**Trachyandra divaricata*	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	**Arctotheca calendula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	**Gazania linearis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Hypochaeris glabra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Asteraceae	**Lactuca serriola*	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Osteospermum ecklonis* (DC) Norl.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Sonchus oleraceus*	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0
Asteraceae	*Olearia axillaris*	1	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1
Asteraceae	**Ursinia anthemoides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	*Podotheca gnaphalioides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Rhodanthe corymbosa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	0
Asteraceae	*Senecio pinnatifolius* var. *latilobus*	1	0	0	0	1	0	1	1	1	1	0	1	0	0	1	1	1	1	1	0	1	1	0	0	0	0	0	1
Brassicaceae	**Brassica tournefortii*	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Brassicaceae	**Raphanus raphanistrum*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	**Petrorhagia dubia*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Caryophyllaceae	**Polycarpon tetraphyllum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0
Caryophyllaceae	**Stellaria media*	0	0	1	1	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0
Chenopodiaceae	*Atriplex cinerea*	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodiaceae	*Rhagodia baccata*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Chenopodiaceae	*Threlkeldia diffusa*	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1
Convolvulaceae	**Cuscuta epithymum*	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	**Crassula glomerata*	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1

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		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Crassulaceae	*Crassula colorata*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Cupressaceae	*Callitris preissii*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Ficinia nodosa*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cyperaceae	*Isolepis marginata*	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Lepidosperma calcicola*	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cyperaceae	*Lepidosperma gladiatum*	1	1	0	1	1	1	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Dilleniaceae	*Hibbertia hypericoides*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0
Dilleniaceae	*Hibbertia leptotheca* (P3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ericaceae	*Acrotriche cordata*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Ericaceae	*Leucopogon parviflorus*	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0
Euphorbiaceae	**Euphorbia paralias*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	**Euphorbia peplus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Euphorbiaceae	**Euphorbia terracina*	1	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1
Fabaceae	**Medicago polymorpha*	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	**Melilotus indicus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	0	0	1
Fabaceae	**Trifolium campestre*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	**Vicia sativa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	*Acacia cochlearis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Acacia cyclops*	0	1	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Acacia rostellifera*	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1
Fabaceae	*Acacia saligna*	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	*Acacia truncata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Fabaceae	*Bossiaea eriocarpa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Fabaceae	*Gastrolobium nervosum*	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Gompholobium tomentosum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Fabaceae	*Hardenbergia comptoniana*	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
Fabaceae	*Templetonia retusa*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	1
Fabaceae	*Jacksonia sericea* (P4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Frankeniaceae	*Frankenia pauciflora*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	**Pelargonium capitatum*	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1
Goodeniaceae	*Lechenaultia linarioides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Goodeniaceae	*Scaevola crassifolia*	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
Goodeniaceae	*Scaevola repens*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Haemodoraceae	*Conostylis aculeata* subsp. *preissii*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis candicans* subsp. *candicans*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis setigera*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0
Hemerocallidaceae	*Corynotheca micrantha*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Hemerocallidaceae	*Dianella revoluta*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
Iridaceae	**Gladiolus caryophyllaceus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0
Iridaceae	**Moraea flaccida*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Iridaceae	**Romulea rosea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Lamiaceae	*Hemiandra glabra*	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lauraceae	*Cassytha flava*	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Lauraceae	*Cassytha* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Malvaceae	*Thomasia triphylla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
Montiaceae	*Calandrinia brevipedata*	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Montiaceae	*Calandrinia tholiformis*	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0
Myrtaceae	*Agonis flexuosa*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Calothamnus quadrifidus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Myrtaceae	*Eucalyptus utilis*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Kunzea glabrescens*	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Melaleuca cardiophylla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	1	0	0
Myrtaceae	*Melaleuca huegelii*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	1
Myrtaceae	*Melaleuca systena*	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Olacaceae	*Olax benthamiana*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	**Oenothera drummondii*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchidaceae	*Pterostylis* sp. (nana complex)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalidaceae	**Oxalis pes-caprae*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Papaveraceae	**Fumaria capreolata*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Phyllanthaceae	*Phyllanthus calycinus*	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago exilis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
Poaceae	**Aira caryophyllea* subsp. *caryophyllea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Poaceae	**Avena barbata*	0	1	0	1	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Poaceae	*Briza maxima	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0
Poaceae	*Briza minima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Poaceae	*Bromus diandrus	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	1	1	0	1	0	1
Poaceae	*Catapodium rigidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1	0	0
Poaceae	*Ehrharta calycina	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0
Poaceae	*Ehrharta longiflora	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	0	1
Poaceae	*Lagurus ovatus	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Poaceae	*Vulpia myuros	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Poaceae	*Austrostipa flavescens*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Poaceae	*Poaceae* sp.	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Poaceae	*Tetrarrhena laevis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Hordeum leporinum	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Spinifex longifolius*	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygalaceae	*Comesperma integerrimum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Primulaceae	*Lysimachia arvensis*	0	0	0	1	0	1	0	1	0	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Proteaceae	*Banksia attenuata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Proteaceae	*Banksia dallanneyi*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Proteaceae	*Banksia sessilis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0
Proteaceae	*Grevillea crithmifolia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Proteaceae	*Grevillea preissii* subsp. *preissii*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
Restionaceae	*Desmocladus flexuosus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0
Rhamnaceae	*Trymalium ledifolium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Rhamnaceae	*Spyridium globulosum*	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1
Rubiaceae	*Galium murale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1
Santalaceae	*Exocarpos sparteus*	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Santalum acuminatum*	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Scrophulariaceae	*Dischisma arenarium	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scrophulariaceae	*Eremophila glabra* subsp. *albicans*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0
Scrophulariaceae	*Myoporum insulare*	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	*Solanum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urticaceae	*Parietaria cardiostegia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0
Urticaceae	*Parietaria debilis*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**25**	**17**	**20**	**20**	**23**	**25**	**31**	**35**	**22**	**30**	**27**	**21**	**40**	**23**	**26**	**32**	**22**	**31**	**39**	**17**	**18**	**24**	**37**	**42**	**32**	**29**	**33**	**23**

Appendix F Quadrat data

Site name	Date	Site type	Observer
Burns Beach ELA01	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune slope	West	10
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378554		6488957	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	10	M	Shrub <5m
Myoporum insulare	4	M	Shrub <5m
**Tetragonia decumbens*	0.5	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Scaevola crassifolia	2	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.3	M	Shrub <2m
**Ehrharta longiflora*	0.5	G	Grass
Lepidosperma gladiatum	0.5	G	Grass
**Bromus diandrus*	0.2	G	Grass
Spinifex longifolius	0.2	G	Grass
**Ehrharta calycina*	0.1	G	Grass
**Trachyandra divaricata*	3	G	Herb
**Pelargonium capitatum*	0.8	G	Herb
**Medicago polymorpha*	0.2	G	Herb
**Euphorbia paralias*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Senecio pinnatifolius var. latilobus	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Vulpia myuros*	0.08	G	Herb
**Brassica tournefortii*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA02	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia scrub over weeds	Dune slope into swale	North-east	3
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378583		6488980	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia rostellifera	40	M	Shrub <5m
Acacia cyclops	5	M	Shrub <5m
Spyridium globulosum	2	M	Shrub <5m
Kunzea glabrescens	0.5	M	Shrub <5m
Rhagodia baccata	1	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Scaevola crassifolia	0.05	M	Shrub <2m
**Tetragonia decumbens*	0.1	M	Shrub <0.5m
**Bromus diandrus*	10	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	6	G	Grass
**Avena barbata*	2	G	Grass
Lepidosperma gladiatum	0.2	G	Grass
Threlkeldia diffusa	0.5	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
Daucus glochidiatus	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA03	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia/Callitris shrub over weeds	Dune slope into swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378615		6488946	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Eucalyptus utilis	10	U	Tree <15m
Agonis flexuosa	2	U	Tree <10m
Callitris preissii	2.5	M	Shrub <10m
Acacia cyclops	8	M	Shrub <5m
Acacia rostellifera	5	M	Shrub <5m
Spyridium globulosum	3	M	Shrub <5m
Acanthocarpus preissii	0.5	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	30	G	Grass
**Fumaria capreolata*	0.5	G	Herb
Daucus glochidiatus	0.5	G	Herb
**Euphorbia terracina*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
**Trachyandra divaricata*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Pterostylis sp. (nana complex)	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber
**Asparagus asparagoides*	0.05	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA04	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia scrub over weeds	Dune slope into swale	East	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378530		6489054	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia rostellifera	20	M	Shrub <5m
Acacia cyclops	15	M	Shrub <5m
Kunzea glabrescens	0.5	M	Shrub <5m
Spyridium globulosum	0.5	M	Shrub <5m
Rhagodia baccata	0.5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
**Ehrharta longiflora*	20	G	Grass
**Avena barbata*	0.5	G	Grass
Lepidosperma gladiatum	0.5	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Lactuca serriola*	0.2	G	Herb
**Pelargonium capitatum*	0.2	G	Herb
**Sonchus oleraceus*	0.2	G	Herb
**Trachyandra divaricata*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Stellaria media*	0.05	G	Herb
**Asparagus asparagoides*	0.1	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA05	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	South-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378370		6489278	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.2	M	Shrub <7m
Myoporum insulare	0.5	M	Shrub <5m
Acacia lasiocarpa var. *lasiocarpa*	0.2	M	Shrub <5m
Acacia rostellifera	0.2	M	Shrub <5m
Acacia saligna	0.1	M	Shrub <5m
Spyridium globulosum	0.1	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Scaevola crassifolia	40	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Spinifex longifolius	2	G	Grass
Lepidosperma gladiatum	0.5	G	Grass
**Hordeum leporinum*	0.1	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Pelargonium capitatum*	0.8	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Trachyandra divaricata*	0.2	G	Herb
Ficinia nodosa	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.01	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA06	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia over *Spyridium* and mixed shrubs	Dune swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378272		6489449	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	10	M	Shrub <5m
Acacia rostellifera	3	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Acacia saligna	0.2	M	Shrub <5m
Melaleuca systena	0.2	M	Shrub <5m
Myoporum insulare	0.2	M	Shrub <5m
Exocarpos sparteus	0.1	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	1	M	Shrub <2m
Acanthocarpus preissii	0.6	M	Shrub <2m
Lepidosperma gladiatum	25	G	Grass
**Ehrharta longiflora*	2	G	Grass
**Avena barbata*	0.1	G	Grass
**Pelargonium capitatum*	0.5	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Cassytha flava	0.2	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Isolepis marginata	0.05	G	Herb
Hardenbergia comptoniana	0.5	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA07	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	South-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378126		6489677	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia lasiocarpa var. *lasiocarpa*	2.5	M	Shrub <5m
Spyridium globulosum	1	M	Shrub <5m
Acacia saligna	0.5	M	Shrub <5m
Exocarpos sparteus	0.5	M	Shrub <5m
Leucopogon parviflorus	0.5	M	Shrub <5m
Acacia cyclops	0.2	M	Shrub <5m
Myoporum insulare	0.1	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	2	M	Shrub <2m
Hemiandra glabra	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Atriplex cinerea	0.1	M	Shrub <2m
**Ehrharta longiflora*	0.2	G	Grass
**Briza maxima*	0.1	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Trachyandra divaricata*	0.5	G	Herb
Threlkeldia diffusa	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Pelargonium capitatum*	0.1	G	Herb
**Vulpia myuros*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis candicans subsp. *calcicola*	0.1	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Dischisma arenarium*	0.02	G	Herb
Daucus glochidiatus	0.02	G	Herb
Senecio pinnatifolius var. *latilobus*	0.02	G	Herb
**Stellaria media*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA08	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia over *Spyridium* and mixed shrubs	Dune swale	North-west	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378007		6489825	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.5	M	Shrub <7m
Spyridium globulosum	10	M	Shrub <5m
Exocarpos sparteus	0.8	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Melaleuca systena	0.3	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m
Scaevola crassifolia	0.8	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.3	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Phyllanthus calycinus	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.4	M	Shrub <0.5m
Lepidosperma gladiatum	25	G	Grass
**Ehrharta longiflora*	2	G	Grass
Lepidosperma calcicola	0.5	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Trachyandra divaricata*	1.5	G	Herb
**Carpobrotus edulis*	0.5	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
Conostylis candicans subsp. *calcicola*	0.5	G	Herb
Daucus glochidiatus	0.5	G	Herb
Poaceae sp.	0.5	G	Herb
Lomandra maritima	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis aculeata subsp. *preissii*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Vulpia myuros*	0.05	G	Herb
Parietaria debilis	0.05	G	Herb
**Sonchus oleraceus*	0.02	G	Herb
Calandrinia tholiformis	0.02	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.08	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA09	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	West	8
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377876		6490025	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	20	M	Shrub <5m
Melaleuca systena	0.5	M	Shrub <5m
Exocarpos sparteus	0.4	M	Shrub <5m
Olearia axillaris	2	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m
Acanthocarpus preissii	1.5	M	Shrub <2m
Hemiandra glabra	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Atriplex cinerea	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Gastrolobium nervosum	0.2	M	Shrub <0.5m
**Ehrharta longiflora*	1.5	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Trachyandra divaricata*	0.4	G	Herb
Poaceae sp.	0.3	G	Herb
**Pelargonium capitatum*	0.2	G	Herb
Conostylis candicans subsp. *calcicola*	0.2	G	Herb
**Stellaria media*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA10	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds and vehicle tracks	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Open low heath	Open swale	N/A	0
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377770		6490154	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Exocarpos sparteus	0.5	M	Shrub <5m
Spyridium globulosum	0.5	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Acacia saligna	0.1	M	Shrub <5m
Olearia axillaris	2	M	Shrub <3m
Acrotriche cordata	2.5	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Scaevola crassifolia	0.2	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Gastrolobium nervosum	0.1	M	Shrub <0.5m
**Ehrharta longiflora*	0.3	G	Grass
**Avena barbata*	0.1	G	Grass
**Ehrharta calycina*	0.05	G	Grass
**Pelargonium capitatum*	1.5	G	Herb
**Trachyandra divaricata*	1	G	Herb
Conostylis candicans subsp. *calcicola*	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Cuscuta epithymum*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Trachymene pilosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Dischisma arenarium*	0.02	G	Herb
Daucus glochidiatus	0.02	G	Herb
Isolepis marginata	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA11	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune swale	South-west	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377648		6499434	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.5	M	Shrub <7m
Spyridium globulosum	4	M	Shrub <5m
Melaleuca systena	1	M	Shrub <5m
Exocarpos sparteus	0.5	M	Shrub <5m
Olearia axillaris	3	M	Shrub <3m
Acanthocarpus preissii	2.5	M	Shrub <2m
Rhagodia baccata	0.4	M	Shrub <2m
Scaevola crassifolia	0.2	M	Shrub <2m
Phyllanthus calycinus	0.08	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Tetragonia decumbens*	0.2	M	Shrub <0.5m
Lepidosperma gladiatum	8	G	Grass
**Ehrharta calycina*	0.1	G	Grass
**Ehrharta longiflora*	0.1	G	Grass
Spinifex longifolius	0.1	G	Grass
**Bromus diandrus*	0.05	G	Grass
**Trachyandra divaricata*	0.5	G	Herb
Lomandra maritima	0.5	G	Herb
**Pelargonium capitatum*	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Conostylis candicans subsp. *calcicola*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Cuscuta epithymum*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Calandrinia brevipedata	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA12	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune rise and swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377545		6490624	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olearia axillaris	4	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m
Acanthocarpus preissii	0.4	M	Shrub <2m
Hemiandra glabra	0.3	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Lepidosperma gladiatum	20	G	Grass
**Ehrharta calycina*	0.4	G	Grass
**Ehrharta longiflora*	0.1	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spinifex longifolius	0.1	G	Grass
**Pelargonium capitatum*	3	G	Herb
**Trachyandra divaricata*	0.8	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.2	G	Herb
Cassytha flava	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.01	G	Herb
**Sonchus oleraceus*	0.01	G	Herb
Calandrinia brevipedata	0.01	G	Herb
Crassula colorata	0.01	G	Herb

Site name	Date	Site type	Observer
Burns Beach ELA13	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Exposed limestone slope	West	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	2-10
Easting		**Northing**	
378691		6488995	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.5	U	Shrub <10m
Melaleuca huegelii	5	M	Shrub <5m
Acacia cochlearis	2	M	Shrub <5m
Spyridium globulosum	2	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Acacia lasiocarpa var. *lasiocarpa*	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Calothamnus quadrifidus	2.5	M	Shrub <2m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.5	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Grevillea preissii subsp. *preissii*	0.1	M	Shrub <2m
Scaevola crassifolia	0.1	M	Shrub <2m
Phyllanthus calycinus	0.02	M	Shrub <2m
Banksia dallanneyi	0.1	M	Shrub <1m
**Bromus diandrus*	0.2	G	Grass
**Ehrharta calycina*	0.2	G	Grass
Lepidosperma calcicola	0.2	G	Grass
**Avena barbata*	0.1	G	Grass
Tetrarrhena laevis	0.02	G	Grass
**Pelargonium capitatum*	0.5	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
**Osteospermum ecklonis* (DC.) Norl.	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Oxalis pes-caprae*	0.1	G	Herb
**Raphanus raphanistrum*	0.1	G	Herb
**Trifolium campestre*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Gazania linearis*	0.05	G	Herb
**Lactuca serriola*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Desmocladus flexuosus	0.05	G	Herb
**Medicago polymorpha*	0.02	G	Herb
**Solanum nigrum*	0.02	G	Herb
**Melilotus indicus*	0.01	G	Herb
**Petrorhagia dubia*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

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Site name	Date	Site type	Observer
Burns Beach ELA14	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune slope	North-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378644		6488819	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	8	M	Shrub <5m
Myoporum insulare	4	M	Shrub <5m
Olearia axillaris	1.5	M	Shrub <3m
Scaevola crassifolia	10	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Lepidosperma gladiatum	5	G	Grass
**Bromus diandrus*	1.5	G	Grass
**Ehrharta longiflora*	0.5	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta calycina*	0.1	G	Grass
Spinifex longifolius	0.1	G	Grass
**Pelargonium capitatum*	2	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
Daucus glochidiatus	0.2	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Lactuca serriola*	0.05	G	Herb
**Oenothera drummondii*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
**Lysimachia arvensis*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA15	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	Limestone	>50
Easting		**Northing**	
378681		6488502	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olax benthamiana	0.1	M	Shrub <7m
Melaleuca huegelii	10	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Olearia axillaris	0.4	M	Shrub <3m
Eremophila glabra subsp. *albicans*	0.5	M	Shrub <2m
Acanthocarpus preissii	0.1	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Rhagodia baccata	0.4	M	Shrub <2m
Scaevola crassifolia	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Frankenia pauciflora	1.5	M	Shrub <1m
**Avena barbata*	0.1	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta longiflora*	0.2	G	Grass
**Hordeum leporinum*	0.2	G	Grass
**Crassula glomerata*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Medicago polymorpha*	0.5	G	Herb
**Melilotus indicus*	0.2	G	Herb
**Polycarpon tetraphyllum*	0.05	G	Herb
**Romulea rosea*	0.2	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Daucus glochidiatus	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.2	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA16	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378831		6488110	

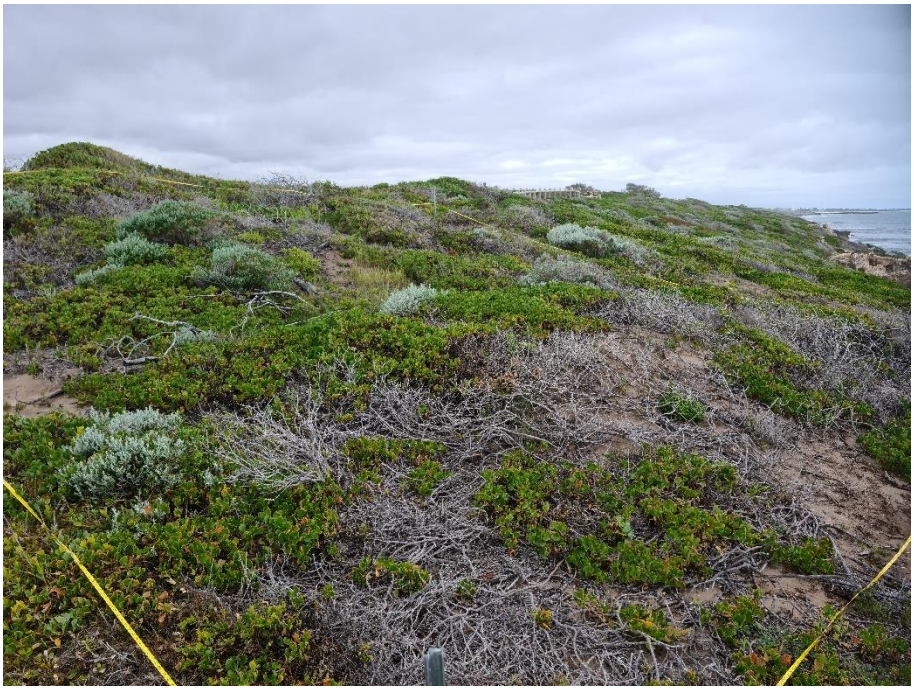


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olax benthamiana	0.3	M	Shrub <7m
Melaleuca cardiophylla	20	M	Shrub <5m
Melaleuca huegelii	0.5	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Spyridium globulosum	0.3	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Hibbertia leptotheca	0.4	M	Shrub <3m
Olearia axillaris	0.1	M	Shrub <3m
Scaevola crassifolia	1.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.5	M	Shrub <2m
Eremophila glabra subsp. *albicans*	0.5	M	Shrub <2m
Rhagodia baccata	0.3	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Thomasia triphylla	0.1	M	Shrub <2m
Frankenia pauciflora	0.5	M	Shrub <1m
Gastrolobium nervosum	0.2	M	Shrub <0.5m
**Catapodium rigidum*	0.2	G	Grass
**Hordeum leporinum*	0.2	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Medicago polymorpha*	0.2	G	Herb
**Melilotus indicus*	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Romulea rosea*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Rhodanthe corymbosa	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Podotheca gnaphalioides	0.05	G	Herb
**Sonchus oleraceus*	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA17	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine shallow sand	Limestone	<2
Easting		**Northing**	
378913		6487822	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	0.5	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Spyridium globulosum	0.4	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m
Scaevola crassifolia	15	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Eremophila glabra subsp. *albicans*	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Frankenia pauciflora	1	M	Shrub <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Catapodium rigidum*	0.5	G	Grass
**Hordeum leporinum*	0.1	G	Grass
**Medicago polymorpha*	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Polycarpon tetraphyllum*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA18	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	High amount of weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune swale	North	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	<2
Easting		**Northing**	
379013		6487773	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	8	M	Shrub <10m
Spyridium globulosum	2	M	Shrub <5m
Acacia rostellifera	1.5	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Melaleuca systena	0.1	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Hibbertia hypericoides	0.2	M	Shrub <3m
Jacksonia calcicola	0.1	M	Shrub <3m
Rhagodia baccata	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.2	M	Shrub <2m
Phyllanthus calycinus	0.1	M	Shrub <2m
Banksia dallanneyi	0.5	M	Shrub <1m
**Ehrharta calycina*	2.5	G	Grass
**Bromus diandrus*	2	G	Grass
**Briza maxima*	1.5	G	Grass
Austrostipa flavescens	0.05	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
Conostylis aculeata subsp. *preissii*	0.5	G	Herb
Lomandra maritima	0.5	G	Herb
**Hypochaeris glabra*	0.2	G	Herb
**Vulpia myuros*	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.2	G	Herb
**Petrorhagia dubia*	0.1	G	Herb
Desmocladus flexuosus	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
**Gladiolus caryophyllaceus*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA19	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Banksia shrubland over low heath	Dune rise	West	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	<2
Easting		**Northing**	
379034		6487880	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	15	M	Shrub <10m
Banksia attenuata	0.8	M	Shrub <10m
Spyridium globulosum	1.5	M	Shrub <5m
Acacia rostellifera	1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Olearia axillaris	0.5	M	Shrub <3m
Jacksonia calcicola	0.1	M	Shrub <3m
Scaevola crassifolia	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Calothamnus quadrifidus	0.4	M	Shrub <2m
Grevillea crithmifolia	0.4	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Acanthocarpus preissii	0.05	M	Shrub <2m
Banksia dallanneyi	0.5	M	Shrub <1m
Gompholobium tomentosum	0.2	M	Shrub <1m
**Ehrharta calycina*	5	G	Grass
**Briza maxima*	3	G	Grass
**Avena barbata*	0.5	G	Grass
Austrostipa flavescens	0.1	G	Grass
Conostylis setigera	2	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
**Ursinia anthemoides*	0.4	G	Herb
Corynotheca micrantha	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
Desmocladus flexuosus	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Hypochaeris glabra*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Trachyandra divaricata*	0.1	G	Herb
Ficinia nodosa	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Moraea flaccida*	0.05	G	Herb
Conostylis candicans subsp. *candicans*	0.05	G	Herb
**Arctotheca calendula*	0.02	G	Herb
**Gladiolus caryophyllaceus*	0.02	G	Herb
**Petrorhagia dubia*	0.02	G	Herb
Senecio pinnatifolius var. *latilobus*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA20	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone hill	North-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378930		6487898	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	60	M	Shrub <5m
Acacia rostellifera	0.2	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Rhagodia baccata	0.05	M	Shrub <2m
**Ehrharta calycina*	0.5	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Galium murale*	0.1	G	Grass
Rhodanthe corymbosa	0.2	G	Herb

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Plantago exilis	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
Trachymene pilosa	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb

Site name	Date	Site type	Observer
Iluka ELA21	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone rise	South-west	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine skeletal sand	Limestone	20-50
Easting		**Northing**	
378889		6488110	

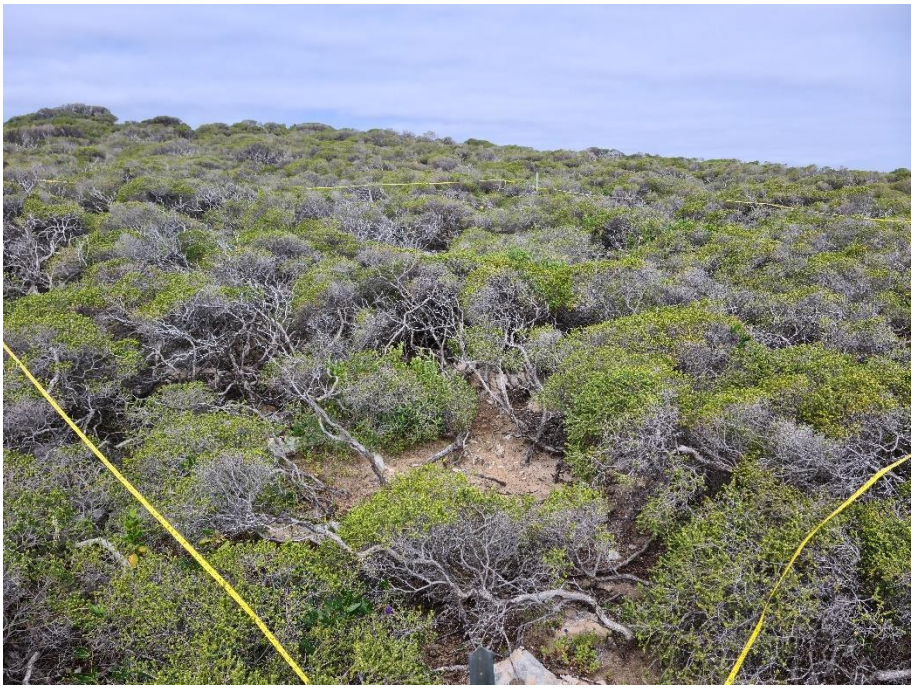


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	80	M	Shrub <5m
Acacia rostellifera	0.1	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Rhagodia baccata	0.2	M	Shrub <2m
**Galium murale*	0.5	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta calycina*	0.05	G	Grass
**Ehrharta longiflora*	0.02	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Parietaria cardiostegia	0.5	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Daucus glochidiatus	0.08	G	Herb
**Carpobrotus edulis*	0.05	G	Herb
**Crassula glomerata*	0.05	G	Herb
Plantago exilis	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.02	G	Herb
**Stellaria media*	0.01	G	Herb

Site name	Date	Site type	Observer
Iluka ELA22	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone rise	North-west	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378862		6488212	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	60	M	Shrub <5m
Acacia rostellifera	0.3	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Rhagodia baccata	0.5	M	Shrub <2m
Thomasia triphylla	0.1	M	Shrub <2m
**Catapodium rigidum*	0.2	G	Grass
**Ehrharta longiflora*	0.2	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Galium murale*	0.2	G	Grass
**Ehrharta calycina*	0.1	G	Grass
Trachymene pilosa	0.3	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
Plantago exilis	0.08	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
Calandrinia tholiformis	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA23	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone heath	Limestone rise	West	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378806		6488840	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	15	M	Shrub <5m
Spyridium globulosum	15	M	Shrub <5m
Acacia cyclops	2	M	Shrub <5m
Acacia truncata	0.5	M	Shrub <5m
Acacia rostellifera	0.1	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Templetonia retusa	0.05	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Eremophila glabra subsp. *albicans*	0.2	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.2	M	Shrub <2m
Grevillea preissii subsp. *preissii*	0.1	M	Shrub <2m
**Ehrharta calycina*	1	G	Grass
**Briza maxima*	0.5	G	Grass
**Ehrharta longiflora*	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
**Briza minor*	0.05	G	Grass
**Catapodium rigidum*	0.05	G	Grass
**Galium murale*	0.03	G	Grass
**Lysimachia arvensis*	0.2	G	Herb
**Melilotus indicus*	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
Parietaria cardiostegia	0.2	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Dianella revoluta	0.1	G	Herb
Poaceae sp.	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Gladiolus caryophyllaceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Daucus glochidiatus	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
Crassula colorata	0.02	G	Herb
**Sonchus oleraceus*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA24	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Mid Acacia/Melaleuca shrubland	Limestone slope	East	1.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	20-50
Easting		**Northing**	
378952		6488371	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	5	M	Shrub <7m
Spyridium globulosum	30	M	Shrub <5m
Melaleuca huegelii	5	M	Shrub <5m
Acacia rostellifera	0.5	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Olearia axillaris	0.05	M	Shrub <3m
Rhagodia baccata	2	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Grevillea preissii subsp. *preissii*	0.2	M	Shrub <2m
**Galium murale*	0.5	G	Grass
**Lagurus ovatus*	0.5	G	Grass
**Briza maxima*	0.3	G	Grass
**Bromus diandrus*	0.2	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta longiflora*	0.1	G	Grass
Lepidosperma calcicola	0.1	G	Grass
**Avena barbata*	0.05	G	Grass
**Ehrharta calycina*	0.01	G	Grass
Desmocladus flexuosus	0.5	G	Herb
Rhodanthe corymbosa	0.4	G	Herb
**Fumaria capreolata*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
Trachymene pilosa	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
Dianella revoluta	0.08	G	Herb
**Aira caryophyllea* subsp. *caryophyllea*	0.05	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Conostylis setigera	0.05	G	Herb
Poaceae sp.	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Polycarpon tetraphyllum*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Crassula colorata	0.01	G	Herb
Thysanotus manglesianus	0.01	G	Herb
Comesperma integerrimum	0.2	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA25	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low Acacia/*Spyridium* shrubland	Limestone rise	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378986		6488112	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.2	M	Shrub <10m
Spyridium globulosum	30	M	Shrub <5m
Melaleuca systena	1.5	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Trymalium ledifolium	0.08	M	Shrub <3m
Rhagodia baccata	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Grevillea preissii subsp. *preissii*	0.2	M	Shrub <2m
Scaevola repens	0.05	M	Shrub <2m
Bossiaea eriocarpa	0.1	M	Shrub <1m
**Briza maxima*	1.5	G	Grass
**Ehrharta longiflora*	0.5	G	Grass
**Ehrharta calycina*	0.2	G	Grass
**Galium murale*	0.1	G	Grass
**Catapodium rigidum*	0.02	G	Grass
Lomandra maritima	4	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
Desmocladus flexuosus	0.2	G	Herb
Daucus glochidiatus	0.15	G	Herb
**Melilotus indicus*	0.1	G	Herb
Dianella revoluta	0.1	G	Herb
Trachymene pilosa	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Conostylis setigera	0.05	G	Herb
Thysanotus manglesianus	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Gladiolus caryophyllaceus*	0.02	G	Herb
Crassula colorata	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA26	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia/Melaleuca shrubland	Limestone slope	West	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378554		6488957	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	5	M	Shrub <7m
Spyridium globulosum	25	M	Shrub <5m
Melaleuca cardiophylla	10	M	Shrub <5m
Acacia rostellifera	3	M	Shrub <5m
Melaleuca huegelii	2	M	Shrub <5m
Rhagodia baccata	1	M	Shrub <2m
**Ehrharta longiflora*	15	G	Grass
**Ehrharta calycina*	5	G	Grass
**Briza maxima*	0.5	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Galium murale*	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
Lepidosperma gladiatum	0.1	G	Grass
**Catapodium rigidum*	0.01	G	Grass
**Lysimachia arvensis*	3	G	Herb
Daucus glochidiatus	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
Trachymene pilosa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Euphorbia terracina*	0.2	G	Herb
**Euphorbia peplus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
Calandrinia brevipedata	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Crassula colorata	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
Calandrinia tholiformis	0.02	G	Herb
Hardenbergia comptoniana	0.2	G	Climber

Site name	Date	Site type	Observer
Iluka ELA27	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia shrubs over weeds	Dune swale	North	0.1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine sand	Limestone	<2
Easting		**Northing**	
378924		6488656	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.5	M	Shrub <10m
Acacia rostellifera	20	M	Shrub <5m
Spyridium globulosum	5	M	Shrub <5m
Acacia saligna	1	M	Shrub <5m
Hibbertia hypericoides	0.2	M	Shrub <3m
Calothamnus quadrifidus	0.5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
Lechenaultia linarioides	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia dallanneyi	0.5	M	Shrub <1m
**Ehrharta calycina*	10	G	Grass
**Briza maxima*	8	G	Grass
**Lagurus ovatus*	5	G	Grass
**Avena barbata*	0.4	G	Grass
Austrostipa flavescens	0.05	G	Grass
**Oxalis pes-caprae*	2	G	Herb
**Pelargonium capitatum*	1.5	G	Herb
**Lachenalia reflexa*	0.5	G	Herb
**Fumaria capreolata*	0.2	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Gladiolus caryophyllaceus*	0.1	G	Herb
**Hypochaeris glabra*	0.1	G	Herb
**Medicago polymorpha*	0.1	G	Herb
**Romulea rosea*	0.1	G	Herb
**Vicia sativa*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Corynotheca micrantha	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Moraea flaccida*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Petrorhagia dubia*	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA28	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low swale heath	Dune swale	North-east	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine sand	Limestone	2-10
Easting		**Northing**	
379031		6487550	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	10	M	Shrub <5m
Spyridium globulosum	8	M	Shrub <5m
Acacia rostellifera	2	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Rhagodia baccata	5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
**Ehrharta calycina*	10	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	2	G	Grass
Lepidosperma gladiatum	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
**Galium murale*	0.1	G	Grass
**Carpobrotus edulis*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Pelargonium capitatum*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Melilotus indicus*	0.05	G	Herb
Cassytha sp.	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
Thysanotus manglesianus	0.02	G	Herb
**Lysimachia arvensis*	0.01	G	Herb
Hardenbergia comptoniana	0.2	G	Climber

Appendix G Conservation and Bush Forever significant flora locations within the survey area

Species	Number of individuals	Listing	Easting	Northing
Marianthus paralius	7	Endangered under EPBC Act and BC Act	[redacted]	[redacted]
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378834	6488121
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378842	6488110
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378838	6488101
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378847	6488099
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378848	6488088
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378860	6488092
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378866	6488082
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378868	6488044
Jacksonia sericea	<5 % cover	Priority 4 / Bush Forever	379006	6487990
Agonis flexuosa	1	Bush Forever	378615	6488946
Callitris preissii	1	Bush Forever	378615	6488946
Lechenaultia linarioides	1	Bush Forever	378924	6488656
Grevillea preissii subsp. *preissii*	1	Bush Forever	378687	6488986
Grevillea preissii subsp. *preissii*	1	Bush Forever	378669	6488993
Grevillea preissii subsp. *preissii*	1	Bush Forever	378803	6488445
Grevillea preissii subsp. *preissii*	1	Bush Forever	378823	6488444
Grevillea preissii subsp. *preissii*	1	Bush Forever	378856	6488432
Grevillea preissii subsp. *preissii*	1	Bush Forever	378941	6488246
Grevillea preissii subsp. *preissii*	1	Bush Forever	378934	6488203
Grevillea preissii subsp. *preissii*	1	Bush Forever	378691	6488995
Grevillea preissii subsp. *preissii*	1	Bush Forever	378952	6488371
Grevillea preissii subsp. *preissii*	1	Bush Forever	378986	6488112
Grevillea preissii subsp. *preissii*	1	Bush Forever	378906	6488050
Trymalium ledifolium	1	Bush Forever	378937	6488220
Trymalium ledifolium	1	Bush Forever	378906	6488050
Diplopeltis huegelii	1	Bush Forever	378939	6488379
Melaleuca cardiophylla	1	Bush Forever	378831	6488110
Melaleuca cardiophylla	1	Bush Forever	378930	6487898
Melaleuca cardiophylla	1	Bush Forever	378889	6488110
Melaleuca cardiophylla	1	Bush Forever	378862	6488212
Melaleuca cardiophylla	1	Bush Forever	378906	6488050

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Species	Number of individuals	Listing	Easting	Northing
Melaleuca lanceolata	1	Bush Forever	378648	6488973
Melaleuca lanceolata	1	Bush Forever	378653	6488820.372

Appendix H Conservation and Bush Forever significant flora photos

Species name	Conservation status	Photo
Marianthus paralius	EN	 
Hibbertia leptotheca	P3	

Species name	Conservation status	Photo
Jacksonia sericea	P4	
Diplopeltis huegelii	Bush Forever significant flora	

Species name	Conservation status	Photo
Grevillea preissii subsp. *preissii*	Bush Forever significant flora	
Lechenaultia linarioides	Bush Forever significant flora	

Species name	Conservation status	Photo
Melaleuca cardiophylla	Bush Forever significant flora	
Trymalium ledifolium	Bush Forever significant flora	

Appendix I Priority weed mapping

*Arctotis sp. (Arctotis)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Arctotis (*Arctotis sp.*)
- Arctotis (*Arctotis sp.*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Asparagus asparagoides (Bridal Creeper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Bridal Creeper (*Asparagus asparagoides*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Avena fatua (Wild Oats)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Oats (*Avena fatua*)
- Wild Oats (*Avena fatua*) (<5%)
- Wild Oats (*Avena fatua*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Carpobrotus edulis (Pigface)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Pigface (*Carpobrotus edulis*)
- Pigface (*Carpobrotus edulis*) (<5%)
- Pigface (*Carpobrotus edulis*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Cynodon dactylon (Couch grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Couch grass (*Cynodon dactylon*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Dimorphotheca ecklonis (Veldt Daisy)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Veldt Daisy (*Dimorphotheca ecklonis*)
- Veldt Daisy (*Dimorphotheca ecklonis*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta calycina (Perennial Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Perennial Veldt (*Ehrharta calycina*)
- Perennial Veldt (*Ehrharta calycina*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta longiflora (Annual Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Annual Veldt (*Ehrharta longiflora*)
- Annual Veldt (*Ehrharta longiflora*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Euphorbia paralias (Sea Spurge)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spurge (*Euphorbia paralias*)
- Sea Spurge (*Euphorbia paralias*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia terracina (Geraldton Carnation Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Carnation Weed (*Euphorbia terracina*)
- Geraldton Carnation Weed (*Euphorbia terracina*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Fumaria sp. (Fumitory)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Fumitory (*Fumaria sp.*)
- Fumitory (*Fumaria sp.*) (<5%)
- Fumitory (*Fumaria sp.*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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A TETRA TECH COMPANY

20PER16745-GM Date: 25/02/2021

Gazania linearis (Gazania)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Gazania (*Gazania linearis*)
- Gazania (*Gazania linearis*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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A TETRA TECH COMPANY

20PER16745-GM Date: 25/02/2021

Lactua serriola (Prickle Lettuce)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Prickle Lettuce (*Lactua serriola*)

0 75 150 300

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Oxalis pes-caprae (Soursob)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Soursob (*Oxalis pes-caprae*)
- Soursob (*Oxalis pes-caprae*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

*Pelargonium capitatum (Rose Pelargonium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Rose Pelargonium (*Pelargonium capitatum*)
- Rose Pelargonium (*Pelargonium capitatum*) (<5%)
- Rose Pelargonium (*Pelargonium capitatum*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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A TETRA TECH COMPANY

20PER16745-GM Date: 25/02/2021

Pennisetum clandestinium (Kikuyu grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

Kikuyu grass (*Pennisetum clandestinium*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

*Raphanus sp. (Wild Radish)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Radish (*Raphanus sp.*)
- Wild Radish (*Raphanus sp.*) (<5%)
- Wild Radish (*Raphanus sp.*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

20PER16745-GM Date: 25/02/2021

*Ricinus communis (Castor Oil Plant)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Castor Oil Plant (*Ricinus communis*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

Schinus terebinthifolia (Japanese Pepper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Japanese Pepper (*Schinus terebinthifolia*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Tetragonia decumbens (Sea Spinach)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spinach (*Tetragonia decumbens*) (<5%)
- Sea Spinach (*Tetragonia decumbens*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Trachyandra divaricata (Onion Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Onion Weed (*Trachyandra divaricata*)
- Onion Weed (*Trachyandra divaricata*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Asparagus asparagoides (Bridal Creeper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Bridal Creeper (*Asparagus asparagoides*)
- Bridal Creeper (*Asparagus asparagoides*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Avena fatua (Wild Oats)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Oats (*Avena fatua*)
- Wild Oats (*Avena fatua*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Carpobrotus edulis (Pigface)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Pigface (*Carpobrotus edulis*)
- Pigface (*Carpobrotus edulis*) (<5%)
- Pigface (*Carpobrotus edulis*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Chamelaucium uncinatum (Geraldton Wax)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Wax (*Chamelaucium uncinatum*)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Dimorphotheca ecklonis (Veldt Daisy)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Veldt Daisy (*Dimorphotheca ecklonis*)
- Veldt Daisy (*Dimorphotheca ecklonis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Ehrharta calycina (Perennial Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Perennial Veldt (*Ehrharta calycina*)
- Perennial Veldt (*Ehrharta calycina*) (<5%)
- Perennial Veldt (*Ehrharta calycina*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta longiflora (Annual Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Annual Veldt (*Ehrharta longiflora*)
- Annual Veldt (*Ehrharta longiflora*) (<5%)
- Annual Veldt (*Ehrharta longiflora*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia paralias (Sea Spurge)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spurge (*Euphorbia paralias*)
- Sea Spurge (*Euphorbia paralias*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia terracina (Geraldton Carnation Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Carnation Weed (*Euphorbia terracina*)
- Geraldton Carnation Weed (*Euphorbia terracina*) (<5%)
- Geraldton Carnation Weed (*Euphorbia terracina*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Fumaria sp. (Fumitory)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Fumitory (*Fumaria sp.*)
- Fumitory (*Fumaria sp.*) (<5%)
- Fumitory (*Fumaria sp.*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Gazania linearis (Gazania)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Gazania (*Gazania linearis*)
- Gazania (*Gazania linearis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Lactua serriola (Prickle Lettuce)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Prickle Lettuce (*Lactua serriola*)
- Prickle Lettuce (*Lactua serriola*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Moraea flaccida (One-leaf Cape Tulip)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- One-leaf Cape Tulip (*Moraea flaccida*)
- One-leaf Cape Tulip (*Moraea flaccida*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Oxalis pes-caprae (Soursob)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Soursob (*Oxalis pes-caprae*)
- Soursob (*Oxalis pes-caprae*) (<5%)
- Soursob (*Oxalis pes-caprae*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Pelargonium capitatum (Rose Pelargonium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Rose Pelargonium (*Pelargonium capitatum*)
- Rose Pelargonium (*Pelargonium capitatum*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Pennisetum clandestinium (Kikuyu grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Kikuyu grass (*Pennisetum clandestinium*)
- Kikuyu grass (*Pennisetum clandestinium*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Raphanus sp. (Wild Radish)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Radish (*Raphanus sp.*)
- Wild Radish (*Raphanus sp.*) (<5%)
- Wild Radish (*Raphanus sp.*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ricinus communis (Castor Oil Plant)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Castor Oil Plant (*Ricinus communis*)
- Castor Oil Plant (*Ricinus communis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Schinus terebinthifolia (Japanese Pepper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Japanese Pepper (*Schinus terebinthifolia*)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Tetragonia decumbens (Sea Spinach)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spinach (*Tetragonia decumbens*)
- Sea Spinach (*Tetragonia decumbens*) (<5%)
- Sea Spinach (*Tetragonia decumbens*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Trachyandra divaricata (Onion Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Onion Weed (*Trachyandra divaricata*)
- Onion Weed (*Trachyandra divaricata*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Tropaeolum sp. (Nasturtium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

Nasturtium (*Tropaeolum sp.*) (<5%)

0 25 50 100
Metres

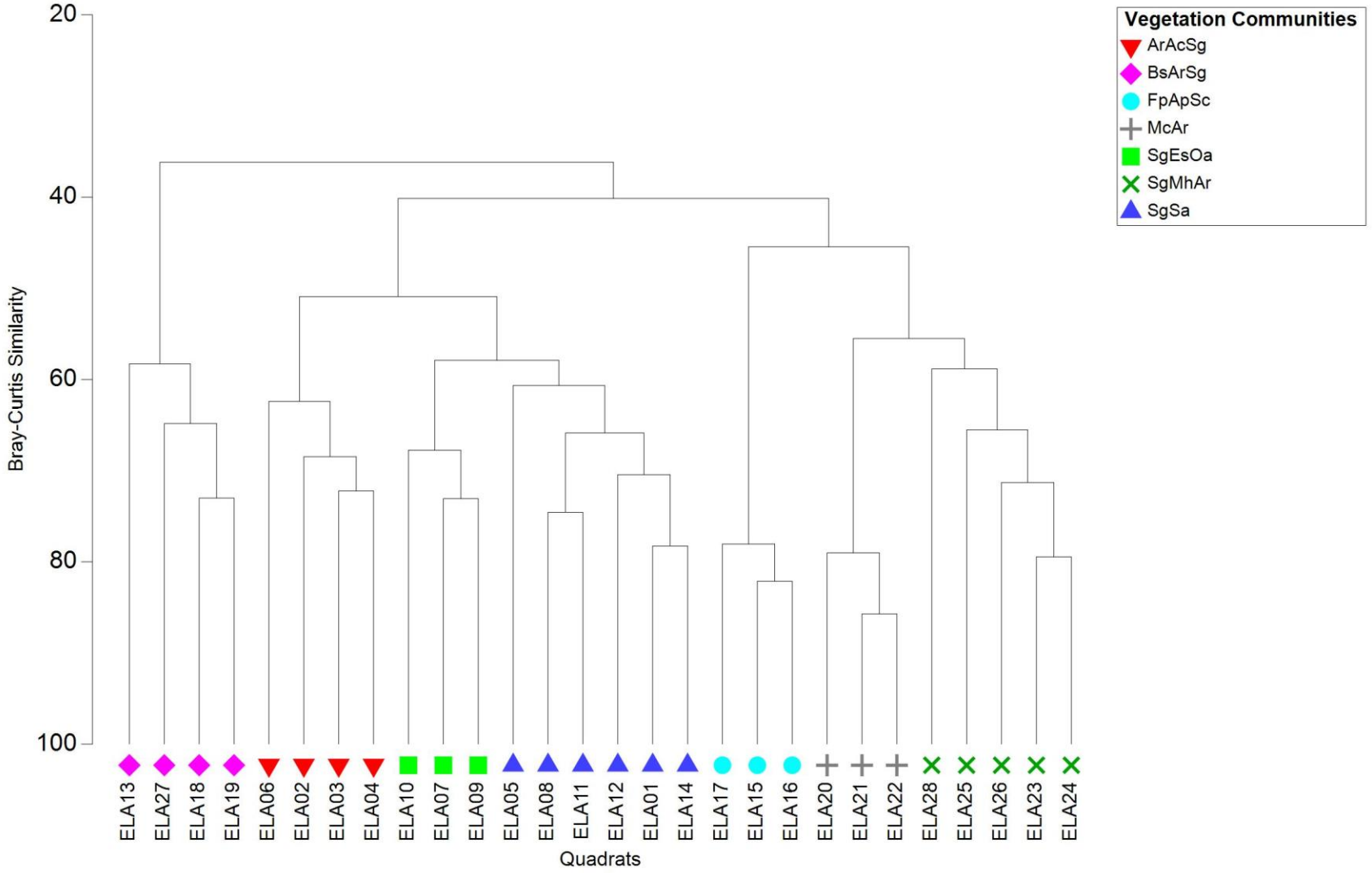
Datum/Projection:
GDA 1994 MGA Zone 50

N

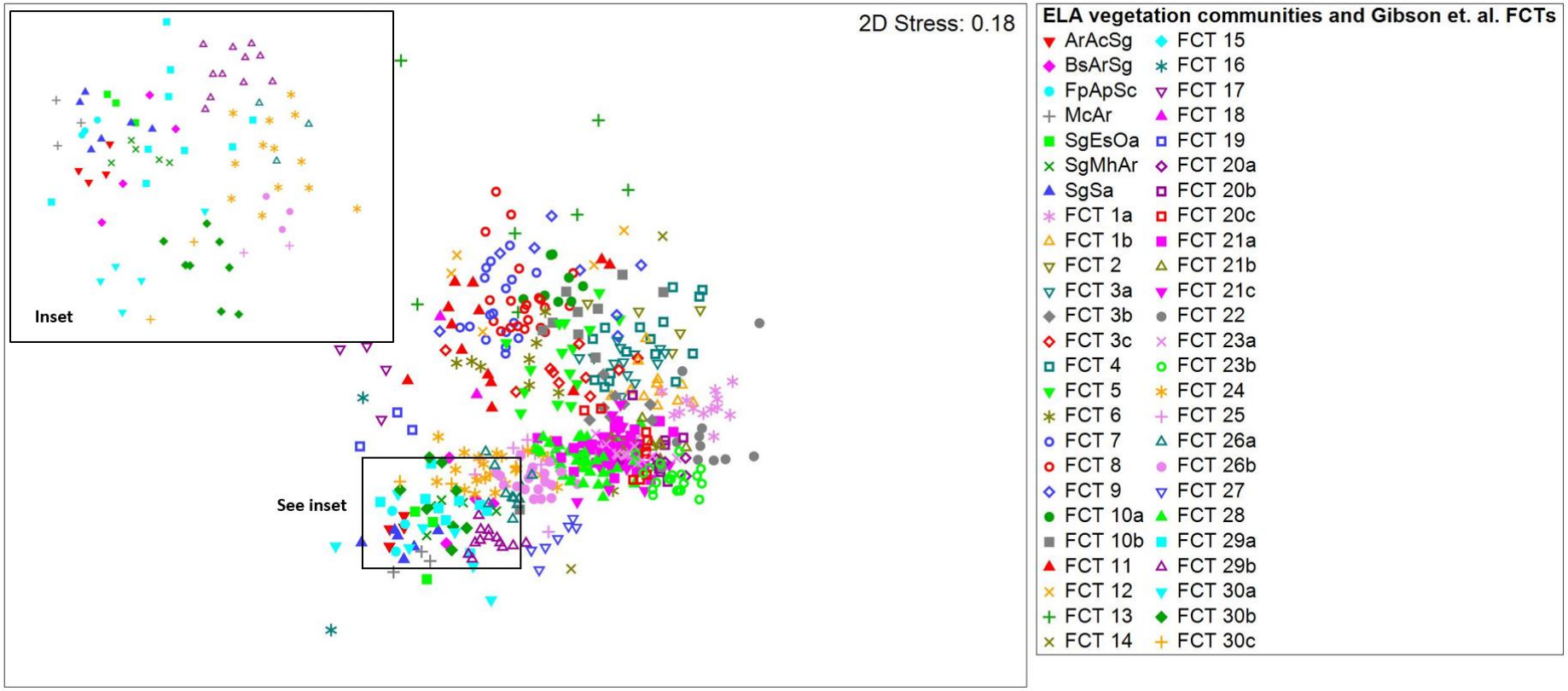
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Appendix J Hierarchical clustering dendrogram



Appendix K MDS: Relationships between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson et al. (1994)



Appendix L Banksia Woodlands TEC assessment

Step	Key diagnostic characteristics	Outcome
1	**Location and physical environment** The Banksia Woodlands ecological community primarily occurs in the Swan Coastal Plain IBRA bioregion	The Iluka and Burns Beach survey areas are located on the Swan Coastal Plain
	Soil and landform The *Banksia* Woodlands typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands	The Iluka and Burns Beach survey areas are located on the Quindalup Dune system
	Structure The structure of the Banksia Woodlands is a low woodland to forest with these features: • A distinctive upper sclerophyllous layer of low trees* (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the *Banksia* species identified under composition • Emergent trees of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* species may sometimes be present above the Banksia canopy • An often highly species-rich understorey that consists of: o A layer of sclerophyllous shrubs of various heights; and, o A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	The BsArSg vegetation community consists of a *Banksia sessilis* shrubland over low heath. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19 as part of the BsArSg vegetation community (Appendix F). This stand comprised of an area of less than 0.5 hectares in size and did not constitute a woodland structure or warrant delineation of a separate vegetation community.

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Step	Key diagnostic characteristics	Outcome

	Composition
	• The canopy is most commonly dominated or co-dominated by *Banksia attenuata* (candlestick banksia, slender banksia) and/or *B. menziesii* (firewood banksia). Other Banksia species that dominate in some examples of the ecological community are *B. prionotes* (acorn banksia) or *B. ilicifolia* (holly-leaved banksia); and
	• The patch must include at least one of the following diagnostic species:
	  o *Banksia attenuata* (candlestick banksia)
	  o *Banksia menziesii* (firewood banksia)
	  o *Banksia prionotes* (acorn banksia)
	  o *Banksia ilicifolia* (holly-leaved banksia).
	• If present, the emergent tree layer often includes *Corymbia calophylla* (marri), *E. marginata* (jarrah), or less commonly *Eucalyptus gomphocephala* (tuart); and
	• Other trees of a medium height that may be present, and may be codominant with the Banksia species across a patch, include *Eucalyptus todtiana* (blackbutt, pricklybark), *Nuytsia floribunda* (Western Australian Christmas tree), *Allocasuarina fraseriana* (western sheoak), *Callitris arenaria* (sandplain cypress), *Callitris pyramidalis* (swamp cypress) and *Xylomelum occidentale* (woody pear); and
	• The understorey typically contains a high to very high diversity of shrub and herb species that often vary from patch to patch***
	• Contra-indicators:
	  o Patches clearly dominated by *Banksia littoralis* are not part of the Banksia Woodlands ecological community but indicates a different, dampland community is present.
	  o Patches clearly dominated by *Banksia burdettii* are not part of the Banksia Woodlands ecological community but indicates a tall shrubland and not the Banksia Woodlands ecological community.
	  o FCT 20c – Eastern shrublands and woodlands, corresponds with a separate EPBC ecological community listing, Shrublands and Woodlands of the eastern Swan Coastal Plain. Occurrences of this FCT should be considered under that separate listing.
		As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The composition key diagnostic characteristic has not been met.

Step	Key diagnostic characteristics	Outcome
2	**Condition thresholds** • Assessments of a patch should initially be centered on the area of highest native floristic diversity and/or cover, i.e. the best condition area of the patch. • Consideration must be given to the timing of surveys and recent disturbance. Ideally surveys should be undertaken in spring with two sampling periods to capture early and late flowering species. • The surrounding context of a patch must also be taken into account when considering factors that add to the importance of a patch that meets the condition thresholds. • Certain vegetation components of the Banksia Woodlands ecological community merit consideration as critical elements to protect. Three components are recognised as threatened in their own right in WA and, as such, are priorities for protection; refer to **Table 1** in the Approved Conservation Advice (TSSC 2016). • A relevant expert (e.g. ecological consultant, local NRM or environment agency) may be useful to help identify the ecological community and its condition.	As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The BsArSg community was assessed and sampled in the highest condition representation available in the survey area. The survey was completed in spring, which is the most appropriate season to survey on the Swan Coastal Plain. The BsArSg vegetation community has been determined to represent the FCT 24 Northern Spearwood shrublands and woodlands (Gibson *et al.* 1994). FCT 24 forms part of the Banksia Woodlands ecological community listing (TSSC 2016), however BsArSg constitutes the heath form of this FCT, as described in described in Gibson (*et al.* 1994), rather than a distinct Banksia woodland.
3	**Minimum patch size** Minimum patch sizes apply for consideration of a patch as part of the listed ecological community for EPBC Act referral, assessment and compliance purposes. Where patches meet different levels of condition, different minimum patch sizes apply: • 'Pristine' – no minimum patch size applies • 'Excellent' – 0.5 ha or 5,000 m2 (e.g. 50 m x 100 m) • 'Very Good' – 1 ha or 10,000 m2 (e.g. 100 m x 100 m) • 'Good' – 2 ha or 20,000 m2 (e.g. 200 m x 100 m). Note: To be considered as part of the EPBC Act ecological community, a patch should meet at least the Good Condition category.	As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The minimum patch size hasn't been met.

Step	Key diagnostic characteristics	Outcome
4	**Further information to assist in determining the presence of the ecological community and significant impacts** • The landscape position of the patch, including its position relative to surrounding vegetation also influences how important it is in the broader landscape. For example, if it enables movement of native fauna or plant material or supports other ecological processes • A patch is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks. Where there is a break in native vegetation cover, from the edge of the tree canopy of 30 m or more (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that separate patches are present. • Variation in canopy cover, quality or condition of vegetation across a patch should not initially be considered to be evidence of multiple patches. Patches can be spatially variable and are often characterised by one or more areas within a patch that meet the key diagnostic characteristics and condition threshold criteria amongst areas of lower condition. Average canopy cover and quality across the broadest area that meets the general description of the ecological community should be used initially in determining overall canopy cover and vegetation condition. Also note any areas that are either significantly higher or lower in quality, gaps in canopy cover and the condition categories that would apply across different parts of the site respectively. Where the average canopy cover or quality falls below the minimum thresholds, the next largest area or areas that meet key diagnostics (including minimum canopy cover requirements) and minimum condition thresholds should be specified and protected. This may result in multiple patches being identified within the overall area first considered. • A buffer zone is a contiguous area immediately adjacent to a patch of the ecological community that is important for protecting its integrity. The purpose of the buffer zone is to help protect and manage the national threatened ecological community. The edges of a patch are considered particularly susceptible to disturbance and the presence of a buffer zone is intended to act as a barrier to further direct disturbance. • The recommended minimum buffer zone for the ecological community is 20–50 m from the outer edge of a patch, and the appropriate size depends on the nature of the buffer and local context (e.g. slope). A larger buffer zone should be applied, where practical, to protect patches that are of particularly high conservation value, or if patches are down slope of drainage lines or a source of nutrient enrichment, or groundwater drawdown.	No vegetation within the Iluka and Burns Beach survey areas were assessed as representing the Banksia Woodlands of the Swan Coastal Plain TEC.

*The term 'woodland' has been chosen as the most typical structure, but the ecological community may also be considered to include examples of shrubland, open woodland or forest under some classification systems. The percentage canopy cover is more than 2% and typically less than 50%. The structure and appearance may also vary due to disturbance history. Similarly, component species of the dominant upper sclerophyllous layer may be variously considered 'tall or large shrubs' or 'small trees'.

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** Refers to relevant *Banksia* species typically being amongst the most common plant species in the upper sclerophyllous layer. There may be localised exceptions to this, either as natural variation or due to disturbance history (e.g. fire).

*** Key species in the sclerophyllous shrub layer of the ecological community include members of the families Asteraceae, Dilleniaceae, Ericaceae, Fabaceae, Myrtaceae and Proteaceae. Widespread species include *Adenanthos cygnorum* (woolly bush), *Allocasuarina humilis* (dwarf sheoak), *Bossiaea eriocarpa* (common brown pea), *Conostephium pendulum* (pearl flower), *Daviesia* spp., *Eremaea pauciflora*, *Gompholobium tomentosum* (hairy yellow pea), *Hibbertia hypericoides* (yellow buttercups), *Jacksonia* spp., *Kunzea glabrescens, Petrophile linearis* (pixie mops), *Philotheca spicata* (pepper and salt), *Stirlingia latifolia* (blueboy), *Phlebocarya ciliata, Hypolaena exsulca* and *Xanthorrhoea preissii* (balga). Key species in the herbaceous ground layer include members of the families Cyperaceae, Droseraceae, Haemodoraceae, Orchidaceae, Restionaceae and "lilies" from various families. Widespread species include *Amphipogon turbinatus* (tufted beard grass), *Burchardia congesta* (milkmaids), *Caladenia* spp. (spider orchids), *Dasypogon bromeliifolius* (pineapple bush), *Desmocladus flexuosus, Drosera erythrorhiza* (red ink sun dew), *Lepidosperma squamatum* (a tufted sedge), *Lomandra hermaphrodita, Lyginia barbata* (southern rush), *Lyginia imberbis, Mesomelaena pseudostygia* (semaphore sedge), *Patersonia occidentalis* (purple flag), *Podolepis* spp., *Stylidium brunonianum* (pink fountain trigger plant), *Stylidium piliferum* (common butterfly trigger plant), *Trachymene pilosa* (dwarf parsnip), and *Xanthosia huegelii* (heath xanthosia).

Appendix M Fauna species list

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Birds													
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill			X								
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill			X								
Acanthizidae	*Acanthiza inornata*	Western Thornbill			X								
Acanthizidae	*Acanthiza sp.*	Thornbill						X					
Acanthizidae	*Gerygone fusca*	Western Gerygone			X								
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren			X		X						
Accipitridae	*Accipiter cirrocephalus*	Collard Sparrowhawk						X					
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk			X								
Accipitridae	*Accipiter fasciatus*	Brown Goshawk			X								
Accipitridae	*Hieraaetus morphnoides*	Little Eagle			X						X		
Alcedinidae	**Dacelo novaeguineae*	Laughing Kookaburra						X				X	X
Artamidae	*Artamus cinereus*	Black-faced Woodswallow			X							X	X
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow			X								
Cacatuidae	*Cacatua galerita*	Sulpher-crested Cockatoo						X					
Cacatuidae	*Cacatua sanguinea*	Little Corella						X				X	X
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	EN	EN	X	X			X		X		X
Cacatuidae	*Eolophus roseicapilla*	Galah			X						X	X	X
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike			X			X				X	X
Campephagidae	*Lalage tricolor*	White-winged Triller			X								
Columbidae	**Spilopelia senegalensis*	Laughing Dove			X							X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Columbidae	*Ocyphaps lophotes*	Crested Pigeon										X	
Columbidae	*Phaps chalcoptera*	Common Bronzewing			X								
Corvidae	*Corvus bennetti*	Little Crow										X	X
Corvidae	*Corvus coronoides*	Australian Raven			X			X			X	X	X
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird						X				X	X
Cracticidae	*Cracticus tibicen*	Australian Magpie			X			X				X	X
Cracticidae	*Cracticus torquatus*	Grey Butcherbird			X								
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo			X								
Falconidae	*Falco cenchroides*	Nankeen Kestrel			X								
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow			X								
Hirundinidae	*Hirundo neoxena*	Welcome Swallow			X								X
Hirundinidae	*Petrochelidon nigricans*	Tree Martin			X								
Laridae	*Larus novaehollandiae*	Silver Gull										X	X
Maluridae	*Malurus lamberti*	Variegated Fairywren										X	X
Maluridae	*Malurus leucopterus*	White-winged Fairywren			X		X					X	X
Maluridae	*Malurus sp.*	Fairywren						X					
Maluridae	*Malurus splendens*	Splendid Fairywren			X		X	X			X		
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater						X					
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill			X			X					
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird			X			X				X	X
Meliphagidae	*Anthochaera lunulata*	Western Little Wattlebird			X								
Meliphagidae	*Gliciphila melanops*	Tawny-crowned Honeyeater			X								
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater			X							X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater			X							X	X
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner			X								
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater			X							X	X
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater			X			X			X	X	X
Meropidae	*Merops ornatus*	Rainbow Bee-eater			X								
Monarchidae	*Grallina cyanoleuca*	Magpie-lark						X				X	X
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush			X			X					
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler			X								
Pandionidae	*Pandion haliaetus*	Eastern Osprey											X
Pardalotidae	*Pardalotus striatus*	Striated Pardalote						X					
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant										X	X
Podargidae	*Podargus strigoides*	Tawny Frogmouth											X
Psittacidae	*Neophema elegans*	Elegant Parrot			X								
Psittacidae	*Platycercus spurius*	Red-capped Parrot			X								
Psittacidae	*Platycercus zonarius*	Australian Ringneck			X			X				X	X
Psittaculidae	*Trichoglossus moluccanus.*	Rainbow Lorikeet						X					
Rhipiduridae	*Rhipidura albiscapa*	Grey Wagtail			X								
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			X			X				X	X
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis										X	X
Zosteropidae	*Zosterops lateralis*	Silvereye			X						X		
Mammals													
Canidae	**Vulpes vulpes*	Red Fox			X			X			X	X	X
Felidae	**Felis catus*	Cat			X						X	X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Leporidae	**Oryctolagus cuniculus*	European Rabbit			X		X	X			X		X
Macropodidae	*Macropus fuliginosus subsp. melanops*	Western Grey Kangaroo			X			X			X		
Macropodidae	*Notamacropus irma*	Western Brush Wallaby		P4							X		
Molossidae	*Austronomus australis*	White-striped Free-tailed Bat										X	X
Muridae	**Mus musculus*	House Mouse			X							X	X
Peramelidae	*Isoodon fusciventer*	Quenda		P4	X						X	X	X
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			X								
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat										X	X
Reptiles													
Agamidae	*Pogona minor subsp. minor*	Western Bearded Dragon			X			X		X	X	X	
Carphodactylidae	*Underwoodisaurus milii*	Southern Barking Gecko								X			
Elapidae	*Demansia psammophis*	Reticulated Whipsnake			X								
Elapidae	*Echiopsis curta*	Bardick								X			X
Elapidae	*Notechis scutatus*	Tiger snake										X	X
Elapidae	*Pseudonaja affinis subsp. affinis*	Dugite			X			X		X	X	X	X
Elapidae	*Simoselaps bertholdi*	Jan's Banded Snake								X			X
Elapidae	*Simoselaps calonotus*	Black-striped Snake										X	
Gekkonidae	*Christinus marmoratus*	Marbled Gecko								X			
Gekkonidae	*Strophurus spinigerus*	Southwest Spiny-tailed Gecko			X					X			X
Pygopodidae	*Delma concinna*	Javelin Legless Lizard			X								
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard			X					X			
Scincidae	*Cryptoblepharus buchananii*	Fence Skink								X		X	X
Scincidae	*Cryptoblepharus plagiocephalus*	Fence Skink			X								

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Scincidae	*Crytoblepharus buchananii*	Buchanan's Snake-eyed Skink									X		
Scincidae	*Ctenotus australis*	West-coast Long-tailed Ctenotus									X		
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus			X					X		X	X
Scincidae	*Cyclodomorphus celatus*	Slender Blue-tongue Lizard			X								X
Scincidae	*Egernia kingii*	King's Skink								X			
Scincidae	*Egernia napoleonis*	South-western Crevice Egernia			X								
Scincidae	*Hemiergis quadrilineata*	Two-toed Earless Skink			X								X
Scincidae	*Lerista elegans*	Elegant Slider			X					X		X	X
Scincidae	*Lerista lineopunctulata*	West Coast Line-spotted Lerista			X								
Scincidae	*Lerista praepedita*	Western Worm Lerista											
Scincidae	*Menetia greyii*	Common Dwarf Skink			X					X			
Scincidae	*Morethia obscura*	Shrubland Morethia Skink			X								X
Scincidae	*Tiliqua occipitalis*	Western Bluetongue			X								
Scincidae	*Tiliqua rugosa subsp. rugosa*	Bobtail			X			X		X	X		X
Typhlopidae	*Anilos australis*	Southern Blind Snake											X
Varanidae	*Varanus gouldii*	Gould's Sand Goanna						X					
		Total			**69**	**1**	**5**	**28**	**1**	**14**	**18**	**37**	**47**

Appendix N Fauna survey photos

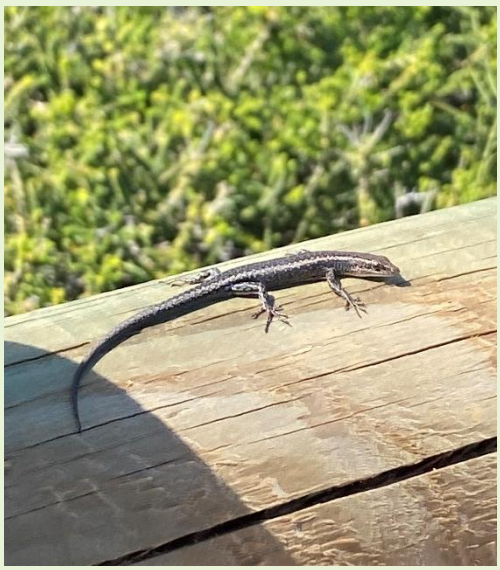
Quenda *Isoodon fusciventer* (P4)	
Red Fox **Vulpes vulpes*	
Cat **Felis catus*	

House Mouse **Mus musculus*	
Western Bearded Dragon *Pogona minor minor*	
Bardick *Echiopsis curta*	

Jan's Banded Snake *Simoselaps bertholdi*	
Black-striped Snake *Simoselaps calonotus*	
Southwest Spiny-tailed Gecko *Strophurus spinigerus*	

West-coast Laterite Ctenotus *Ctenotus fallens*	
Slender Blue-tongue Lizard *Cyclodomorphus celatus*	
Two-toed Earless Skink *Hemiergis quadrilineata*	

Elegant Slider *Lerista elegans*	
Shrubland Morethia Skink *Morethia obscura*	
Bobtail Lizard *Tiliqua rugosa*	

Fence Skink *Cryptoblepharus buchananii*	

Appendix O Raw fauna trapping data

Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
10/11/2020	TS1 P1	Pitfall	House Mouse	*Mus musculus*	2	
10/11/2020	TS1 P6	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
10/11/2020	TS1 P9	Pitfall	House Mouse	*Mus musculus*	2	
10/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
10/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
10/11/2020	TS2 P10	Pitfall	House Mouse	*Mus musculus*	1	
10/11/2020	TS3 CAM	Motion camera	Pied Butcherbird	*Cracticus nigrogularis*	1	
10/11/2020	TS3 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
10/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS1 P1	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P4, F3-4	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P9	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 C1	Cage	Quenda	*Isoodon fusciventer*	1	Male, healthy
11/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
11/11/2020	TS2 CAM	Camera	Quenda	*Isoodon fusciventer*	1	
11/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS2 E7	Elliot	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 P10	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 P5	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS3 CAM	Camera	Magpielark	*Grallina cyanoleuca*	1	
11/11/2020	TS3 CAM	Camera	Pied Butcherbird	*Cracticus nigrogularis*	1	
11/11/2020	TS3 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS3 P10	Pitfall	Two-toed Earless Skink	*Hemiergis quadrilineata*	1	
11/11/2020	TS4 C3	Cage	Quenda	*Isoodon fusciventer*	1	Female with pouch young

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Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
11/11/2020	TS4 CAM	Camera	Cat	*Felis catus*	1	
11/11/2020	TS4 CAM	Camera	Singing Honeyeater	*Lichenostomus virescens*	1	
11/11/2020	TS4 P1	Pitfall	Southern Blind Snake	*Anilos australis*	1	
11/11/2020	TS4 P2, F1-2	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS4 P6, F5-6	Funnel	Shrubland Morethia Skink	*Morethia obscura*	1	
11/11/2020	TS4 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
12/11/2020	TS1 CAM	Camera	Australian Raven	*Corvus coronoides*	1	
12/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
12/11/2020	TS1 P3	Pitfall	Black-striped Snake	*Simoselaps calonotus*	1	
12/11/2020	TS1 P5	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
12/11/2020	TS1 P8	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
12/11/2020	TS2 C1	Cage	Quenda	*Isoodon fusciventer*	1	Male
12/11/2020	TS2 C2	Cage	Quenda	*Isoodon fusciventer*	1	Male, missing most of tail
12/11/2020	TS2 C3	Cage	Quenda	*Isoodon fusciventer*	1	Male
12/11/2020	TS2 C4	Cage	Quenda	*Isoodon fusciventer*	1	Male, missing most of tail
12/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
12/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
12/11/2020	TS2 P4	Pitfall	Elegant Slider	*Lerista elegans*	2	
12/11/2020	TS2 P5	Pitfall	Elegant Slider	*Lerista elegans*	1	
12/11/2020	TS3 C4	Cage	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS3 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS3 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 CAM	Camera	Willy Wagtail	*Rhipidura leucophrys*	1	
12/11/2020	TS4 P2, F1-2	Funnel	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 P4, F3-4	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	

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Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
13/11/2020	TS1 P1	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
13/11/2020	TS1 P10	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS1 P6	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS1 P6	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
13/11/2020	TS1 P7	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 C2	Cage	Quenda	*Isoodon fusciventer*	1	Male, recapture of individual missing most of tail
13/11/2020	TS2 E7	Elliot	House Mouse	*Mus musculus*	1	
13/11/2020	TS2 P2	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 P3	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 P3	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS3 C4	Cage	Quenda	*Isoodon fusciventer*	1	Male
13/11/2020	TS3 CAM	Camera	Australian Raven	*Corvus coronoides*	1	
13/11/2020	TS3 CAM	Camera	Laughing Dove	*Spilopelia senegalensis*	1	
13/11/2020	TS3 P2	Pitfall	Jan's Banded Snake	*Simoselaps bertholdi*	1	
13/11/2020	TS3 P4, F3-4	Pitfall	Southwest Spiny-tailed Gecko	*Strophurus spinigerus*	1	
13/11/2020	TS3 P7	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS4 CAM	Camera	Singing Honeyeater	*Lichenostomus virescens*	1	
13/11/2020	TS4 P2	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS4 P3	Pitfall	Slender Blue-tongue Lizard	*Cyclodomorphus celatus*	1	
13/11/2020	TS4 P5	Pitfall	Bardick	*Echiopsis curta*	1	
13/11/2020	TS4 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS5 E5	Elliot	House Mouse	*Mus musculus*	1	

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Appendix P Invertebrate species

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Acrididae	*^Austroicetes*	*vulgaris*	X	
Acrididae	*Austracris*	*guttulosa*	X	
Acrididae	*Cedarinia*	*fuscotibialis*	X	
Acrididae	*Coryphistes*	*ruricola*	X	
Acrididae	Gen.	sp. TBC	X	
Acrididae	Gen. *Novum* 47 (Rentz)	*pilipes* (walker)	X	
Acrididae	*Goniaea*	*australasiae*	X	
Acrididae	*Goniaea*	*opomaloides*	X	
Acrididae	*Pycnostictus*	*seriatus*	X	
Acrididae	*Urnisa*	*rugosa*	X	
Aeshnidae	**Hemianax*	*papuensis*	X	
Agromyzidae	Gen.	sp. TBC	X	
Agromyzidae	Gen.	sp. TBC	X	
Alloniscidae	*Alloniscus*	*pallidulus*	X	
Amorphoscelidae	*Paraoxypilus*	*laticollis*	X	
Anisolabididae	*Carcinophora*	*occidentalis*	X	
Anisolabididae	nr. *Gonolabis*	sp. TBC	X	
Anostostomatidae	*Leponosandrus*	*lepismoides*	X	
Anthelidae	*Anthela*	*inornata*	X	
Anthomyiidae	Gen.	sp. TBC	X	
Anthomyiidae	Gen.	sp. TBC	X	
Anthomyiidae	Gen.	sp. TBC	X	
Apidae	*^Apis*	*mellifera*	X	
Apidae	*Amegilla (Notomegilla)*	*chlorocyanea*	X	
Araneidae	*Araneus*	nr. *eburneiventris*	X	
Araneidae	*Argiope*	*protensa*	X	
Araneidae	*Argiope*	*trifasciata*	X	
Araneidae	*Backobourkia*	*heroine*	X	
Araneidae	*Dolophones*	*conifera* TBC	X	
Araneidae	*Eriophora*	*biapicata* TBC	X	
Araneidae	Gen.	sp. TBC	X	
Araneidae	Gen.	sp. TBC	X	
Araneidae	Gen.	sp.		X
Araneidae	Gen.	sp. TBC	X	
Araneidae	*Nephila*	*edulis*	X	
Armadillidae	Gen.	sp. TBC	X	
Armadillidiidae	*^Armadillidium*	*vulgare*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Aslidae	*Cerdistus*	sp. TBC	X	
Aslidae	Gen.	sp. TBC	X	
Aslidae	Gen.	sp. TBC	X	
Barychelidae	*Idiommata*	*blackwalli*	X	
Belidae	*Rhinotia*	*acaciae*	X	
Belidae	*Rhinotia*	*suturalis*	X	
Bethylidae	*Rhabdepyris*	sp. TBC	X	
Blaberidae	*Calolampra*	*marginalis*	X	
Blattidae	*Drymaplaneta*	*semivitta*	X	
Blattidae	*Melanozosteria*	sp. TBC	X	
Blattidae	*Melanozosteria*	sp. TBC	X	
Blattidae	*Zonioploca*	*bicolor*	X	
Bombyliidae	*Anthrax*	sp. TBC	X	
Bombyliidae	*Villa*	sp. TBC	X	
Bothriembryontidae	*Bothriembryon (Bothriembryon)*	*kendricki*	X	
Braconidae	*Callibracon*	nr. *capitator*	X	
Braconidae	Gen.	sp. TBC	X	
Buprestidae	*Castiarina*	*cupreoflava*	X	
Buprestidae	*Castiarina*	*dilatata*	X	
Buprestidae	*Castiarina*	*placida*	X	
Buprestidae	*Castiarina*	*simulata*	X	
Buprestidae	*Diphucrania* (D.)	*pamela*	X	
Buprestidae	*Melobasis*	sp. TBC	X	
Buprestidae	*Neospades*	sp. TBC	X	
Buprestidae	*Stigmodera*	*roei*	X	
Buthidae	*Lychas*	sp. *'marmoreus'* complex TBC	X	
Byrridae	*Microchaetes*	sp. TBC	X	
Caeciliusidae	Gen.	sp. TBC	X	
Calliphoridae	*^Calliphora*	*dubia*	X	
Calliphoridae	Gen.	sp.		X
Calliphoridae	*Stomorhina*	sp. TBC	X	
Carabidae	*Hypharpax*	*ranula*	X	
Carabidae	*Mecylothorax*	*ambiguus* TBC	X	
Carabidae	*Trigonothops*	sp. TBC	X	
Carabidae	*Trigonothops (Trigonothops)*	*pacificus* TBC	X	
Carposinidae	*Carposina*	*telesla*	X	
Castniidae	*Synemon*	*gratiosa*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Cerambycidae	*Ancita*	*marginicollis*	X	
Cerambycidae	*Ancita*	*sparsa*	X	
Cerambycidae	*Stenoderus*	*suturalis*	X	
Chalcididae	*Brachymeria*	sp. TBC	X	
Chernetidae	Gen.	sp. TBC	X	
Chironomidae	**Chironomus*	*cloacalis* TBC	X	
Chironomidae	**Procladius*	sp. TBC	X	
Chrysomelidae	*^Chrysolina*	*hyperici*	X	
Chrysomelidae	*Ditropidus*	*fugitivus*	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	*Loxopleurus*	*obtusus*	X	
Chrysomelidae	*Paropsisterna*	sp. TBC	X	
Chrysomelidae	*Paropsisterna*	sp. TBC	X	
Chrysomelidae	*Peltoschema*	sp. TBC	X	
Chrysomelidae	*Peltoschema*	*subapicalis*	X	
Chrysomelidae	*Peltoschema*	*suturalis*	X	
Chrysopidae	Gen.	sp. TBC	X	
Chrysopidae	*Mallada*	*tripunctatus*	X	
Chrysopidae	*Plesiochrysa*	*ramburi*	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadidae	*Pauropsalta*	*encaustica*	X	
Cicadidae	*Physeema*	*quadricincta*	X	
Cleridae	*Eunatalis*	*hirta* TBC	X	
Coccidae	*Cryptes*	*baccatus marmoreus*	X	
Coccinellidae	*^Coccinella*	*transversalis*	X	
Coccinellidae	*Harmonia*	*conformis*	X	
Cochlicellidae	*^Cochlicella*	*acuta*	X	
Coelopidae	*Chaetocoelopa*	*sydneyensis* TBC	X	
Coelopidae	Gen.	sp. TBC	X	
Colletidae	Gen.	sp. TBC	X	
Colletidae	*Hylaeorhiza*	*quadratus* TBC	X	
Colletidae	*Hylaeus (Prosopisteron)*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Colletidae	*Hylaeus (Pseudhylaeus)*	sp. TBC	X	
Colletidae	*Leioproctus (Leioproctus)*	sp. TBC	X	
Coreidae	*Mictis*	*profana*	X	
Cosmopterigidae	*Macrobathra*	*sarcoleuca*	X	
Cosmopterigidae	*Macrobathra*	sp. TBC	X	
Cosmopterigidae	*Macrobathra*	sp. TBC	X	
Cossidae	*Endoxyla*	*biarpiti*	X	
Crambidae	*^Antigastra*	*catalaunalis*	X	
Crambidae	*Achyra*	*affinitalis*	X	
Crambidae	*Achyra*	*massalis*	X	
Crambidae	Gen.	sp. TBC	X	
Crambidae	*Hednota*	*pedionoma*	X	
Crambidae	*Herpetogramma*	*licarsisalis*	X	
Crambidae	*Nacoleia*	*rhoeoalis*	X	
Crambidae	nr. *Metasia*	sp. TBC	X	
Crambidae	*Otiophora*	*clavifera* TBC	X	
Crambidae	*Ptochostola*	*microphaeellus*	X	
Crambidae	*Scoparia*	*syntaracta* TBC	X	
Crambidae	*Spoladea*	*recurvalis*	X	
Crambidae	*Uresiphita*	*ornithopteralis*	X	
Culicidae	**Culex (Culex)*	*australicus*	X	
Culicidae	Gen.	sp.		X
Curculionidae	*^Phlyctinus*	*callosus*	X	
Curculionidae	*Ancytallia*	*acaciae*	X	
Curculionidae	*Catasarcus*	*ashphaltinus*	X	
Curculionidae	*Catasarcus*	*spinipennis*	X	
Curculionidae	*Decilaus*	sp. TBC	X	
Curculionidae	Gen.	sp. TBC	X	
Curculionidae	Gen.	sp. TBC	X	
Curculionidae	*Leptopius*	*spinipennis*	X	
Curculionidae	*Lycosura*	*breweri* TBC	X	
Curculionidae	*Orthorrhinus*	*cylindrirostris*	X	
Curculionidae	*Pascoellus*	sp. TBC	X	
Curculionidae	*Pelororhinus*	*argentosus* TBC	X	
Curculionidae	*Pseudonotophones*	*lemnus*	X	
Curculionidae	*Rhinaria*	*tesselata*	X	
Curculionidae	*Titinia*	*brevicollis*	X	
Cydnidae	*Adrisa*	sp. TBC	X	
Cydnidae	Gen.	sp. TBC	X	
Cylindrachetidae	*Cylindraustralia*	*kochii*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Deinopidae	*Deinopis*	*subrufa*	X	
Dermestidae	Gen.	sp. TBC	X	
Desidae	*Badumna*	*insignis*	X	
Ectobiidae	*Ellipsidion*	*humerale*	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Erebidae	*Acyphas*	*chionitis*	X	
Erebidae	*Anomis*	*involuta*	X	
Erebidae	*Ardices*	*glatygnyi*	X	
Erebidae	*Arrade*	*destituta*	X	
Erebidae	*Dasypodia*	*selenophora*	X	
Erebidae	Gen.	sp. TBC	X	
Erebidae	*Hypoprora*	*tyra*	X	
Erebidae	*Nyctemera*	*amicus*	X	
Erebidae	*Pantydia*	*canescens*	X	
Erebidae	*Pantydia*	*diemeni*	X	
Erebidae	*Pantydia*	*sparsa*	X	
Erebidae	*Praxis*	*marmarinopa*	X	
Erebidae	*Scoliacma*	*nr. pactolias* TBC	X	
Erebidae	*Scoliacma*	*pasteophara*	X	
Erebidae	*Teia*	*athlophora*	X	
Erebidae	*Utetheisa*	*pulchelloides*	X	
Eriophyidae	Gen.	sp. TBC	X	
Erirhinidae	*Aonychus*	*bicruciatus*	X	
Eurybrachyidae	*Maon*	*sinuatus*	X	
Eutichuridae	*Cheiracanthium*	*gracile*	X	
Eutichuridae	*Cheiracanthium*	*mordax* TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Family TBC	Gen.	sp. TBC	X	
Family TBC	*Gen.*	*sp. TBC*	X	
Flatidae	*Siphanta*	*roseicincta*	X	
Formicidae	*^Pheidole*	*megacephala*	X	
Formicidae	*Amblyopone*	sp. TBC	X	
Formicidae	*Aphaenogaster*	*poultoni*	X	
Formicidae	*Camponotus*	*chalceus*	X	
Formicidae	*Camponotus*	*darlingtoni*	X	
Formicidae	*Camponotus*	*gasseri*	X	
Formicidae	*Camponotus*	*insipidus*	X	
Formicidae	*Camponotus*	*terebrans*	X	
Formicidae	*Cerapachys*	*ruficornis*	X	
Formicidae	*Cerapachys*	*sp. TBC*	X	
Formicidae	*Crematogaster*	(*cornigera* group) sp. TBC	X	
Formicidae	*Crematogaster*	(*cornigera* group) sp. TBC	X	
Formicidae	*Iridomyrmex*	*bicknelli*	X	
Formicidae	*Iridomyrmex*	*chasei*	X	
Formicidae	*Iridomyrmex*	*dromus* TBC	X	
Formicidae	*Iridomyrmex*	sp.		X
Formicidae	*Myrmecia*	sp.		X
Formicidae	*Myrmecia*	*swalei*	X	
Formicidae	*Odontomachus*	*ruficeps*	X	
Formicidae	*Polyrhachis (Campomyrma)*	*phryne*	X	
Formicidae	*Rhytidoponera*	*metallica*	X	
Formicidae	*Rhytidoponera*	*punctigera*	X	
Formicidae	*Technomyrmex*	*albipes*	X	
Gelastocoridae	*Nerthra*	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	*Anarsia*	*molybdota*	X	
Gelechiidae	*Anarsia*	sp. TBC	X	
Geometridae	*Anachloris*	*subochraria*	X	
Geometridae	*Anachloris*	*uncinata*	X	
Geometridae	*Capusa*	*stenophara*	X	
Geometridae	*Casbia*	*celidosema*	X	
Geometridae	*Chlenias*	sp. ANIC3	X	
Geometridae	*Chlorocoma*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Geometridae	*Ciampa*	*heteromorpha*	X	
Geometridae	*Cleora*	*injectaria*	X	
Geometridae	*Cryphaea*	sp. ANIC17 TBC	X	
Geometridae	*Dichromodes*	sp. ANIC76	X	
Geometridae	*Dichromodes*	sp. ANIC77	X	
Geometridae	*Epyaxa*	*nr. sodaliata* TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen. (*Boarmia*)	sp. ANIC6	X	
Geometridae	Gen. *(Boarmia)*	*zaloschema*	X	
Geometridae	*Isturgia*	*penthearia*	X	
Geometridae	*Lipogya*	nr. *exprimataria* TBC	X	
Geometridae	nr. *Melanodes*	sp. TBC	X	
Geometridae	*Phrissogonus*	*laticostata*	X	
Geometridae	*Phrixocomes*	sp. ANIC1	X	
Geometridae	*Phrixocomes*	sp. ANIC5	X	
Geometridae	*Poecilasthena*	*xylocyma*	X	
Geometridae	*Prasinocyma*	*ocyptera*	X	
Geometridae	*Rhinodia*	*undiferaria*	X	
Geometridae	*Scioglyptis*	*canescaria*	X	
Geometridae	*Scopula*	*optivata*	X	
Geometridae	*Syneora*	*cymatomita*	X	
Geometridae	*Syneora*	*leucanthes*	X	
Geometridae	*Xanthorohe*	nr. *vacuaria*	X	
Gnaphosidae	*Anzacia*	sp. TBC	X	
Gnaphosidae	*Encoptarthria*	nr. *echemophthalma* TBC	X	
Gracillariidae	*Caloptilia*	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gryllidae	*^Gryllodes*	*sigillatus*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Gryllidae	*Pteronemobius*	sp. TBC	X	
Gryllotalpidae	*^Gryllotalpa*	*pluvialis*	X	
Halictidae	Gen.	sp. TBC	X	
Halictidae	*Lipotriches (Austronomia)*	*flavoviridis*	X	
Heleomyzidae	Gen.	sp. TBC	X	
Helicidae	*^Theba*	*pisana*	X	
Hemerobiidae	*Micromus*	*tasmaniae*	X	
Hemicorduliidae	**Hemicordulia*	*tau*	X	
Hepialidae	*Aenetus*	*djernaesae*	X	
Hesperiidae	*Anisynta*	*sphenosema*	X	
Hesperiidae	*Taractrocera*	*papyria agraulia*	X	
Hydrophilidae	**Limnoxenus*	*zealandicus*	X	
Hyocephalidae	*Maevius*	*indecorus*	X	
Hypertrophidae	*Thudaca*	*campylota*	X	
Hypertrophidae	*Thudaca*	*haplonota*	X	
Ichneumonidae	*Ctenochares*	*bicolorus*	X	
Ichneumonidae	*Echthromorpha*	*intricatoria*	X	
Ichneumonidae	Gen.	sp. TBC	X	
Ichneumonidae	Gen.	sp. TBC	X	
Ichneumonidae	*Labium*	sp. TBC	X	
Ichneumonidae	*Netelia*	*producta* TBC	X	
Ichneumonidae	*Xanthopimpla*	sp. TBC	X	
Iridopterygidae	*Bolbe*	nr. *nigra* TBC	X	
Ixodidae	*Amblyomma*	*albolimbatum*	X	
Ixodidae	*Amblyomma*	*triguttatum*	X	X
Julidae	*^Ommatoiulus*	*moreletii*	X	X
Keroplatidae	Gen.	sp. TBC	X	
Keroplatidae	Gen.	sp. TBC	X	
Lamponidae	*Lampona*	*brevipes*	X	
Lamponidae	*Lampona*	*cylindrata*	X	
Lasiocampidae	*Genduara*	*nr. pinnalis*	X	
Lasiocampidae	*Genduara*	*subnotata*	X	
Lasiocampidae	*Symphyta*	*nephelodes*	X	
Lepismatidae	*Acrotelsella*	sp. TBC	X	
Lepismatidae	*Acrotelsella*	sp. TBC	X	
Leptoceridae	**Triplectides*	sp. TBC	X	
Lestidae	**Austrolestes*	*analis*	X	
Libellulidae	**Diplacodes*	*bipunctatus*	X	
Libellulidae	**Orthetrum*	*caledonicum*	X	
Libellulidae	**Pantala*	*flavescens*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Lycaenidae	*Candalides*	*acasta*	X	
Lycaenidae	*Nacaduba*	*biocellata*	X	
Lycaenidae	*Theclinesthes*	*serpentata*	X	
Lycidae	*Porrostoma (Porrostoma)*	sp. TBC	X	
Lycosidae	*Artoria*	sp. TBC	X	
Lycosidae	*Artoriopsis*	*eccentrica*	X	
Lycosidae	Gen.	sp.		X
Lycosidae	Gen. (*'Lycosa'*)	*australicola*	X	
Lycosidae	Gen. (*Ariadne* Group)	sp. TBC	X	
Lycosidae	Gen. (*Ariadne* Group)	sp. TBC	X	
Lycosidae	*TasmANICosa*	*godeffroyi*	X	
Lycosidae	*Tetralycosa*	*oraria*	X	
Lycosidae	*Venator*	*immansueta*	X	
Lycosidae	*Venatrix*	*pallustra*	X	
Lygaeidae	*Spilostethus*	*pacificus*	X	
Mantidae	*Archimantis*	*sobrina*	X	
Mantidae	*Mantis*	*octospilota*	X	
Mantidae	*Orthodera*	*ministralis*	X	
Mantidae	*Trachymantis*	*dentifrons*	X	
Megachilidae	*Megachile*	sp.		X
Megachilidae	*Megachile*	sp. TBC	X	
Megachilidae	*Megachile*	sp. TBC	X	
Megachilidae	*Megachile (Eutricharaea)*	*chrysopyga*	X	
Membracidae	*Sextius*	*virescens* TBC	X	
Miridae	*Creontiades*	*dilutus*	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miturgidae	Odo	sp. TBC	X	
Morabidae	Heide	sp. TBC	X	
Morabidae	Heide	sp. TBC	X	
Mordellidae	Gen.	sp. TBC	X	
Muscidae	*^Musca*	*domestica*	X	
Muscidae	*^Musca*	*vetustissima*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Muscidae	Gen.	sp. TBC	X	
Mutillidae	*Ephutomorpha*	sp. TBC	X	
Mutillidae	*Ephutomorpha*	sp. TBC	X	
Myrmeleontidae	*Heoclisis*	*acuta*	X	
Nemesiidae	*Aname*	*mainae*	X	
Nemesiidae	*Aname*	sp. TBC	X	
Nicoletiidae	*Australiatelura*	*michaelseni*	X	
Nitidulidae	Gen.	sp. TBC	X	
Noctuidae	*^Agrotis*	*infusa*	X	
Noctuidae	*^Agrotis*	*munda*	X	
Noctuidae	*^Apina*	*callisto*	X	
Noctuidae	*^Chrysodeixis*	*argentifera*	X	
Noctuidae	*^Helicoverpa*	*punctigera*	X	
Noctuidae	*^Mythimna (Pseudaletia)*	*convecta*	X	
Noctuidae	*^Persectania*	*dyscrita*	X	
Noctuidae	*^Persectania*	*ewingii*	X	
Noctuidae	*Athetis*	*tenuis*	X	
Noctuidae	*Australothis*	*rubrescens*	X	
Noctuidae	*Ectopatria*	*clavigera*	X	
Noctuidae	*Ectopatria*	nr. *aspera* TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	*Leucania*	*diatrecta*	X	
Noctuidae	*Leucania*	*uda* TBC	X	
Noctuidae	*Proteuxoa*	*cornuta* TBC	X	
Noctuidae	*Proteuxoa*	*florescens*	X	
Noctuidae	*Proteuxoa*	*gypsina*	X	
Noctuidae	*Proteuxoa*	*hypochalcis* TBC	X	
Noctuidae	*Proteuxoa*	*metaneura*	X	
Noctuidae	*Proteuxoa*	*nr. melanographa* TBC	X	
Noctuidae	*Proteuxoa*	*paragypsa*	X	
Noctuidae	*Proteuxoa*	*poliocrossa*	X	
Noctuidae	*Proteuxoa*	*tibiata*	X	
Noctuidae	*Spodoptera*	*litura*	X	
Nogodonidae	*Bilbilicallia*	sp. TBC	X	
Nolidae	*Nola*	*hesycha*	X	
Nolidae	*Nola*	sp. TBC	X	
Nymphalidae	*^Danaus*	*plexippus*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Nymphalidae	*Geitoneura*	*minyas*	X	
Nymphalidae	Gen.	sp.		X
Nymphalidae	*Junonia*	*villida*	X	
Nymphalidae	*Vanessa*	*kershawi*	X	
Ocypodidae	**Ocypode*	*convexa*	X	
Oecophoridae	*Barea*	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	*Hoplostega*	*ochroma*	X	
Oecophoridae	nr. *Conobrosis*	sp. TBC	X	
Oecophoridae	nr. *Eochrois*	sp. TBC	X	
Oecophoridae	nr. *Thema*	sp. TBC	X	
Oecophoridae	*Philobota*	sp. TBC	X	
Oecophoridae	*Tachystola*	sp. TBC	X	
Oxypidae	*Oxyopes*	*gracilipes*	X	
Pachygronthidae	*Stenophyella*	*macreta*	X	
Paradoxosommatidae	Gen.	sp. TBC	X	
Pentatomidae	*Cermatulus*	*nasalis*	X	
Pentatomidae	*Cuspicona*	*procallosa*	X	
Pentatomidae	*Kalkadoona*	*enchylaenae* TBC	X	
Pentatomidae	*Kapunda*	*troughtoni*	X	
Pentatomidae	*Oechalia*	*schellenbergii*	X	
Pentatomidae	*Oncocoris*	*apicalis* TBC	X	
Pentatomidae	*Poecilometis*	*apicalis apicalis*	X	
Phalacridae	*Litochrus*	sp. TBC	X	
Phasmatidae	*Acanthomima*	*rhipheus*	X	
Phasmatidae	*Acanthomima*	sp.		X
Phasmatidae	*Denhama*	*eutrachelia*	X	
Phlaeothripidae	*Klambothrips*	sp. TBC	X	
Pholcidae	*^Holocnemus*	*pluchei*	X	
Pieridae	*^Pieris*	*rapae*	X	
Platystomatidae	Gen.	sp. TBC	X	
Platystomatidae	*Rivellia*	sp. TBC	X	
Platystomatidae	*Rivellia*	sp. TBC	X	
Pompilidae	*Ctenostigmus*	*immitis* TBC	X	
Pompilidae	Gen.	sp. TBC	X	
Porcellionidae	*^Porcellio*	*laevis*	X	
Porcellionidae	*^Porcellio*	*scaber*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Porcellionidae	*^Porcellionides*	*pruinosus*	X	
Prodidomidae	*Molycria*	*vokes*	X	
Psychidae	*Clania*	*ignobilis*	X	
Psychidae	*Clania*	sp. TBC	X	
Psychidae	*Hyalarcta*	sp. TBC	X	
Psyllidae	Gen.	sp. TBC	X	
Psyllidae	*Glycaspis*	*brimblecombei*	X	
Pyralidae	*^Faveria*	*tritalis*	X	
Pyralidae	*Balanomis*	*encyclia*	X	
Pyralidae	*Epicrocis*	*mesembrina*	X	
Pyralidae	Gen.	sp. TBC	X	
Pyralidae	nr. *Crocydopora*	sp. TBC	X	
Pyralidae	*Salma*	*ebenina*	X	
Pyralidae	*Spectrotrota*	*fimbrialis*	X	
Pyralidae	*Vinicia*	*gypsopa*	X	
Pyrgomorphidae	Gen.	sp.		X
Pyrgotidae	*Cardiacera*	sp. TBC	X	
Pyrgotidae	*Cardiacera*	sp. TBC	X	
Rhyparochromidae	*Euander*	sp. TBC	X	
Rhyparochromidae	*nr. Tempyra*	sp. TBC	X	
Salticidae	*Clynotis*	*severus*	X	
Salticidae	Gen.	sp.		X
Salticidae	Gen.	sp. TBC	X	
Salticidae	Gen.	sp. TBC	X	
Salticidae	*Hypoblemum*	*villosum*	X	
Salticidae	*Jotus*	sp. TBC	X	
Salticidae	*Maratus*	*parvonis*	X	
Salticidae	*Maratus*	*speciosus*	X	
Salticidae	*Maratus*	*speculifer*	X	
Salticidae	*Opisthoncus*	nr. *polyphemus*	X	
Salticidae	*Servaea*	sp.	X	
Salticidae	*Simaethula*	sp. TBC	X	
Scarabaeidae	*^Australaphodius*	*frenchi* TBC	X	
Scarabaeidae	*^Heteronychus*	*arator*	X	
Scarabaeidae	*Aphodius*	sp. TBC	X	
Scarabaeidae	*Colpochila*	sp. TBC	X	
Scarabaeidae	*Glycyphana*	*stolata*	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Liparetrus*	sp. TBC	X	
Scarabaeidae	*Neophyllotocus*	nr. *legnotus*	X	
Scarabaeidae	*Prochelyna*	*velutina* TBC	X	
Scoliidae	*Austroscolia*	*soror*	X	
Scoliidae	*Radumeris*	*tasmaniensis*	X	
Scolopendridae	*Cormocephalus*	*hartmeyeri*	X	
Scutelleridae	*Choerocoris*	*paganus*	X	
Scutelleridae	*Coleotichus*	*costatus*	X	
Sparassidae	*Delena*	*convexa*	X	
Sparassidae	Gen.	sp. TBC	X	
Sphecidae	*Podalonia*	*tydei suspiciosa*	X	
Sphecidae	*Sphex*	*ephippium*	X	
Sphecidae	*Sphex*	*fumipennis*	X	
Sphingidae	*Hippotion*	*celerio*	X	
Sphingidae	*Hippotion*	*scrofa*	X	
Stratiomyidae	Gen.	sp. TBC	X	
Stratiomyidae	Gen.	sp. TBC	X	
Tabanidae	*Scaptia (Pseudoscione)*	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	*Rutilia (Chrysorutilia)*	sp. TBC	X	
Tachinidae	*Winthemia*	sp. TBC	X	
Talitridae	*Platorchestia*	*platensis*	X	
Tenebrionidae	*Chalcopteroides*	sp. TBC	X	
Tenebrionidae	*Ectyche*	*erebea* TBC	X	
Tenebrionidae	Gen.	sp. TBC	X	
Tenebrionidae	Gen.	sp. TBC	X	
Tenebrionidae	*Gonocephalum*	*elderi*	X	
Tenebrionidae	*Helea*	*perforata*	X	
Tenebrionidae	*Metistete*	nr. *ebenina*	X	
Tenebrionidae	*Pterohelaeus*	sp. TBC	X	
Tenebrionidae	*Pterohelaeus*	sp. TBC	X	
Tenebrionidae	*Sympetes*	*bremei*	X	
Tenebrionidae	*Sympetes*	sp. TBC	X	
Tettigoniidae	*Caedicia*	sp. TBC	X	
Tettigoniidae	Gen.	sp.		X

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Tettigoniidae	*Hemisaga*	*denticulata*	X	
Tettigoniidae	*Metaballus*	*frontalis*	X	
Tettigoniidae	*Mygalopsis*	*marki*	X	
Tettigoniidae	*Requena*	*verticalis*	X	
Theridiidae	*Cryptachaea*	sp. TBC	X	
Theridiidae	*Cryptachaea*	sp. TBC	X	
Theridiidae	*Euryopis*	*elegans*	X	
Theridiidae	Gen.	sp. TBC	X	
Theridiidae	Gen.	sp. TBC	X	
Theridiidae	*Latrodectus*	*hasselti*	X	
Thomisidae	*Hedana*	*valida*	X	
Thomisidae	*Lehtinelagia*	nr. *prasina* TBC	X	
Thomisidae	*Sidymella*	*longipes*	X	
Thomisidae	*Sidymella*	*trapezia*	X	
Tineidae	*Monopis*	*ethelella*	X	
Tineidae	*Monopis*	*meloriella*	X	
Tiphiidae	*Epactiothynnus*	sp. TBC	X	
Tiphiidae	Gen.	sp. TBC	X	
Tipulidae	*Gen.	sp. TBC	X	
Tipulidae	*Gen.	sp. TBC	X	
Tipulidae	**Leptotarsus*	nr. *clavatus* TBC	X	
Tipulidae	**Leptotarsus*	sp. TBC	X	
Tortricidae	*Cacoecia*	*tessulatana*	X	
Tortricidae	*Cryptophlebia*	*endophaga*	X	
Tortricidae	*Epiphyas*	*liadelpha*	X	
Tortricidae	Gen.	sp. TBC	X	
Tortricidae	Gen.	sp. TBC	X	
Tortricidae	*Holocola*	*deloschema*	X	
Tortricidae	*Oxysemaphora*	*hacobiani*	X	
Tortricidae	*Parastranga*	*macrogona*	X	
Tortricidae	*Strepsicrates*	*macropetana*	X	
Tortricidae	*Ancylis*	sp. TBC	X	
Tortricidae	*Capua*	nr. *leucospila* TBC	X	
Tortricidae	Gen. (as *Conchylis tasmaniana)*	sp. TBC	X	
Tortricidae	*Tortrix*	*phaeoneura*	X	
Tortricidae	*Tortrix*	*procapna*	X	
Torymidae	Gen.	sp. TBC	X	
Torymidae	Gen.	sp. TBC	X	
Torymidae	*Megastigmus*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Vespidae	*^Polistes (Polistes)*	*dominulus*	X	
Vespidae	*Delta*	*latreillei*	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	*Habronestes*	*australiensis*	X	
Zodariidae	*Neostorena*	sp. TBC	X	
Zygaenidae	*Pollanisus*	sp. TBC	X	
		Total	**548**	**14**

Appendix Q Conservation significant fauna locations

Common name	Scientific name	Conservation status		Easting	Northing	Observation type
		EPBC Act	BC Act/DBCA			
Carnaby's Cockatoo	*Calyptorhynchus latirostris*	EN	EN	379067	6487636	Observed flying overhead
Quenda	*Isoodon fusciventer*		P4	378531	6489126	2 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	378531	6489114	2 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	378536	6489069	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378534	6489059	1 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	379027	6487701	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378859	6488356	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378533	6489072	Detected on motion camera

Appendix R Introduced fauna species locations

Type	Species	Common name	Easting	Northing	Observation type
Bird	**Dacelo novaeguineae*	Laughing Kookaburra	378911	6488354	Heard, directly observed
Bird	**Spilopelia senegalensis*	Laughing Dove	378536	6489069	Heard, directly observed
Bird	**Spilopelia senegalensis*	Laughing Dove	379046	6487612	Heard, directly observed
Invertebrate	**Ommatoiulus moreletii*	Portuguese Millipede	378929	6488625	Bycatch from pitfall and funnel traps
Mammal	**Felis catus*	Cat	378533	6489072	Detected on motion camera
Mammal	**Felis catus*	Cat	379084	6487639	Detected on motion camera
Mammal	**Mus musculus*	House Mouse	378128	6489766	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378178	6489694	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378525	6489084	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378533	6489060	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378813	6488180	Individual trapped in small aluminium box trap
Mammal	**Oryctolagus cuniculus*	European Rabbit	378917	6488634	Scats found
Mammal	**Vulpes vulpes*	Red Fox	378083	6489789	Detected on motion camera
Mammal	**Vulpes vulpes*	Red Fox	378533	6489072	Detected on motion camera
Mammal	**Vulpes vulpes*	Red Fox	378909	6488641	Detected on motion camera

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Ocean Reef Foreshore Reserve Flora Survey and Vegetation Condition Assessment

City of Joondalup

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
the City	City of Joondalup
CLUSTER	Hierarchical Clustering
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy and the Environment and Water
DEC	Department of Environment and Conservation
DotEE	Department of Environment and Energy
DPIRD	Department of Primary Industries and Regional Development
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EN	Endangered
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Act 1999*
ESA	Environmentally Sensitive Area
FCT	Floristic Community Type
ha	hectares
IBRA	Interim Biogeographical Regionalisation for Australia
km	kilometre
KPI	Key Performance Indicator
MDS	Multi-Dimensional Scaling
mm	millimetre
m	metre
P	Priority
PEC	Priority Ecological Community
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
SIMPER	Similarity Percentages
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
WA	Western Australia

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Abbreviation	Description
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

Executive Summary

Eco Logical Australia was engaged by the City of Joondalup to undertake a Detailed and Targeted flora survey and vegetation condition assessment of Ocean Reef Foreshore Reserve, an area of bushland 56.9 hectares in size, located in the suburb of Ocean Reef, Western Australia. The information provided from the current assessment will be used to report on the change in vegetation condition in accordance with the City's endorsed Natural Area Key Performance Indicators (KPIs), and to inform an update of the existing Ocean Reef Foreshore Reserve Management Plan. The most recent study was completed by Natural Area in 2018, with a total survey area of 55.5 hectares.

The field survey was conducted in Spring from 18 to 20 September 2023, in accordance with the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016).

Vegetation communities were described through the reassessment of thirteen 10 x 10 metre quadrats, twelve of which were previously established by Natural Area in 2018, and one of which was newly established in 2023. A Targeted flora survey was conducted to record occurrences of conservation significant flora species and/or communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions. Opportunistic flora species were also recorded across the survey area.

A Targeted weed survey was conducted to record weed species within the survey area, including mapping of City of Joondalup pest plant (Caltrop), City of Joondalup priority weed species and species listed as a Weed of National Significance or as a Declared Pest under the State *Biosecurity and Agriculture Management Act 2007*.

A total of 142 flora taxa (90 native and 52 introduced) were recorded within the survey area from quadrats (99 taxa) and opportunistic collections (43 taxa), representing a 17.4% increase in species recorded by Natural Area in 2018 (121 species total; 77 native and 44 introduced; Natural Area 2019). No Threatened (Declared Rare) or Priority listed flora species by the Department of Biodiversity, Conservation and Attractions were recorded. Two Bush Forever significant flora species were recorded within the survey area. *Alyogyne huegelii* was recorded from 17 locations (32 individuals), while *Melaleuca cardiophylla* was mapped across 9.34 hectares (16.4% of the survey area) at a >50% cover. These species are listed as a Bush Forever significant to Bush Forever Site 325: Coastal Strip from Burns Beach to Hillarys (Government of Western Australia 2000).

A total of 52 introduced (weed) species were recorded within the survey area, representing 36.6% of the total species recorded. Of these, **Asparagus asparagoides* (Bridal Creeper) is listed as a Weed of National Significance and as a Declared Pest under the State *Biosecurity and Agriculture Management Act 2007*, and **Moraea flaccida* (One-leaf Cape Tulip) is listed as a Declared Pest under the State *Biosecurity and Agriculture Management Act 2007*. Both species are categorised as s22(2) (exempt). Declared Pests "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. Of the 52 weed species recorded, 18 are listed on the City of Joondalup priority weed list for Ocean Reef Foreshore Reserve. The City's declared pest plant, **Tribulus terrestris* (Caltrop), was not recorded during the current survey.

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A total of four vegetation communities were delineated and mapped within the survey area, all of which are consistent with those originally described and mapped by Natural Area in 2018 (Natural Area 2019). These were *Acacia rostellifera* Shrubland, *Spinifex hirsutus* and **Thinopyrum distichum* Grassland, Mixed Open Shrubland, and *Melaleuca cardiophylla* Closed Heath.

Intact vegetation within the survey area comprised 50.9 hectares (89.6% of the survey area), with the remaining 5.9 hectares (10.4% of the survey area) comprising 'Open Beach/Rocks' (3.7 ha; 6.5%) and 'Tracks/Cleared Areas' (2.3 hectares; 4.0%). Vegetation community 'Mixed Open Shrubland' was the most widespread vegetation community recorded, covering 42.1% (23.9 hectares) of the survey area.

Extent of vegetation communities recorded within the survey area has remained relatively consistent since the 2018 assessment (Natural Area 2019), with minor changes accounted for due to the increase in survey area size and refinement of vegetation community boundaries in 2023. Areas of the Mixed Open Shrubland' vegetation community along the western boundary of the survey area were reclassified to 'Open Beach/Rocks' during the current survey, resulting in a reduction of 2.7 hectares of this community. An additional 1.6 ha of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was mapped within the survey area, which can be attributed to the refinement of boundaries in 2023.

Results of the multivariate analysis showed that quadrats within vegetation community '*Acacia rostellifera* Shrubland' had a moderate affiliation with Floristic Community Type 29a, while quadrats within vegetation communities 'Mixed Open Shrubland' and '*Melaleuca cardiophylla* Closed Heath' had a moderate to strong affiliation with Floristic Community Type 29a. Floristic Community Type 29a, described as 'coastal shrublands on shallow sands, mostly heaths on shallow sands over limestone close to the coast' is listed as a Priority 3 ecological community. A total of 50.3 hectares (88.6% of the survey area) is considered as representing this Priority 3 ecological community.

One patch of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was found to have a strong affiliation with Floristic Community Type 29a, and a moderate affiliation with Floristic Community Type 24. Floristic Community Type 24, described as 'Northern Spearwood shrublands and woodlands', is listed as a Priority 3 ecological community (DBCA 2023b). This patch, totaling 1.3 hectares (2.3% of the survey area), is considered to represent both Floristic Community Types to varying degrees.

Quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' were not assessed against quadrats defined by Gibson *et al*. (1994) due to poor condition and low species diversity. Quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' are qualitatively likely to represent Supergroup 4: S14: *Spinifex longifolius* grassland and low shrublands, based on the dominance of *Spinifex* species, location (Quindalup South System) and landform (foredunes; Keighery *et al*. 2012; Government of Western Australia 2000).

Vegetation condition within the survey area ranged from Completely Degraded to Excellent condition, based on the Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). Majority of the survey area was observed to be in Excellent condition (36.3 hectares; 63.9% of the survey area). Proportions of each vegetation condition class within the survey area have remained relatively consistent between survey periods, with a slight decrease in areas classed as being in Excellent condition (38.4 ha in 2018 compared to 36.3 ha in 2023). This is likely accounted for in the refinement of boundaries in 2023, with areas

previously classed as Excellent condition along the western boundary of the survey area reclassified to 'Open Beach/Rocks'.

One fungi species was recorded within the survey area, namely Scarlet Bracket Fungi (*Pycnoporus coccineus*). Scarlet Bracket Fungi was recorded from one location, growing on dead wood. This fungi species is not of conservation significance.

A total of 29 fauna species (25 native, three pest and one naturalised species) were recorded opportunistically within the survey area, comprising 20 birds, four reptiles, three insects and two mammals. Of these, two are listed as conservation significant fauna species, namely Osprey (*Pandion haliaetus*), listed as Migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the State *Biodiversity Conservation Act 2016*, and Quenda (*Isoodon fusciventer*), listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions. Quenda was directly observed at one location (m 379125E; 6487303N). Osprey was observed flying overhead during the field survey.

Based on results of the current survey, the following recommendations have been made to assist in the conservation of native flora, vegetation and environmental values present within Ocean Reef Foreshore Reserve:

- Continue long-term monitoring of weed populations within the survey area. Implement weed control, particularly for Weeds of National Significance and Declared Pests (e.g., **Asparagus asparagoides* and **Moraea flaccida*) and City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Prioritise maintenance of the vegetation at Ocean Reef Foreshore Reserve due to the presence of the Floristic Community Type 29a and Floristic Community Type 24 Priority 3 Ecological Communities.
- Consider completing Targeted fauna works to determine the population numbers and extent of Quenda within the Ocean Reef Foreshore Reserve.
- Undertake ongoing feral animal control, particularly for European Red Fox (**Vulpes vulpes)* to reduce predation on the Priority 4 listed Quenda (*Isoodon fusciventer*), and for European Honeybee (**Apis* sp.) to reduce the competition for hollows for native birds.
- Continue monitoring for evidence of pathogens and maintain correct hygiene practices within the survey area.
- Monitor the dumping of large rubbish (e.g., unauthorised camps, skate areas) and remove where necessary.
- Limit uncontrolled access to the dunes (establish/repair fencing where necessary).
- Continue dune stabilisation works (e.g., planting, matting) to reduce erosion, where required.

1. Introduction

1.1. Project background

Eco Logical Australia (ELA) was engaged by the City of Joondalup (the City) to undertake a Detailed and Targeted flora survey and vegetation condition assessment of Ocean Reef Foreshore Reserve, an area of approximately 56.9 hectares (ha; the survey area) in size located in Ocean Reef, approximately 28 kilometres (km) north of Perth, Western Australia (WA; **Figure 1**).

Ocean Reef Foreshore Reserve is a major conservation area within the City of Joondalup, vested with and managed by the City, with high biodiversity values. It has been recognised for its regional environmental significance by being designated as a Bush Forever site (325) by the Western Australian Planning Commission (Government of Western Australia 2000).

Information provided from the current assessment will be used to report on the change in vegetation condition in accordance with the City's endorsed Natural Area Key Performance Indicators (KPIs), and to inform an update of the existing Ocean Reef Foreshore Reserve Management Plan. The most recent ecological surveys were undertaken by Natural Area Consulting Management Services (Natural Area) in 2018 (Natural Area 2019), to inform the development of the Ocean Reef Foreshore Reserve Management Plan (City of Joondalup 2019). The current survey area is 1.4 ha larger than the 2018 Natural Area survey area (55.5 ha).

More specifically, the objectives of this survey include:

- An assessment of flora and vegetation communities in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016);
- Undertake a vegetation condition assessment using the Keighery vegetation condition scale (1994; EPA 2016);
- A Targeted survey for State, Federal and/or Department of Biodiversity, Conservation and Attractions (DBCA) conservation significant flora, including Bush Forever significant flora and/or vegetation;
- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community', using the four-stage assessment process itemised in the Approved Conservation Advice (Threatened Species Scientific Committee [TSSC] 2016);
- An assessment to verify if the vegetation meets the requirement specified in the Department of Environment and Energy (DotEE; recently updated to be the Department of Climate Change, Energy and the Environment and Water [DCCEEW]) 'Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community' using the assessment process outlines in the Conservation Advice (DotEE 2019a);

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- [1]An assessment to verify if the vegetation meets the requirements specified in the Commonwealth EPBC Act '*Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion*' using the assessment process outlines in the Conservation Advice (Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2023);
- Record and mapping of all weed species encountered including State, Federal (Weed of National Significance [WoNS], Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007* [BAM Act]), City of Joondalup pest plant and/or priority weeds in the City of Joondalup (priority species list provided by the City);
- Record opportunistic sightings of fauna (including invertebrates) and fungi during the flora survey, in particular fauna species of State or Federal conservation significance; and
- Make recommendations to conserve biodiversity values.

[1] It is noted that the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion was listed as a TEC in effect under the EPBC Act 1999 from 15 November 2023, and as such has been included in the assessment retrospectively.



Figure 1: Survey area location

Survey Area

N

0 150 300 600

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 5/12/2023

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2. Environmental setting

2.1. Regional context

Broad environmental values for the region relevant to the survey area are presented in **Table 1**.

Table 1: Environmental values of the region

Existing environmental attributes	Survey area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (Department of Agriculture, Water and the Environment [DAWE] 2023)	Swan Coastal Plain (SWA)
IBRA Subregion (DAWE 2023)	Perth (SWA02)
Geology, landform and soils (Department of Primary Industries and Regional Development [DPIRD] 2023a)	**Spearwood System**: Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands. **Quindalup South System**: Coastal dunes, of the Swan Coastal Plain, with calcareous deep sands and yellow sands. Coastal scrub.
FCTs inferred within the survey area (Government of Western Australia 2000)	**Supergroup 2**: Seasonal Wetlands - **FCT*16**: Highly saline seasonal wetlands (*Frankenia pauciflora* Low Shrubland on Tamala Limestone Cliffs) **Supergroup 4**: Uplands centred on Spearwood and Quindalup Dunes - **FCT27**: Species-poor mallees and shrublands on limestone - **FCT29a**: Coastal shrublands on shallow sands - **FCT*29b**: *Acacia* shrublands on taller dunes - **S*11**: Northern *Acacia rostellifera – Melaleuca acerosa* shrublands - **S*13**: Northern *Olearia axillaris – Scaevola crassifolia* shrublands - **S*14**: *Spinifex longifolius* grassland and low shrublands
Bush Forever (Government of Western Australia 2000)	Bush Forever Site 325
Beard's (1975) vegetation mapping	**Guilderton 129**: Bare areas; dune sand (94.7% remaining in the Perth sub-region; Government of Western Australia 2019). **Guilderton 1007**: Mosaic: Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* & *Acacia cyclops* thicket (68.7% remaining in the Perth sub-region; Government of Western Australia 2019).

3. Methodology

3.1. Desktop review

3.1.1. Database searches and literature review

The following State databases were searched for information relating to conservation listed flora and ecological communities in order to compile and summarise existing data to inform the field survey. Database searches undertaken around the central coordinate 379719 metres (m) E; 6485521 N are presented in **Table 2**. Applied buffers below are considered suitable based on flora and fauna assemblages expected to occur within the survey area.

Table 2: Database searches undertaken for the survey area

Database	Reference	Buffer (km)
DBCA Threatened and Priority flora database searches for Declared Rare Flora (DRF) listed under the latest WA Wildlife Conservation (Rare Flora) Notice and Priority Flora.	DBCA 2023a	10
DBCA Threatened and Priority Ecological Communities' database search.	DBCA 2023b	10
DPIRD Western Australian Organism List (WAOL)	DPIRD 2023b	-
Department of Water and Environmental Regulation (DWER) Environmentally Sensitive Area (ESA) Database	DWER 2023	-

In addition, the following documents were also reviewed:

- *Ocean Reef Foreshore Flora, Fauna and Fungi Report* (Natural Area 2019); and
- *Ocean Reef Foreshore Reserve Management Plan* (City of Joondalup 2019).

3.2. Field survey

3.2.1. Survey team and timing

A Detailed and Targeted flora and vegetation survey was conducted by Jeff Cargill (Principal Botanist), Jeni Morris (Ecologist), Glenn Maslen (Spatial Ecologist) and Maitland Ely (Graduate Ecologist) from 18 to 20 September 2023. The survey team's relevant qualifications, experience and licences are provided in **Table 3** below.

A total of 36.8 millimetres (mm) of rainfall was recorded from the nearby Bureau of Meteorology (BoM) Wanneroo weather station (station number 9105; rainfall data 1905-present; located approximately 6 km northeast of the survey area) during the field survey (BoM 2023). In the three months prior to the field survey (June to August), a total of 364.1 mm of rainfall was recorded, which is less than the long-term average for the same period (445 mm; BoM 2023). Survey conditions during the field survey were considered suitable, with the majority of flora species in various stages of reproduction (e.g., flowering, seeding, fruiting), allowing for positive identification of both common and cryptic species.

Table 3: Survey team

Name	Qualification	Relevant experience	Licenses
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has extensive experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted threatened and priority flora surveys, fauna and black cockatoo surveys, MNES surveys and rehabilitation and vegetation monitoring programs.	Flora Taking (Biological Assessment) Licence number: FB62000138-2 Authorisation to Take Threatened Flora: Herbarium Specimens number: TFL 2223-0115
Jeni Morris	BSc. Conservation and Wildlife Biology	Jeni has completed several flora and vegetation surveys on the Swan Coastal Plain and within the City of Joondalup including at Shepherd's Bush Reserve, Iluka-Burns Beach Coastal Reserve, Warwick Open Space, Craigie Bushland Reserve and Yellagonga Regional Park.	Flora Taking (Biological Assessment) Licence number: FB62000070-2 Authorisation to Take Threatened Flora: Herbarium Specimens number: TFL 178-2122
Glenn Maslen	BSc Environmental Science	Glenn has six years of experience in the ecology and environmental assessment industry, having worked in both the private and public sectors. Glenn has experience in undertaking ecological surveys including flora, vegetation, and fauna assessments for private industry, local, state, and federal government. He has undertaken ecological surveys across many areas of Western Australia, including the Jarrah Forest and Swan Coastal Plain.	Flora Taking (Biological Assessment) Licence number: FB62000376
Maitland Ely	BSc. Conservation Biology and Botany	Maitland joined ELA as a Graduate Environmental Scientist in 2020. He has experience undertaking Baseline and Targeted flora and vegetation survey and Basic and Detailed fauna survey in Western Australia.	Flora Taking (Biological Assessment) Licence number: FB62000455

3.3. Flora and vegetation survey

A Detailed and Targeted flora and vegetation survey was conducted in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). A total of twelve 10 m x 10 m existing quadrats, established by Natural Area in 2018 (Natural Area 2019) were re-sampled during the current survey (**Figure 2**).

Stainless steel fence droppers were used to permanently mark the north-west corner of each quadrat, where not already present. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

Where possible, photos were taken from the same position as those undertaken by ELA (ELA 2019). The following data was recorded within each quadrat:

- Site details (site name, site number, observers, date and location);

- Environmental information including landform, soil type and colour, bare ground and leaf litter cover, rock outcropping and time since last fire event; and
- Biological information including vegetation structure, vegetation condition in accordance with Keighery (1994), degree of disturbance, species present and species percentage cover.

A Targeted survey was completed within the survey area to identify any conservation significant flora or communities potentially occurring, including:

- Threatened flora or Threatened Ecological Communities (TECs) listed under the EPBC Act;
- Threatened (Declared Rare) Flora listed under the latest WA Wildlife Conservation (Rare Flora) Notice under the State *Biodiversity Conservation Act 2016* (BC Act);
- Priority Ecological Communities (PECs) endorsed by the Western Australian Minister for the Environment;
- Priority (P) flora recognised by DBCA; and
- Bush Forever significant flora (specific to Ocean Reef Foreshore Reserve; Government of Western Australia 2000).

The survey methodology involved personnel conducting traverses across the survey area, with lined spaced (on average) 5-30 m apart depending on factors such as habitat type, disturbance (e.g., tracks) and landform. Locations of survey transects are shown in **Figure 2** below. Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

3.4. Weed survey and mapping

The survey area was surveyed and mapped for State, Federal and/or Priority weeds as specified by the City of Joondalup, including all WoNS, Declared Pests listed under the BAM Act and City of Joondalup declared pest plants. The City of Joondalup *Priority Weed List for Ocean Reef Foreshore Reserve* is provided in **Table 4**.

For each priority weed species, including WoNS and/or Declared Pest species encountered, a GPS location coordinate was recorded using points for individual plants or polygons for populations. Weed data was collected in accordance with the DBCA (previously Department of Environment and Conservation [DEC]) Standard Operating Procedure 22.1 *Techniques for mapping weed distribution and cover in bushland and wetlands* (DEC 2011).

Table 4: City of Joondalup Priority weed species list for Ocean Reef Foreshore Reserve

Species (Common Name)	Ranking^
**Arabis* sp. (Stock plant)	Permitted – s11
**Arctotis* sp. (Arctotis)	Permitted – s11
**Asparagus asparagoides* (Bridal Creeper)	Declared Pest - s22(2) (Exempt), WoNS
**Avena fatua* (Wild Oats)	Permitted – s11
**Cakile edentula* (Sea Rocket)	Permitted – s11
**Carpobrotus edulis* (Pigface)	Permitted – s11
**Centranthus macrosiphon* (Pretty Betsy)	Permitted – s11
**Ehrharta calycina* (Perennial Veldt Grass)	Permitted – s11
**Ehrharta longiflora* (Annual Veldt Grass)	Permitted – s11
**Euphorbia paralias* (Sea Spurge)	Permitted – s11
**Euphorbia terracina* (Geraldton Carnation Weed)	Permitted – s11
**Fumaria capreolata* (Fumitory)	Permitted – s11
**Lactuca serriola* (Prickly Lettuce)	Permitted – s11
**Moraea* sp. (Cape Tulip)	Declared Pest - s22(2) under the BAM Act
**Osteospermum ecklonis* (Veldt Daisy)	Permitted – s11
**Oxalis pes-caprae* (Soursob)	Permitted – s11
**Pelargonium capitatum* (Rose Pelargonium)	Permitted – s11
**Raphanus raphanistrum* (Wild Radish)	Permitted – s11
**Tegragonia decumbens* (Sea Spinach)	Permitted – s11
**Thinopyrum distichum* (Sea wheat)	Permitted – s11
**Trachyandra divaricata* (Onion Weed)	Permitted – s11
**Retama raetam* (White Broom)	Permitted – s11
**Ricinus communis* (Caster Oil)	Permitted – s11

Note: * refers to an introduced species.

^ DPIRD Western Australian Organism List (DPIRD 2023b)

3.5. Data analysis

3.5.1. Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke and Gorley 2006). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.5.2. Vegetation communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). A presence/absence transformation was applied to the dataset to align with Gibson *et al.* (1994). Introduced species (weeds), specimens not identified to species level and singletons (species recorded at a single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

Previously assigned vegetation mapping codes and descriptions (ELA 2019) were validated and retained during the current assessment to maintain consistency between survey periods.

A Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form was completed and submitted for all TECs and PECs identified within the survey area.

3.5.2.1. FCT analysis

Species within the Gibson *et al*. (1994) data set were updated to align with current names as specified by FloraBase (DBCA and Western Australian Herbarium [WAH] 2023). Using current records, several species in the Gibson *et al*. (1994) data set were shown to be significant range extensions from the Swan Coastal Plain, where appropriate such cases were removed. Excluded and misapplied names were removed from the data set and infra-specific names were reduced. The merged dataset was analysed using a combination of pre-treatments such as the inclusion and/or removal of introduced species and singletons. The removal of singletons from the merged dataset, an accepted pre-treatment for such analysis, produced the best results (e.g., stronger correlations; Clarke and Gorley 2006). Inclusion of such data merely served to confound the dataset by introducing stochastic and 'site' artefact data. Transformed data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, single insertion Cluster Analysis (Flexible Beta) and Multi-Dimensional Scaling (MDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to Floristic Community Types (FCTs) defined by Gibson *et al*. (1994). To identify the presence of FCT's appropriate multivariate analyses comparing current data to that of Gibson *et al*. (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g., spatial and temporal differences), results and subsequent extrapolations, assigned FCT's within the survey area were inferred and not absolute, i.e., a vegetation code assigned

to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al*. (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA (ELA 2019).

3.5.2.2. Assessment of diagnostics to assess presence of Threatened Ecological Communities

The 'Banksia Woodlands of the Swan Coastal Plain' TEC is listed as Endangered (EN) under the EPBC Act (TSSC 2016). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the DotEE Species Profile and Threats Database (TSSC 2016). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations (TSSC 2016).

In order to determine whether the 'Banksia Woodlands of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 2 of the Conservation Advice (TSSC 2016). The four-stage assessment identified by DotEE to ascertain the presence of the Banksia Woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

The 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community is listed as Critically Endangered (CR) under the EPBC Act (DotEE 2019). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice on the DotEE Species Profile and Threats Database (DotEE 2019). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations (DotEE 2019a).

In order to determine whether the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 3.2 of the Conservation Advice (DotEE 2019). The assessment identified by DotEE to ascertain the presence of the Tuart (*Eucalyptus gomphocephala*) Woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

3.6. Flora identification and nomenclature

Flora specimen identification was undertaken by ELA Principal Botanist Jeff Cargill. Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH collection. Where considered appropriate, specimens that meet WAH specimen lodgement requirements (e.g., Threatened and Priority Flora, range extensions), will be submitted along with Threatened and Priority Report forms to DBCA. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2022).

3.7. Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the Detailed and Targeted flora and vegetation for the survey area are summarised in **Table 5** below. No survey limitations were identified.

Table 5: Survey limitations

Constraint	Limitations
Sources of information	**Not a constraint**: The Swan Coastal Plain has been well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. Several flora surveys have been undertaken in the region which have been utilised for the purposes of this survey. Gibson *et al*. 1994 was a primary source for determination of methods, analysis and results for assessing FCTs. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope of work	**Not a constraint:** The survey requirement for a Detailed and Targeted flora and vegetation survey in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met.
Completeness of survey	**Not a constraint:** The area was surveyed to the satisfaction of the scope and a Detailed and Targeted flora and vegetation survey as per relevant guidelines.
Intensity of survey	**Not a constraint:** Survey effort was considered adequate to meet objectives of the scope. The area was surveyed for conservation significant flora species and vegetation communities by field staff undertaking transects across the survey area spaced 5-30 m apart on average. This method provided an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation communities present and to identify any vegetation of conservation significance. A species accumulation curve determined that approximately 75.8% of the flora species potentially present within the survey area were recorded from quadrats (99 species). This result, in addition to flora species recorded opportunistically (43 species), indicates that the majority of flora potentially present within the survey area were recorded. This figure suggests that a comprehensive flora inventory of the survey area has been compiled.
Timing, weather, season, cycle	**Not a constraint:** The survey area is located in the Swan Coastal Plain bioregion of Western Australia. Recommended survey timing for this region is in spring (September – November; EPA 2016). The field survey was undertaken at the beginning of September, with only slightly less than average rainfall recorded in the three months preceding the field survey (BoM 2023). Many flora species were flowering at the time of the field survey or had sufficient material (fruit) available to identify the dominant and target species. The timing was appropriate for conducting this level of survey.
Disturbances	**Not a constraint:** Disturbances within the survey area included the presence of weeds, grazing and edge effects. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Resources	**Not a constraint:** The personnel conducting this field survey were suitably qualified to identify specimens, having previously undertaken flora and vegetation assessments on the Swan Coastal Plain, including in several reserves for the City of Joondalup.
Accessibility	**Not a constraint:** All relevant areas of the survey area were easily accessed and able to be surveyed.



Figure 2: Survey effort (North)

Survey Area
Quadrat
Traverse

N

0 75 150
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 18/12/2023

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Figure 2: Survey effort (South)

Survey Area
Quadrat
Traverse

N

0 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 18/12/2023

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4. Results

4.1. Desktop review

4.1.1. Conservation significant flora species and ecological communities

A DBCA Threatened and Priority Flora and Ecological Communities' database search was undertaken to identify conservation significant flora species and communities recorded within, or nearby to, the survey area (current and historic). Additional documents reviewed included:

- *Ocean Reef Foreshore Flora, Fauna and Fungi Report* (Natural Area 2019); and
- *Ocean Reef Foreshore Reserve Management Plan* (City of Joondalup 2019).

A total of 23 flora species of conservation significance were identified from the desktop assessment occurring within a 10 km radius of the survey area, including one species listed as EN under the EPBC Act and BC Act, one species listed as VU under the EPBC Act and BC Act, and 21 species listed as Priority flora by DBCA. Of these, none have been previously recorded within the survey area:

- *Marianthus paralius* (listed as EN under the EPBC Act and BC Act);
- *Eucalyptus argutifolia* (listed as VU under the EPBC Act and BC Act);
- *Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425; listed as P1 by DBCA);
- *Grevillea* sp. Ocean Reef (D. Pike Joon 4; listed as P1 by DBCA);
- *Leucopogon maritimus* (listed as P1 by DBCA);
- *Acacia benthamii* (listed as P2 by DBCA);
- *Fabronia hampeana* (listed as P2 by DBCA);
- *Lecania turicensis* var. *turicensis* (listed as P2 by DBCA);
- *Netrostylis* sp. Chandala (G.J. Keighery 17055; listed as P2 by DBCA);
- *Poranthera moorokatta* (listed as P2 by DBCA);
- *Thelymitra variegata* (listed as P2 by DBCA);
- *Austrostipa mundula* (listed as P3 by DBCA);
- *Conostylis bracteata* (listed as P3 by DBCA);
- *Hibbertia leptotheca* (listed as P3 by DBCA);
- *Jacksonia gracillima* (listed as P3 by DBCA);
- *Pimelea calcicola* (listed as P3 by DBCA);
- *Sarcozona bicarinata* (listed as P3 by DBCA);
- *Stylidium maritimum* (listed as P3 by DBCA);
- *Stylidium paludicola* (listed as P3 by DBCA);
- *Styphelia filifolia* (listed as P3 by DBCA);
- *Utricularia oppositiflora* (listed as P3 by DBCA);
- *Eucalyptus foecunda* subsp. *foecunda* (listed as P4 by DBCA) and
- *Jacksonia sericea* (listed as P4 by DBCA).

A total of six conservation significant ecological communities were identified as occurring within a 10 km radius of the survey area (DBCA 2023b), none of which intersect with the survey area (**Table 6**).

Conservation codes, categories and criteria for flora and fauna protected under the EPBC Act and the BC Act are provided in **Appendix A**.

Table 6: Conservation significant ecological communities occurring within, or in proximity to, the survey area (DBCA 2023b)

Community ID	Community description	Ranking (Federal)	Ranking (State)
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	CR	P3
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	EN	P3
SCP30a	*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain (floristic community type 30a as originally described in Gibson et al. 1994)	-	CR
SCP29a	Coastal shrublands on shallow sands	-	P3
SCP24	Northern Spearwood shrublands and woodlands	-	P3
SCP25	Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	-	P3
*Honeymyrtle shrubland	Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion	CR	CR

*It is noted that the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion was listed as a TEC in effect under the EPBC Act 1999 from 15 November 2023, and as such has been included in the desktop assessment retrospectively.

4.1.2. Expected flora assemblages

A summary of the number of flora species (native and introduced) previously recorded from within Ocean Reef Foreshore Reserve is provided in **Table 7** below.

Table 7: Summary of flora species and conservation significant species recorded within Ocean Reef Foreshore Reserve from previous studies

Study	Number of species			Number of quadrats established	Conservation significant species/communities recorded
	Native	Introduced	Total		
Natural Area (2019)	77	44	121	12	Bush Forever significant species: *Callitris preissii*

4.2. Flora and vegetation

4.2.1. Flora overview

A total of 142 taxa (90 native and 52 introduced taxa) from 122 genera and 55 families were recorded across thirteen 10 x 10 m quadrats established within the survey area (99 taxa), and from opportunistic collections (43 taxa). Average species richness per quadrat was 24.4 species, ranging from a low of 7 species at Q7 to a high of 51 species at the newly established Q13. Families with the highest number of species included Fabaceae (16 species), Poaceae (14 species) and Asteraceae (11 species). *Acacia* and *Melaleuca* were the best represented genera throughout the survey area with six and five taxa recorded, respectively. One orchid species, *Caladenia latifolia* (Pink Fairy Orchid), was recorded during the field survey, as presented in **Appendix B**. A flora species list is provided in **Appendix C** and a site by species matrix is provided in **Appendix D**. Quadrat site data is presented in **Appendix E**.

4.2.2. Accumulates species – site surveyed (species-area curve)

A species accumulation curve (**Figure 3**) was used to evaluate the adequacy of sampling (Clarke and Gorley 2006). Only species data recorded from defined quadrats were used; no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling.

Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 130.6. Based on this value, and the total of 99 species recorded within quadrats, approximately 75.8% of the flora species potentially present within the survey area were recorded. This result, in addition to a total of 43 opportunistic collections, indicates that the majority of flora potentially present within the survey area were recorded.

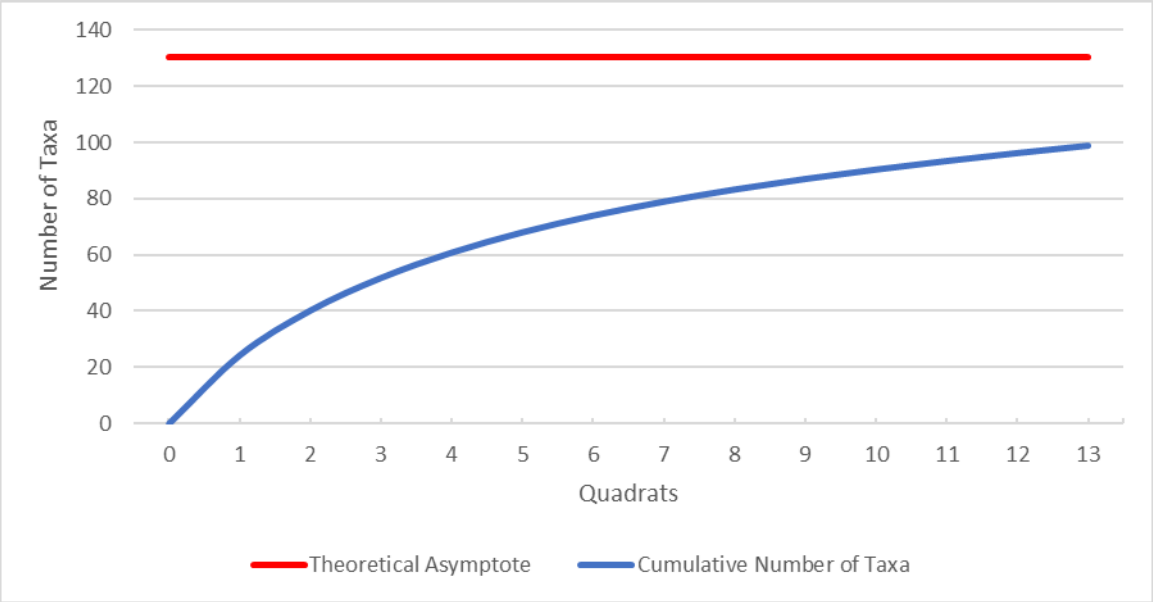


Figure 3: Average randomised species accumulation curve

4.2.3. Conservation and Bush Forever significant flora

No Threatened flora species listed under the EPBC Act or the BC Act were recorded within the survey area. Two Bush Forever significant species were recorded within the survey area, namely *Alyogyne huegelii* and *Melaleuca cardiophylla*. *Alyogyne huegelii* was recorded from 17 locations (32 individuals), while *Melaleuca cardiophylla* was mapped across 9.34 ha (16.4% of the survey area) at a >50% cover (**Figure 4**). These species are listed as Bush Forever significant to Bush Forever Site 325: Coastal Strip from Burns Beach to Hillarys (Government of Western Australia 2000).

4.2.4. Introduced flora

A total of 52 introduced (weed) species were recorded within the survey area, representing 36.6% of the total species recorded. Of these, **Asparagus asparagoides* (Bridal Creeper) is listed as a WoNS and as a Declared Pest under the BAM Act, and **Moraea flaccida* (One-leaf Cape Tulip) is listed as a Declared Pest under the BAM Act. Both species are categorised as s22(2) (exempt). Declared Pests "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2022b).

Asparagus asparagoides* (Bridal Creeper) was recorded at one location (one individual) within the 'Mixed Open Shrubland' vegetation community (Appendix F**). **Moraea flaccida* (One-leaf Cape Tulip) was recorded at two point-locations (two individuals) and five polygon locations (all <5% cover), with majority of records occurring in the southern half of the survey area within the 'Mixed Open Shrubland' and '*Melaleuca cardiophylla* Closed Heath' vegetation communities (**Appendix F**). No WoNS or Declared Pests have previously been recorded within the survey area (Natural Area 2019).

Of the 52 introduced (weed) species recorded, 18 are listed on the City of Joondalup priority weed list for Ocean Reef Foreshore Reserve. The City's declared pest plant, **Tribulus terrestris* (Caltrop), was not recorded during the current survey. A list of all City of Joondalup priority weeds, Declared Pests and WoNS recorded within the survey area are listed in **Table 8** and presented in **Appendix F**.

Table 8: CoJ Priority weed species recorded within Ocean Reef Foreshore Reserve

Species (Common name)	Ranking
**Arabis* sp. (Stock plant)	Permitted – s11
**Asparagus asparagoides* (Bridal Creeper)	Declared Pest - s22(2) (Exempt), WoNS
**Avena fatua* (Wild Oats)	Permitted – s11
**Cakile edentula* (Sea Rocket)	Permitted – s11
**Carpobrotus edulis* (Pigface)	Permitted – s11
**Centranthus macrosiphon* (Pretty Betsy)	Permitted – s11
**Ehrharta longiflora* (Annual Veldt Grass)	Permitted – s11
**Euphorbia paralias* (Sea Spurge)	Permitted – s11
**Euphorbia terracina* (Geraldton Carnation Weed)	Permitted – s11
**Fumaria capreolata* (Fumitory)	Permitted – s11
**Moraea* sp. (Cape Tulip)	Declared Pest - s22(2) under the BAM Act
**Osteospermum ecklonis* (Veldt Daisy)	Permitted – s11
**Oxalis pes-caprae* (Soursob)	Permitted – s11
**Pelargonium capitatum* (Rose Pelargonium)	Permitted – s11
**Raphanus raphanistrum* (Wild Radish)	Permitted – s11
**Tegragonia decumbens* (Sea Spinach)	Permitted – s11
**Thinopyrum distichum* (Sea wheat)	Permitted – s11
**Trachyandra divaricata* (Onion Weed)	Permitted – s11

4.2.5. Vegetation communities

A total of four vegetation communities were delineated and mapped within the survey area (**Appendix G**). Where relevant, vegetation codes previously assigned by Natural Area in 2018 (Natural Area 2019) were validated during the current analysis and subsequently retained for consistency purposes. Vegetation communities are described in **Table 9** and presented in **Figure 5** below. Intact vegetation within the survey area comprised 50.9 hectares (89.6% of the survey area), with the remaining 5.9 hectares (10.4% of the survey area) comprising 'Open Beach/Rocks' (3.7 ha; 6.5%) and 'Tracks/Cleared Areas' (2.3 ha; 4.0%). Vegetation community 'Mixed Open Shrubland' was the most widespread vegetation community recorded, covering 42.1% (23.9 hectares) of the survey area.

Extent of vegetation communities recorded within the survey area has remained relatively consistent since the 2018 assessment (Natural Area 2019; **Table 9**), with minor changes accounted for due to the increase in survey area size and refinement of boundaries in 2023. Extent of the 'Mixed Open Shrubland' vegetation community was reduced by 2.7 hectares, due to areas of this community along the western boundary reclassified to 'Open Beach/Rocks' during the current survey. An additional 1.6 ha of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was mapped within the survey area, which can be attributed to the refinement of boundaries in 2023.

Table 9: Vegetation communities recorded within the survey area

Image	Vegetation community	Vegetation description	Quadrats	Natural Area 2019		ELA 2023	
				Extent (ha)	Proportion (%)	Extent (ha)	Proportion (%)
	*Acacia rostellifera* Shrubland	*Acacia rostellifera* Shrubland over mixed shrubland; *Scaevola crassifolia*, *Rhagodia baccata* and *Spyridium globulosum* and an understory of weedy grasses and herbs such as **Bromus diandrus* **Ehrharta longiflora*, and **Euphorbia terracina*. This vegetation type occurs on the tertiary dunes at the eastern edge of the site.	Q1, Q5, Q11	17.9	32.3	17.1	30.1
	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland with sparse *Olearia axillaris* shrubs. This vegetation type occurs along the foredunes on the western edge of the site.	Q2, Q7, Q9	0.5	0.9	0.5	0.9

Image	Vegetation community	Vegetation description	Quadrats	Natural Area 2019		ELA 2023	
				Extent (ha)	Proportion (%)	Extent (ha)	Proportion (%)
	Mixed Open Shrubland	Mixed Open Shrubland of Olearia axillaris, Rhagodia *baccata* and *Scaevola crassifolia* and other mixed shrubs over an understorey of weedy grasses and mixed herbs; This vegetation type occurs on the secondary and tertiary dunes along the entire length of the site.	Q3, Q8, Q12	26.6	47.9	23.9	42.1
	*Melaleuca cardiophylla* Closed Heath	Closed Heath of *Melaleuca cardiophylla* over *Styphelia insularis* and mixed shrubs and an understorey of mixed herbs and weed grasses. This vegetation type is situated on shallow sand over limestone.	Q4, Q6, Q10, Q13	7.7	13.9	9.3	16.4
Open Beach/Rocks				N/A	N/A	3.7	6.5
Tracks/Cleared Areas					5.0	2.3	4.0
Total				**55.5**	**100.0**	**56.9**	**100.0**

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4.2.6. Conservation significant ecological communities

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of this analysis are shown below in **Table 10**.

Results of the multivariate analysis showed that quadrats within vegetation community '*Acacia rostellifera* Shrubland' had a moderate affiliation with FCT 29a and, to a lesser extent, FCT 29b. This community, covering a total area of 17.1 ha (30.1% of the survey area), is considered to represent floristic aspects of FCT 29a (**Table 10**; **Figure 6**). FCT 29a, described as 'coastal shrublands on shallow sands, mostly heaths on shallow sands over limestone close to the coast' is listed as a Priority 3 ecological community (DBCA 2023b). These results are consistent with Natural Area (2019), who determined that vegetation community '*Acacia rostellifera* Shrubland' represents aspects of FCT 29a, based on similarities in vegetation structure and composition (17.9 ha; Natural Area 2019).

Quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' were not assessed against FCTs defined by Gibson *et al*. (1994) due to poor condition and low species diversity. Qualitatively, quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' are likely to represent S14: *Spinifex longifolius* grassland and low shrublands, based on similarities in species, location and landform (Keighery *et al*. 2012). This assessment is further supported with S14 listed as inferred to be present within the Bush Forever site 325 (Government of Western Australia 2000).

Quadrats within vegetation community 'Mixed Open Shrubland' had a moderate to strong affiliation with FCT 29a. This community, covering a total area of 23.9 ha (42.1% of the survey area), is considered as representing floristic aspects of the FCT 29a (listed as P3 by DBCA; **Table 10**; **Figure 6**). These results are consistent with Natural Area (2019), who determined that vegetation community 'Mixed Open Shrubland' represents aspects of FCT 29a, based on similarities in vegetation structure and composition (26.6 ha total; Natural Area 2019).

Quadrats within vegetation community '*Melaleuca cardiophylla* Closed Heath' had a moderate to strong affiliation with FCT 29a. This community, covering a total area of 9.3 ha (16.4% of the survey area), is considered as representing floristic aspects of FCT 29a (listed as P3 by DBCA; **Table 10**; **Figure 6**). These results are consistent with Natural Area (2019), who determined that vegetation community '*Melaleuca cardiophylla* Closed Heath' represents aspects of FCT 29a, based on similarities in vegetation structure and composition (26.6 ha total; Natural Area 2019).

One patch of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was found to have a strong affiliation with FCT 29a, as well as and a moderate affiliation with FCT 24. FCT 24, described as 'Northern Spearwood shrublands and woodlands', is listed as a Priority 3 ecological community (DBCA 2023b). FCT 24 is known to occur on deeper soils of the spearwood system, and on limestone derived soils and Tamala Limestone expressions along coastal areas of the Swan Coastal Plain, with heathlands typically including *Calothamnus quadrifidus*, *Banksia sessilis* and *Ammothryon grandiflorum* (DBCA 2023c). The patch, totaling 1.3 hectares (2.3% of the survey area), is considered to represent both Floristic Community Types to varying degrees, based on similarities in landform (limestone), vegetation structure (heathland) and species composition (**Table 10**; **Figure 6**).

A graphical representation of relationships between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson *et al*. (1994) is shown in **Appendix H**.

Table 10: Relationships between ELA vegetation communities and FCTs defined by Gibson et al. (1994)

ELA Vegetation Community	ELA Quadrat	Gibson site	FCT	%Bray-Curtis Similarity
Acacia rostellifera Shrubland	1	BURN-2	29a	32.4
		TRIG-2	29a	44.4
	5	TRIG-1	29b	34.1
		PRES-1	29a	25.6
	11	PRES-1	29a	31.6
Spinifex hirsutus and **Thinopyrum distichum* Grassland	2	n/a	n/a	n/a
	7	n/a	n/a	n/a
	9	n/a	n/a	n/a
Mixed Open Shrubland	3	GARDEN-2	29a	26.1
		TRIG-2	29a	38.1
		SEAB-8	29a	40
		BURN-1	29a	48.1
	8	BURN-1	29a	43.3
		SEAB-8	29a	42.4
		NAVB-2	29a	34.8
		PRES-1	29a	23.3
	12	BURN-1	29a	48.5
		SEAB-8	29a	41.7
		TRIG-2	29a	40
Melaleuca cardiophylla Closed Heath	4	TRIG-2	29a	26.2
		GARDEN-2	29a	29.8
		BURN-1	29a	36.4
		SEAB-8	29a	31.3
		SEAB-4	29a	28.9
		SEAB-5	29a	23.9
		SEAB-2	29b	29.3
		NWIL-1	29b	19.7
		NWIL-3	29b	19.4
		SEAB-3	29b	12.3
		SEAB-7	29b	9.4
		NPRES-1	29b	27.2
		WHILL-1	29b	33.8
		WHILL-2	29b	27.6
		PB-5	29b	28.6
		PB-3	29b	16.1
		PB-2	29b	26.9
		PB-4	29b	30.3
	6	BURN-1	29a	50
		SEAB-8	29a	38.5
		TRIG-2	29a	42.9
		GARDEN-2	29a	25.8
	10	BURN-1	29a	63.2
		TRIG-2	29a	43.3
		NAVB-2	29a	40
		PRES-1	29a	30.5
	13	BURN-1	29a	55.5

ELA Vegetation Community	ELA Quadrat	Gibson site	FCT	%Bray-Curtis Similarity
		NAVB-2	29a	38.4
		COOL 03	24	29.3
		COOL 02	24	37.5
		COOL 08	24	33.3
		MTB-3	24	33.7
		MTB-2	24	36.8
		NAVB-4	24	24.7

4.2.6.1. Banksia Woodlands of the Swan Coastal Plain TEC diagnostic

Vegetation within the survey area does not represent the Banksia Woodlands of the Swan Coastal Plain TEC, due to there being no *Banksia* tree species recorded. As such, the full assessment for this TEC, as outlined in the approved conservation advice (TSSC 2016), was not completed.

4.2.6.2. Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC diagnostic

Vegetation within the survey area does not represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC, due to there being no *E. gomphocephala* recorded. As such, the full assessment for this TEC, as outlined in the approved conservation advice (DotEE 2019), was not completed.

4.2.6.3. Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion TEC diagnostic

It is noted that the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion was listed as a TEC in effect under the EPBC Act 1999 from 15 November 2023 (post-field survey). As such, an assessment against diagnostic characteristics listed in the approved conservation advice (DCCEEW 2023), was not completed. In WA the nationally defined Honeymyrtle shrubland ecological community is typically identified and mapped as FCT 26a *Melaleuca huegelii – M. systena* shrublands of limestone ridges (Gibson 1994; DCCEEW 2023). Vegetation within the '*Melaleuca cardiophylla* Closed Heath' vegetation community, though dominated by *Melaleuca huegelii*, is not considered as likely representing the TEC, with FCT analysis of the patch finding no affiliation with FCT 26a.

4.2.7. Vegetation condition

Vegetated areas within the survey area accounted for 50.9 hectares (89.6% of the survey area) and ranged from Completely Degraded to Excellent condition, based on the Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). Majority of the survey area was observed to be in Excellent condition (36.3 hectares; 63.9% of the survey area). Disturbances within the survey area included the presence of weeds, edge effects (lesser condition) adjacent to tracks/cleared areas and minor rubbish dumping.

A comparison of vegetation condition between the current survey and those recorded by Natural Area (2019) is presented in **Table 11**. Proportions of each vegetation condition class within the survey area have remained relatively consistent between survey periods. A slight decrease in areas classed as being in Excellent condition was observed (38.4 ha in 2018 compared to 36.3 ha in 2023), with changes likely accounted for due to the refinement of boundaries, with areas previously classed as Excellent condition along the western boundary of the survey area reclassified to 'Open Beach/Rocks'.

Vegetation condition within the survey area is presented in **Figure 7** below. Vegetation condition per vegetation community is presented in **Table 12** and **Figure 8**.

Table 11: Vegetation condition in 2023 compared with vegetation condition recorded by Natural Area in 2018 (Natural Area 2019)

Vegetation condition	Natural Area 2019		Current assessment (2023)	
	Total area (ha)	Proportion of the survey area (%)	Total area (ha)	Proportion of the survey area (%)
Pristine	0	0.0	0	0
Excellent	38.4	69.2	36.3	63.9
Very Good	9.5	17.1	9.3	16.3
Good	3.2	5.8	3.1	5.5
Degraded	1.8	3.2	1.8	3.2
Completely Degraded	0.2	0.4	0.4	0.7
Open Beach/Rocks	N/A	N/A	3.7	6.5
Tracks/Cleared Areas	2.4	4.3	2.3	4.0
Total	**55.5**	**100.0**	**56.9**	**100.0**

*Areas of Open Beach/Rocks and Completely Degraded vegetation condition previously included tracks and cleared areas however they have been separated for the current assessment

Table 12: Vegetation condition per vegetation community within the survey area

Vegetation community	Vegetation Condition ha (% of total of vegetation community)						
	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded	Total ha (%)*
Acacia rostellifera Shrubland	0.0 (0.0)	11.9 (69.3)	3.8 (22.0)	1.5 (8.6)	0.04 (0.2)		17.3 (100.0)
Spinifex hirsutus and **Thinopyrum distichum* Grassland	0.0 (0.0)	0.0 (0.0	0.0 (0.0	0.1 (23.3)	0.4 (76.7)	0.0 (0.0	0.5 (100.0)
Mixed Open Shrubland	0.0 (0.0)	16.1 (67.4)	5.1 (21.2)	1.2 (5.2)	1.4 (5.8)	0.1 (0.4)	25.0 (100.0)
Melaleuca cardiophylla Closed Heath	0.0 (0.0)	8.3 (88.9)	0.4 (4.5)	0.3 (3.1)	0.0 (0.0)	0.3 (3.5)	8.2 (100.0)

*Totals are subject to rounding errors of 0.01-0.1

4.3. Fungi

One fungi species was recorded within the survey area, namely Scarlet Bracket Fungi (*Pycnoporus coccineus*; **Plate 1**). Scarlet Bracket Fungi was recorded from one location, growing on dead wood. This fungi species is not of conservation significance.



Plate 1: Scarlet Bracket Fungi (*Pycnoporus coccineus*) at Ocean Reef Foreshore Reserve

4.4. Fauna

A total of 29 fauna species (25 native, three pest and one naturalised species) were recorded opportunistically within the survey area, comprising 20 birds, four reptiles, three insects and two mammals (**Table 13**). Of these, two are listed as conservation significant fauna species, namely Osprey (*Pandion haliaetus*), listed as Migratory under the EPBC Act and BC Act, and Quenda (*Isoodon fusciventer*), listed as P4 by DBCA. Quenda was directly observed at one location (m 379125E; 6487303N). Osprey was observed flying overhead during the field survey.

Three introduced fauna species were directly observed during the field survey, namely **Vulpes vulpes* (European Red Fox), **Apis* sp. (European Honeybee) and **Ommatoiulus moreleti* (Portuguese Millipede). The European Red Fox was recorded several times, with sightings in both the northern and southern sections of the survey area. European Honeybee and Portuguese Millipede were recorded opportunistically, with one European Honeybee nest observed at m E379880; N6484878) in an old, discarded armchair.

Table 13: Fauna species recorded opportunistically within the survey area

Type	Species	Common name	Observation type
Bird	*^Spilopelia senegalensis*	Laughing Dove	Directly observed
Bird	*Anthochaera carunculata*	Red Wattlebird	Directly observed
Bird	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike	Directly observed
Bird	*Corvus coronoides*	Australian Raven	Directly observed
Bird	*Elanus scriptus*	Letter-winged Kite	Directly observed
Bird	*Eolophus roseicapilla*	Galah	Directly observed
Bird	*Gallirallus philippensis*	Buff-banded Rail	Directly observed
Bird	*Hirundo neoxena*	Welcome Swallow	Directly observed
Bird	*Lichenostomus virescens*	Singing Honeyeater	Directly observed
Bird	*Lichmera indistincta*	Brown Honeyeater	Directly observed
Bird	*Malurus leucopterus*	White-winged Fairywren	Directly observed
Bird	*Malurus splendens*	Splendid Fairywren	Directly observed
Bird	*Megalurus gramineus*	Little Grassbird	Directly observed
Bird	*Pachycephala pectoralis*	Golden Whistler	Directly observed
Bird	*Pandion haliaetus* (MI)	Osprey	Directly observed
Bird	*Phalacrocorax varius*	Pied Cormorant	Directly observed
Bird	*Phylidonyris niger*	White-cheeked Honeyeater	Directly observed
Bird	*Phylidonyris novaehollandiae*	New Holland Honeyeater	Directly observed
Bird	*Rhipidura leucophrys*	Willy Wagtail	Directly observed
Bird	*Zosterops lateralis*	Silvereye	Directly observed
Insect	**Apis* sp. (species unknown)	European Honeybee	Directly observed
Insect	**Ommatoiulus moreleti*	Portuguese Millipede	Directly observed
Insect	*Austracantha minax*	Christmas Spider	Directly observed
Mammal	**Vulpes vulpes*	European Red Fox	Directly observed
Mammal	*Isoodon fusciventer* (P4)	Quenda	Directly observed
Reptile	*Pogona minor minor*	Western Bearded Dragon	Directly observed
Reptile	*Pseudonaja affinis*	Dugite	Directly observed
Reptile	*Strophurus spinigerus*	Southwest Spiny-tailed Gecko	Directly observed
Reptile	*Tiliqua rugosa*	Bobtail Lizard	Directly observed

Note: * refers to a pest species; ^ refers to a naturalised exotic species



Figure 4: Locations of conservation significant flora within the survey area (North)

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Conservation significant flora

Alyogyne huegelii (Bush Forever Significant)
Melaleuca cardiophylla (Bush Forever Significant)

0 37.5 75 150
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 15/12/2023

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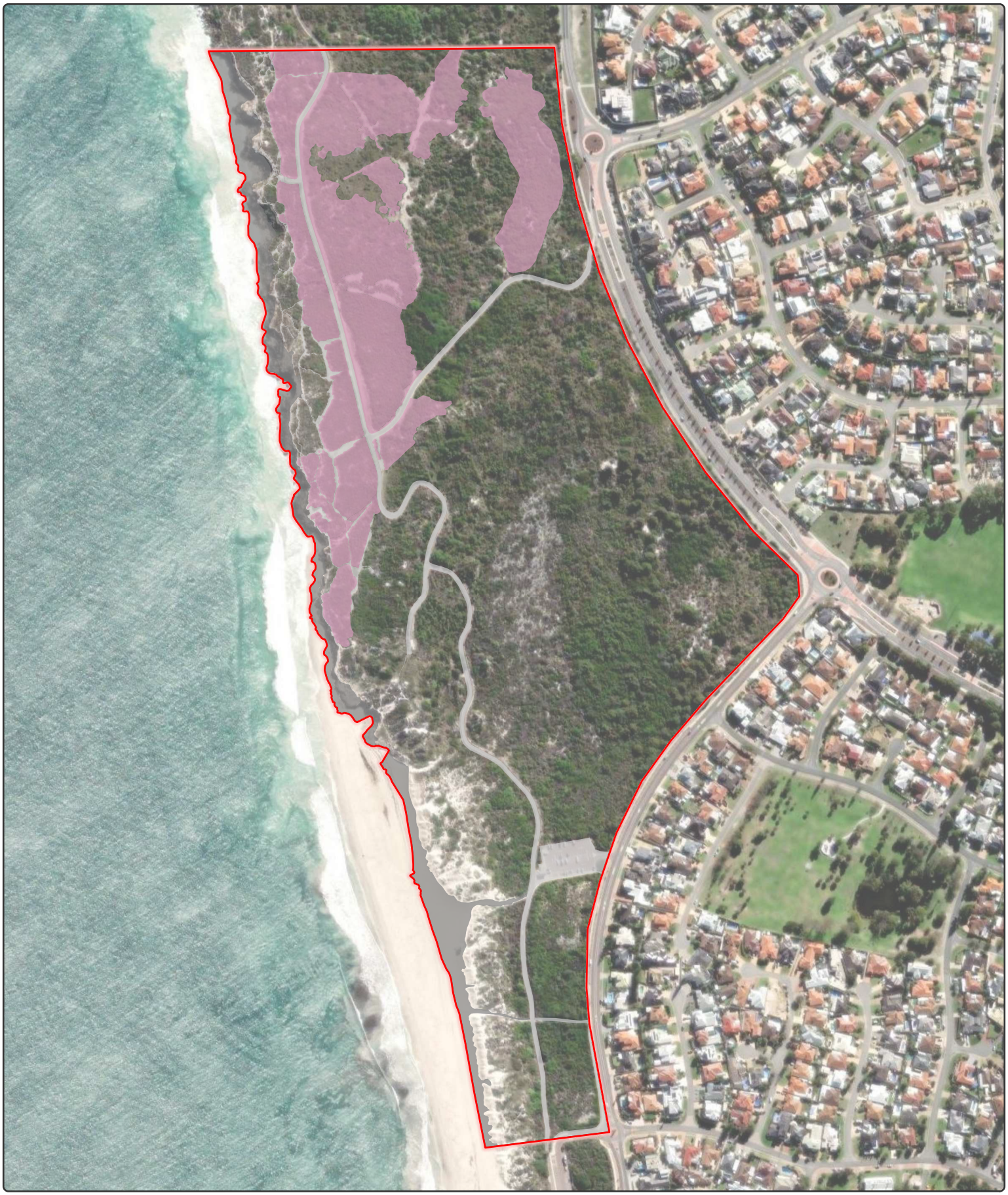


Figure 4: Locations of conservation significant flora within the survey area (South)

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Conservation significant flora

Melaleuca cardiophylla (Bush Forever Significant)

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 18/12/2023

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Figure 5: Vegetation communities recorded within the survey area

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Vegetation communities

Acacia rostellifera Shrubland
Melaleuca cardiophylla Closed Heath
Mixed Open Shrubland
Spinifex hirsutus and **Thinopyrum distichum* Grassland

0 37.5 75 150
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 6/12/2023

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Figure 5: Vegetation communities recorded within the survey area (South)



Figure 6: Conservation significant vegetation communities recorded within the survey area (North)

Survey Area

Tracks/Cleared Areas

Open Beach/Rocks

Conservation significant vegetation communities

FCT 29a: Coastal shrublands on shallow sands (P3)

FCT 29a: Coastal shrublands on shallow sands (P3) / FCT 24 Northern Spearwood shrublands and woodlands (P3)

0 37.5 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 6/12/2023

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Figure 6: Conservation significant vegetation communities recorded within the survey area (South)

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Conservation significant vegetation communities

FCT 29a: Coastal shrublands on shallow sands (P3)

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 6/12/2023

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Figure 7: Vegetation condition recorded within the survey area (North)



Figure 7: Vegetation condition recorded within the survey area (South)



Figure 8: Vegetation condition per community within the survey area (North)

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Vegetation communities

Acacia rostellifera Shrubland
Melaleuca cardiophylla Closed Heath
Mixed Open Shrubland
Spinifex hirsutus and **Thinopyrum distichum* Grassland

Vegetation condition

Excellent
Very Good
Good

0 37.5 75 150
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 6/12/2023

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Figure 8: Vegetation condition per community within the survey area (South)

Survey Area
Tracks/Cleared Areas
Open Beach/Rocks

Vegetation communities

Acacia rostellifera Shrubland
Melaleuca cardiophylla Closed Heath
Mixed Open Shrubland
Spinifex hirsutus and **Thinopyrum distichum* Grassland

Vegetation condition

Excellent
Very Good
Good
Degraded
Completely Degraded

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-JP Date: 6/12/2023

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5. Discussion and recommendations

5.1. Flora

A total of 142 flora taxa (90 native and 52 introduced) were recorded within the survey area from quadrats and opportunistic collections. This number represents a 17.4% increase from the number of species recorded by Natural Area in 2018 (121 species total; 77 native and 44 introduced; Natural Area 2019). An increased in taxa recorded is likely attributed to an increase in survey effort (Natural Area completed a field survey utilising two personnel over three days, while ELA utilised three personnel over three days) and due to the establishment of an additional quadrat within the survey area. Previous surveys in nearby reserves recorded a similar number of taxa, with Burns Beach-Iluka Foreshore Reserve, located approximately 6 km to the north, recording 121 species (74 native and 47 introduced) and Hillarys-Kallaroo Coastal Foreshore Reserve, located approximately 6 km to the south, recording 117 species (68 native and 49 introduced; ELA 2021; 2022).

Average species richness per quadrat was 24.4 species, ranging from a low of 7 species at Q7 to a high of 51 species at the newly established Q13. This is higher than Natural Area (2019), where an average species richness of 16.8 species (range 7-36 species) was recorded. A species accumulation curve determined that approximately 75.8% of the flora species potentially present within the survey area were recorded from quadrats (99 species). This result, in addition to flora species recorded opportunistically (43 species), indicates that the majority of flora potentially present within the survey area were recorded. This figure suggests that a comprehensive flora inventory of the survey area has been compiled.

No Threatened or Priority flora listed under the EPBC Act, the BC Act or by DBCA were recorded within the survey area. Two Bush Forever significant species was recorded, namely *Alyogyne huegelii* and *Melaleuca cardiophylla*. *Alyogyne huegelii* was recorded opportunistically from 17 locations (32 individuals), while *Melaleuca cardiophylla* was mapped within the '*Melaleuca cardiophylla* Closed Heath' vegetation community a >50% cover (9.34 ha; 16.4% of the survey area). Both species had been previously recorded within the survey area by Natural Area (2019), however were not identified as significant.

A total of 52 weed species were recorded within the survey area, representing an overall increase in the number of weed species recorded by Natural Area (2019), who recorded 44 introduced taxa. Given the time between surveys (2018 to 2023), a slight increase in the number of weed species recorded could be attributed to an increase in survey effort, natural fluctuations in occurrence or natural movement.

Of the 52 weed species recorded within the survey area, **Asparagus asparagoides* (Bridal Creeper) is listed as a WoNS and as a Declared Pest under the BAM Act, and **Moraea flaccida* (One-leaf Cape Tulip) is listed as a Declared Pest under the BAM Act. Both species are categorised as s22(2) (exempt). Declared Pests "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2022b). Bridal Creeper was recorded from one location (one individual), along the south-eastern boundary of the survey area within the 'Mixed Open Shrubland' vegetation community. Bridal Creeper was not recorded previously by Natural Area (2019). One-leaf Cape Tulip was recorded at two point-locations (two individuals) and five polygon

locations (all <5% cover), with majority of records occurring in the southern half of the survey area within the 'Mixed Open Shrubland' and '*Melaleuca cardiophylla* Closed Heath' vegetation communities. One-leaf Cape Tulip was not recorded previously by Natural Area (2019).

Of the 52 weed species recorded, 18 are listed on the City of Joondalup priority weed list for Ocean Reef Foreshore Reserve. Of these, **Ehrharta longiflora* (Annual Veldt Grass), **Euphorbia terracina* (Geraldton Carnation Weed), **Pelargonium capitatum* (Rose Pelargonium) and **Trachyandra divaricata* (Onion Weed) were the most prevalent across the survey area, occurring at low to moderate densities across the survey area. The City's declared pest plant, **Tribulus terrestris* (Caltrop), was not recorded within the survey area, and has not been previously recorded (Natural Area 2019).

5.2. Vegetation

A total of four vegetation communities were delineated and mapped within the survey area. Quadrats previously established by Natural Area (2019) were re-surveyed (twelve in total), with a minimum of three quadrats established per vegetation community, as specified in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). One additional quadrat (Q13) was established within the '*Melaleuca cardiophylla* Closed Heath' vegetation community. Vegetation codes and descriptions previously described by Natural Area (2019) remained valid between the two survey periods and as such were retained for consistency.

Extent of vegetation communities recorded within the survey area has remained relatively consistent since the 2018 assessment, with minor changes accounted for due to the increase in survey area size and refinement of boundaries in 2023. Extent of the 'Mixed Open Shrubland' vegetation community was reduced by 2.7 hectares, due to areas of this community along the western boundary reclassified to 'Open Beach/Rocks' during the current survey. An additional 1.6 ha of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was mapped within the survey area, which can be attributed to the refinement of boundaries in 2023.

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of the multivariate analysis showed that quadrats within vegetation community '*Acacia rostellifera* Shrubland' had a moderate affiliation with FCT 29a, while quadrats within vegetation communities 'Mixed Open Shrubland' and '*Melaleuca cardiophylla* Closed Heath' had a moderate to strong affiliation with FCT 29a. FCT 29a, described as 'coastal shrublands on shallow sands, mostly heaths on shallow sands over limestone close to the coast' is listed as a Priority 3 ecological community (DBCA 2023b). These communities, covering a total of 50.3 ha (88.6% of the survey area), are considered to represent floristic aspects of FCT 29a. Common species recorded include *Acanthocarpus preissii*, *Rhagodia baccata*, *Spyridium globulosum*, *Crassula colorata*, *Daucus glochidiatus*, *Austrostipa flavescens*, *Hardenbergia comptoniana* and *Leucopogon parviflorus*. These results are consistent with Natural Area (2019), who similarly assigned FCT 29a to vegetation communities '*Acacia rostellifera* Shrubland', 'Mixed Open Shrubland' and '*Melaleuca cardiophylla* Closed Heath' (Natural Area 2019).

One quadrat (Q13) within a patch of the '*Melaleuca cardiophylla* Closed Heath' vegetation community was found to have a moderate affiliation with FCT 24, as well as a strong affiliation with FCT 29a (described above). FCT 24, described as 'Northern Spearwood shrublands and woodlands' is listed as a Priority 3 ecological community (DBCA 2023b). It is described as occurring on deeper soils and Tamala

limestone of the spearwood system, with heathlands typically including *Calothamnus quadrifidus*, *Banksia sessilis* and *Ammothryon grandiflorum*. The patch, totaling 1.3 hectares (2.3% of the survey area), has elements of both FCT 29a (as described above) and FCT 24, based on similarities in landform (occurring on limestone), vegetation structure (heathland) and species composition, with common species recorded including *Banksia sessilis*, *Calothamnus quadrifidus*, *Hardenbergia comptoniana*, *Dianella revoluta*, *Lomandra maritima*, **Bromus diandrus* and **Lysimachia arvensis*. It is noted that Bush Forever results for Site 325 have FCT 27 listed as the limestone community occurring in the general area, however both Bush Forever sites to the north (Site 323) and south (Site 308) of this area have FCT 24 listed as occurring.

Quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' were not assessed against FCTs defined by Gibson *et al*. (1994) due to poor condition and low species diversity. Quadrats within vegetation community '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' are, subjectively, likely to represent Supergroup S14: *Spinifex longifolius* grassland and low shrublands, based on species, location and landform (Keighery *et al*. 2012). Supergroup 4: S14 is not listed as a Threatened or Priority Ecological Community. Natural Area did not assign an FCT to this vegetation community due to low species diversity and condition (Natural Area 2019), however the current findings are further supported with S14 listed as inferred to be present within the Bush Forever site 325 (Government of Western Australia 2000).

Vegetation within the survey area does not represent the Banksia Woodlands of the Swan Coastal Plain TEC due to the absence of key diagnostic species present within the survey area (e.g., *Banksia attenuata*, *B. menziesii*, *B. prionotes*, *B. ilicifolia*; TSSC 2016). As such, the full four-stage assessment for this TEC, as outlined in the approved conservation advice (TSSC 2016), was not completed for the survey area.

Vegetation within the survey area does not represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC due to the absence of *Eucalyptus gomphocephala* trees within the survey area. As such, the full assessment for this TEC, as outlined in the approved conservation advice (DotEE 2019), was not completed for the survey area.

It is noted that the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion was listed as a TEC in effect under the EPBC Act 1999 from 15 November 2023 (post-field survey). As such, an assessment against diagnostic characteristics listed in the approved conservation advice (DCCEEW 2023), was not completed. In WA the nationally defined Honeymyrtle shrubland ecological community is typically identified and mapped as FCT 26a *Melaleuca huegelii – M. systena* shrublands of limestone ridges (Gibson 1994; DCCEEW 2023). Vegetation within the '*Melaleuca cardiophylla* Closed Heath' vegetation community, though dominated by *Melaleuca huegelii*, is not considered as likely representing the TEC, with FCT analysis of the patch finding no affiliation with FCT 26a. Vegetation within the '*Melaleuca cardiophylla* Closed Heath' vegetation community showed an affiliation with FCT 24 and FCT 29a (as mentioned above), which typically have more near-coastal species than other more inland communities known to occur on Tamala limestone, including 26a, which was reflected in the quadrat data with species such as *Acanthocarpus preissii*, *Threlkeldia diffusa* and *Olearia axillaris* being prominent.

Vegetation condition within the survey area ranged from Completely Degraded to Excellent condition, based on the Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and*

Vegetation Surveys for Environmental Impact Assessment (EPA 2016). Majority of the survey area was observed to be in Excellent condition (36.3 hectares; 63.9% of the survey area). Proportions of each vegetation condition class within the survey area have remained relatively consistent between survey periods, with a slight decrease in areas classed as being in Excellent condition (38.4 ha in 2018 compared to 36.3 ha in 2023). This is likely accounted for in the refinement of boundaries in 2023, with areas previously classed as Excellent condition along the western boundary of the survey area reclassified to 'Open Beach/Rocks'. Disturbances within the survey area included the presence of weeds, edge effects (lesser condition) adjacent to tracks/cleared areas, access to dunes via unauthorised tracks, and rubbish dumping/camp areas. One particularly large rubbish/camp area was observed at m E379880; N6484878, consisting of a couch/armchair, and unauthorised skate ramps.

Further dune stabilisation works within the survey area (e.g., planting works, matting) can be undertaken to reduce erosion of the sand dunes. In addition, unauthorised access to the dunes may prevent establishment of vegetation in these areas, due to disturbance and trampling. Repair and maintenance of fencing around the dunes, including clearly marked authorised tracks, will reduce the risk of dune disturbance and increase the success of dune stabilisation works.

5.3. Fauna

Two conservation listed fauna species were recorded from the field survey, namely Osprey (*Pandion haliaetus*), listed as Migratory under the EPBC Act and BC Act, and Quenda (*Isoodon fusciventer*), listed as P4 by DBCA. Quenda was directly observed at one location (m 379125E; 6487303N), while Osprey was observed flying overhead during the field survey.

The Osprey (*Pandion haliaetus*; listed as MI under the EPBC Act and BC Act) is a medium-sized raptor (length 50–65 cm; wingspan 145–170 cm), dark brown to black/brown above and white below with a white head and neck (DCCEEW 2022). The breeding range of the Eastern Osprey extends around the northern coast of Australia from Albany in Western Australia to Lake Macquarie in NSW, with the species occurring in littoral and coastal habitats and wetlands, occasionally travelling inland, particularly in northern Australia (DCCEEW 2022). This species has been previously recorded from other coastal reserves in the City of Joondalup, including Iluka-Burns Beach Foreshore Reserve (ELA 2021) and Hillarys-Kallaroo Coastal Foreshore Reserve (ELA 2022). Within the survey area, one individual of this species was recorded flying overhead, and it is considered likely that this species may frequent habitat within the survey area to rest or hunt.

The Quenda (*Isoodon fusciventer*; listed as P4 by DBCA) is a medium-sized ground dwelling marsupial with coarse dark greyish brown fur above and creamy white below, a tapered, dark brown tail and short, rounded ears (Threatened Species Recovery Hub 2021). Though this species is widespread, occurring along an arc in on the Swan Coastal Plain from Geraldton to Esperance in WA, population numbers are in decline due to habitat loss via land clearing, altered fire regimes, predation from feral species and competition for resources (Bryant 2019). The species known to inhabit urban backyards and parklands, bush fragments and conservation reserves (Bryant 2019), with records of this species known from other coastal reserves in the City of Joondalup (e.g., Iluka-Burns Beach Foreshore Reserve; ELA 2021). This species prefers areas of scrubby vegetation (often swampy areas) with a dense cover of up to 1 m in height, often foraging in adjacent forest and woodland areas. Within the survey area, one individual of

this species was recorded from one location within the Mixed Open Shrubland vegetation community (m 405366E; m 6436363N).

Three introduced fauna species were directly observed during the field survey, namely **Vulpes vulpes* (European Red Fox), **Apis* sp. (European Honeybee) and **Ommatoiulus moreleti* (Portuguese Millipede). The European Red Fox was recorded several times, with sightings in both the northern and southern sections of the survey area. European Honeybee and Portuguese Millipede were recorded opportunistically, with one European Honeybee nest observed at m E379880; N6484878) in an old, discarded armchair. Control of feral animals within the survey area would positively impact native animals, particularly for European Red Fox (**Vulpes vulpes)* to reduce predation on the Priority 4 listed Quenda (*Isoodon fusciventer*), and for European Honeybee (**Apis* sp.) to reduce the competition for hollows for native birds.

5.4. Recommendations

Based on results of the current survey, the following recommendations have been made to assist in the conservation of native flora, vegetation and environmental values present within Ocean Reef Foreshore Reserve:

- Continue long-term monitoring of weed populations within the survey area. Implement weed control, particularly for Weeds of National Significance and Declared Pests (e.g., **Asparagus asparagoides* and **Moraea flaccida*) and City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Prioritise maintenance of the vegetation at Ocean Reef Foreshore Reserve due to the presence of the Floristic Community Type 29a and Floristic Community Type 24 Priority 3 Ecological Communities.
- Consider completing Targeted fauna works to determine the population numbers and extent of Quenda within the Ocean Reef Foreshore Reserve.
- Undertake ongoing feral animal control, particularly for European Red Fox (**Vulpes vulpes)* to reduce predation on the Priority 4 listed Quenda (*Isoodon fusciventer*), and for European Honeybee (**Apis* sp.) to reduce the competition for hollows for native birds.
- Continue monitoring for evidence of pathogens and maintain correct hygiene practices within the survey area.
- Monitor the dumping of large rubbish (e.g., unauthorised camps, skate areas) and remove where necessary.
- Limit uncontrolled access to the dunes (establish/repair fencing where necessary).
- Continue dune stabilisation works (e.g., planting, matting) to reduce erosion, where required.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

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

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

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Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	M	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

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

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

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Orchid species recorded at Ocean Reef Foreshore Reserve



Caladenia latifolia (Pink Fairy Orchid)

Appendix C Flora species list

Family	Species	Common Name	Natural Area 2019	ELA 2023
Aizoaceae	**Carpobrotus edulis*	Hottentot Fig	X	X
Aizoaceae	**Tetragonia decumbens*	Sea Spinach	X	X
Aizoaceae	*Carpobrotus virescens*	Coastal Pigface	X	X
Apiaceae	*Apium prostratum* subsp. *prostratum* var. *prostratum*	Sea Celery		X
Apiaceae	*Daucus glochidiatus*	Australian Carrot	X	X
Araliaceae	*Trachymene pilosa*	Native Parsnip		X
Arecaceae	**Phoenix dactylifera*	Date Palm	X	
Asparagaceae	**Asparagus asparagoides*	Bridal Creeper		X
Asparagaceae	*Acanthocarpus preissii*		X	X
Asparagaceae	*Lomandra maritima*		X	X
Asparagaceae	*Thysanotus manglesianus*	Mangles' Fringed Lily		X
Asphodelaceae	**Trachyandra divaricata*		X	X
Asteraceae	**Arctotheca calendula*	Cape Weed	X	X
Asteraceae	**Arctotheca populifolia*	Dune Arctotheca	X	X
Asteraceae	**Arctotis stoechadifolia*	White Arctotis	X	
Asteraceae	**Lactuca serriola*	Prickly Lettuce	X	
Asteraceae	**Montanoa* sp.	Tree Daisy	X	
Asteraceae	**Osteospermum ecklonis*			X
Asteraceae	**Senecio elegans*	Purple Groundsel	X	
Asteraceae	**Sonchus oleraceus*	Common Sowthistle	X	X
Asteraceae	**Urospermum picroides*	False Hawkbit	X	X
Asteraceae	*Leucophyta brownii*		X	X
Asteraceae	*Olearia axillaris*	Coastal Daisybush	X	X
Asteraceae	*Pithocarpa cordata*	Tangle Daisy	X	X
Asteraceae	*Podotheca angustifolia*	Sticky Longheads		X
Asteraceae	*Rhodanthe corymbosa*			X
Asteraceae	*Senecio pinnatifolius*		X	X
Brassicaceae	**Arabis* sp. (Stock Plant)			X
Brassicaceae	**Brassica tournefortii*	Mediterranean Turnip	X	X

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Family	Species	Common Name	Natural Area 2019	ELA 2023
Brassicaceae	**Cakile edentula*	American Sea Rocket		X
Brassicaceae	**Cakile maritima*	Sea Rocket	X	
Brassicaceae	**Matthiola incana*	Common Stock	X	
Brassicaceae	**Raphanus raphanistrum*	Wild Radish		X
Campanulaceae	*Isotoma hypocrateriformis*	Woodbridge Poison	X	X
Caprifoliaceae	**Centranthus macrosiphon*			X
Caryophyllaceae	**Cerastium glomeratum*	Mouse Ear Chickweed		X
Caryophyllaceae	**Petrorhagia dubia*			X
Caryophyllaceae	**Silene gallica*	French Catchfly	X	X
Caryophyllaceae	**Stellaria media*	Chickweed		X
Casuarinaceae	**Casuarina equisetifolia*			X
Casuarinaceae	*Allocasuarina humilis*	Dwarf Sheoak	X	
Casuarinaceae	*Allocasuarina lehmanniana*	Dune Sheoak		X
Casuarinaceae	*Casuarina obesa*	Swamp Sheoak	X	
Celastraceae	*Stackhousia monogyna*			X
Chenopodiaceae	*Atriplex cinerea*	Grey Saltbush	X	X
Chenopodiaceae	*Atriplex isatidea*	Coast Saltbush	X	X
Chenopodiaceae	*Rhagodia baccata*	Berry Saltbush	X	X
Chenopodiaceae	*Salicornia quinqueflora*	Beaded Samphire	X	X
Chenopodiaceae	*Threlkeldia diffusa*	Coast Bonefruit	X	X
Convolvulaceae	**Cuscuta planiflora*		X	X
Convolvulaceae	**Cuscuta epithymum*	Lesser Dodder		X
Crassulaceae	**Crassula glomerata*		X	X
Crassulaceae	*Crassula colorata*	Dense Stonecrop		X
Cupressaceae	*Callitris preissii*	Rottnest Island Pine	X	X
Cyperaceae	*Ammothryon grandiflorum*	Large Flowered Bog-rush		X
Cyperaceae	*Ficinia marginata*	Coarse Club Rush		X
Cyperaceae	*Ficinia nodosa*	Knotted Club Rush	X	X
Cyperaceae	*Lepidosperma calcicola*			X

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Family	Species	Common Name	Natural Area 2019	ELA 2023
Cyperaceae	*Lepidosperma costale*		X	
Cyperaceae	*Lepidosperma gladiatum*	Coast Sword-sedge	X	X
Dilleniaceae	*Hibbertia racemosa*	Stalked Guinea Flower	X	X
Ericaceae	*Acrotriche cordata*	Coast Ground Berry	X	X
Ericaceae	*Styphelia insularis*		X	
Ericaceae	*Leucopogon parviflorus*	Coast Beard-heath	X	X
Ericaceae	*Styphelia insularis*			X
Euphorbiaceae	**Euphorbia paralias*	Sea Spurge	X	X
Euphorbiaceae	**Euphorbia peplus*	Petty Spurge	X	X
Euphorbiaceae	**Euphorbia terracina*	Geraldton Carnation Weed	X	X
Fabaceae	**Medicago polymorpha*	Burr Medic	X	X
Fabaceae	**Melilotus indicus*		X	X
Fabaceae	**Retama raetam*			X
Fabaceae	**Trifolium campestre*	Hop Clover		X
Fabaceae	*Acacia cochlearis*	Rigid Wattle	X	X
Fabaceae	*Acacia cyclops*	Coastal Wattle		X
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*	Panjang	X	X
Fabaceae	*Acacia rostellifera*	Summer-scented Wattle	X	X
Fabaceae	*Acacia saligna*	Orange Wattle	X	X
Fabaceae	*Acacia truncata*		X	X
Fabaceae	*Acacia xanthina*	White-stemmed Wattle	X	
Fabaceae	*Bossiaea eriocarpa*	Common Brown Pea		X
Fabaceae	*Gastrolobium nervosum*		X	X
Fabaceae	*Gompholobium tomentosum*	Hairy Yellow Pea	X	X
Fabaceae	*Hardenbergia comptoniana*	Native Wisteria	X	X
Fabaceae	*Kennedia prostrata*	Scarlet Runner	X	X
Fabaceae	*Templetonia retusa*	Cockies Tongues	X	X
Frankeniaceae	*Frankenia pauciflora*	Seaheath	X	X
Gentianaceae	**Centaurium pulchellum*		X	X

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Family	Species	Common Name	Natural Area 2019	ELA 2023
Geraniaceae	**Pelargonium capitatum*	Rose Pelargonium	X	X
Goodeniaceae	*Scaevola crassifolia*	Thick-leaved Fan-flower	X	X
Goodeniaceae	*Scaevola nitida*	Shinning Fanflower	X	X
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*		X	X
Hemerocallidaceae	*Dianella revoluta*	Blueberry Lily	X	X
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily	X	X
Iridaceae	**Gladiolus caryophyllaceus*	Wild Gladiolus		X
Iridaceae	**Moraea flaccida*	One-leaf Cape Tulip		X
Iridaceae	**Romulea rosea*	Guildford Grass	X	X
Lamiaceae	*Hemiandra glabra*		X	X
Lauraceae	*Cassytha racemosa*	Dodder Laurel	X	X
Loganiaceae	*Logania vaginalis*	White Spray	X	X
Malvaceae	**Malva parviflora*	Marshmallow	X	
Malvaceae	*Alyogyne huegelii*	Lilac Hibiscus	X	X
Malvaceae	*Thomasia triphylla*		X	X
Montiaceae	*Calandrinia* sp.			X
Myrtaceae	**Eucalyptus utilis*		X	
Myrtaceae	**Melaleuca nesophila*	Mindiyed	X	X
Myrtaceae	*Agonis flexuosus*	Peppermint Tree	X	X
Myrtaceae	*Calothamnus quadrifidus*	One-sided Bottlebrush	X	X
Myrtaceae	**Eucalyptus utilis*	Coastal Moort		X
Myrtaceae	*Melaleuca cardiophylla*	Tangling Melaleuca	X	X
Myrtaceae	*Melaleuca huegelii*	Chenille Honeymyrtle	X	X
Myrtaceae	*Melaleuca lanceolata*	Rottnest Teatree	X	X
Myrtaceae	*Melaleuca systena*		X	X
Nitrariaceae	*Nitraria billardierei*	Nitre Bush	X	X
Olacaceae	*Olax benthamiana*		X	X
Onagraceae	**Oenothera drummondii*	Beach Evening Primrose	X	X
Orchidaceae	*Caladenia latifolia*	Pink Fairies		X

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Family	Species	Common Name	Natural Area 2019	ELA 2023
Orobanchaceae	**Bellardia trixago*	Bellardia	X	X
Oxalidaceae	**Oxalis pes-caprae*	Soursob		X
Papaveraceae	**Fumaria capreolata*	Whiteflower Fumitory	X	X
Phyllanthaceae	*Lysiandra calycina*	False Boronia		X
Phyllanthaceae	*Phyllanthus calycinus*	False Boronia	X	
Plantaginaceae	**Plantago lanceolata*	Ribwort Plantain	X	
Poaceae	**Avena barbata*	Bearded Oat Grass	X	
Poaceae	**Avena fatua*	Wild Oat		X
Poaceae	**Bromus diandrus*	Great Brome	X	X
Poaceae	**Catapodium rigidum*	Rigid Fescue	X	X
Poaceae	**Cenchrus echinatus*	Burrgrass	X	X
Poaceae	**Ehrharta longiflora*	Annual Veldt Grass	X	X
Poaceae	**Lagurus ovatus*	Hare's Tail Grass	X	X
Poaceae	**Lolium rigidum*	Wimmera Ryegrass	X	
Poaceae	**Stenotaphrum secundatum*	Buffalo Grass	X	X
Poaceae	**Thinopyrum distichum*	Sea wheatgrass	X	X
Poaceae	**Vulpia bromoides*	Squirrel Tail Fescue		X
Poaceae	*Austrostipa flavescens*		X	X
Poaceae	*Poa poiformis*	Coastal Poa	X	X
Poaceae	*Spinifex hirsutus*	Hairy Spinifex	X	X
Poaceae	*Spinifex longifolius*	Beach Spinifex	X	X
Poaceae	*Sporobolus virginicus*	Marine Couch	X	X
Polygalaceae	*Comesperma confertum*		X	X
Polygalaceae	*Comesperma integerrimum*		X	X
Primulaceae	**Lysimachia arvensis*	Pimpernel	X	X
Proteaceae	*Banksia dallanneyi*	Couch Honeypot	X	
Proteaceae	*Banksia sessilis*	Parrot Bush	X	X
Proteaceae	*Grevillea preissii*		X	X
Proteaceae	*Petrophile serruriae*			X

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Family	Species	Common Name	Natural Area 2019	ELA 2023
Ranunculaceae	*Clematis linearifolia*		X	X
Restionaceae	*Desmocladus flexuosus*		X	X
Rhamnaceae	*Spyridium globulosum*	Basket Bush	X	X
Rhamnaceae	*Trymalium ledifolium*			X
Rubiaceae	**Galium murale*	Small Goosegrass		X
Rubiaceae	*Opercularia vaginata*	Dog Weed	X	X
Santalaceae	*Exocarpos sparteus*	Broom Ballart	X	X
Santalaceae	*Leptomeria preissiana*		X	X
Santalaceae	*Santalum acuminatum*	Quandong	X	X
Sapindaceae	*Diplopeltis huegelii*			X
Scrophulariaceae	**Dischisma arenarium*		X	X
Scrophulariaceae	*Eremophila glabra*	Tar Bush	X	X
Scrophulariaceae	*Myoporum insulare*	Blueberry Tree	X	X
Solanaceae	*Anthocercis littorea*	Yellow Tailflower	X	X
Thymelaeaceae	*Pimelea ferruginea*		X	X
Urticaceae	*Parietaria debilis*	Pellitory	X	X

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Appendix D Species by site matrix

Family	Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Oppo
Aizoaceae	**Carpobrotus edulis*														X
Aizoaceae	**Tetragonia decumbens*		X					X		X			X		
Aizoaceae	*Carpobrotus virescens*								X	X	X		X	X	
Apiaceae	*Apium prostratum* subsp. *prostratum* var. *prostratum*										X				
Apiaceae	*Daucus glochidiatus*	X		X	X		X				X				
Araliaceae	*Trachymene pilosa*												X	X	
Asparagaceae	**Asparagus asparagoides*														X
Asparagaceae	*Acanthocarpus preissii*			X	X	X	X		X		X		X	X	
Asparagaceae	*Lomandra maritima*						X						X	X	
Asparagaceae	*Thysanotus manglesianus*														X
Asphodelaceae	**Trachyandra divaricata*		X			X		X	X	X					
Asteraceae	**Arctotheca calendula*														X
Asteraceae	**Arctotheca populifolia*														X
Asteraceae	**Osteospermum ecklonis*														X
Asteraceae	**Sonchus oleraceus*	X		X		X	X		X	X	X	X	X	X	
Asteraceae	**Urospermum picroides*										X	X			
Asteraceae	*Leucophyta brownii*								X	X					
Asteraceae	*Olearia axillaris*		X	X	X		X	X	X	X	X	X	X	X	
Asteraceae	*Pithocarpa cordata*														X
Asteraceae	*Podotheca angustifolia*			X											
Asteraceae	*Rhodanthe corymbosa*										X			X	
Asteraceae	*Senecio pinnatifolius*								X	X	X		X	X	
Brassicaceae	**Arabis* sp. (Stock Plant)														X
Brassicaceae	**Brassica tournefortii*			X											
Brassicaceae	**Cakile maritima*		X					X		X					
Brassicaceae	**Raphanus raphanistrum*														X
Campanulaceae	*Isotoma hypocrateriformis*				X										
Caprifoliaceae	**Centranthus macrosiphon*														X
Caryophyllaceae	**Cerastium glomeratum*						X				X		X	X	

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Family	Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Oppo
Caryophyllaceae	**Petrorhagia dubia*														X
Caryophyllaceae	**Silene gallica*				X										
Caryophyllaceae	**Stellaria media*														X
Casuarinaceae	**Casuarina equisetifolia*														X
Casuarinaceae	*Allocasuarina lehmanniana*														X
Celastraceae	*Stackhousia monogyna*														X
Chenopodiaceae	*Atriplex cinerea*														X
Chenopodiaceae	*Atriplex isatidea*														X
Chenopodiaceae	*Rhagodia baccata*	X		X	X	X	X		X		X	X	X	X	
Chenopodiaceae	*Salicornia quinqueflora*														X
Chenopodiaceae	*Threlkeldia diffusa*			X	X	X	X		X		X		X	X	
Convolvulaceae	**Cuscuta planiflora*														X
Convolvulaceae	**Cuscuta epithymum*					X					X				
Crassulaceae	**Crassula glomerata*	X	X	X	X	X	X		X	X	X		X	X	
Crassulaceae	*Crassula colorata*													X	
Cupressaceae	*Callitris preissii*														X
Cyperaceae	*Ammothryon grandiflorum*													X	
Cyperaceae	*Ficinia marginata*													X	
Cyperaceae	*Ficinia nodosa*		X			X				X					
Cyperaceae	*Lepidosperma calcicola*			X	X		X							X	
Cyperaceae	*Lepidosperma gladiatum*			X											
Dilleniaceae	*Hibbertia racemosa*			X											
Ericaceae	*Acrotriche cordata*				X										
Ericaceae	*Leucopogon parviflorus*			X	X		X				X			X	
Ericaceae	*Styphelia insularis*			X	X		X						X	X	
Euphorbiaceae	**Euphorbia paralias*									X					
Euphorbiaceae	**Euphorbia peplus*						X								
Euphorbiaceae	**Euphorbia terracina*			X		X	X					X	X		
Fabaceae	**Medicago polymorpha*						X		X		X	X			

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Family	Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Oppo
Fabaceae	**Melilotus indicus*				X						X			X	
Fabaceae	**Retama raetam*														X
Fabaceae	**Trifolium campestre*				X									X	
Fabaceae	*Acacia cochlearis*	X										X			
Fabaceae	*Acacia cyclops*			X										X	
Fabaceae	*Acacia lasiocarpa*			X	X		X							X	
Fabaceae	*Acacia rostellifera*	X		X		X						X	X	X	
Fabaceae	*Acacia saligna*														X
Fabaceae	*Acacia truncata*			X	X						X			X	
Fabaceae	*Bossiaea eriocarpa*														X
Fabaceae	*Gastrolobium nervosum*			X											
Fabaceae	*Gompholobium tomentosum*				X									X	
Fabaceae	*Hardenbergia comptoniana*			X			X				X		X	X	
Fabaceae	*Kennedia prostrata*										X			X	
Fabaceae	*Templetonia retusa*			X	X						X			X	
Frankeniaceae	*Frankenia pauciflora*								X						
Gentianaceae	**Centaurium pulchellum*				X									X	
Geraniaceae	**Pelargonium capitatum*	X		X		X				X	X	X			
Goodeniaceae	*Scaevola crassifolia*	X							X			X			
Goodeniaceae	*Scaevola nitida*					X									
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*			X			X						X	X	
Hemerocallidaceae	*Dianella revoluta* var. *revoluta*				X		X							X	
Hemerocallidaceae	*Tricoryne elatior*														X
Iridaceae	**Gladiolus caryophyllaceus*													X	
Iridaceae	**Moraea flaccida*				X										
Iridaceae	**Romulea rosea*			X					X						
Lamiaceae	*Hemiandra glabra*			X											
Lauraceae	*Cassytha racemosa*			X	X									X	
Loganiaceae	*Logania vaginalis*														X

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Family	Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Oppo
Malvaceae	*Alyogyne huegelii*														X
Malvaceae	*Thomasia triphylla*				X										
Montiaceae	*Calandrinia sp.*												X		
Myrtaceae	*Agonis flexuosa*														X
Myrtaceae	*Calothamnus quadrifidus*													X	
Myrtaceae	**Eucalyptus utilis*														X
Myrtaceae	*Melaleuca cardiophylla*				X		X		X		X				
Myrtaceae	*Melaleuca huegelii*				X						X			X	
Myrtaceae	*Melaleuca lanceolata*														X
Myrtaceae	**Melaleuca nesophila*														X
Myrtaceae	*Melaleuca systena*			X			X							X	
Nitrariaceae	*Nitraria billardierei*														X
Olacaceae	*Olax benthamiana*														X
Onagraceae	**Oenothera drummondii*														X
Orchidaceae	*Caladenia latifolia*														X
Orobanchaceae	**Bellardia trixago*														X
Oxalidaceae	**Oxalis pes-caprae*				X										
Papaveraceae	**Fumaria capreolata*						X								
Phyllanthaceae	*Lysiandra calycina*				X									X	
Poaceae	**Avena barbata*					X									
Poaceae	**Bromus diandrus*			X		X			X		X	X	X	X	
Poaceae	**Catapodium rigidum*														X
Poaceae	**Cenchrus echinatus*														X
Poaceae	**Ehrharta longiflora*			X		X	X				X	X	X	X	
Poaceae	**Lagurus ovatus*	X		X	X	X	X		X		X	X			
Poaceae	**Stenotaphrum secundatum*														X
Poaceae	**Thinopyrum distichum*														
Poaceae	**Vulpia bromoides*													X	
Poaceae	*Austrostipa flavescens*			X	X		X								

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Family	Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Oppo
Poaceae	*Poa poiformis*			X	X		X				X			X	
Poaceae	*Spinifex hirsutus*		X					X							
Poaceae	*Spinifex longifolius*		X					X		X					
Poaceae	*Sporobolus virginicus*														X
Polygalaceae	*Comesperma confertum*				X										
Polygalaceae	*Comesperma integerrimum*				X										
Primulaceae	**Lysimachia arvensis*	X		X	X	X	X		X		X	X	X	X	
Proteaceae	*Banksia sessilis*													X	
Proteaceae	*Grevillea preissii*													X	
Proteaceae	*Petrophile serruriae*														X
Ranunculaceae	*Clematis linearifolia*			X			X				X		X		
Restionaceae	*Desmocladus flexuosus*						X				X			X	
Rhamnaceae	*Spyridium globulosum*	X		X	X		X				X		X	X	
Rhamnaceae	*Trymalium ledifolium*														X
Rubiaceae	**Galium murale*	X					X				X		X	X	
Rubiaceae	*Opercularia vaginata*			X	X									X	
Santalaceae	*Exocarpos sparteus*			X											
Santalaceae	*Leptomeria preissiana*														X
Santalaceae	*Santalum acuminatum*			X											
Sapindaceae	*Diplopeltis huegelii*										X				
Scrophulariaceae	**Dischisma arenarium*			X			X						X	X	
Scrophulariaceae	*Eremophila glabra*				X				X		X			X	
Scrophulariaceae	*Myoporum insulare*								X	X			X		
Solanaceae	*Anthocercis littorea*														X
Thymelaeaceae	*Pimelea ferruginea*				X										
Urticaceae	*Parietaria debilis*										X	X	X	X	

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Appendix E Quadrat data

Quadrat	Date	Site type	Observer
Q1	19/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	*Acacia rostellifera* Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	50	SW	Secondary dune
Easting		**Northing**	
380026		6483909	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acacia rostellifera	70	M	Shrubs >2m
Spyridium globulosum	25	M	Shrubs 1-2m
Rhagodia baccata	2	M	Shrubs 1-2m
Scaevola crassifolia	1.5	M	Shrubs <1m
Acacia cochlearis	0.5	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Lagurus ovatus*	0.1	G	Grasses
**Lysimachia arvensis*	0.2	G	Herbs
**Pelargonium capitatum*	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Daucus glochidiatus	0.1	G	Herbs

Quadrat	Date	Site type	Observer
Q2	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Degraded	Weeds	No evidence	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
White sand	0	W	Foredune
Easting		**Northing**	
379943		6483936	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Olearia axillaris	5	M	Shrubs <1m
**Tetragonia decumbens*	2	M	Shrubs <1m
Ficinia nodosa	0.2	G	Sedges
**Thinopyrum distichum*	30	G	Grasses
Spinifex hirsutus	20	G	Grasses
Spinifex longifolius	0.5	G	Grasses

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Cakile maritima*	0.5	G	Herbs
**Trachyandra divaricata*	0.5	G	Herbs
**Crassula glomerata*	0.01	G	Herbs

Quadrat	Date	Site type	Observer
Q3	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	Mixed Open Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
White sand	1	W	Tertiary dune
Easting		**Northing**	
379889		6484504	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acacia cyclops	10	M	Shrubs 1-2m
Santalum acuminatum	5	M	Shrubs 1-2m
Spyridium globulosum	5	M	Shrubs 1-2m
Acacia rostellifera	2.5	M	Shrubs 1-2m
Olearia axillaris	2	M	Shrubs 1-2m
Acanthocarpus preissii	25	M	Shrubs <1m
Rhagodia baccata	10	M	Shrubs <1m

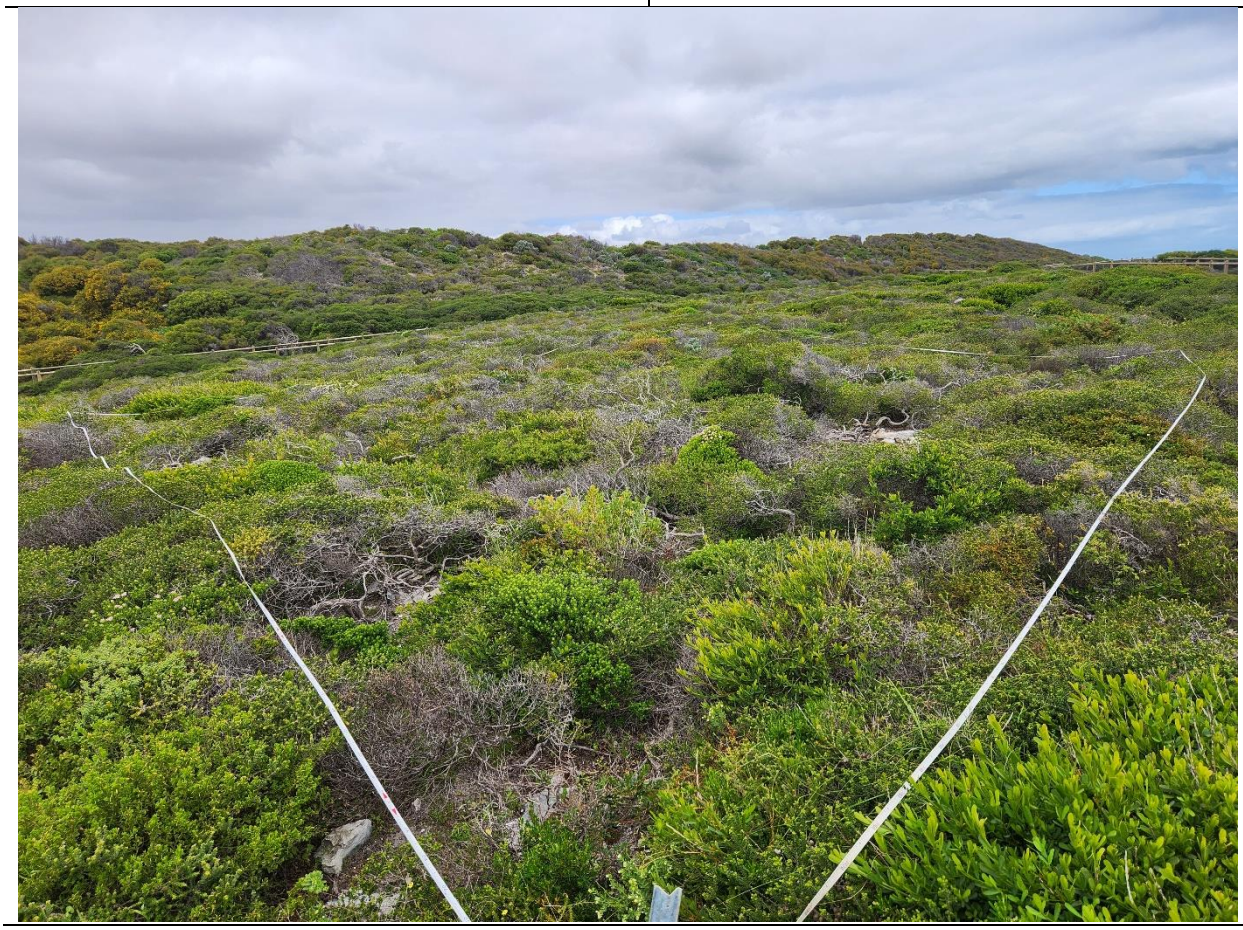
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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Melaleuca systena	4	M	Shrubs <1m
Styphelia insularis	3	M	Shrubs <1m
Templetonia retusa	3	M	Shrubs <1m
Acacia truncata	0.5	M	Shrubs <1m
Exocarpos sparteus	0.5	M	Shrubs <1m
Gastrolobium nervosum	0.5	M	Shrubs <1m
Hibbertia racemosa	0.5	M	Shrubs <1m
Leucopogon parviflorus	0.5	M	Shrubs <1m
Acacia lasiocarpa	0.3	M	Shrubs <1m
Hemiandra glabra	0.1	M	Shrubs <1m
Lepidosperma gladiatum	10	G	Sedges
Lepidosperma calcicola	0.2	G	Sedges
**Ehrharta longiflora*	0.5	G	Grasses
**Lagurus ovatus*	0.2	G	Grasses
Austrostipa flavescens	0.2	G	Grasses
**Bromus diandrus*	0.1	G	Grasses
**Lagurus ovatus*	0.1	G	Grasses
Poa poiformis	0.1	G	Grasses
Threlkeldia diffusa	5	G	Herbs
Hardenbergia comptoniana	3.5	G	Herbs
**Pelargonium capitatum*	2	G	Herbs
Clematis linearifolia	2	G	Herbs
**Lysimachia arvensis*	0.5	G	Herbs
Conostylis candicans subsp. *calcicola*	0.5	G	Herbs
**Brassica tournefortii*	0.2	G	Herbs
**Euphorbia terracina*	0.2	G	Herbs
Opercularia vaginata	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Dischisma arenarium*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Cassytha racemosa	0.1	G	Herbs

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Daucus glochidiatus	0.1	G	Herbs
**Romulea rosea*	0.05	G	Herbs
Podotheca angustifolia	0.02	G	Herbs

Quadrat	Date	Site type	Observer
Q4	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	*Melaleuca cardiophylla* Closed Heath
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	0.1	SE	Tertiary dune
Easting		**Northing**	
379834		6484613	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Melaleuca cardiophylla	50	M	Shrubs <1m
Melaleuca huegelii	10	M	Shrubs <1m
Templetonia retusa	7	M	Shrubs <1m
Styphelia insularis	5	M	Shrubs <1m
Pimelea ferruginea	3	M	Shrubs <1m
Acanthocarpus preissii	1.5	M	Shrubs <1m
Acrotriche cordata	1	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Spyridium globulosum	1	M	Shrubs <1m
Acacia lasiocarpa	0.5	M	Shrubs <1m
Acacia truncata	0.5	M	Shrubs <1m
Gompholobium tomentosum	0.5	M	Shrubs <1m
Lysiandra calycina	0.5	M	Shrubs <1m
Rhagodia baccata	0.5	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Comesperma confertum	0.1	M	Shrubs <1m
Eremophila glabra	0.1	M	Shrubs <1m
Olearia axillaris	0.1	M	Shrubs <1m
Thomasia triphylla	0.1	M	Shrubs <1m
Comesperma integerrimum	0.02	M	Shrubs <1m
Lepidosperma calcicola	0.1	G	Sedges
**Lagurus ovatus*	0.1	G	Grasses
Austrostipa flavescens	0.1	G	Grasses
Poa poiformis	0.1	G	Grasses
**Crassula glomerata*	0.5	G	Herbs
Dianella revoluta var. *revoluta*	0.5	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
**Melilotus indicus*	0.2	G	Herbs
**Oxalis pes-caprae*	0.2	G	Herbs
**Trifolium campestre*	0.2	G	Herbs
Daucus glochidiatus	0.2	G	Herbs
**Centaurium pulchellum*	0.1	G	Herbs
**Moraea flaccida*	0.1	G	Herbs
Cassytha racemosa	0.1	G	Herbs
Opercularia vaginata	0.1	G	Herbs
Threlkeldia diffusa	0.1	G	Herbs
**Silene gallica*	0.05	G	Herbs
Isotoma hypocrateriformis	0.01	G	Herbs

Quadrat	Date	Site type	Observer
Q5	19/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Good	High weed cover	No evidence	*Acacia rostellifera* Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
White sand	20	SW	Tertiary dune
Easting		**Northing**	
380103		6484536	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acacia rostellifera	70	M	Shrubs >2m
Rhagodia baccata	2	M	Shrubs 1-2m
Acanthocarpus preissii	3	M	Shrubs <1m
Scaevola nitida	0.5	M	Shrubs <1m
Ficinia nodosa	0.2	G	Sedges
**Bromus diandrus*	30	G	Grasses
**Lagurus ovatus*	15	G	Grasses

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Ehrharta longiflora*	10	G	Grasses
**Lagurus ovatus*	10	G	Grasses
**Avena barbata*	5	G	Grasses
**Euphorbia terracina*	15	G	Herbs
**Trachyandra divaricata*	5	G	Herbs
**Sonchus oleraceus*	1	G	Herbs
**Pelargonium capitatum*	0.5	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Threlkeldia diffusa	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Cuscuta epithymum*	0.1	G	Herbs

Quadrat	Date	Site type	Observer
Q6	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Very Good	Bike jump established	No evidence	*Melaleuca cardiophylla* Closed Heath
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	5	W	Tertiary dune
Easting		**Northing**	
379920		6484897	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Melaleuca cardiophylla	80	M	Shrubs 1-2m
Rhagodia baccata	2	M	Shrubs 1-2m
Styphelia insularis	5	M	Shrubs <1m
Leucopogon parviflorus	2	M	Shrubs <1m
Melaleuca systena	2	M	Shrubs <1m
Spyridium globulosum	1	M	Shrubs <1m
Acanthocarpus preissii	0.2	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Olearia axillaris	0.2	M	Shrubs <1m
Acacia lasiocarpa	0.1	M	Shrubs <1m
Desmocladus flexuosus	0.5	G	Sedges
Lepidosperma calcicola	0.3	G	Sedges
**Ehrharta longiflora*	20	G	Grasses
**Lagurus ovatus*	15	G	Grasses
Poa poiformis	0.5	G	Grasses
Austrostipa flavescens	0.2	G	Grasses
Lomandra maritima	4	G	Herbs
Hardenbergia comptoniana	2	G	Herbs
**Lysimachia arvensis*	0.5	G	Herbs
**Medicago polymorpha*	0.5	G	Herbs
**Euphorbia terracina*	0.4	G	Herbs
**Cerastium glomeratum*	0.2	G	Herbs
**Crassula glomerata*	0.2	G	Herbs
**Fumaria capreolata*	0.2	G	Herbs
Hardenbergia comptoniana	0.2	G	Herbs
Threlkeldia diffusa	0.2	G	Herbs
**Dischisma arenarium*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Clematis linearifolia	0.1	G	Herbs
Conostylis candicans subsp. calcicola	0.1	G	Herbs
Daucus glochidiatus	0.1	G	Herbs
Dianella revoluta var. revoluta	0.1	G	Herbs
**Euphorbia peplus*	0.05	G	Herbs

Quadrat	Date	Site type	Observer
Q7	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Degraded	Weeds	No evidence	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
White sand	0	W	Foredune
Easting		**Northing**	
379902		6484061	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Tetragonia decumbens*	30	M	Shrubs <1m
Olearia axillaris	0.5	M	Shrubs <1m
**Thinopyrum distichum*	10	G	Grasses
Spinifex longifolius	10	G	Grasses
Spinifex hirsutus	2.5	G	Grasses
**Cakile maritima*	0.5	G	Herbs

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Trachyandra divaricata*	0.1	G	Herbs

Quadrat	Date	Site type	Observer
Q8	18/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	Mixed Open Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	0.1	W	Primary dune
Easting		**Northing**	
379719		6484881	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Scaevola crassifolia	30	M	Shrubs <1m
Frankenia pauciflora	15	M	Shrubs <1m
Olearia axillaris	12	M	Shrubs <1m
Rhagodia baccata	5	M	Shrubs <1m
Eremophila glabra	0.5	M	Shrubs <1m
Leucophyta brownii	0.5	M	Shrubs <1m
Melaleuca cardiophylla	0.5	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acanthocarpus preissii	0.2	M	Shrubs <1m
Myoporum insulare	0.2	M	Shrubs <1m
**Bromus diandrus*	0.2	G	Grasses
**Lagurus ovatus*	0.1	G	Grasses
**Medicago polymorpha*	2.5	G	Herbs
Carpobrotus virescens	2	G	Herbs
**Trachyandra divaricata*	1.5	G	Herbs
**Lysimachia arvensis*	0.5	G	Herbs
Threlkeldia diffusa	0.5	G	Herbs
**Crassula glomerata*	0.2	G	Herbs
**Romulea rosea*	0.2	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Senecio pinnatifolius	0.1	G	Herbs

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Quadrat	Date	Site type	Observer
Q9	20/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Good	Weeds	No evidence	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
White sand	0	W	Foredune
Easting		**Northing**	
379095		6487284	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Tetragonia decumbens*	35	M	Shrubs <1m
Olearia axillaris	1	M	Shrubs <1m
Leucophyta brownii	0.5	M	Shrubs <1m
Myoporum insulare	0.5	M	Shrubs <1m
Ficinia nodosa	0.5	G	Sedges
Spinifex longifolius	30	G	Grasses

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Trachyandra divaricata*	4	G	Herbs
**Cakile maritima*	1.5	G	Herbs
**Pelargonium capitatum*	0.2	G	Herbs
Carpobrotus virescens	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Euphorbia paralias*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Senecio pinnatifolius	0.1	G	Herbs

Quadrat	Date	Site type	Observer
Q10	19/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	*Melaleuca cardiophylla* Closed Heath
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	5	W	Foredune
Easting		**Northing**	
379183		6487147	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Melaleuca cardiophylla	90	M	Shrubs 1-2m
Rhagodia baccata	5	M	Shrubs 1-2m
Olearia axillaris	0.5	M	Shrubs 1-2m
Spyridium globulosum	0.5	M	Shrubs 1-2m
Acanthocarpus preissii	0.5	M	Shrubs <1m
Melaleuca huegelii	0.5	M	Shrubs <1m
Acacia truncata	0.2	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Templetonia retusa	0.2	M	Shrubs <1m
Diplopeltis huegelii	0.1	M	Shrubs <1m
Eremophila glabra	0.1	M	Shrubs <1m
Leucopogon parviflorus	0.05	M	Shrubs <1m
Desmocladus flexuosus	0.05	G	Sedges
**Ehrharta longiflora*	3	G	Grasses
**Bromus diandrus*	0.5	G	Grasses
**Lagurus ovatus*	0.1	G	Grasses
Poa poiformis	0.1	G	Grasses
Threlkeldia diffusa	5	G	Herbs
**Melilotus indicus*	3.5	G	Herbs
**Lysimachia arvensis*	1	G	Herbs
Carpobrotus virescens	0.5	G	Herbs
Hardenbergia comptoniana	0.5	G	Herbs
**Crassula glomerata*	0.2	G	Herbs
**Pelargonium capitatum*	0.2	G	Herbs
**Sonchus oleraceus*	0.2	G	Herbs
Apium prostratum subsp. *prostratum var. prostratum*	0.2	G	Herbs
**Cerastium glomeratum*	0.1	G	Herbs
**Cuscuta epithymum*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Medicago polymorpha*	0.1	G	Herbs
**Urospermum picroides*	0.1	G	Herbs
Clematis linearifolia	0.1	G	Herbs
Daucus glochidiatus	0.1	G	Herbs
Kennedia prostrata	0.1	G	Herbs
Parietaria debilis	0.1	G	Herbs
Rhodanthe corymbosa	0.1	G	Herbs
Senecio pinnatifolius	0.05	G	Herbs

Quadrat	Date	Site type	Observer
Q11	20/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Good	Weeds	No evidence	*Acacia rostellifera* Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand, some limestone rocks	10	E	Tertiary dune
Easting		**Northing**	
379386		6486602	

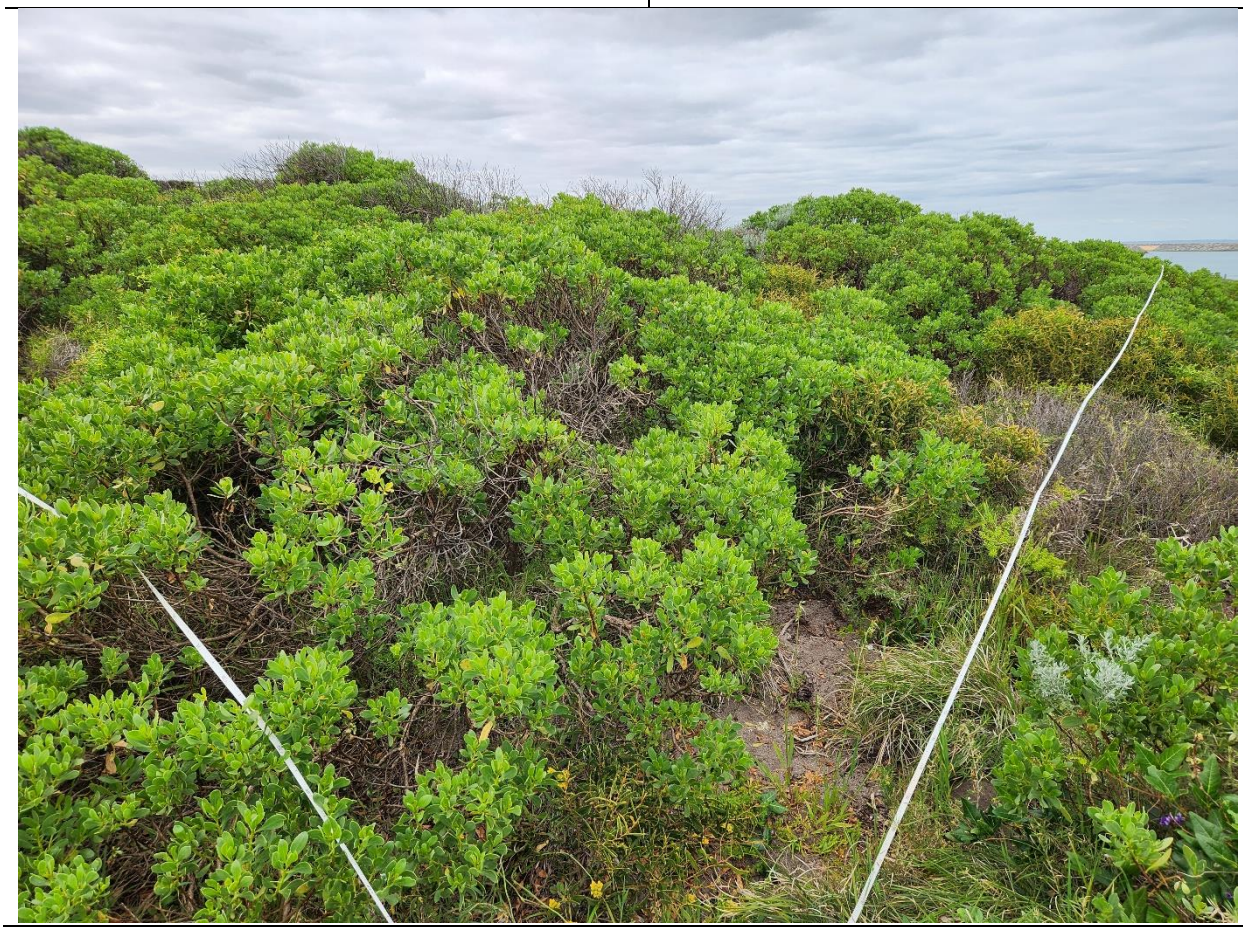


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acacia rostellifera	80	M	Shrubs >2m
Acacia cochlearis	2	M	Shrubs 1-2m
Olearia axillaris	2	M	Shrubs 1-2m
Rhagodia baccata	3	M	Shrubs <1m
Scaevola crassifolia	0.5	M	Shrubs <1m
**Ehrharta longiflora*	60	G	Grasses
**Bromus diandrus*	15	G	Grasses

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
**Lagurus ovatus*	2	G	Grasses
**Pelargonium capitatum*	1	G	Herbs
**Medicago polymorpha*	0.5	G	Herbs
**Sonchus oleraceus*	0.5	G	Herbs
**Urospermum picroides*	0.2	G	Herbs
**Euphorbia terracina*	0.1	G	Herbs
**Lysimachia arvensis*	0.1	G	Herbs
Parietaria debilis	0.05	G	Herbs

Quadrat	Date	Site type	Observer
Q12	20/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Weeds	No evidence	Mixed Open Shrubland
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	5	NW	Secondary dune
Easting		**Northing**	
379250		6486942	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Myoporum insulare	60	M	Shrubs 1-2m
Acacia rostellifera	5	M	Shrubs 1-2m
Olearia axillaris	2.5	M	Shrubs 1-2m
Spyridium globulosum	20	M	Shrubs <1m
Rhagodia baccata	4	M	Shrubs <1m
Acanthocarpus preissii	2	M	Shrubs <1m
**Tetragonia decumbens*	1	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Styphelia insularis	0.2	M	Shrubs <1m
**Ehrharta longiflora*	2	G	Grasses
**Bromus diandrus*	0.5	G	Grasses
Lomandra maritima	4	G	Herbs
Threlkeldia diffusa	2	G	Herbs
Carpobrotus virescens	0.5	G	Herbs
Hardenbergia comptoniana	0.5	G	Herbs
**Crassula glomerata*	0.2	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Conostylis candicans subsp. *calcicola*	0.2	G	Herbs
**Cerastium glomeratum*	0.1	G	Herbs
**Dischisma arenarium*	0.1	G	Herbs
**Euphorbia terracina*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Clematis linearifolia	0.1	G	Herbs
Hardenbergia comptoniana	0.1	G	Herbs
Parietaria debilis	0.1	G	Herbs
Senecio pinnatifolius	0.1	G	Herbs
Trachymene pilosa	0.1	G	Herbs
Calandrinia sp.	0.05	G	Herbs

Quadrat	Date	Site type	Observer
Q13	22/9/2023	Quadrat (10 x 10m)	Jeff Cargill
Condition	**Disturbances**	**Fire history**	**Vegetation community**
Excellent	Grazing, Weeds, Rabbits	No evidence	*Melaleuca cardiophylla* Closed Heath
Soil description	**Leaf litter**	**Aspect / slope (°)**	**Landform**
Grey sand	-	NW	Hill
Easting		**Northing**	
379233		6487163	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Spyridium globulosum	1.5	M	Shrubs 1-2m
Banksia sessilis	0.5	M	Shrubs 1-2m
Olearia axillaris	0.5	M	Shrubs 1-2m
Melaleuca huegelii	30	M	Shrubs <1m
Rhagodia baccata	5	M	Shrubs <1m
Acacia truncata	2	M	Shrubs <1m
Acacia lasiocarpa	1.5	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Acacia cyclops	0.5	M	Shrubs <1m
Calothamnus quadrifidus	0.5	M	Shrubs <1m
Grevillea preissii	0.5	M	Shrubs <1m
Melaleuca systena	0.5	M	Shrubs <1m
Acacia rostellifera	0.3	M	Shrubs <1m
Acanthocarpus preissii	0.2	M	Shrubs <1m
Eremophila glabra	0.2	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Lysiandra calycina	0.2	M	Shrubs <1m
Styphelia insularis	0.2	M	Shrubs <1m
Templetonia retusa	0.2	M	Shrubs <1m
Gompholobium tomentosum	0.1	M	Shrubs <1m
Desmocladus flexuosus	0.4	G	Sedges
Ammothryon grandiflorum	0.1	G	Sedges
Isolepis marginata	0.05	G	Sedges
Lepidosperma calcicola	0.05	G	Sedges
**Ehrharta longiflora*	0.3	G	Grasses
Poa poiformis	0.3	G	Grasses
**Bromus diandrus*	0.1	G	Grasses
**Vulpia bromoides*	0.1	G	Grasses
Threlkeldia diffusa	1	G	Herbs
**Melilotus indicus*	0.5	G	Herbs
**Trifolium campestre*	0.5	G	Herbs
Hardenbergia comptoniana	0.5	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Carpobrotus virescens	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Cassytha racemosa	0.1	G	Herbs
Conostylis candicans subsp. *calcicola*	0.1	G	Herbs

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Dianella revoluta var. *revoluta*	0.1	G	Herbs
Kennedia prostrata	0.1	G	Herbs
Lomandra maritima	0.1	G	Herbs
Opercularia vaginata	0.1	G	Herbs
Rhodanthe corymbosa	0.1	G	Herbs
Senecio pinnatifolius	0.1	G	Herbs
Trachymene pilosa	0.1	G	Herbs
**Centaurium pulchellum*	0.05	G	Herbs
**Cerastium glomeratum*	0.05	G	Herbs
**Dischisma arenarium*	0.05	G	Herbs
**Gladiolus caryophyllaceus*	0.05	G	Herbs
Crassula colorata	0.05	G	Herbs
Parietaria debilis	0.05	G	Herbs

Appendix F Weed mapping

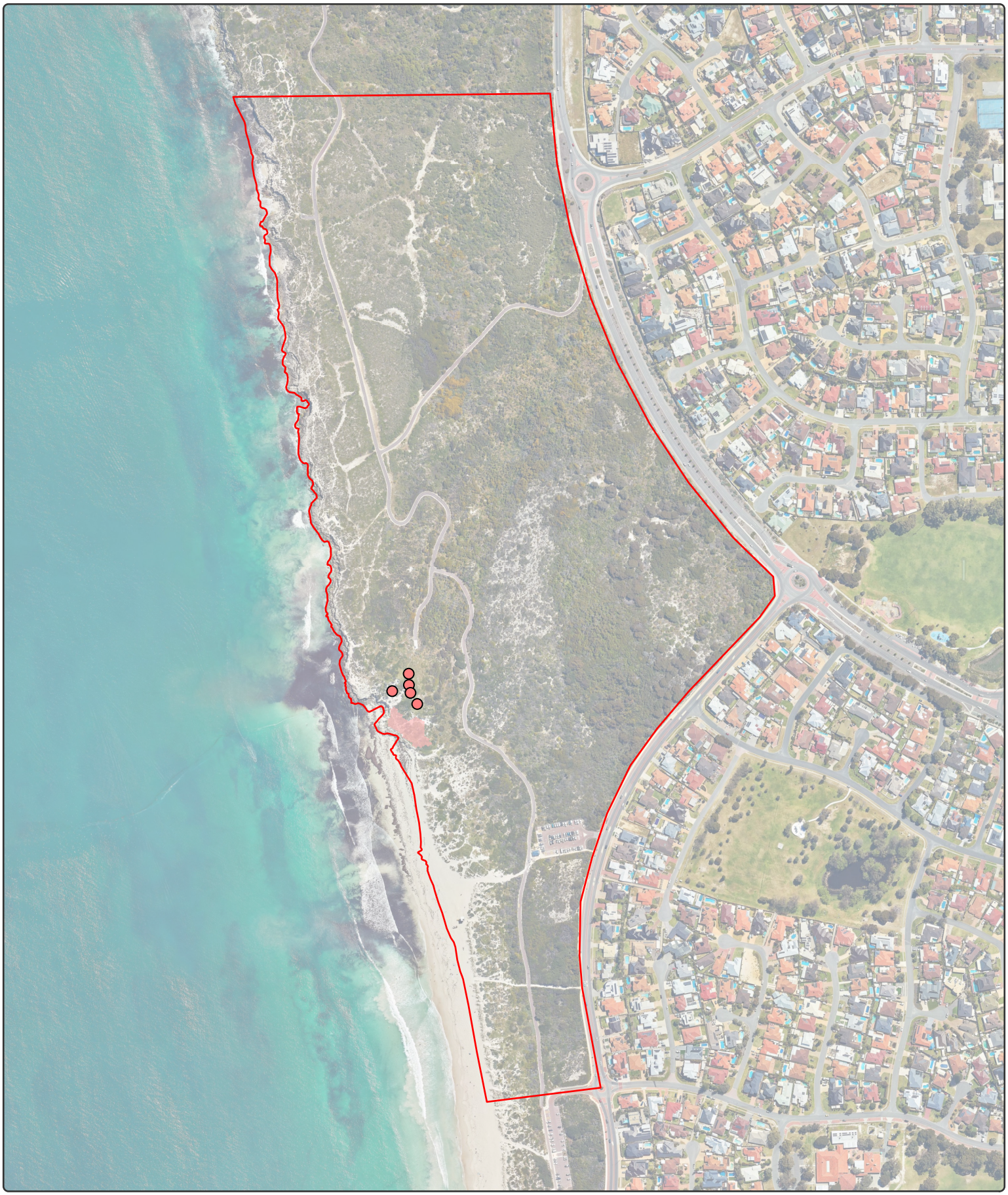


Figure: Records of *_Arabis_ sp. Or _Matthiola incana_? (Stock plant) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Arabis sp. Or _Matthiola incana_? (Stock plant)

Weed coverage

0 - 5%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

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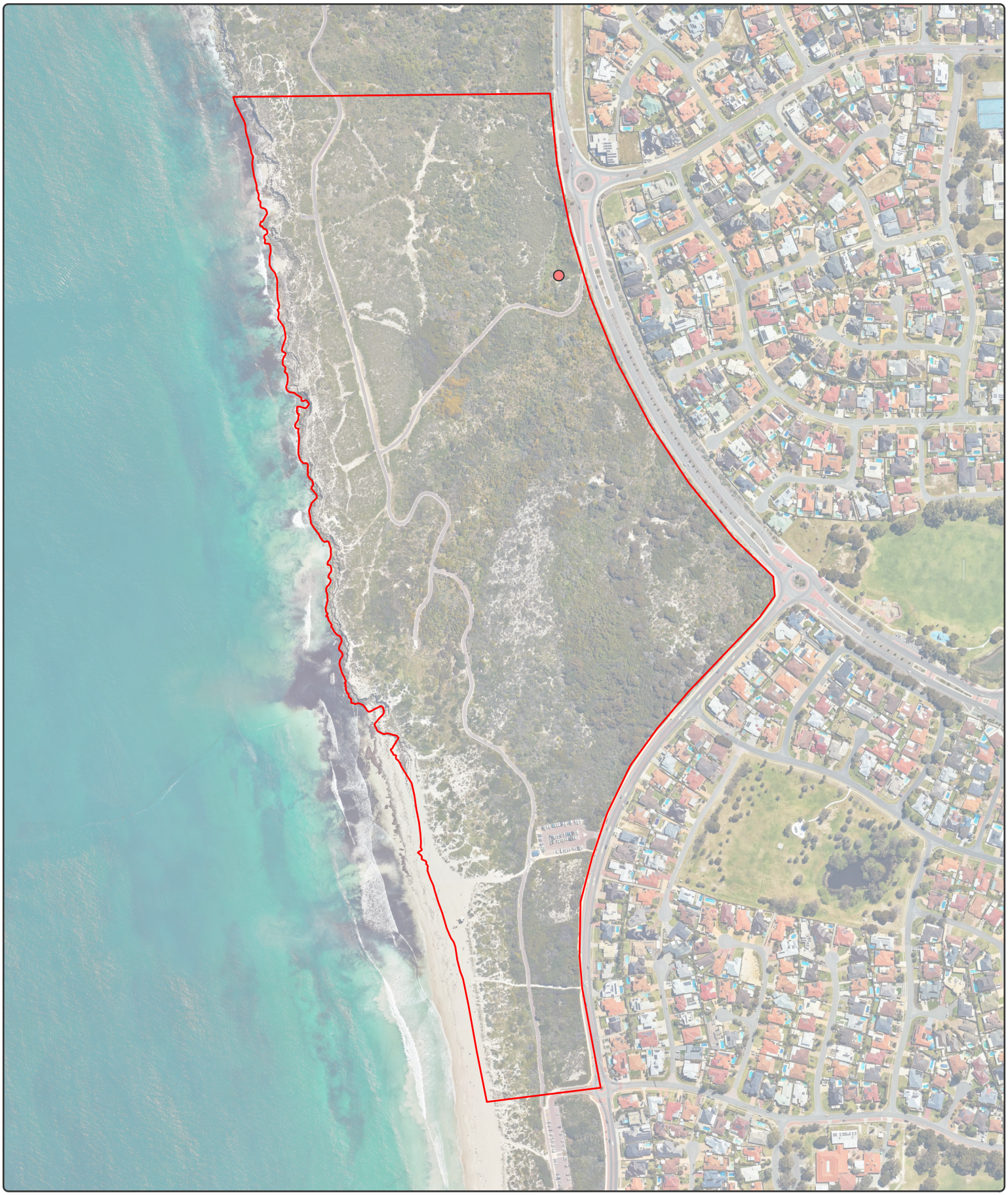


Figure: Records of *_Asparagus asparagoides_ (Bridal Creeper) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Asparagus asparagoides (Bridal Creeper)

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

N

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Figure: Records of *_Avena fatua_ (Wild Oats) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Avena fatua (Wild Oats)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

N

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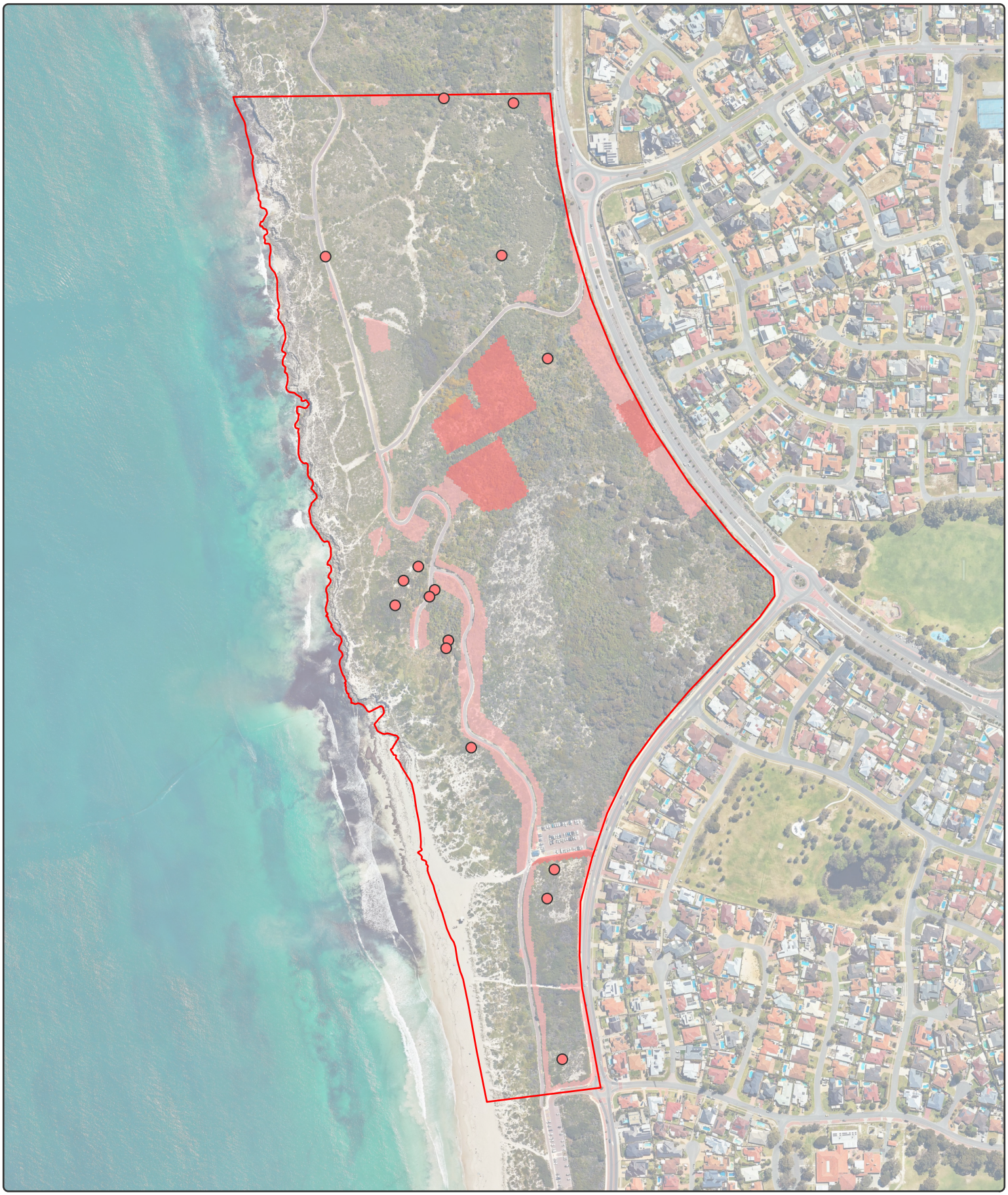


Figure: Records of *_Avena fatua_ (Wild Oats) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Avena fatua (Wild Oats)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

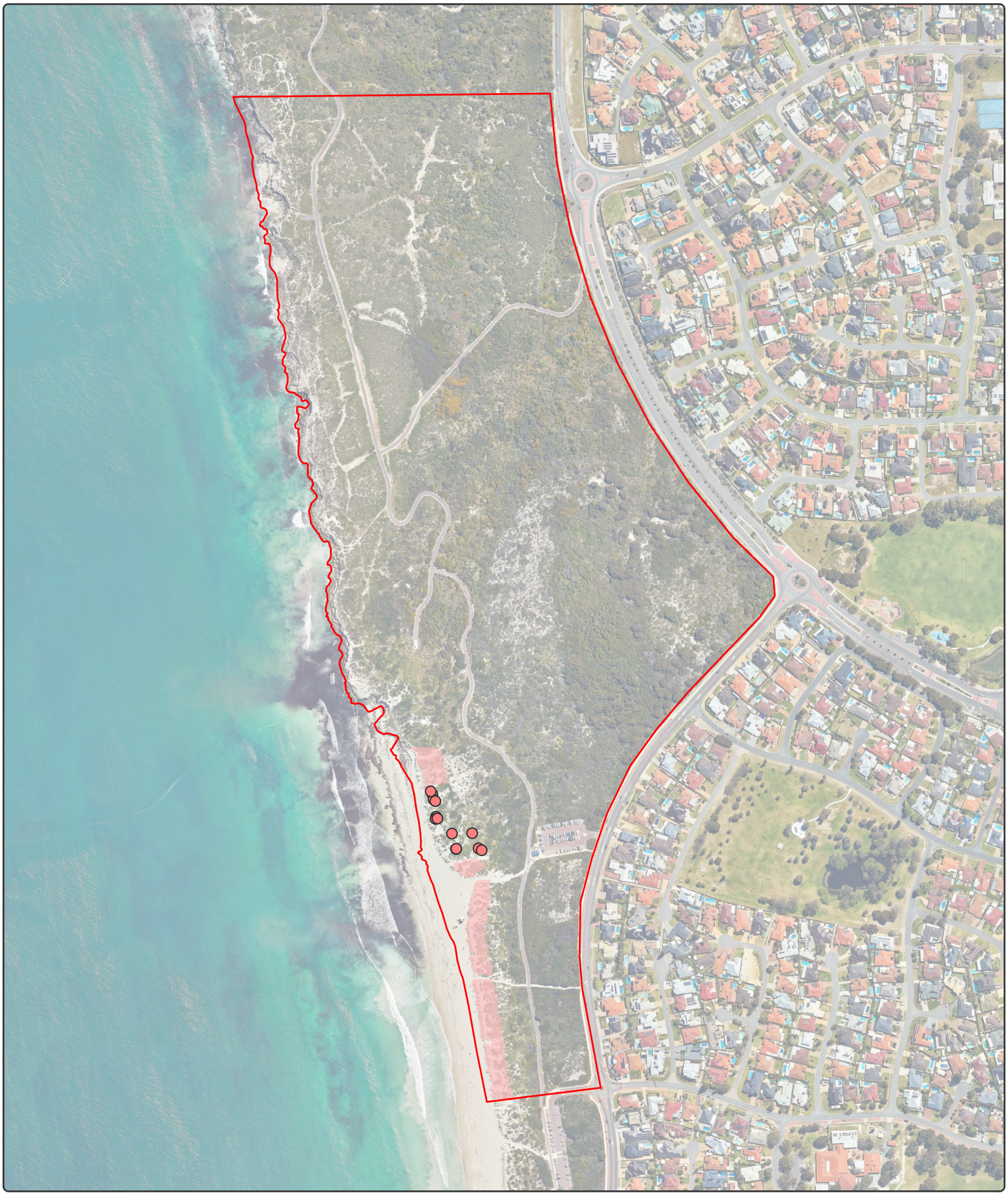


Figure: Records of *_Cakile edentula_ (Sea Rocket) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Cakile edentula (Sea Rocket)

Weed coverage

0 - 5%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of *_Carpobrotus edulis_ (Pigface) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Carpobrotus edulis (Pigface)

0 75 150

Metres

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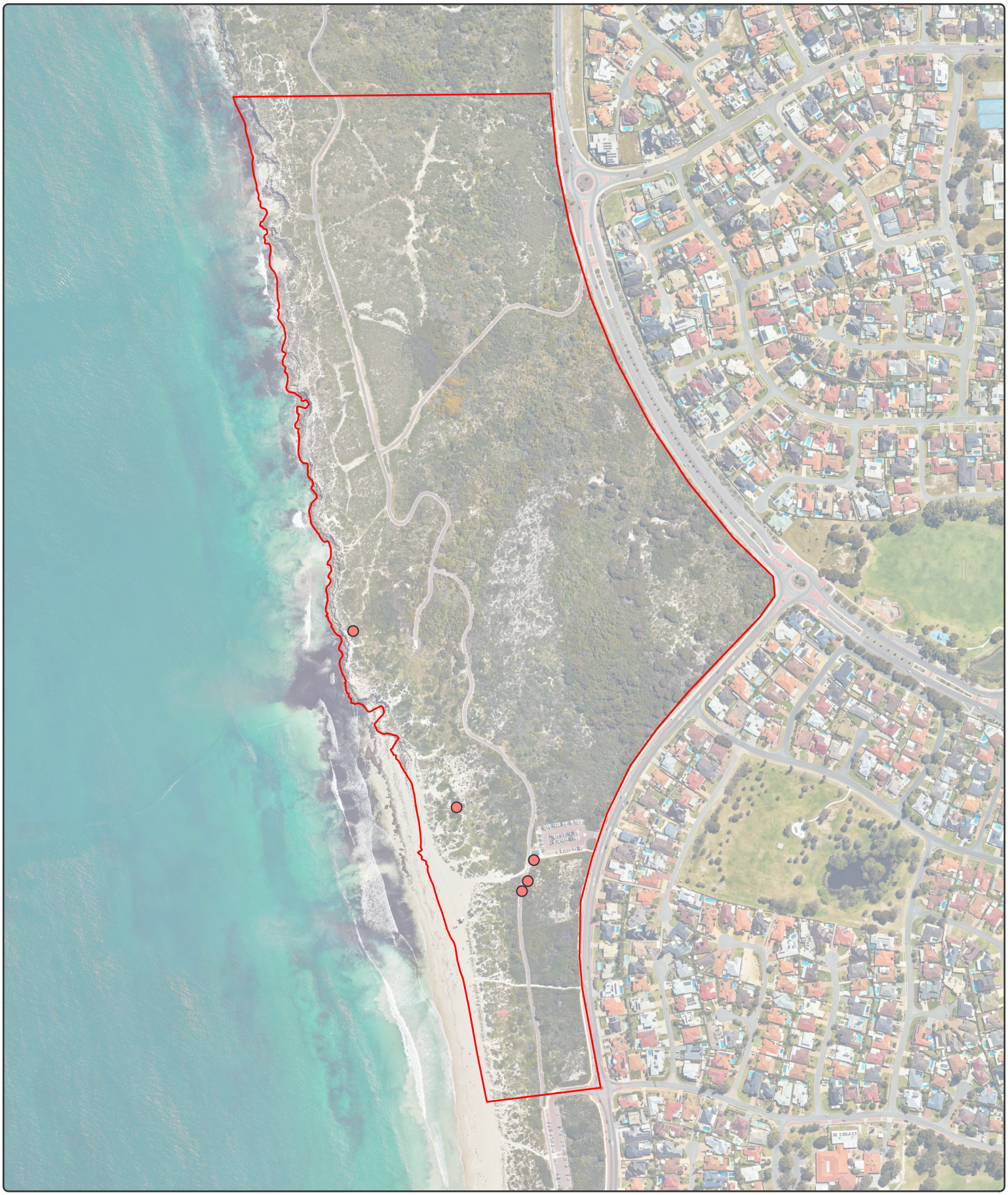


Figure: Records of *_Carpobrotus edulis_ (Pigface) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Carpobrotus edulis (Pigface)

Weed coverage

0 - 5%

0 100 200

Metres

Datum/Projection:
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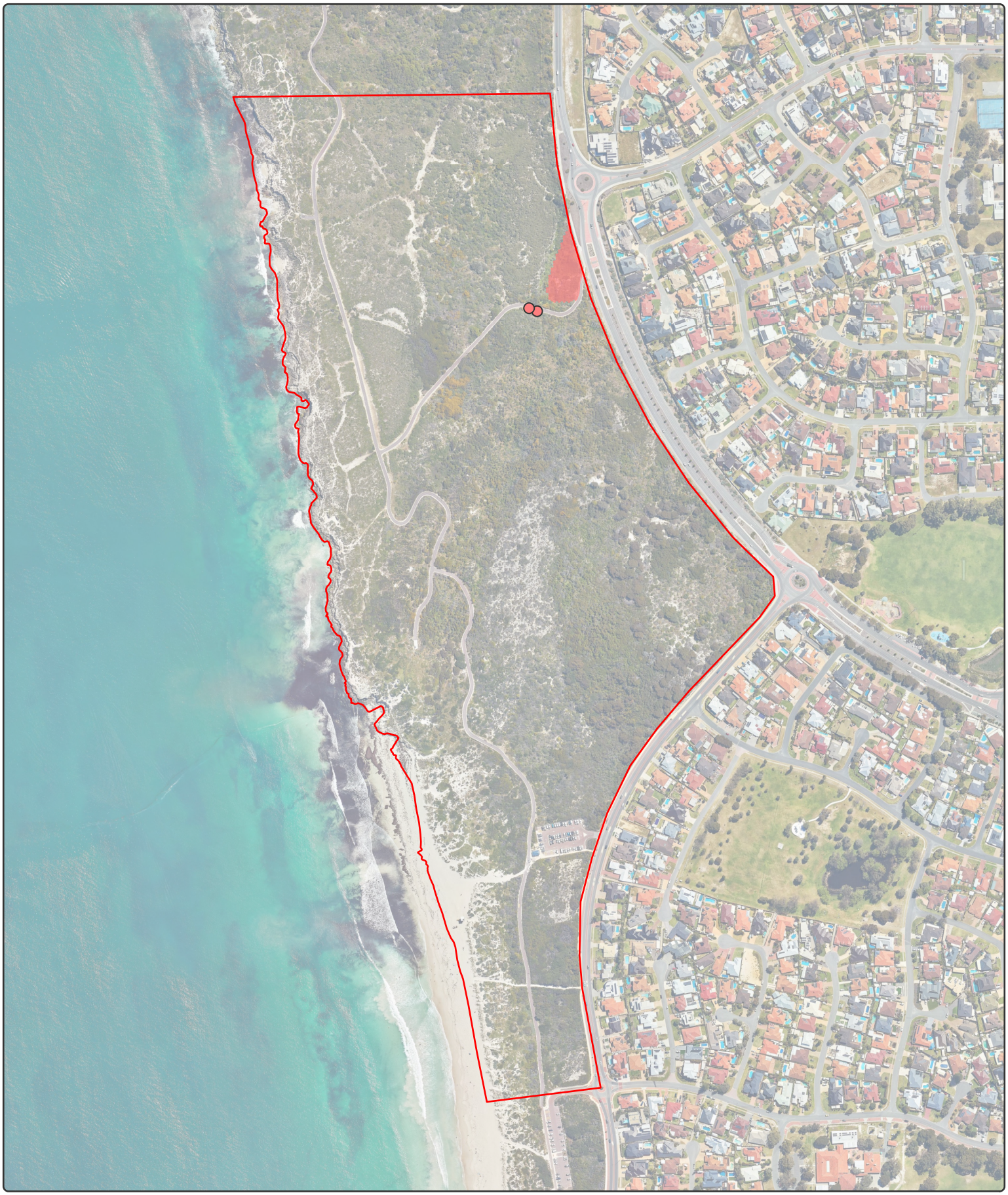


Figure: Records of *_Centranthus macrosiphon_ (Pretty Betsy) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Centranthus macrosiphon (Pretty Betsy)

Weed coverage

6 - 75%

0 100 200

Metres

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Figure: Records of *_Ehrharta longiflora_ (Annual Veldt Grass) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Ehrharta longiflora
(Annual Veldt Grass)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
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Figure: Records of *_Ehrharta longiflora_ (Annual Veldt Grass) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Ehrharta longiflora (Annual Veldt Grass)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of *_Euphorbia paralias_ (Sea Spurge) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Euphorbia paralias
(Sea Spurge)

0 75 150
Metres

Datum/Projection:
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Figure: Records of *_Euphorbia terracina_ (Geraldton Carnation Weed) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Euphorbia terracina (Geraldton Carnation Weed)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of *_Euphorbia terracina_ (Geraldton Carnation Weed) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Euphorbia terracina (Geraldton Carnation Weed)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of *_Fumaria capreolata_ (Fumitory) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Fumaria capreolata (Fumitory)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

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Figure: Records of *_Fumaria capreolata_ (Fumitory) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Fumaria capreolata (Fumitory)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of **Moraea* sp. (Cape Tulip) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed coverage

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

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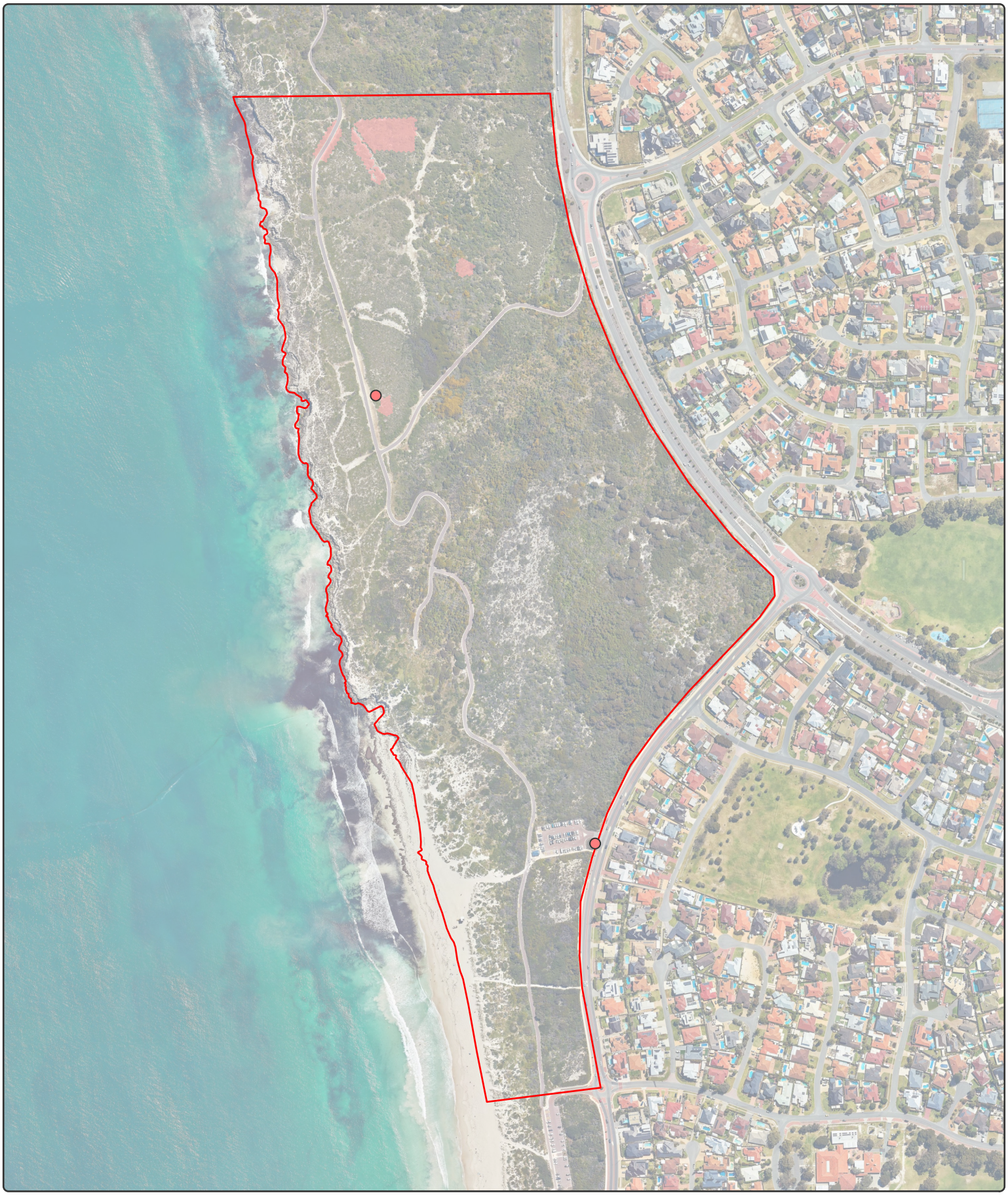


Figure: Records of **Moraea* sp. (Cape Tulip) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Moraea sp. (Cape Tulip)

Weed coverage

0 - 5%

0 100 200

Metres

Datum/Projection:
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Figure: Records of *_Osteospermum ecklonis_ (Veldt Daisy) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Osteospermum ecklonis (Veldt Daisy)

Weed coverage

0 - 5%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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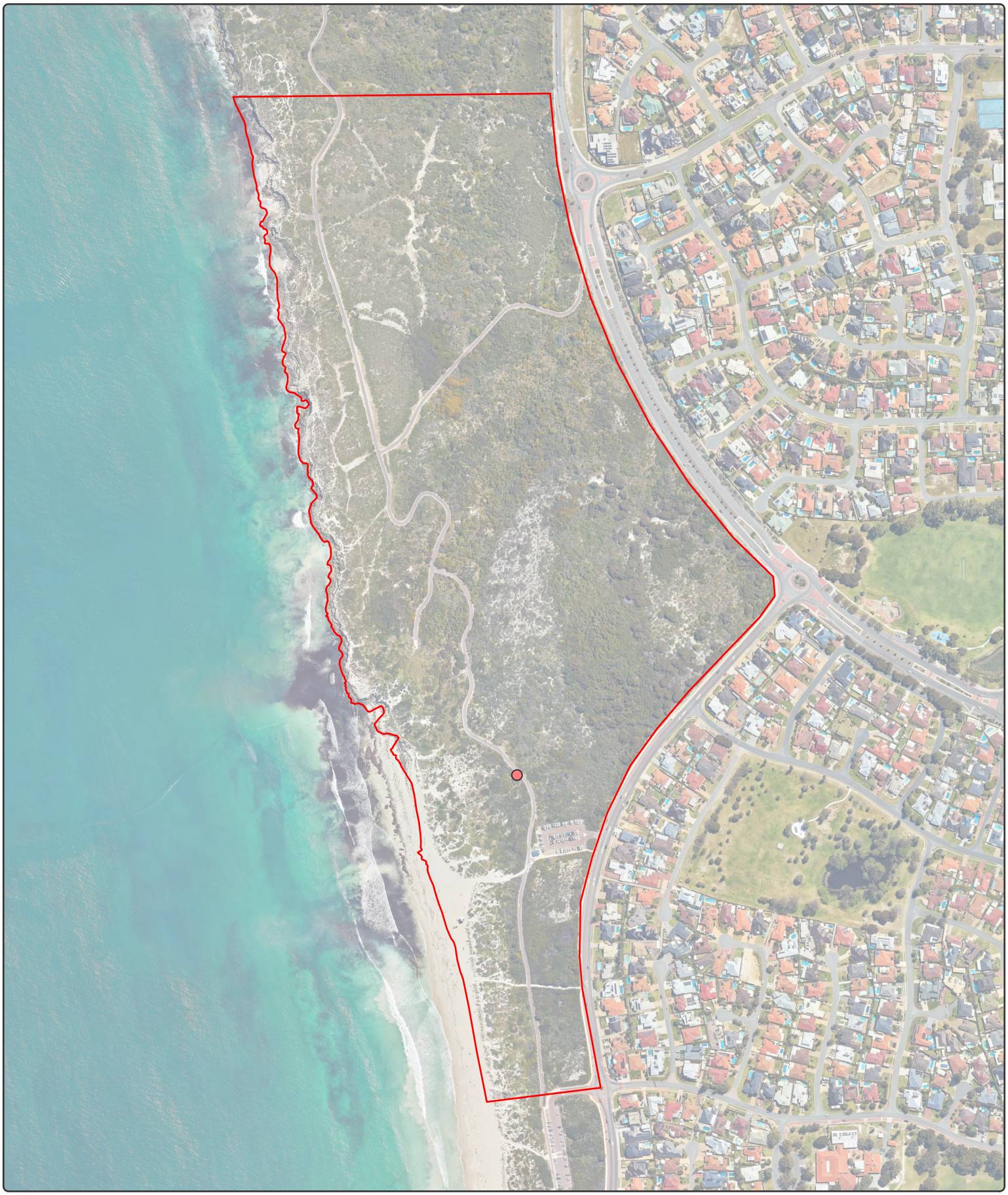


Figure: Records of *_Osteospermum ecklonis_ (Veldt Daisy) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Osteospermum ecklonis
(Veldt Daisy)

0 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure: Records of *_Oxalis pes-caprae_ (Soursob) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Oxalis pes-caprae (Soursob)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6239-GM Date: 20/12/2023

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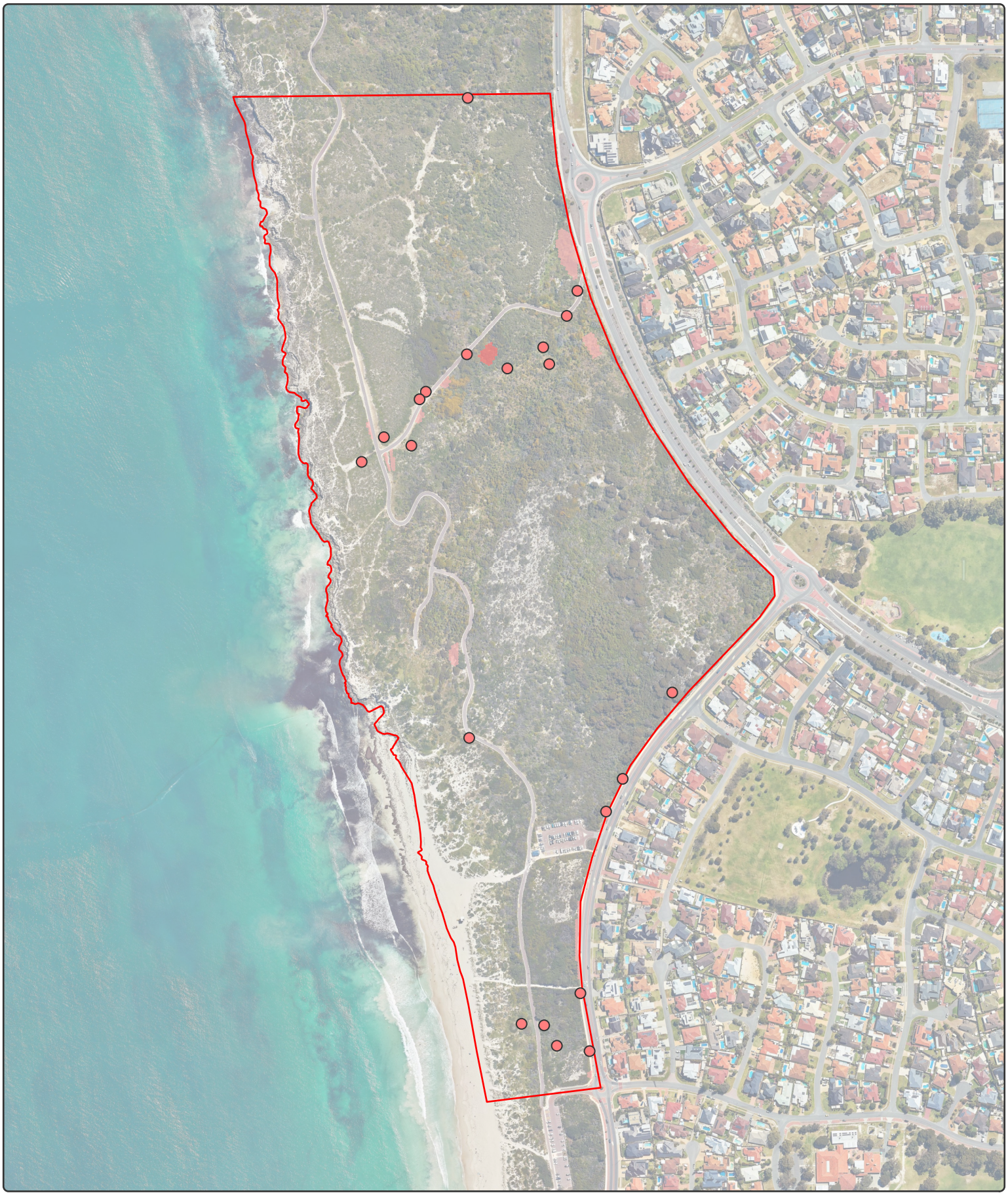


Figure: Records of *_Oxalis pes-caprae_ (Soursob) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Oxalis pes-caprae (Soursob)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
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Figure: Records of *_Pelargonium capitatum_ (Rose Pelargonium) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Pelargonium capitatum (Rose Pelargonium)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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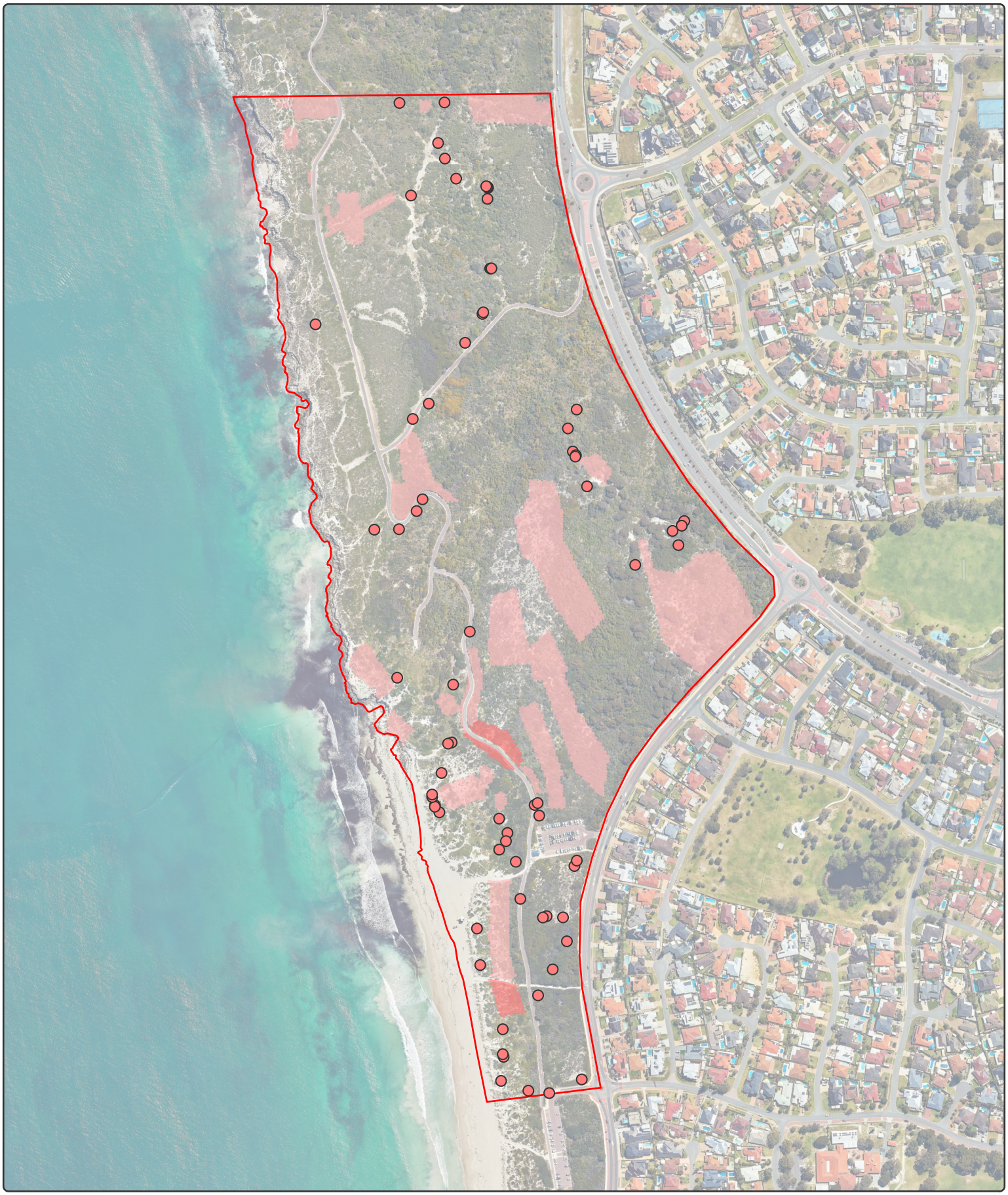


Figure: Records of *_Pelargonium capitatum_ (Rose Pelargonium) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Pelargonium capitatum (Rose Pelargonium)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
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Figure: Records of *_Raphanus raphanistrum_ (Wild Radish) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Raphanus raphanistrum (Wild Radish)

Weed coverage

0 - 5%

0 75 150

Metres

Datum/Projection:
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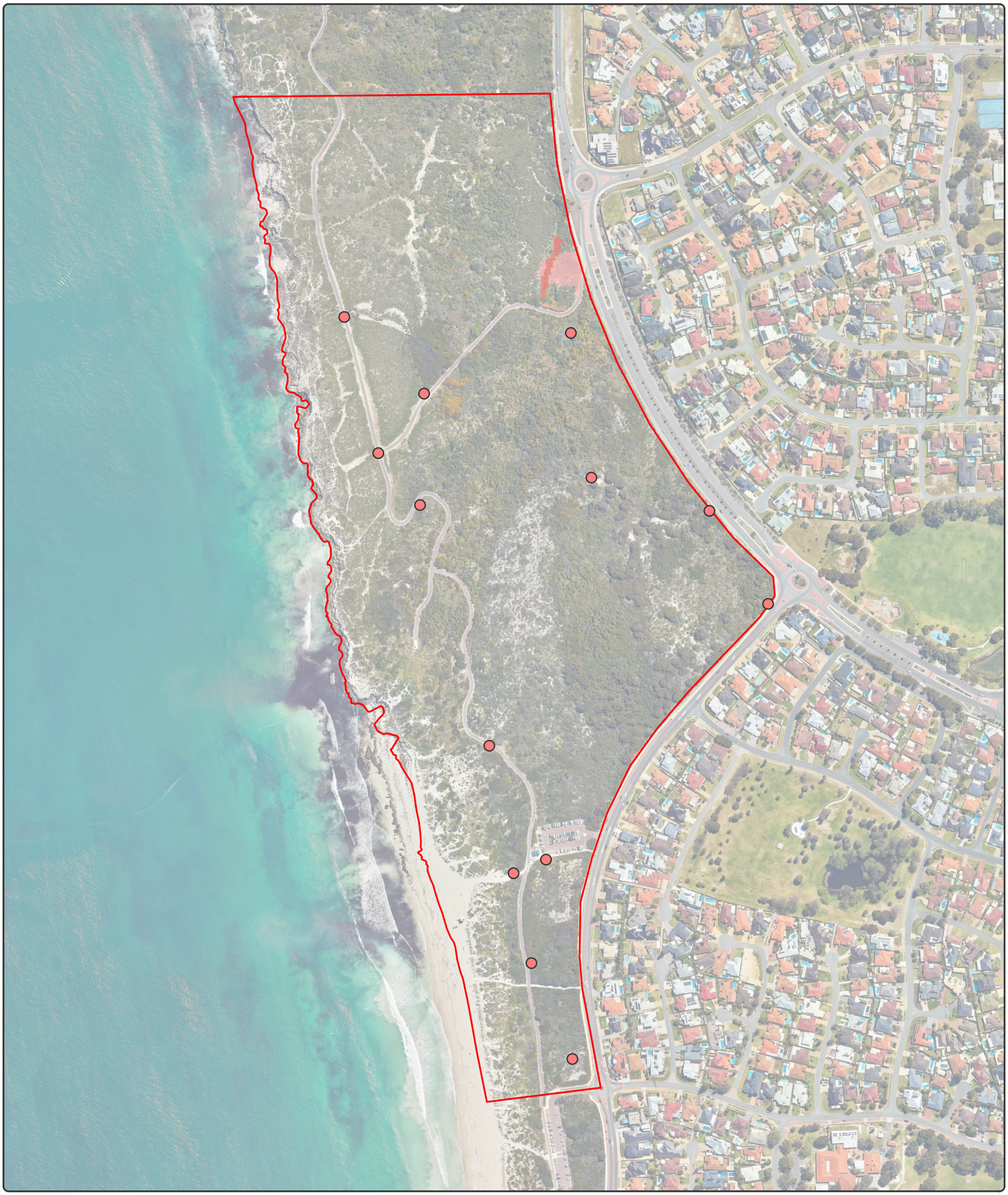


Figure: Records of *_Raphanus raphanistrum_ (Wild Radish) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Raphanus raphanistrum (Wild Radish)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

Datum/Projection:
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Figure: Records of *_Tetragonia decumbens_ (Sea Spinach) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Tetragonia decumbens (Sea Spinach)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
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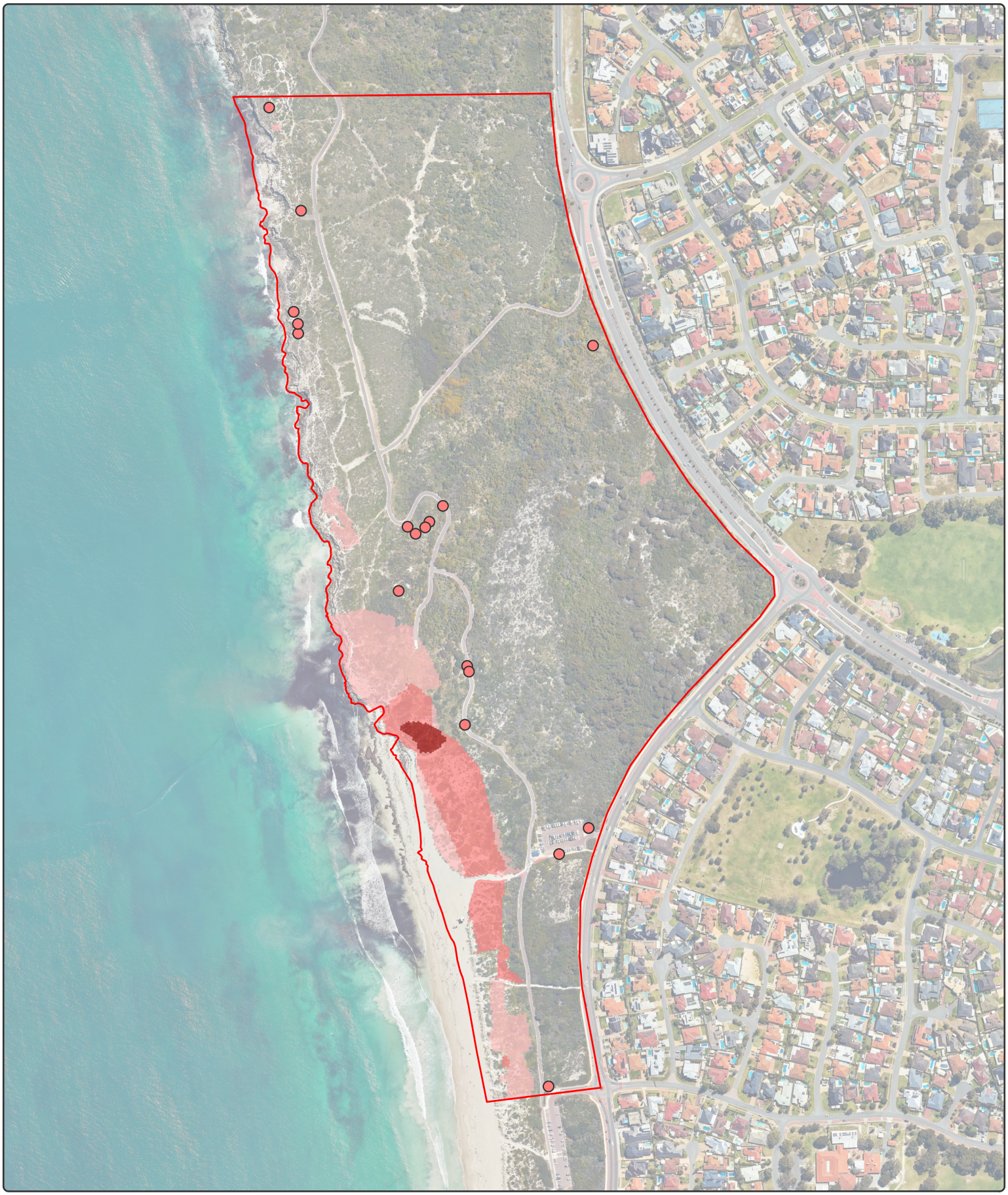


Figure: Records of *_Tetragonia decumbens_ (Sea Spinach) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Tetragonia decumbens (Sea Spinach)

Weed coverage

0 - 5%

6 - 75%

76 - 100%

0 100 200

Metres

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Figure: Records of *_Thinopyrum distichum_ (Sea wheat) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed coverage

0 - 5%

0 75 150

Metres

Datum/Projection:
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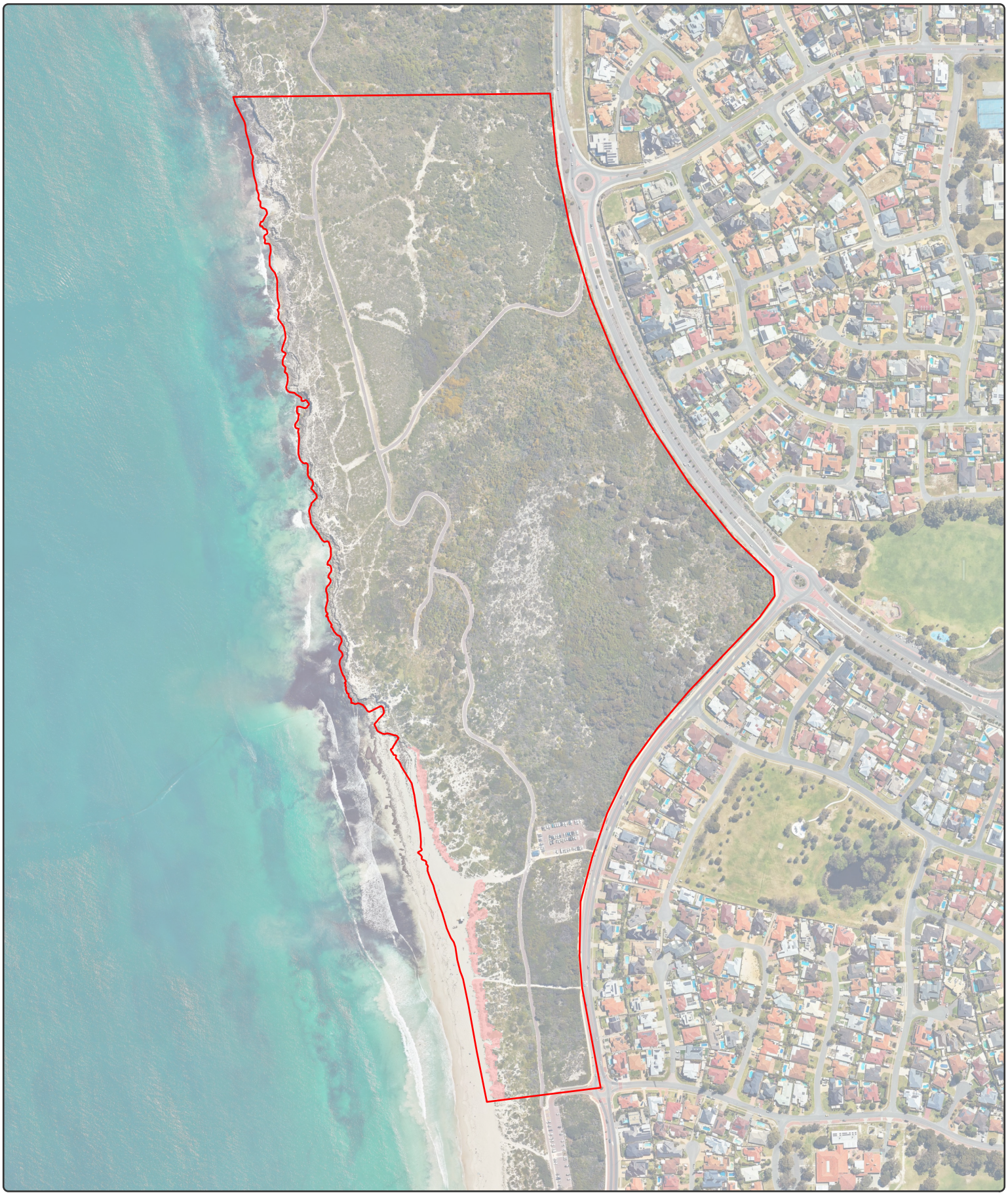


Figure: Records of **Thinopyrum distichum* (Sea wheat) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed coverage

0 - 5%

0 100 200

Metres

Datum/Projection:
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Figure: Records of *_Trachyandra divaricata_ (Onion Weed) in Ocean Reef (North)

Legend

Ocean Reef (North)

Weed location

Trachyandra divaricata (Onion Weed)

Weed coverage

0 - 5%

6 - 75%

0 75 150

Metres

Datum/Projection:
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Figure: Records of *_Trachyandra divaricata_ (Onion Weed) in Ocean Reef (South)

Legend

Ocean Reef (South)

Weed location

Trachyandra divaricata (Onion Weed)

Weed coverage

0 - 5%

6 - 75%

0 100 200

Metres

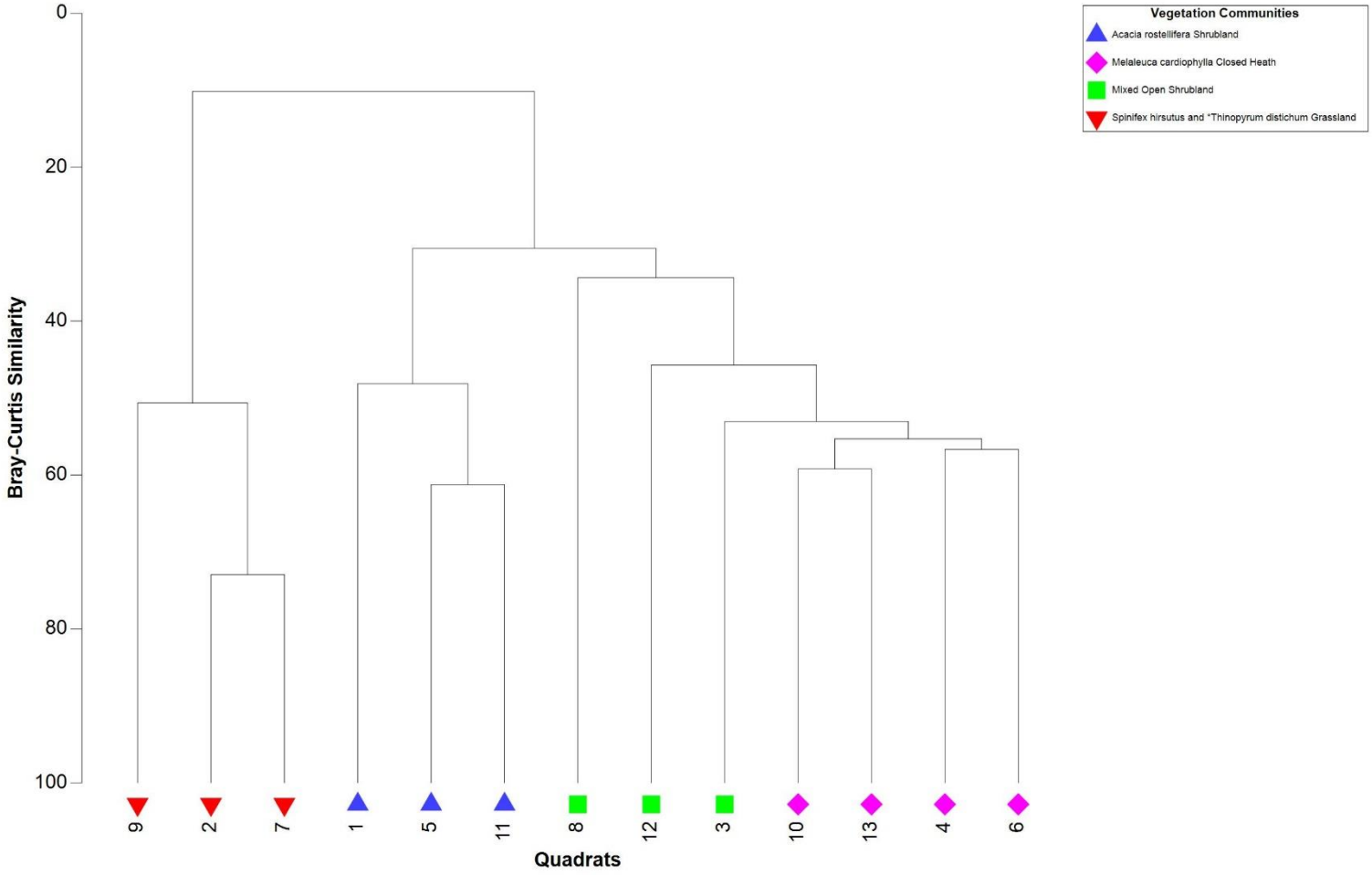
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23PER6239-GM Date: 20/12/2023

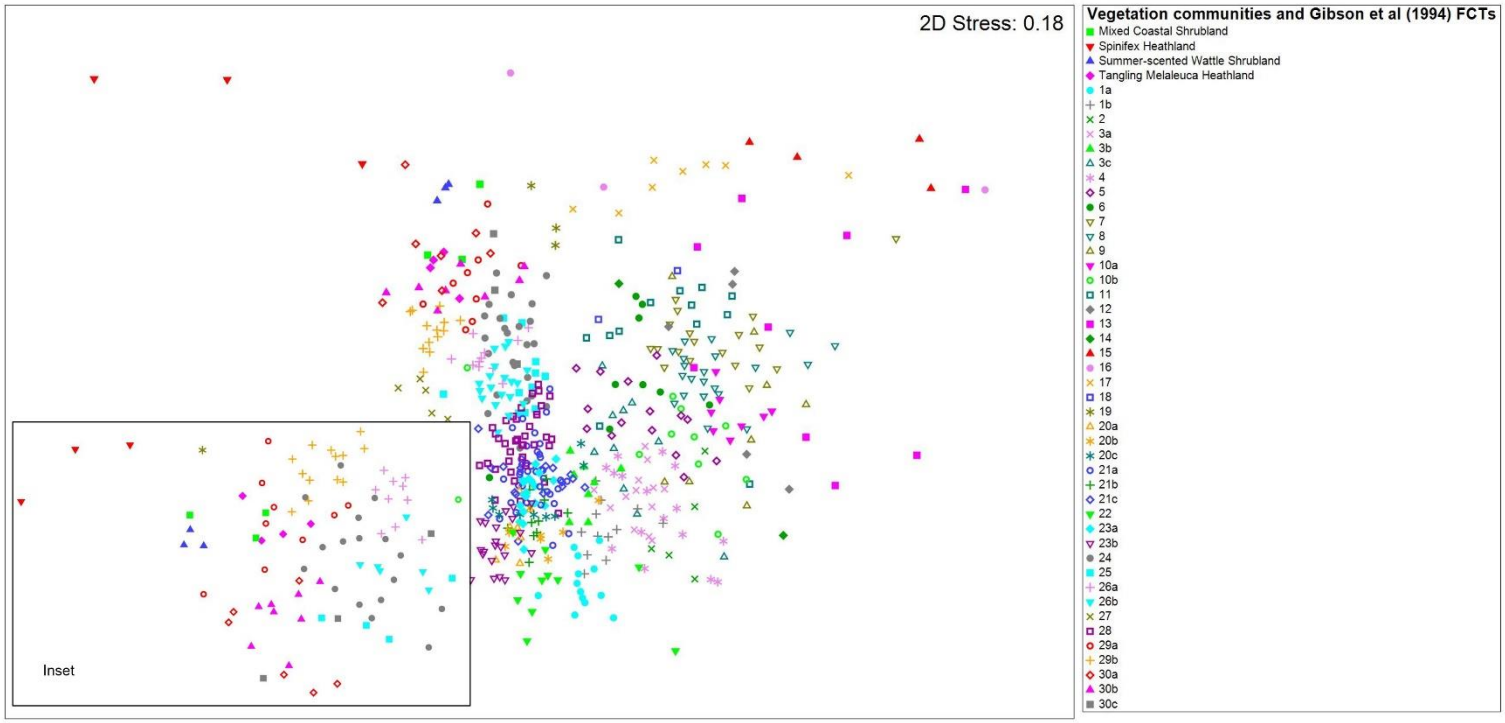
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Appendix G Hierarchical clustering dendrogram



Appendix H Relationship between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson *et al*. (1994)



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