Flora and Vegetation Survey Report over the Proposed Myalup Primary Industries Reserve

Prepared for RPS Australia Asia Pacific
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Executive Summary

Ecoedge was engaged by RPS Australia Asia Pacific (RPS) in August 2018 on behalf of their client LandCorp to undertake flora and vegetation surveys across approximately 2,051 ha of remnant vegetation[1] within a 6,378 ha Project Area at Myalup. The Project Area lies within and adjacent to a portion of State Forest No. 16 (SF16). The Project Area is located in the Shire of Harvey and extends 20 km north-south from just south Myalup Road in the south to just south of Johnston Road in the north. In addition to the field surveys required to be carried out over this area, a desktop assessment encompassing a larger area of land, approximately 15,067 ha in size (the Desktop Assessment Area (DAA)), was also required to provide a broader ecological context in which to assess the project.

LandCorp proposes to convert existing cleared areas and pine plantations within portions of the SF16 boundary to intensive agriculture. This will be implemented in several stages over the next 20 years, with stages one and two being the focus of this current survey.

The flora and vegetation surveys and desktop assessment were required in order to assist LandCorp in its determination of direct and indirect impacts of the proposal both within and adjacent to the Project Area. Potential direct impacts include clearing of native vegetation and potential indirect impacts are alteration of the local hydrology resulting from the permanent removal of pine plantations which may affect nearby groundwater dependent ecosystems (GDEs).

The flora and vegetation survey methodology was required to align with State and Commonwealth requirements for the bioregion and species and communities present, and be consistent with State guidelines and Technical Guides and Commonwealth survey guidelines for any relevant threatened species.

The field surveys were carried out during the period 17 August 2018 to 10 January 2019.

A total of 356 native taxa was recorded within the approximately 2,051 ha of remnant native vegetation of the Myalup Project Area. This is comparable with the 324 taxa found during a survey over a similar area (2,019 ha) immediately to the south in the Kemerton area.

The Project Area provides habitat for at least seven Priority Flora and six range-end taxa and it is likely that it provides a transition-zone between some mid-Swan Coastal Plain flora and taxa with a more southern centre of distribution.

No Threatened flora were found during the survey, although targeted surveys for threatened orchids were undertaken. Seven priority-listed flora and five taxa that are either range-extensions, or near the limit of their natural range on the Swan Coastal Plain were found. The seven Priority Flora species were *Acacia semitrullata* (P4), *Acacia flagelliformis*

[1] That is, vegetation classified as Degraded or better condition.

(P4), *Boronia capitata* subsp. *gracilis* (P3), *Caladenia speciosa* (P3), *Chamaescilla gibsonii* (P2), *Dillwynia dillwynioides* (P3), and *Lasiopetalum membranaceum* (P3).

Three species declared as plants Pest Plants under the under the *Biosecurity and Agriculture Management Act 2007* are widespread throughout the Project Area, viz. Bridal Creeper (**Asparagus asparagoides*), Arum lily (**Zantedeschia aethiopica*) and Narrow-leaf cotton bush (**Gomphocarpus fruticosus*). Of these plants only Narrow-leaf cotton bush has a legal obligation on land managers for its management. It is quite widely distributed within the semi-cleared, former pine plantation areas within Stage 1 of the Project Area.

There are extensive infestations of environmental weeds in several parts of the Project Area, particularly *Watsonia meriana* along the Harvey River Diversion Drain. These weeds have spread away from the drain into adjacent bushland in several places.

Ten vegetation units were identified and mapped within the Project Area. These are divided into three main groups: Group A, Jarrah-*Banksia attenuata* open forest or woodland, with several other trees as co-dominants (three vegetation units); Group B, Tuart-*Banksia attenuata* open forest, with several other trees as co-dominants (three vegetation units); and Group C, the wetland group, divided into four floristically diverse vegetation units.

The results of a multivariate analysis of the Project Area quadrats indicated that the vegetation units from Group A were aligned to Floristic Community Type (FCT) 21a (Central *Banksia attenuata - Eucalyptus marginata* woodlands) and Group B to FCT 25 (Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands) of Gibson *et al*. (1994).

Most of the wetland quadrats were similar to FCT 5 (Mixed Shrub damplands), while two of them, from the deeper wetlands, were aligned to FCT 12 (*Melaleuca teretifolia*/Astartea shrublands).

Both FCT 21a and FCT 25 are listed as Priority 3 ecological communities (PEC). FCT 21a is part of the 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' PEC, and FCT 25 itself is listed.

About 70% of the vegetation in the Project Area belongs to either Group A or B and because of the presence of *Banksia attenuata* as an understorey species the vegetation in these groups meets the criteria of Federally-listed TEC 'Banksia Woodlands of the Swan Coastal Plain' Threatened Ecological Community (TEC).

Just over half of the remnant vegetation in the Project Area (ca 1,730 ha) was in 'Excellent' or 'Very Good' condition. Approximately a third of the Project Area was pine plantation, or land previously planted to pines. The effects of 'Dieback disease' caused by the pathogen *Phytophthora* sp. was evident in some of the native vegetation, particularly in vegetation

units A3 and C1, and sometimes in unit A3 on Bassendean sands in the east of the Project Area.

The areas of open forest and woodland in the Project Area where *B. attenuata* is an important component and which are on Spearwood soils (which means they are somewhat resistant to '*Phytophthora* dieback') are of sufficient size and condition to be Nationally-significant occurrences of the 'Banksia Woodlands of the Swan Coastal Plain' TEC.

There is approximately 770 ha of Tuart forest within the Project Area. This comprises approximately 14% of the total area of Tuart woodlands or forests in conservation reserves.

Within the Project Area, the vegetation of the southern part of Lyons Forest Block provides a corridor linking wetland vegetation in Yalgorup National Park with the wetlands of the Riverdale Nature Reserve and the Harvey Flats east of the Mandurah-Eaton Ridge.

There is a large amount of structurally and floristically diverse wetland vegetation (>340 ha) within the Project Area located in the eastern part of Lyons Forest Block that is mainly in Very Good or Excellent condition. Much of this wetland vegetation, which lies near the boundary between the Spearwood and Bassendean dune systems, has been cleared for agriculture to the north and south of the Project Area. Therefore, the occurrences within the Project Area have special importance as representations of these wetland ecosystems.

Six vegetation complexes are mapped as occurring within the DAA: the Bassendean Complex-Central and South, the Cottesloe Complex-Central and South, the Karrakatta Complex-Central and South, the Serpentine River Complex, the Vasse Complex and the Yoongarillup Complex.

The extents remaining of the Bassendean Complex-Central and South, Karrakatta Complex-Central and South, and Serpentine Complex are below the Commonwealth 30% retention target, with less than 10% of the pre-European extent of the Serpentine River complex remaining. These complexes are also relatively poorly represented in Department of Biodiversity Conservation and Attractions (DBCA) managed lands. The extents remaining of the other three complexes only just exceed the 30% threshold. In order to avoid further impacts to all of these communities it is recommended that, where possible, remnant vegetation is retained and impacts to the represented vegetation complexes are minimised.

It is also recommended that special attention is given to minimising potential impacts to the area containing the Serpentine River complex. This area also has a number of other high conservation values; parts of it comprise Environmentally Sensitive Areas (ESAs) associated with Conservation category wetlands and it contains two Federally protected Threatened Ecological Communities: SCP09 Dense shrublands on clay flats and Banksia Woodlands of the Swan Coastal Plain. This area of Serpentine River complex falls within the Desktop Assessment Area but outside of the Project Area, so it is unlikely to be directly impacted by

the Project, however indirect impacts such as increased fertiliser use, changes in hydrology or increased extraction of groundwater for irrigation may indirectly impact this area. It is therefore recommended that intensive horticultural practices that may be located within the Project Area are situated away from this area and that the band of native vegetation in the Project Area which provides a buffer to this area is maintained in a good condition. The ongoing management of the Byrd Nature reserve in this area by the DBCA is also important to preservation this area.

A number of Conservation category wetlands (CCWs) occur within the boundary of both the Desktop Assessment Area and the Project Area. Most of these wetlands are buffered from potential Project Area activities by an existing band of remnant native vegetation between 50 m and 180 m in width. However, there are some parts where the boundaries of the CCW occur within and are immediately adjacent to cleared land within the Project Area. These are located in the NE and central-east parts of the Project Area. This makes these areas particularly vulnerable to both direct and indirect impacts from potential horticultural activities in the Project Area.

Examples of direct impacts include vegetation clearing and examples of indirect impacts include: alteration of wetland hydrology from increased ground water extraction, or exchange of deep-rooted perennial pine trees to shallow-rooted annual crops; nutrient enrichment from fertilisers; herbicide and pesticide drift and weed invasion. The most significant of these impacts is likely to be altered wetland hydrology. The scale and extent of this impact is difficult to determine without hydrological modelling.

Conservation category wetlands are specially protected under the *Environmental Protection Act 1986* (EP Act) and as such Environmentally Sensitive Areas are designated over them. It is therefore recommended that a study is undertaken to determine potential impacts of the proposal on the hydrology of all CCWs within the DAA; and that the horticultural precinct is planned and designed to ensure that direct and indirect impacts to these important conservation areas is avoided or minimised, where practically possible.

Impacts to these wetlands arising from the project may present constraints to the proposal.

Eight regional ecological linkage axis lines are mapped within the DAA and Project Area. Most of the remnant bushland within this area is classified as having the two highest linkage proximity ratings because of its proximal connectivity with the mapped linkages. The most substantial linkage runs south-east from the Yalgorup National Park and then south through the SE corner of the DAA and in places 1.7 km in width. Another much narrower and fragmented linkage runs north–south along the western boundary of the Project Area.

These ecological linkages were determined based on remnant native vegetation, not on exotic or planted vegetation. It is understood that the proposed horticultural precinct will entail the use of existing cleared areas and existing pine plantations. If this is the case the

proposal is unlikely to have a significant impact on the mapped regional ecological linkages. It may however be possible to bolster linkages by the careful planning and design of the horticultural precinct, for example by the planting of native vegetation shelter belts or wind breaks between existing parcels of bushland.

There are several ESAs within the DAA and Project Area. These are associated with the Conservation category wetlands discussed above and the precincts of the Yalgorup National Park, Crampton Nature Reserve, Riverdale Nature Reserve and Byrd Nature Reserve. Environmental Sensitive Areas are afforded special protection under the EP act and exemptions to clearing under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply in these areas.

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Statement of Limitations

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In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction and Desktop Assessment

Ecoedge was engaged by RPS Australia Asia Pacific (RPS) in August 2018 on behalf of their client LandCorp to undertake flora and vegetation surveys across native vegetation within and adjacent to a portion of State Forest No. 16 (SF16), located approximately two kilometres (km) east of the settlement of Myalup, within the Shire of Harvey (**Figure 1**, **Figure 2**) ('the Project Area'). The Project Area is approximately 6,378 hectares (ha) in size and comprises of about 2,051[2] ha of native vegetation.

LandCorp proposes to convert existing cleared areas and pine plantations within portions of the SF16 Project Area boundary to intensive agriculture. This will be implemented in several stages over the next 20 years, with stages one and two being the focus of this current survey. Stage 1 of the proposed development is situated within Lyons Forest Block, and stages 2 and 3 are in Guthrie Forest Block (**Figure 2**, **Figure 3**).

Flora and vegetation surveys are required in order to assist LandCorp in its determination of direct and indirect impacts of the proposal both within and adjacent to the Project Area. Potential direct impacts include clearing (loss) of vegetation and potential indirect impacts are alteration of the local hydrology resulting from the permanent removal of pine plantations which may affect nearby ground water dependent ecosystems (GDEs).

The field surveys were comprised of two parts:

1. A Reconnaissance survey over all remnant native vegetation within the Project Area plus a 50 m buffer of the future Stage 2 area[3] where possible. The approximate area of remnant vegetation within this area is 2,051 hectares (ha) (**Figure 3**).
2. A Detailed and Targeted survey over remnant vegetation within the 'Potential Hort Block' areas plus a 50 m buffer where possible[4]. The approximate area of remnant vegetation within this area is 86 ha (**Figure 3**).

A desktop assessment encompassing a larger area of land, approximately 15,067 ha, was also required to provide a broader ecological context in which to assess the project. This larger area, which encompasses the Project Area, is referred to as the 'Desktop Assessment Area' (DAA) (**Figure 1** - **Figure 3**).

Table 1. provides an overview of the various survey and project areas shown **Figure 2** and **Figure 3**.

[2] Vegetation rated as of Degraded condition or better was used to arrive at this area.
[3] As indicated in the 'Potential_Hort_Blocks.shp' shapefile provided by LandCorp. Stage 2 is shown in yellow hashing on Figure 3.
[4] Shown in blue on Figure 3.

Table 1. Overview of project and survey areas within the Project Area and Desktop Assessment Area.

Area	Land use	Survey Type	Total Area (ha)
Project Area	State Forest No. 16 comprising: • cleared areas pine plantation and • remnant vegetation	• Detailed • Reconnaissance • Targeted	6,378 ha
Stage 1	State Forest No. 16 comprising: • cleared areas • pine plantation	N/A	2,149 ha
Stage 2		N/A	2,116 ha
Desktop Assessment Area	State Forest No. 16 Project Area comprising: • cleared areas, • pine plantation • remnant vegetation Yalgorup National Park Nature reserves Agricultural land	• Desktop assessment • Constraints and values identification and mapping	15,067 ha
Reconnaissance Survey Area	Remnant vegetation within the SF No.16 Project Area and within a 50 m buffer of Stage 2.	Reconnaissance	2,136 ha (2,051 ha remnant vegetation)
Detailed and Targeted Survey Area	Remnant vegetation in Stage 1 Potential Horticulture Block area plus a buffer of 50m.	• Detailed • Targeted	1,349 ha (86 ha remnant vegetation)

The survey methodology was required to align with State and Commonwealth requirements for the bioregion and species and communities present and be consistent with State guidelines and Technical Guides and Commonwealth survey guidelines for any relevant threatened species.

The flora and vegetation survey was undertaken during the period 17 August 2018 to 10 January 2019, in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016). This report compiles findings of the field survey.

1.1 Scope and Objectives

The objective of the flora and vegetation surveys was to provide LandCorp with sufficient information to allow it to determine potential direct and indirect impacts of their proposal on conservation values of flora and vegetation within and adjacent to the Project Area. The survey scope specified the following requirements:

Desktop Assessment

The Desktop Assessment Area (DAA) is shown in **Figure 2** and **Figure 3**, and this assessment/ mapping includes known locations of:-

- Threatened and Priority flora (according to Department of Biodiversity, Conservation and Attractions (DBCA) databases) and those likely to occur;
- Threatened ecological communities (TEC) and Priority ecological communities (PEC) (according to DBCA databases) and those likely to occur;
- Vegetation complexes mapped for the site and their remaining extents according to the 2018 Statewide Vegetation Statistics;
- Environmentally Sensitive Areas;
- Wetlands of conservation significance (according to the Department of Water Geomorphic wetlands of the Swan Coastal Plain dataset); and
- Regional ecological linkages.

Field Surveys

A Reconnaissance survey (excluding a Targeted survey) was carried out over the SF16 area including a 50 m buffer around Stage 2; and a Detailed and Targeted survey over remnant native vegetation in Stage 1 plus a buffer of 50 m (total of 86 ha), as indicated in **Figure 3**.

This included:

- Specific, targeted searching for significant flora taxa with transects at 20-30 m intervals
- Installation of over 15 permanently marked flora survey quadrats
- Preparation of a representative and comprehensive flora species lists
- Multivariate classification analysis of quadrat data from the Survey Area will be conducted using the computer software PATN
- Characterisation of the vegetation via mapping of vegetation units using the NVIS Level V – Association (or vegetation type)
- Identification of areas comprising potential habitat for conservation significant flora
- Assessment and mapping of vegetation condition using the EPA (2016) condition scale
- Mapping of locations of opportunistically located conservation significant flora and identification of areas of vegetation that may or are likely to be habitat for Threatened and Priority flora
- Mapping of locations of opportunistically located declared pest plants
- Identification of any GDEs within and adjacent to Stage 2 (i.e. in the 50 m buffer) that may potentially be affected by altered hydrology resulting from the removal of the pine plantation
- ESRI shapefiles of field survey data produced as part of reporting

- Vegetation condition was recorded using the EPA (2016) condition scale at all quadrats, and at regular intervals within the Project Area during the reconnaissance and targeted rare flora traverses
- Mapping of vegetation type and condition as well as locations of all conservation significant flora and weeds was produced as part of the report and
- ESRI shapefiles of field survey data as well as locations of quadrats was produced as part of reporting.

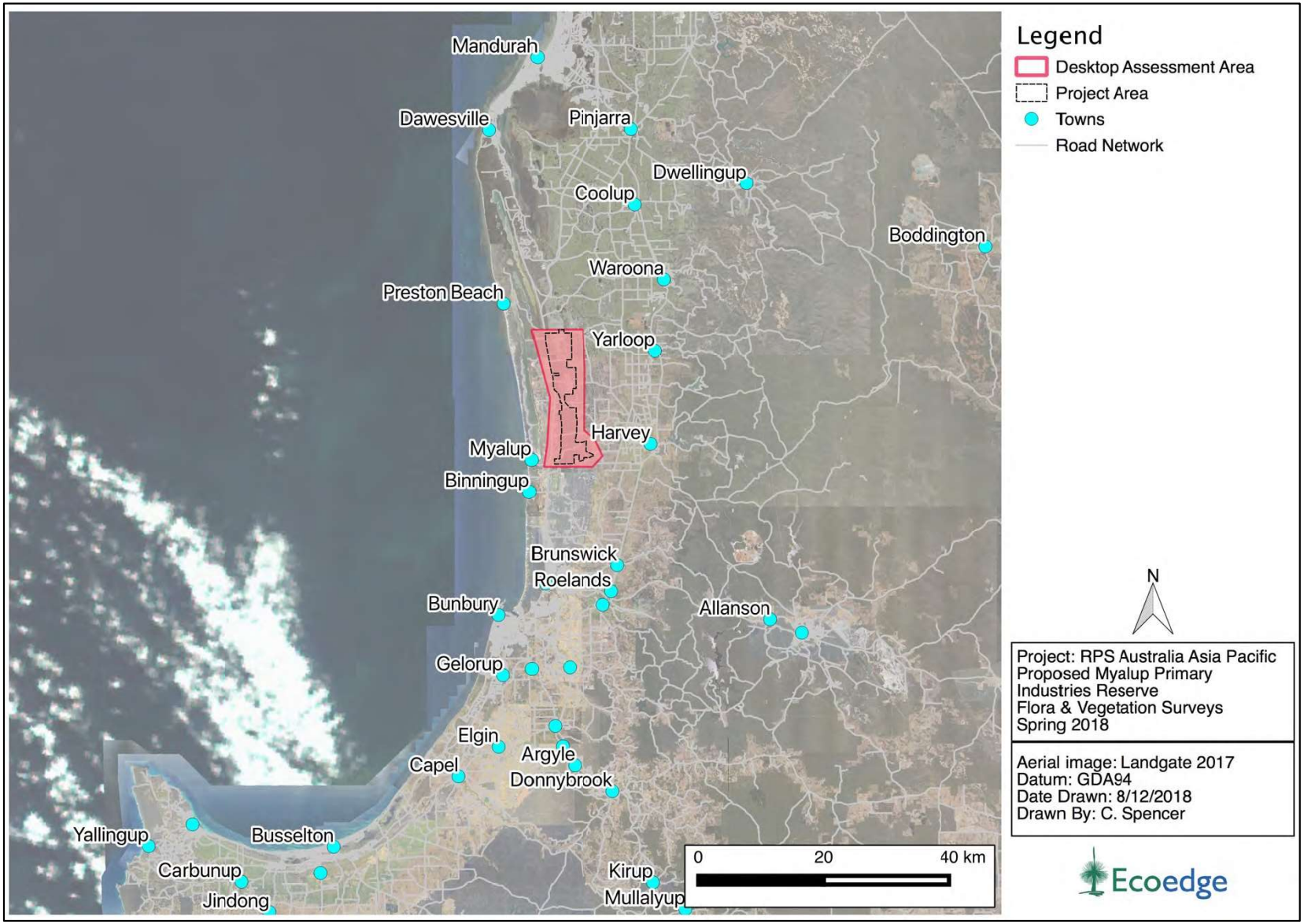

Figure 1. Aerial photograph showing the location of the Desktop Assessment Area and the Project Area.

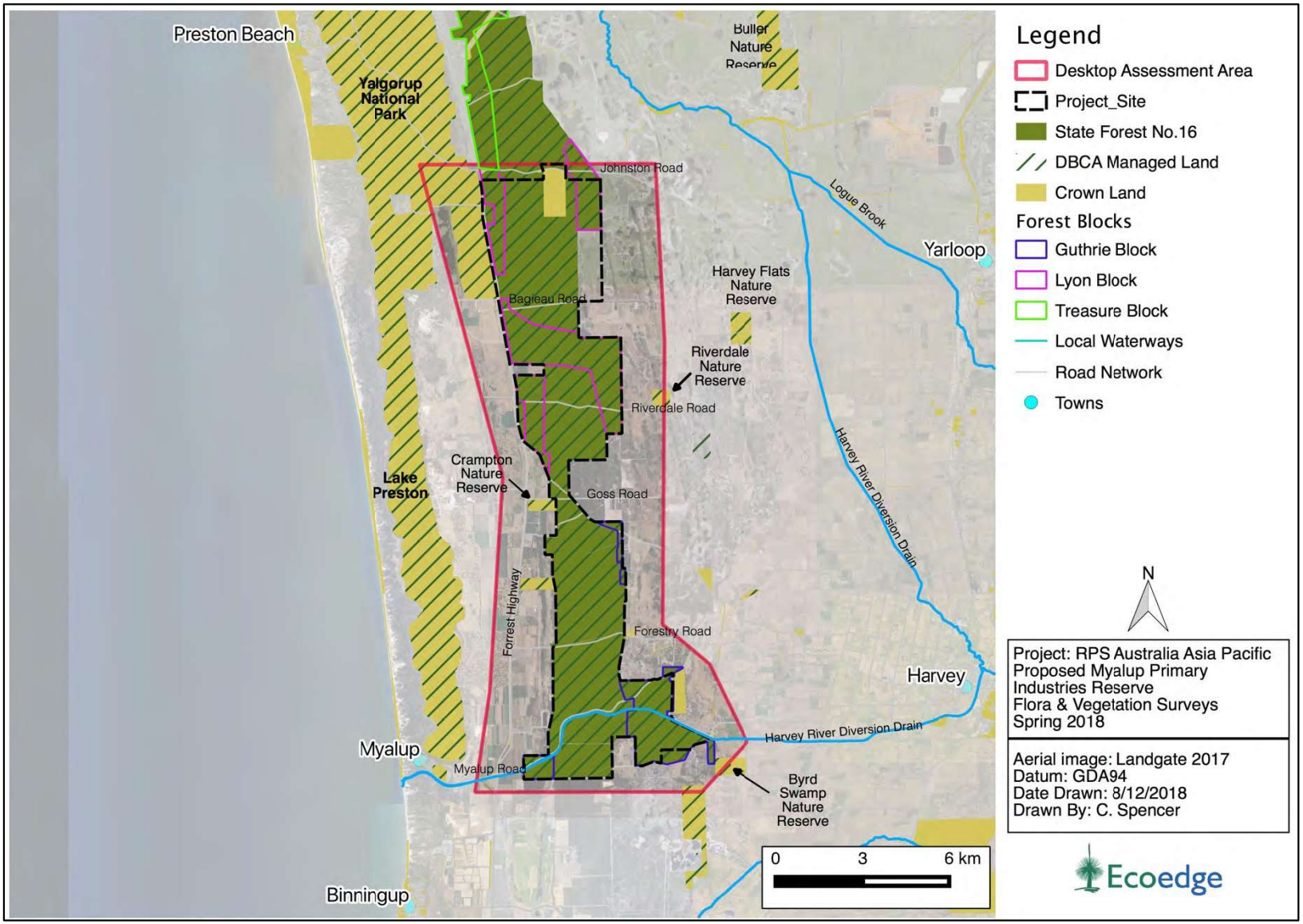

Figure 2. The Desktop Assessment and Project Area in context of surrounding land uses.

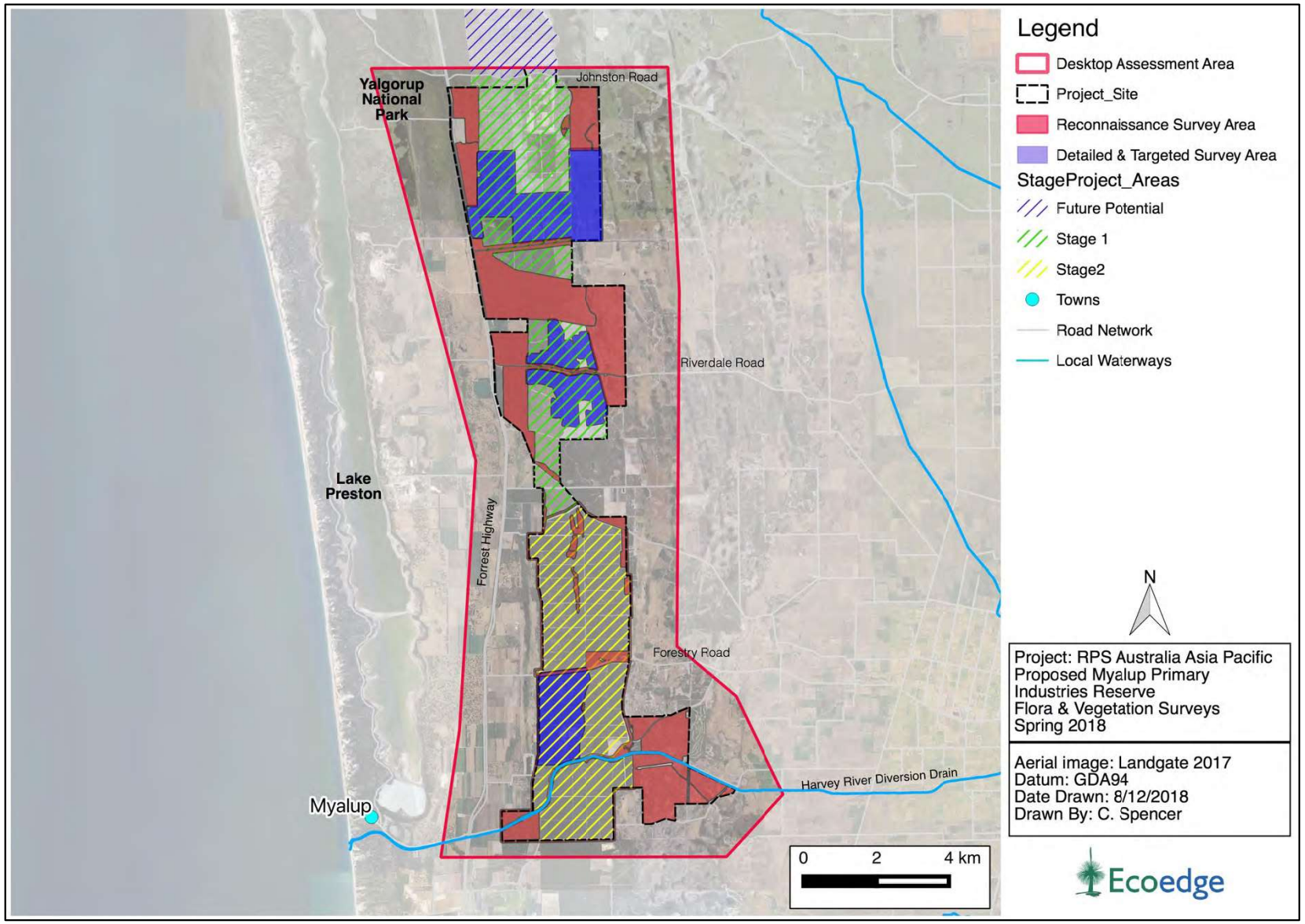

Figure 3. Project Area and flora and vegetation survey location map.

1.2 Biogeographic Region and Location

The DAA covers approximately 15,067 ha of land. It is situated within the Swan Coastal Plain (SWA02) sub-region of the Swan Coastal Plain biogeographic region, as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Commonwealth of Australia, 2016). It is located within the Shire of Harvey in an agricultural setting. The DAA comprises of a portion of DBCA managed State Forest No.16 (comprised of Lyons and Guthrie forest blocks), agricultural land holdings, three small DBCA managed nature reserves (Crampton, Riverdale and Byrd) and the Yalgorup National Park. Lake Preston is located between 0.65 km and 2.2 km to the west and runs generally parallel to the DAA. A section of the Harvey River Diversion Drain passes through the southern portion of the area (**Figure 2**, **Figure 3**).

Within the DAA, a 6,378 ha 'Project Area' was subject to a Reconnaissance, and in parts, a Detailed flora survey. The Project Area encompasses a relatively small area of native vegetation existing as 'islands' within the pine plantation, as well as the larger areas of native vegetation to the east and west of the pine plantation (as well as along some of the east-west roads) in Lyons forest block north of Crampton Road and Guthrie forest block south of Crampton Road. Topographical relief in the Project Area ranges from about 4 m A.M.S.L (above mean sea level) in the east along the Forrest Highway to about 60 m on the highest points of the chain of Spearwood dunes formed of Tamala limestone (the 'Mandurah-Eaton Ridge'; V & C Semeniuk Research Group, 2009) running north-south to about 14 m along parts of the eastern boundary

1.3 Geology

The DAA is situated on the Swan Coastal Plain (SCP), which is bounded by the Darling Scarp to the east, Indian Ocean to the west, Moore River to the north and Dunsborough to the south. In broad terms, the Swan Coastal Plain is built up of two belts of sediments that differ in origin: aeolian sediments in the west and alluvial sediments in the east. The aeolian sediments are a consistent feature up and down the plain and comprise of three major sand dune systems: The Bassendean Dune System is the most easterly and oldest system; the Quindalup System is the most westerly and youngest system with the Spearwood system located in between. For most of the central and southern portion of the plain, the Bassendean system presses up against the Pinjarra plain, this is built up of alluvium deposited by streams from the adjacent Darling Plateau. The Quindalup and western portion of the Spearwood dune system in this section of the SCP are also intersected by the estuarine derived Vasse System (**Figure 4**).

The DAA comprises of four of these systems; the Vasse, Spearwood, Bassendean and Pinjarra plain, with the Spearwood and Bassendean systems forming the bulk of the area (Barnesby *et al.* 1995; van Gool and Kipling, 1992).

The Vasse system is a system of poorly drained estuarine flats, comprised of tidal flat soil, saline wet soil and pale deep sand. The Spearwood System is characterised by sand dunes and plains of yellow deep sands, pale deep sands and yellow/brown shallow sands. The

Bassendean System is described as Pleistocene sand dunes with very low relief, leached grey siliceous sand intervening sandy and clayey swamps and gently undulating plains. The Pinjarra system is described as a poorly drained coastal plain with variable alluvial and aeolian soils (Barnesby *et al.* 1995; van Gool and Kipling, 1992).

These soil-landscape systems have been divided into subsystems, and further divided into soil phases. Thirty soil phases are mapped across the Project Area. These are described in **Table 2** and mapped in **Figure 4**.

Table 2. DAA soil phases (Barnesby *et al.* 1995; van Gool and Kipling, 1992).

System	Soil Phase	Description
211Sp Spearwood	211Sp_S1a	Shallow to moderately deep siliceous yellow-brown sands.
	211Sp_S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
	211Sp_S1c	Deep bleached grey sands with yellow-brown subsoils.
	211Sp_S2a	Moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils.
	211Sp_S2b	Very shallow to deep siliceous yellow-brown sands.
	211Sp_S2c	Bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c).
	211Sp_S3	Deep rapidly drained siliceous yellow-brown sands.
	211Sp_S4a	Deep, pale and sometimes bleached, sands with yellow-brown subsoils.
	211Sp_S4b	Shallow to moderately deep siliceous yellow-brown and grey-brown sands.
	211Sp_S4c	Deep, yellow-brown or dark brown siliceous sands.
	211Sp_S6	Very shallow siliceous sands.
	211SpW_SWAMP	Wet soils, water.
211Va Vasse	211Va_V3	Deep alkaline alluvial sands and clayey sands.
	211Va_V4	Shallow to moderately deep uniform alkaline black sandy loams to loams overlying unconsolidated shell beds or clayey marl.
	211Va_V7	Very broad shallow depression with deep, poorly drained, fine textured alkaline estuarine alluvium.
212Bs Bassendean	212Bs_B1	Deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m.
	212Bs_B1a	Deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface.
	212Bs_B2	Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
	212Bs_B3	Moderately deep, bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.
	212Bs_B3a	Poorly drained grey and brown sands, with an iron-organic (or siliceous) hardpan at generally <1 metre.
	212Bs_B4	Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.
	212Bs_B5	Deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan
	212Bs_B6	Deep or very deep grey siliceous sands.
	212BsW_SWAMP	Wet soils (Pale deep sands and peaty sands)
213Pj Pinjarra	213Pj_B1	Deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at generally > 2m
	213Pj_B2	Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
	213Pj_B6	Deep or very deep grey siliceous sands.
	213Pj_P3	Deep acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.
	213Pj_P7	Variable acidic mottled yellow and grey duplex soils.
	213PjSWP6c	Uniform friable brown loams, or well-structured gradational brown earths.

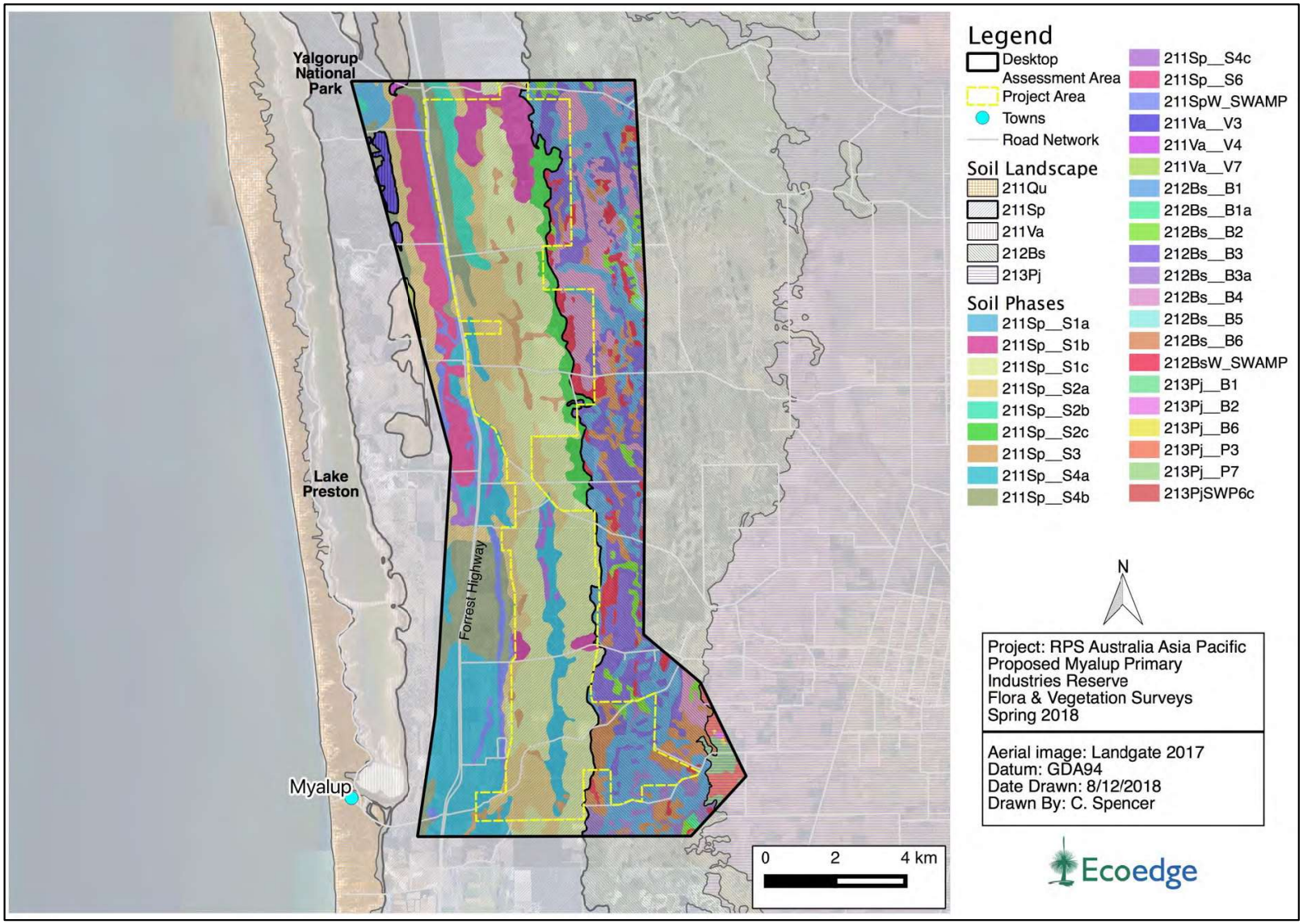

Figure 4. Soil phases mapped for the DAA (Barnesby *etal.* 1995; van Gool and Kipling, 1992).

1.4 Vegetation Description according to pre-European Mapping Datasets

The DAA covers approximately 15,067 ha of land. Approximately 6,378 ha of this comprises the SF16 Project Area and of this 2,136 ha was the subject of the field surveys (**Figure 3**).

1.4.1 Vegetation Complexes

In 2016, the then Department of Parks and Wildlife (DPaW) revised the mapping datasets for the Darling Scarp and Plateau Regional Forest Agreement (RFA) mapping of Mattiske and Havel (1998) and the Swan Coastal Plain mapping of Heddle *et al.* (1980). The purpose of the revision was to fill data gaps and improve alignment and correlation between the two datasets (Webb, *et al.* 2016).

According to the 1:250,000 mapping of vegetation complexes in the Swan Coastal Plain of Western Australia (Heddle *et al.,* 1980) as updated by Webb *et al*. (2016), six vegetation complexes occur within the Project Area. These are described in **Table 3** and mapped in **Figure 5.**

Table 3. Vegetation complexes mapped for the DAA (Webb *et al*., 2016).

Vegetation Complex	Description
Bassendean Complex – Central and South	Vegetation ranges from woodland of *Eucalyptus marginata* (Jarrah) - *Allocasuarina fraseriana* (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* (Jarrah) to *Eucalyptus todtiana* (Pricklybark) in the vicinity of Perth.
Cottesloe Complex – Central and South	Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri); closed heath on the Limestone outcrops.
Karrakatta Complex – Central and South	Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River.
Serpentine River Complex	Closed scrub of Melaleuca species and fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca rhaphiophylla* (Swamp Paperbark) along streams.
Vasse Complex	Mixture of the closed scrub of Melaleuca species fringing woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). Will include areas dominated by Tecticornia and Sarcocornia species (Samphire) near Mandurah and south of the Capel River.
Yoongarilup Complex	Woodland to tall woodland of *Eucalyptus gomphocephala* (Tuart) with *Agonis flexuosa* in the second storey. Less consistently an open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). South of Bunbury is characterized by *Eucalyptus rudis* (Flooded Gum)-Melaleuca species open forests.

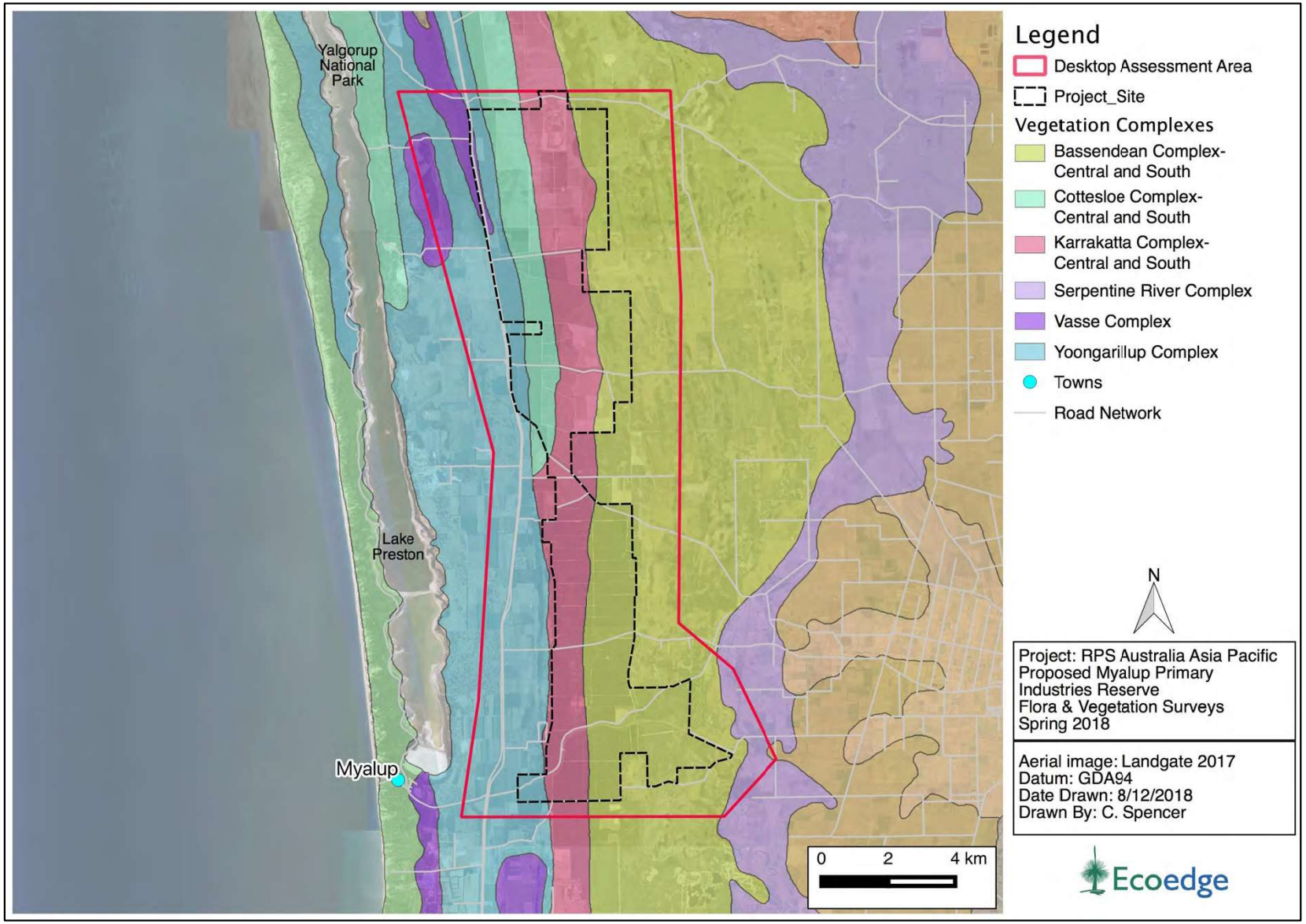

Figure 5. Vegetation complexes mapped within the DAA and the Project Area (Webb *et al*., 2016).

1.4.2 Assessment of Remaining Extent against Pre-European Extent

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community was necessary if Australia's biological diversity was to be protected (Environment Australia, 2001).

In its report on the Statewide Vegetation Statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for WA (Government of Western Australia, 2018). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the "CAR Reserve Analysis".

Table 4 lists the percentage remaining of each vegetation complex identified within the Desktop Assessment Area and indicates whether the Commonwealth 30% retention target is met.

Table 4. Vegetation complexes mapped within the DAA with regard to the Commonwealth retention target (Government of Western Australia, 2018).

Vegetation Complex	% Remaining of pre-European	Is the 30% Target Met?	% in DBCA Managed Lands*
Bassendean Complex – Central and South	26.9%	No	4.99%
Cottesloe Complex – Central and South	32.17%	Yes	14.55%
Karrakatta Complex – Central and South	23.48%	No	8.06%
Serpentine River Complex	9.58%	No	2.61%
Vasse Complex	31.41%	Yes	14.58%
Yoongarillup Complex	35.55%	Yes	18.34%

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

1.5 Threatened and Priority Ecological Communities

Ecological communities are defined by Western Australia's DBCA (previously DPaW and the Department of Environment and Conservation (DEC)) as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an

ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC, 2013).

Through a non-statutory process, the Minister for Environment (Western Australia) may list communities that are considered to be at threat as either Threatened or Priority ecological communities. A Threatened ecological community (TEC) is one which is found to fit into one of the following categories; Presumed Totally Destroyed (PD), Critically Endangered (CE), Endangered (E) or Vulnerable (V) (DEC, 2013). Possible threatened ecological communities that do not meet survey criteria are added to DBCA's Priority ecological community Lists under Priorities 1, 2 and 3 (referred to as P1, P2, P3). Ecological communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC, 2013).

The current listing of Threatened and Priority ecological communities is specified in DBCA (2018a; 2019).

Threatened ecological communities can also be listed under the Commonwealth EPBC Act (Department of the Environment and Energy (DotEE), 2018a; Department of Environment, Water, Heritage and the Arts (DEWHA), 1999). There are three categories of TEC under the EPBC Act: Critically Endangered (CE), Endangered (E) and Vulnerable (V). These are defined in **Appendix 1** (DotEE, 2018a).

TECs and PECs occurring within 5 km of the DAA generated from an extract from the DBCA databases (DBCA, 2018b) and a Protected Matters Search Tool search within 5 km of the DAA (DotEE, 2018b; **Appendix 2**) are listed in **Table 5** and presented in **Figure 6**. Five of these communities occur within the DAA and are marked with an asterisk in **Table 5**.

Table 5. TECs and PECs occurring within 5 km of the DAA (Gibson *et al*. 1994; DBCA, 2018b; DotEE, 2018b).

Community Identifier	Community Description	Status (WA)	Status (EPBC Act)
*Thrombolite (microbialite) Community of a Coastal Brackish Lake (Lake Clifton)	Stromatolite like freshwater microbialite community of coastal brackish lakes.	TEC (CE)	CE
*SCP09 Dense shrublands on clay flats	Typically inundated for long periods, common taxa include *Chorizandra enodis, Cyathochaeta avenacea*, *Lepidosperma longitudinale* and *Leptocarpus coangustatus.* Shrubs including *Hakea varia*, *Melaleuca viminea* and *Eutaxia virgata* are common.	TEC (VU)	CE

Community Identifier	Community Description	Status (WA)	Status (EPBC Act)
Muchea Limestone: Shrublands and woodlands on Muchea Limestone	Occurs on the heavy soils on the eastern side of the Swan Coastal Plain. Common taxa include *Casuarina obesa, Eucalyptus decipiens* and *Eucalyptus foecunda* and the shrubs *Melaleuca huegelii, Alyogyne huegelii* var. *huegelii, Grevillea curviloba* ssp. *incurva*, *Grevillea curviloba* ssp. *curviloba*, *Grevillea evanescens, Melaleuca acerosa*, *Melaleuca huegelii* and *Thysanotus arenarius*.	TEC (EN)	EN
*Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	The canopy is most commonly dominated or co-dominated by *Banksia attenuata* and/or *B. menziesii*. Other Banksia species that can dominate in the community are *B. prionotes* or *B.ilicifolia*.	PEC (P3)	EN
*SCP18 Shrublands on calcareous silts of the Swan Coastal Plain	Very species rich, common taxa include *Acacia saligna* (suckering form), *Leptomeria lehmannii, Xanthorrhoea preissii, Ghania trifida* and *Melaleuca teretifolia.*	TEC (VU)	N/A
*SCP25 Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	Woodlands of *Eucalyptus gomphocephala - Agonis flexuosa* typically south of Woodman Point. Recorded from the Karrakatta, Cottesloe and Vasse units. Dominants other than Tuart can include *Corymbia calophylla* and *Eucalyptus decipiens.* Banksias found in this community include *Banksia attenuata*, *B. grandis* and *B. littoralis*.	PEC (P3)	EN TEC (part)
SCP26a Melaleuca huegelii - Melaleuca acerosa (currently *M. systena*) shrublands on limestone ridges	Species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii*, *M. systena*, *Dryandra sessilis* over *Grevillea preissii, Acacia lasiocarpa* and *Spyridium globulosum*, occurring on skeletal soil on ridge slopes and ridge tops.	TEC (EN)	N/A
Living microbial mats in hypersaline ponds. - Lake Preston - Pamelup Pond	Extant hypersaline pond stromatolitic 'Conophyton' like unlithified communities formed with little sediment incorporation by (?) *Phormidium hypersalinum.*	PEC (P2)	N/A
SCP 21b Southern *Banksia attenuata* woodlands	Structurally, this community type is normally *Banksia attenuata* or *Eucalyptus marginata – B. attenuata* woodland. Common taxa include *Acacia extensa, Jacksonia* sp. *Busselton, Laxmannia sessiliflora, Lysinema ciliatum* and *Johnsonia acaulis.*	PEC (P3)	EN
SCP24 Northern Spearwood shrublands and woodlands	Heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils typically north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include *Dryandra sessilis, Calothamnus quadrifidus,* and *Schoenus grandiflorus.*	PEC (P3)	N/A
SCP29a Coastal shrublands on shallow sands	Mostly heaths on shallow sands over limestone close to the coast. No single dominant but important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris.*	PEC (P3)	N/A

*Threated or Priority ecological communities occurring within the DAA.

Note: This table only includes formally recognised TECs that are known of and mapped by DBCA and are included in their database.

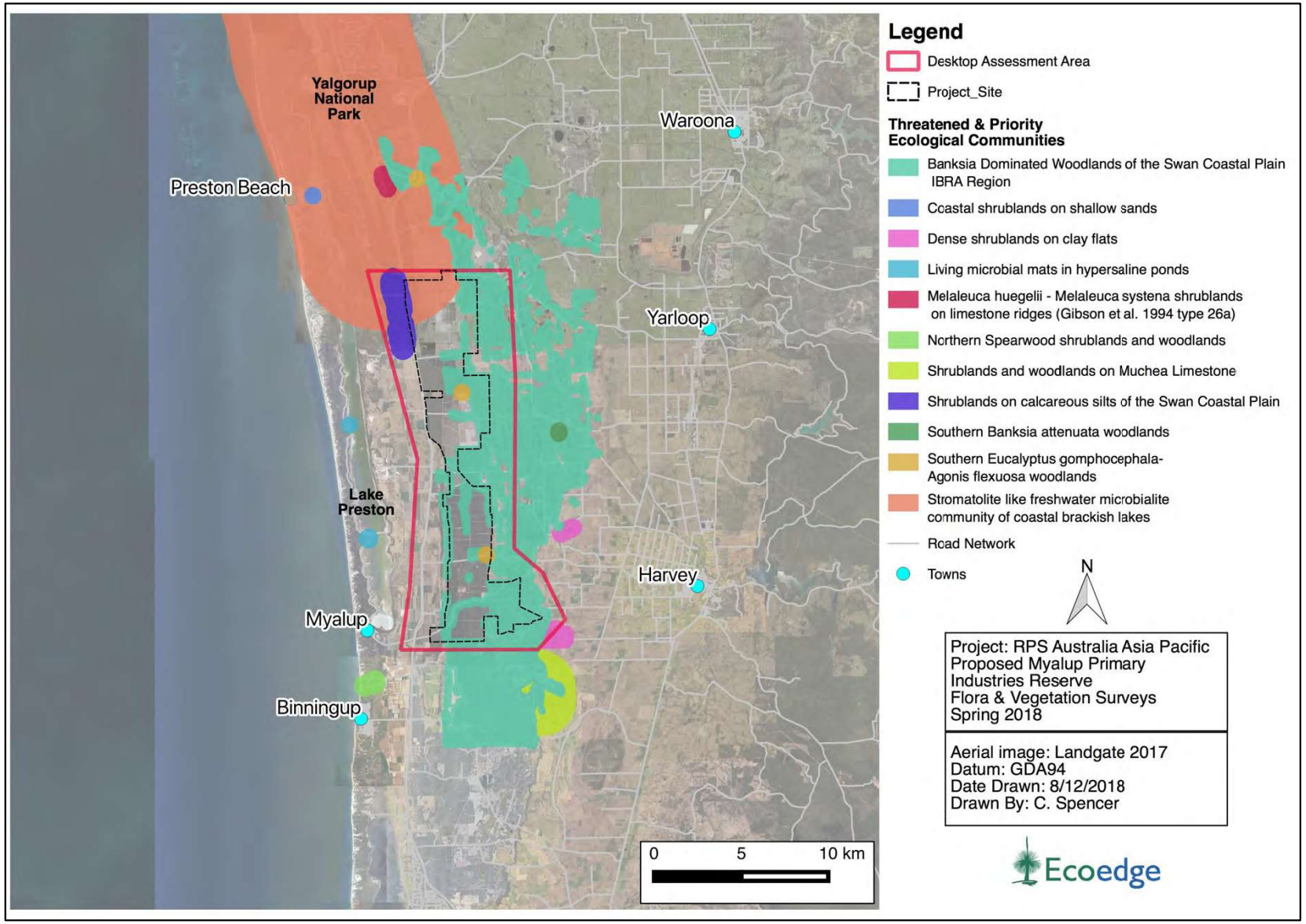

Figure 6. Threatened and Priority ecological communities within 5 km of the DAA (DBCA, 2018b).

1.6 Threatened and Priority Flora

Species of flora and fauna are defined as having Threatened or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Water and Environment Regulation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Threatened Flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act 1950* (WC Act)[5] and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 6 of the WC Act defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means."

Priority flora are under consideration for future declaration as "rare flora", dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species require monitoring every 5-10 years. Under the WC Act, Threatened flora are ranked according to their level of threat using IUCN Red List categories and criteria of Extinct (EX), Critically Endangered (CE), Endangered (EN) or Vulnerable (VU). **Appendix 3** presents the categories of Threatened and Priority Flora as defined by the WC Act (DPaW, 2017).

Under the EPBC Act, a species may be listed in one of six categories; the definitions of these categories are summarised in **Appendix 4** (DotEE, 2018c).

Threatened or Priority flora occurring within 5 km of the Project Area generated from an extract from the DBCA databases (DBCA, 2018c) and a NatureMap search within 20 km of the Project Area (DBCA, 2018d; **Appendix 5**) are listed in **Table 6.** Taxa listed under the EPBC Act (based on results of the Protected Matters Search Tool query (DotEE, 2018b; **Appendix 2**) were also included in the preparation of the table. The results of the DBCA datasearch are mapped in **Figure 7**. Several of the species listed in **Table 6** could potentially occur within the Project Area, based on an assessment of their preferred habitats.

[5] Transition to the *Biodiversity Conservation Act 2016* will commence in the near future. At the time of preparing this report, the WC Act 1950 was current in regards to the conservation of Threatened and Priority flora.

Table 6. Threatened and Priority List flora known to occur within 5 km of the DAA (DBCA, 2018c, 2018d; DotEE, 2018b.)

Species	Cons Status*	Flowering	Description and Habitat	Likelihood
Caladenia procera	T (CE)	Sep-Oct	Tuberous, perennial, herb, 0.35-0.9 m high. Fl. yellow. Rich clay loam,. Alluvial loamy flats, jarrah/marri/peppermint woodland, dense heath, sedges.	Low
Andersonia gracilis	T (EN)	Sep-Nov	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Low
Austrostipa bronwenae	T (EN)	Sep-Oct	Perennial grass, 0.6 m high x 0.3 m wide. Flowers green. Reproductive method: seeds, caespitose.	Low
Caladenia huegelii	T (EN)	Sep-Oct	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green, cream, red. Grey or brown sand, clay loam.	Low
Chamelaucium sp. Gingin (N.G.Marchant 6)	T (EN)	Sep-Dec	Open straggly shrub 1 - 2 m tall. The flowers are pale pinkish-white, the buds are tinged a deeper pink. and Flowering occurs September to December.	None
Diuris purdiei	T (EN)	Sep-Oct	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow. Grey-black sand, moist. Winter-wet swamps.	Low
Drakaea elastica	T (EN)	Oct-Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Moderate
Synaphea stenoloba	T (EN)	Aug-Oct	Caespitose shrub, 0.3–0.45 m high. Fl. Yellow. Sandy or sandy clay soils. Winter-wet flats, granite. Shrublands and woodlands on loamy soils.	Low
Diuris micrantha	T (VU)	Sep-Oct	Tuberous, perennial, herb, 0.3–0.6 m high. Fl. yellow, brown. Brown loamy clay. Winter-wet swamps, in shallow water.	Low
Drakaea micrantha	T (VU)	Sep-Oct	Tuberous, perennial, herb, 0.15–0.3 m high. Fl. red, yellow. White-grey sand.	Moderate
Eleocharis keigheryi	T (VU)	Aug-Nov	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green. Clay, sandy loam. Emergent in freshwater: creeks, claypans	Low
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	Oct	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. Yellow. Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Low
Synaphea sp. Pinjarra Plain (A.S. George 17182)	T	Sep-Nov	Erect, clumped shrub (sub-shrub), to 0.8 m high. Fl. yellow. Grey sandy loam or clay, grey-brown clayey sand, brown clayey loam, laterite. Flats, seasonally wet areas, railroad reserves often with wet depressions or drains.	Low
Synaphea sp. Serpentine	T	Sep-Oct	Shrublands and woodlands on loamy soils	Low

Species	Cons Status*	Flowering	Description and Habitat	Likelihood
Boronia juncea subsp. *juncea*	P1	Apr	Slender or straggly shrub, pedicels and sepals glabrous. Fl. pink. Sand. Low scrub.	Moderate
Haloragis scoparia	P1		Perennial, herb, 0.3-0.6 m high.	Low
Alyogyne sp. Rockingham (G.J. Keighery 14463)	P2	Dec	Found within Yalgorup National Park and Kemerton Nature Reserve	Moderate
Haloragis aculeolata	P2	Sep or Dec	Slender, erect perennial, herb, to 0.4 m high. Fl. green. Black sand or clay over limestone. Winter-wet areas.	Low
Pterostylis frenchii	P2	Nov-Dec	Tuberous, herb, to 0.35 m high, with rosette leaves. Fl. white. Calcareous sand with limestone, laterite. Flatlands and gentle slopes.	Moderate
Acacia horridula	P3	May-Aug	Harsh, slender, single-stemmed shrub, 0.3-0.6(-1) m high. Fl. yellow. Gravelly soils over granite, sand. Rocky hillsides.	None
Blennospora doliiformis	P3	Oct-Nov	Erect annual, herb, to 0.15 m high. Fl. yellow. Grey or red clay soils over ironstone. Seasonally-wet flats.	None
Boronia capitata subsp. *gracilis*	P3	Jun-Nov	Slender shrub, 0.3-0.6(-3) m high, branches pilose. Fl. pink. White/grey or black sand. Winter-wet swamps,	Moderate
Cyathochaeta teretifolia	P3	Oct-Jan	Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high, to 1.0 m wide. Fl. brown. Grey sand, sandy clay. Swamps, creek edges.	Moderate
Dillwynia dillwynioides	P3	Aug-Dec	Decumbent or erect, slender shrub, 0.3–1.2 m high. Fl. red, yellow, orange. Sandy soils. Winter-wet depressions, inundated flats generally alongside rivers or deeper swamps.	Moderate
Galium leptogonium	P3	Spring - Autumn	Herb, fl. corolla 1.5–2.5 mm diam., with lobes 0.7–1.2 mm long, not apiculate, cream or greenish-cream, sometimes tinged purple-red abaxially, rarely hairy.	Low
Hemigenia microphylla	P3	Sep-Dec	Slender shrub, 0.4-1.8 m high. Fl. blue-purple. Sandy clay, peaty clay, granite. Winter-wet depressions.	Low
Hibbertia spicata subsp. *leptotheca*	P3	Jul-Oct	Erect or spreading shrub, 0.2-0.5 m high. Fl. yellow. Sand. Near-coastal limestone ridges, outcrops & cliffs.	Moderate
Lasiopetalum membranaceum	P3	Sep-Dec	Multi-stemmed shrub, 0.2-1 m high. Fl. pink, blue, purple. Sand over limestone.	High

Species	Cons Status*	Flowering	Description and Habitat	Likelihood
Meionectes tenuifolia	P3	Oct	Haloragaceae family, broadly distributed across the Swan Coastal Plain, northern and southern Jarrah forests.	Moderate
Pimelea calcicola	P3	Sep-Nov	Erect to spreading shrub, 0.2-1 m high. Fl. pink. Sand. Coastal limestone ridges.	Moderate
Platysace ramosissima	P3	Oct-Nov	Perennial, herb, to 0.3 m high. Fl. white, cream. Sandy soils.	Moderate
Schoenus sp. Waroona (G.J. Keighery 12235)	P3	Oct-Nov	Tufted annual, grass-like or herb (sedge), 0.02-0.06 m high. Fl. brown-red-green. Clay or sandy clay. Winter-wet flats.	Low
Sphaerolobium calcicola	P3	Jun or Sep or Nov	Slender, multi-stemmed, scandent or erect shrub, to 1.5 m high. Fl. orange-red. White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Low
Stylidium maritimum	P3	Sep-Nov	Caespitose perennial, herb, 0.3-0.7 m high. Inflorescence paniculate. Fl. white/purple. Sand over limestone. Dune slopes and flats.	Moderate
Stylidium paludicola	P3	Oct-Dec	Reed-like perennial, herb, 0.35-1 m high. Inflorescence racemose. Fl. pink. Peaty sand over clay. Winter wet habitats.	Moderate
Stylidium trudgenii	P3		Caespitose perennial, herb, 0.05-0.5 m high. Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions.	Moderate
Styphelia filifolia	P3	Mar - May	Erect shrubs to 90 cm high, 70 cm wide, Inflorescence axillary, pendulous; 1–4-flowered; flowers pendulous, Fl white. Sandy soils usually in Banksia or Jarrah woodland and in low-lying situations.	Moderate
Acacia flagelliformis	P4	May-Sep	Rush-like, erect or sprawling shrub, 0.3-0.75(-1.6) m high. Fl. yellow. Sandy soils. Winter-wet areas.	High
Acacia semitrullata	P4	May-Oct	Slender, erect, pungent shrub, (0.1-)0.2-0.7(-1.5) m high. Fl. cream, white. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.	High
Caladenia speciosa	P4	Sep-Oct	Tuberous, perennial, herb, 0.35-0.6 m high. Fl. white, pink. White, grey or black sand.	High
Conostylis pauciflora subsp. *pauciflora*	P4	Aug-Oct	Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1-0.35 m high. Fl. yellow. Grey sand, limestone. Hillslopes, consolidated dunes.	Moderate

Species	Cons Status*	Flowering	Description and Habitat	Likelihood
Stylidium longitubum	P4	Oct-Dec	Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. Pink. Sandy clay, clay. Seasonal wetlands.	Moderate
Tripterococcus brachylobus	P4	Nov-Dec or Feb	Perennial, herb, to 1 m high. Fl. yellow/yellow-green. Grey sand, red clay, laterite, often moist. Low-lying flats.	Low
Hakea oligoneura	P4	Sept	Shrubs to 2 m high x 2 m wide. Bark smooth or finely fissured. Inflorescences white; pedicels 2-2.5 mm long. White-brown sand on limestone ridges in open Mallee over *Melaleuca acerosa*, Xanthorrhoea and Hibbertia.	Moderate

Note: The WC Act Conservation Status is shown, EPBC Act status, where relevant, is in brackets.

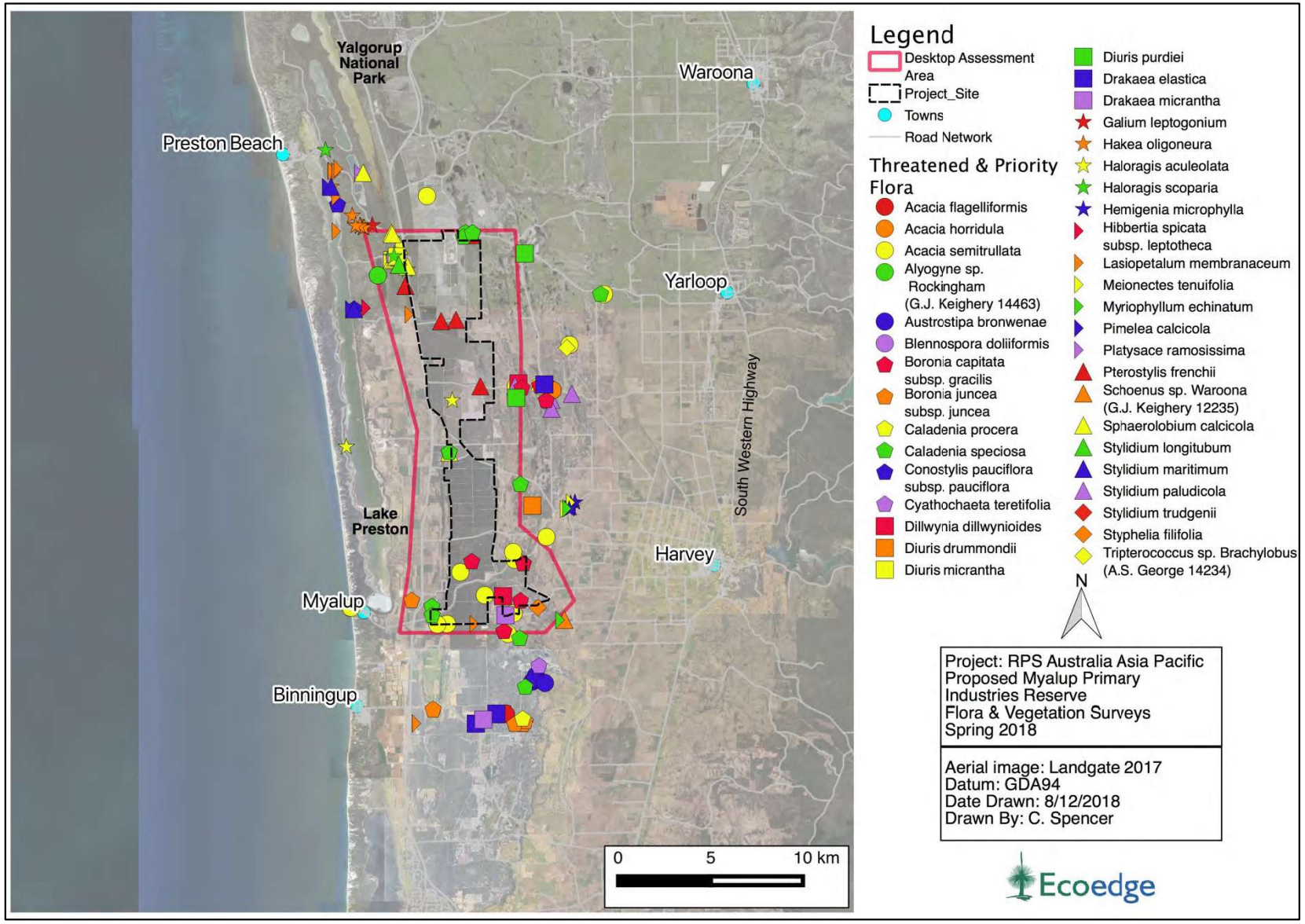

Figure 7. Known occurrences of Threatened and Priority flora within 5 km of the DAA (DBCA, 2018c).

1.7 Geomorphic Wetlands

Wetlands on the Swan Coastal Plain have been classified into types using the geomorphic wetland classification system of Semeniuk & Semeniuk (1995), which is based on the characteristics of landform and water permanence, for example lakes, palusplains and damplands. These are described in **Table 7.** The Swan Coastal Plain wetlands have also been evaluated and assigned an appropriate management category and corresponding category objective, providing guidance on the nature of the management and protection the wetland should be afforded. These categories are described in **Table 8.**

Table 7. Wetland types (adapted from Semeniuk & Semeniuk, 1995).

Management Category	Basin	Flat	Channel	Slope	Highland
Permanently inundated	Lake		River		
Seasonally inundated	Sumpland	Floodplain	Creek		
Intermittent inundation	Playa	Barlkarra	Wadi		
Seasonally waterlogged	Dampland	Palusplain	Trough	Paluslope	Palusmont

Table 8. Definitions of and objectives for the different wetland management categories (Hill *et al.*, 1996).

Management Category	Definition	Category Objective
Conservation	Wetlands with high conservation value for both natural or human use	To preserve wetland (natural) attributes and functions
Resource Enhancement	Wetlands with moderate natural and human use attributes that can be restored or enhanced	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use	Wetlands that score poorly on both natural and human use attributes	To use, develop and manage wetlands in the context of water, town and environmental planning

An assessment of the DEC Geomorphic Wetland database (DEC, 2008) shows four different natural wetland types occur both within the boundary of DAA and Project Area: damplands, palusplains, sumplands and lakes. These wetlands are associated with the lowland plains which occur at the west and east of the DAA (**Figure 8**).

The largest extent of wetlands in the DAA occur east of the Project Area on Bassendean and Pinjarra Plain soils within the predominantly cleared agricultural landscape. Most of these wetlands are classified as Multiple Use, with a smaller number of Resource Enhancement wetlands associated with better quality bushland areas (**Figure 9**). Within the DAA, a small number of Conservation category wetlands (CCW) occur outside the Project Area but most

are located within it. These are in the north-east, within Lyons Forest Block and in the south-east in Guthrie Forest Block.

A relatively narrow line of wetlands occurs on the Spearwood soils to the west and outside of the Project Area but within the DAA, adjacent to the west boundary of the Project Area. These wetlands predominantly comprise Multiple Use wetlands within agricultural land. A large CCW occurs within the boundary of the Yalgorup National Park in the north east of the DAA on the west side of the Forrest Highway.

1.8 Ecological Linkages and Connectivity

Information for this section is taken from Molloy *et al*. (2009) and their report on the South West Regional Ecological Linkages (SWREL) Project.

Ecological linkages are defined as:

> "*A series of (both contiguous and non-contiguous) patches which, by virtue of their proximity to each other, act as stepping stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within, and across, a landscape*."

Regional ecological linkages link protected patches of regional significance by retaining the best (condition) patches available as stepping stones for flora and fauna between regionally significant areas. This increases the long-term viability of all the constituent areas.

The SWREL report is the result of collaboration between the Western Australian Local Government Association's *South West Biodiversity Project* and the then Department of Environment and Conservation's *Swan Bioplan* to provide a tool for the identification of ecological linkages and guidance for the protection of linkages through planning policy documents.

Molloy *et al.* (2009) assessed and assigned "proximity value ratings" to all patches of remnant native vegetation as a way of indicating their distance from the nearest regional ecological linkage axis line. These values are defined in **Table 9**. It should be noted however, that the proximity value of a patch of remnant vegetation to an ecological linkage is not intended to replace the need to consider the other biodiversity conservation values of that patch of remnant vegetation.

Eight ecological linkage axis lines are mapped within the DAA (**Figure 10**). Most of the remnant vegetation within the DAA has been assigned the two highest proximity ratings of "1a" and "1b" because of their <100 m proximity to the axis lines and neighbouring parcels of bushland. The most substantial of these linkages is associated with an axis line which runs SE from the Yalgorup National Park through the DAA.

While there is no statutory basis for regional ecological linkages identified through the SWREL project, the importance of ecological linkages have been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA, 2009 and references therein). In its statement regarding the SWREL Project, the EPA stated that even though Ecological Linkages are just one measure of the conservation values of a patch of remnant vegetation it expected that:

> *In preparing plans and proposals for development, consideration will be given to both the site-specific biodiversity conservation values of patches of native vegetation, as well as the landscape function and core linkage significance of a patch in supporting the maintenance of ecological linkage* (EPA, 2009).

Table 9. Linkage proximity rating values assigned to patches of remnant vegetation within a landscape (from Molloy *et al*., 2009).

1a: with an edge touching or <100m from a linkage
1b: with an edge touching or <100m from a natural area selected in 1a
1c: with an edge touching or <100m from a natural area selected in 1b
2a: with an edge touching or <500m from a linkage
2b: with an edge touching or <500m from a natural area selected in 2a
2c: with an edge touching or <500m from a natural area selected in 2b
3a: with an edge touching or <1000m from a linkage
3b: with an edge touching or <1000m from a natural area selected in 3a
3c: with an edge touching or <1000m from a natural area selected in 3b

1.9 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 and are selected for their environmental values at state or national levels (Government of Western Australia, 2005). They include;

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened Ecological Communities;
- Area of vegetation within 50 m of Threatened flora;
- Bush Forever sites; and
- Declared World Heritage property sites.

A number of ESAs occur along the eastern third of the DAA and within the eastern boundary of the Project Area. These are associated with CCWs which are described in **Section 1.7** and mapped in **Figure 9**, and the Riverdale and Byrd Nature Reserves (**Figure 2**). A relatively

large ESA occurs in the NW portion of the DAA and Project Area. This is associated with Conservation category dampland wetland within the Yalgorup National Park which is also mapped as an ESA. A further ESA associated with the Crampton Nature Reserve is located in the central west portion of the DAA (**Figure 11**).

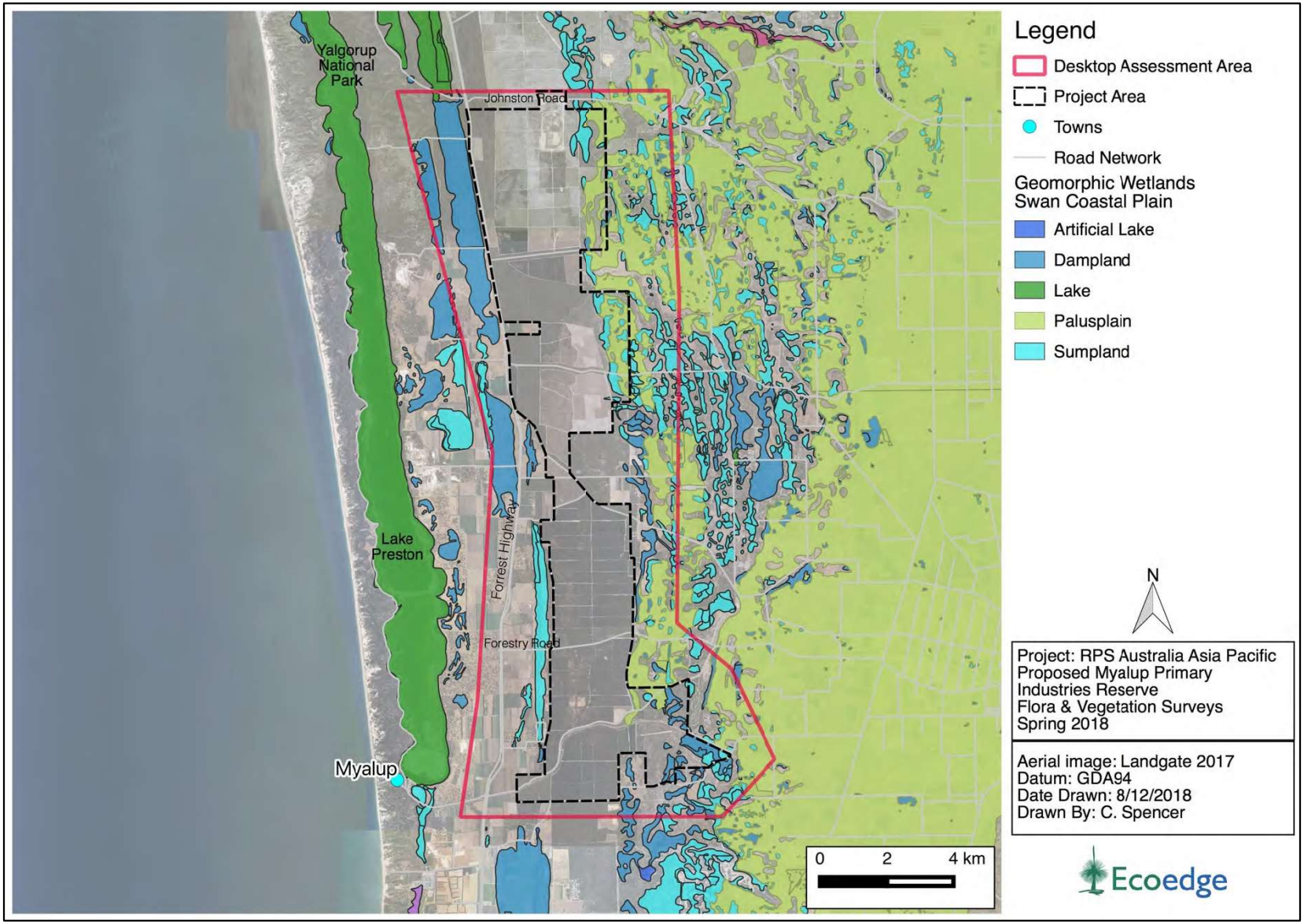

Figure 8. Geomorphic wetland types within the DAA (DEC, 2008).

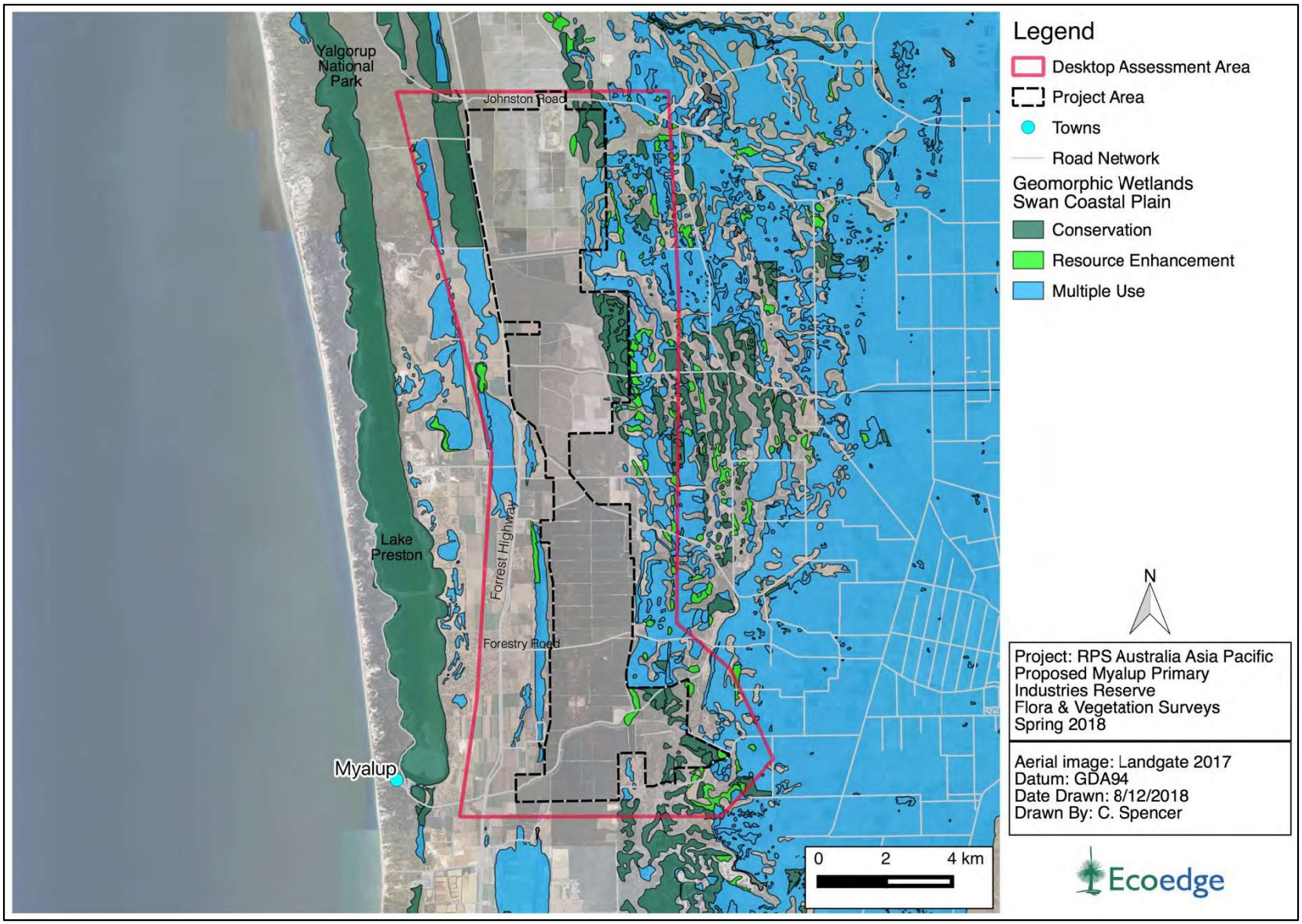

Figure 9. Management classifications of geomorphic wetlands within the DAA (DEC, 2008).

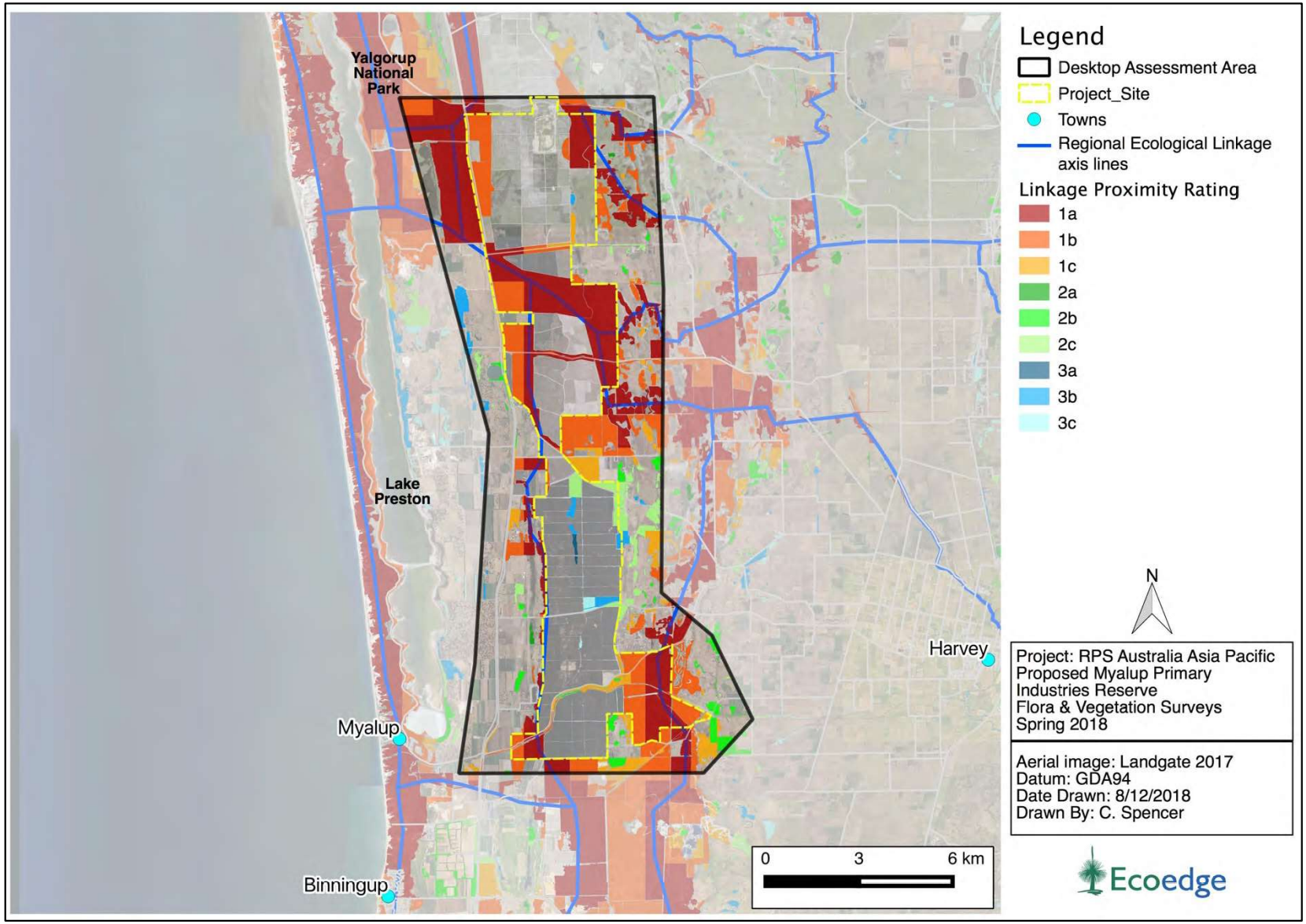

Figure 10. The DAA in relation to regional ecological linkages (Molloy *et al.*, 2009).

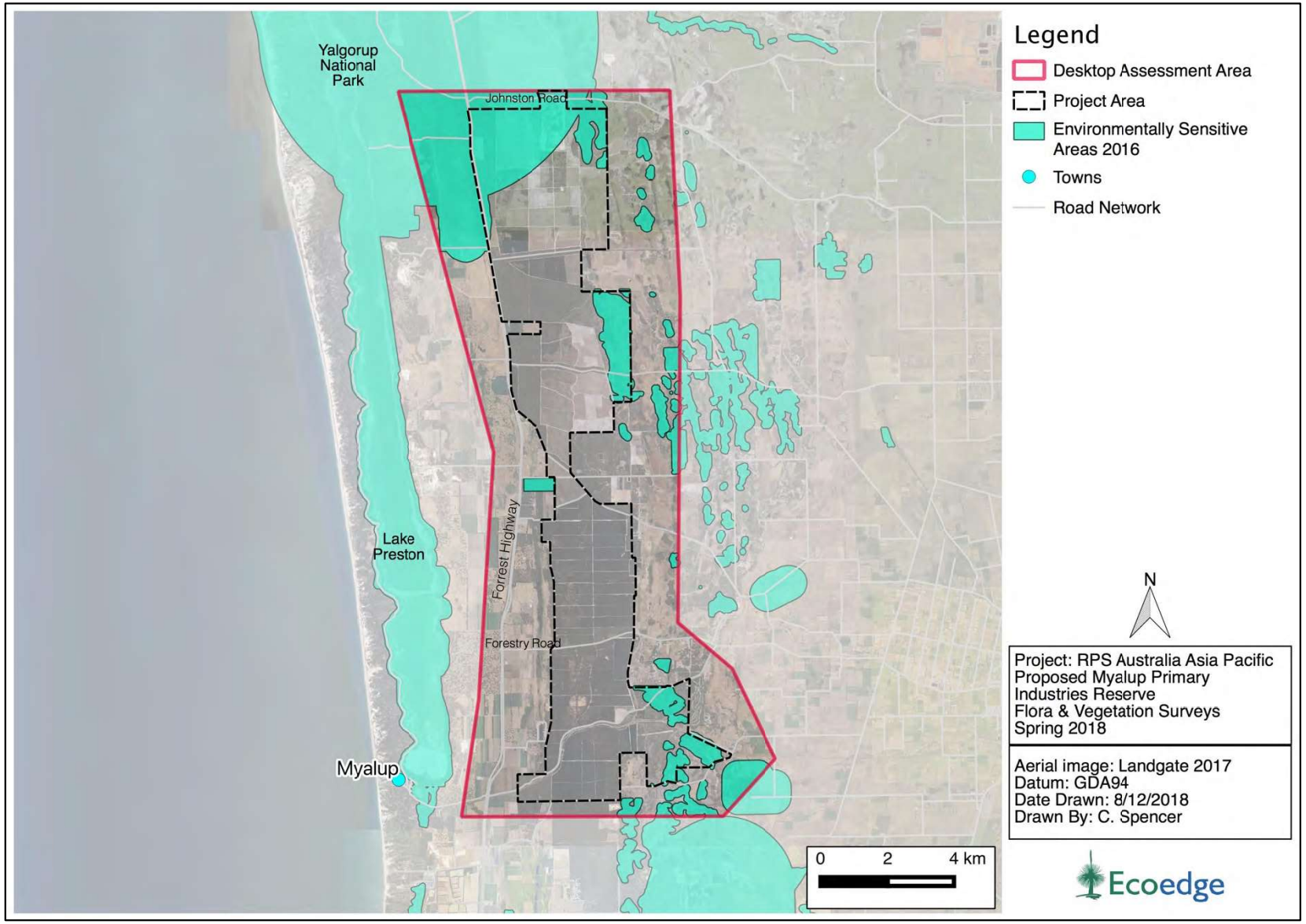

Figure 11. Environmentally Sensitive Areas located in the DAA (DER, 2016).

2 Methods

2.1 Desktop Assessment

Prior to the field survey, a "desktop assessment" was carried out by downloading from the Threatened and Priority flora (TPFL) and W.A. Herbarium databases of records occurring within 10 km of the Project Area (DBCA, 2018c). A NatureMap report was generated listing all flora (including Threatened flora) occurring within 20 km of the Project Area (DBCA 2018d) (**Appendix 5**). A Protected Matters Search report was generated to provide information regarding Matters of National Environmental Significance (MNES) known or potentially occurring within 5 km of the Project Area (DotEE, 2018b) (**Appendix 2**). This data was used to establish the list of Threatened and Priority flora to target during the survey, as well as providing a list of what other plant taxa might be encountered during the survey.

2.2 Field Survey

The field survey was undertaken by Russell Smith (SL flora permit SL011843) and Colin Spencer (flora permit SL012460) during the period 17 August 2018 to 10 January 2019. The survey extended over approximately 2,051 ha of remnant vegetation, which included 86 ha that was the subject of a Detailed and Targeted flora survey within a 50 m buffer of remnant vegetation adjacent to the Stage 1 area. The remainder was the subject of a Reconnaissance flora survey where there was an assessment of the potential for the presence of significant flora, significant plant communities and significant wetlands in accordance with relevant Commonwealth and State guidance.

Information on species present, vegetation structure and condition were collected at 417 recording sites, or relevés, and thirty-one 10 m x 10 m floristic quadrats (details in **Appendix 6**). The floristic quadrats were installed and assessed using the method described in EPA (2016). At 50 of the recording sites enough information on species present was collected (at least 20 species within an approx. 10 m radius) for it to be a termed a relevé. These relevés together with the floristic quadrat data were used in determining vegetation units for the Project Area. Locations of the floristic quadrats and relevés are shown in **Figure 12**.

A comprehensive list of native and introduced species was compiled, either in the field, or from specimens that were collected or photographed for later identification. Taxonomy and conservation status of flora species was checked against the Department of Parks and Wildlife Service databases (DBCA, 2018e and 2018f).

Vegetation mapping used the quadrat and releve information and was carried out with reference to GoogleEarth™ and recent aerial photography, particularly for mapping the various wetland communities. An informal multivariate analysis (MVA) of the quadrat and relevé data was used to help determine the vegetation units.

Vegetation condition was assessed in the field using the method described in EPA (2016) (**Appendix 7**). Mapping of vegetation condition was carried out using the data collected in the field and recent aerial photography.

Vegetation units are described using the structural classes as described by Keighery (1994).

2.3 Survey Limitations

Potential limitations for the assessment are addressed in **Table 10.**

Table 10. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	No	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements.
Proportion of flora identified	Minor	Because the survey was carried out during the main flowering period for southwest Western Australian native plants, most taxa were identifiable. However, parts of the Project Area were inaccessible, and only a Reconnaissance survey was required over most of the Project Area. Perhaps 85-90% of native species were identified in the Project Area.
Climatic and seasonal effects	Negligible	Rainfall for the wet season in the south-west of W.A. (1st April – 31st October) was 80-100% of average. Germination and growth of herbaceous species is not expected to have been negatively affected by rainfall.
Availability of contextual information	Negligible	Many flora and vegetation surveys have been carried out in the region.
Completeness of the survey	Minor	An intensive survey was carried out for Threatened flora in the buffer adjacent to the Stage 1 areas. The remainder of the Project Area was subject to a Reconnaissance survey.
Skill and knowledge of the botanists	No	The botanists each have 15 - 25 years' experience working in south west vegetation.

2.4 Multivariate Analysis

The floristic quadrat data from the Project Area was subjected to MVA using the software PATN (Belbin, 2003) to determine the relationship of the vegetation units described and mapped within the Project Area to the floristic community types derived for the Swan Coastal Plain by Gibson *et al*. (1994).

The MVA used two-way classification (Agglomerative Hierarchical Fusion) of the presence/absence data for each quadrat. The flexible UPGMA classification strategy was

used (β = -0.1), together with the Bray-Curtis site similarity measure. The default settings for number of groups to be produced by the classification (i.e. the "cut-off level") was accepted in each case. The primary output of the classification were dendrograms and a two-way table of taxa and quadrats (refer to **Section 3.5**).

Data from all relevant quadrats from the Southern Swan Coastal Plain (SCP) survey dataset (Gibson *et al*., 1994) was used in the MVA after taxonomic updating was carried out. Taxonomic updating of the 25-year-old SCP data was required because many taxonomic changes have taken place since the original survey was carried out (e.g. Dryandra to Banksia, *Eucalyptus calophylla* to *Corymbia calophylla*, etc.). In addition, there is some uncertainty about the identification of such species as *Thysanotus manglesianus* and *T. patersonii*, where many Swan Coastal Plain specimens have intermediate characteristics between the two. In such cases terms such as '*Thysanotus manglesianus*/*patersonii complex*' were used.

In the trimmed down Swan Coastal Plain dataset used for the MVA reported here, quadrats with assigned floristic community types (FCTs) that only occur north of Perth, or which occur on soils or landscapes not found in or near the Project Area were removed from the dataset (**Table 11**). Also, "singletons" (flora taxa recorded at only one site) were excluded. Due to the properties of the Bray-Curtis coefficient, singletons are seen as 'indicators' for grouping and therefore sway results.

Table 11. Quadrats from the following Swan Coastal Plain FCTs[6] were not used as part of the MVA.

FCT Code
1a
15
23a
23b
23c
26a
26b
29a
29b
30a
30b
30c
10b
19
S01 to S20

[6] Form Gibson *et al*. (1994) and EPA (1996).

In total 585 quadrats and 122 taxa were used in the analysis. A location map is presented in **Appendix 8**. Output from the MVA is in the form of dendrograms and quadrat group/species group tables and quadrat group association scores. Because of the very large size of the resulting diagram, only segments of it showing the Myalup quadrats, and the clusters in which they were located, are produced in this report (**Appendix 9**).

For the quadrats from the Gibson *et al*. (1994) report, the assigned FCT code was affixed to the quadrat name to facilitate understanding the MVA outputs (see **Appendix 9**).

3 Results

3.1 Flora

Four hundred and forty vascular flora taxa (from 71 plant families) were identified within the Project Area, of which 84 were introduced species (**Appendix 10**). The 356 native taxa and 84 introduced taxa found within the approximately 2,051 ha of remnant native vegetation of the Project Area is comparable with the 324 native and 74 introduced taxa found during a survey over a similar area (2,019 ha) immediately to the south by Cardno (2010).

The dominant families present were Fabaceae (35 native taxa, 13 weed taxa), Orchidaceae (34 native taxa, 1 weed taxon), Asteraceae (24 native taxa, 12 weed taxa), Myrtaceae (24 native taxa, no weed taxon), Asparagaceae (21 native taxa, one weed taxon), Proteaceae (21 native, one possibly planted taxon) and Cyperaceae (21 native, 1 weed taxon).

Species richness within the Project Area ranged from 17 to 59 taxa per 100 m^2 quadrat, with lowest diversity in the seasonally-inundated wetlands and highest diversity in the Jarrah-Tuart open woodlands on yellow-brown sand on the crest of the Spearwood dunes that run north-south through the Project Area.

3.2 Priority Flora and Other Significant Taxa

No Threatened flora were found during the survey, however seven priority-listed flora and five taxa that are either range-extensions, or near the limit of their natural range on the Swan Coastal Plain, were found (**Table 12**). These taxa are discussed below in regard to their distribution within the Project Area and more widely, their usual habitat and their conservation status. The locations of the priority flora and other significant flora are shown in **Figure 12**. The completed Threatened and Priority Flora report forms for the Priority species found in the Project Area are provided in **Appendix 11**.

Table 12. Priority flora and other significant flora found within the Myalup Project Area.

Taxon	Status
Acacia semitrullata	Priority 4
Acacia flagelliformis	Priority 4
Boronia capitata subsp. *gracilis*	Priority 3
Caladenia speciosa	Priority 4
Chamaescilla gibsonii	Priority 3
Dillwynia dillwynioides	Priority 3
Lasiopetalum membranaceum	Priority 3
Callitris pyramidalis	Near southern limit on Swan Coastal Plain
Drosera porrecta	Near southern limit on Swan Coastal Plain
Melaleuca systena	Near southern limit on Swan Coastal Plain
Schoenus subfascicularis	Near southern limit on Swan Coastal Plain
Stenopetalum gracile	Near southern limit on Swan Coastal Plain
Tersonia cyathiflora	Near southern limit on Swan Coastal Plain

3.2.1 *Acacia semitrullata*

Acacia semitrullata (P4), an erect shrub to about 1 metre, has a mainly Swan Coastal Plain distribution from the Nine Mile Lake NR which is located west of Coolup, south to Dunsborough. It is also found in scattered locations on the Blackwood Plateau, Whicher Scarp and Collie Basin and near Donnybrook. Its favoured habitat is sandplains, which may be either well-drained or seasonally moist. It is represented by 116 records in DBCA databases[7], with many of the Swan Coastal Plain records being located on road verges or in small reserves. It is widespread within the A3 (Jarrah-*Banksia attenuata-Xylomelum occidentale* woodland) and C1 (Jarrah-*Banksia ilicifolia-Melaleuca preissiana* woodland) vegetation units in the eastern part of the Project Area. In fact, it is one of the more common species in the C1 vegetation unit and the population extends over 100s of hectares[8].

3.2.2 *Acacia flagelliformis*

Acacia flagelliformis (P4), an erect or sprawling shrub to about 1 metre, also has a mainly Swan Coastal Plain distribution, from west of Yarloop south to near Dunsborough, with a few populations on the Whicher Scarp and northern Blackwood Plateau (55 records in DBCA databases). Its favoured habitat is on seasonally wet sandy soils. Within the Project Area it was found within the C1 (Jarrah-*Banksia ilicifolia-Melaleuca preissiana* woodland) vegetation unit.

[7] The main DBCA databases are the 'Threatened and Priority Flora Database' and 'Florabase' (WA Herbarium).
[8] Only a representative selection of the sites where *A. semitrullata* was seen is shown in Figure 14.

3.2.3 *Boronia capitata* subsp. *gracilis*

Boronia capitata subsp. *gracilis* (P3), a slender shrub generally growing to 0.6 metres, is found from Lakes Road east of Mandurah to near Quindalup, and along the Whicher Scarp (39 records in DBCA databases). Its natural habitat is seasonally-wet grey or black sands. It was found in the south-eastern part of the Project Area in wetter parts of the C1 vegetation unit. Several hundred plants were observed, and it is believed that the species is quite widespread within the *Melaleuca preissiana* open woodland phase of the vegetation unit.

3.2.4 *Caladenia speciosa*

Caladenia speciosa (P4) is an orchid found primarily on the Swan Coastal Plain between Lancelin and Capel (84 records in DBCA databases), growing mainly in Jarrah-*Banksia* woodland on well-drained pale, grey or dark-grey sand. In the south-west part of the Project Area a few plants of this species were found in vegetation unit A1 (Jarrah- *Agonis flexuosa* and *Banksia attenuata* open forest).

3.2.5 *Chamaescilla gibsonii*

Chamaescilla gibsonii (P3) is a tuberous rhizomatous herb mainly restricted to the Swan Coastal Plain between Lancelin and Busselton, with outlying populations east of Manjimup. It typically occurs in freshwater claypans under *Melaleuca* shrubs. It is represented by 42 records in DBCA databases. It was found in the north-east of the Project Area in the C3 vegetation unit.

3.2.6 *Dillwynia dillwynioides*

Dillwynia dillwynioides (P3) is an erect slender shrub, growing to 1.2 m high on sandy soils in winter-wet depressions. It is found on the Swan Coastal Plain from east of Ledge Point south to Australind near Bunbury. It is represented by 80 records in DBCA databases. Within the Project Area it is found in wetter parts of the C2 (*Melaleuca preissiana* woodland) vegetation unit.

3.2.7 *Lasiopetalum membranaceum*

Lasiopetalum membranaceum (P3) is a multi-stemmed shrub to 1 metre high found on soils derived from limestone on the Swan Coastal Plain from Two Rocks north of Perth, south to Ludlow 973 records in DBCA databases). Within the Project Area it was found in the B2 (Tuart-Jarrah- *Agonis flexuosa-Banksia attenuata* open forest) and C4 vegetation units (Marri-*Eucalyptus rudis-Melaleuca rhaphiophylla* open forest).

3.2.8 *Callitris pyramidalis*

Callitris pyramidalis is a shrub or small tree (to 5 metres) that occurs in the south-west of Western Australia from Geraldton to Esperance. The population in the Project Area represents 4 km extension southwards of the taxon from the previous most southerly occurrence on the Swan Coastal Plain, at Ellis Road.

3.2.9 *Drosera porrecta*

Drosera porrecta is a tuberous, perennial, herb common on the Swan Coastal Plain from near Dongara to the Peel-Harvey Inlet area. There are only two previous records for this species south of Lake Clifton, however it is quite common in the Project Area in Tuart-*Banksia attenuata* open forest.

3.2.10 *Melaleuca systena*

Melaleuca systena is a common shrub of near coastal areas from Sharks Bay south to Windy Harbour. It is usually found within 3 or 4 km of the coastline, on sand over limestone. The population in the Project Area, along with another at Kemerton, represents one of the most southerly occurrences on the Swan Coastal Plain. In the Project Area it is found in the B3 vegetation unit (Tuart-*Banksia attenuata-B. grandis* open forest on shallow sand over limestone).

3.2.11 *Schoenus subfascicularis*

Schoenus subfascicularis is a tufted perennial, grass-like or herb (sedge) that is widespread in the south-west of Western Australia from Geraldton to Esperance, however on the Swan Coastal Plain there are no records in DBCA databases for occurrences of this taxon further south than the Peel-Harvey Inlet. The populations in the Project Area therefore represent a substantial southward extension for this taxon. It is found in the C3 vegetation unit (*Melaleuca rhaphiophylla* or *M. preissiana* with *Eucalyptus rudis* woodland in seasonally inundated basins).

3.2.12 *Stenopetalum gracile*

Stenopetalum gracile is a tufted annual, herb to 0.4 metres high, found on the Swan Coastal Plain between Cervantes to Forrest Beach near Capel, as well as scattered inland locations. The populations in the Project Area represent some of the most southerly on the Swan Coastal Plain.

3.2.13 *Tersonia cyathiflora*

Tersonia cyathiflora is a prostrate annual or biennial, herb or shrub to 0.6 metres high by 1.5 metres wide. It is found along the west coast from near Carnarvon to the Lake Preston Area on yellow-brown or red-brown sand over limestone. The populations in the Myalup Project Area represent some of the most southerly occurrences of this taxon.

3.3 Environmental Weeds and Declared Pest Plants

There are extensive infestations of environmental weeds in several parts of the Project Area, particularly along the Harvey River Diversion Drain. These weeds have in several places spread away from the drain into adjacent bushland. The locations of some of these environmental weeds are shown in **Figure 13**. The most widespread weed is **Watsonia meriana*, which covers tens of hectares along and adjacent to the Harvey River Diversion Drain. Three other widespread weeds are Bridal Creeper (**Asparagus asparagoides*), Arum

lily (*_Zantedeschia aethiopica_), and Narrow-leaf cotton bush (*_Gomphocarpus fruticosus_). These are all classified as Pest Plants under the under the _Biosecurity and Agriculture Management Act 2007_, but only Narrow-leaf cotton bush has a management category under the Act. Its C3 management category places a legal obligation on land managers for its control. It is quite widely distributed within the semi-cleared, former pine plantation areas within Stage 1 of the Project Area (**Figure 3**).

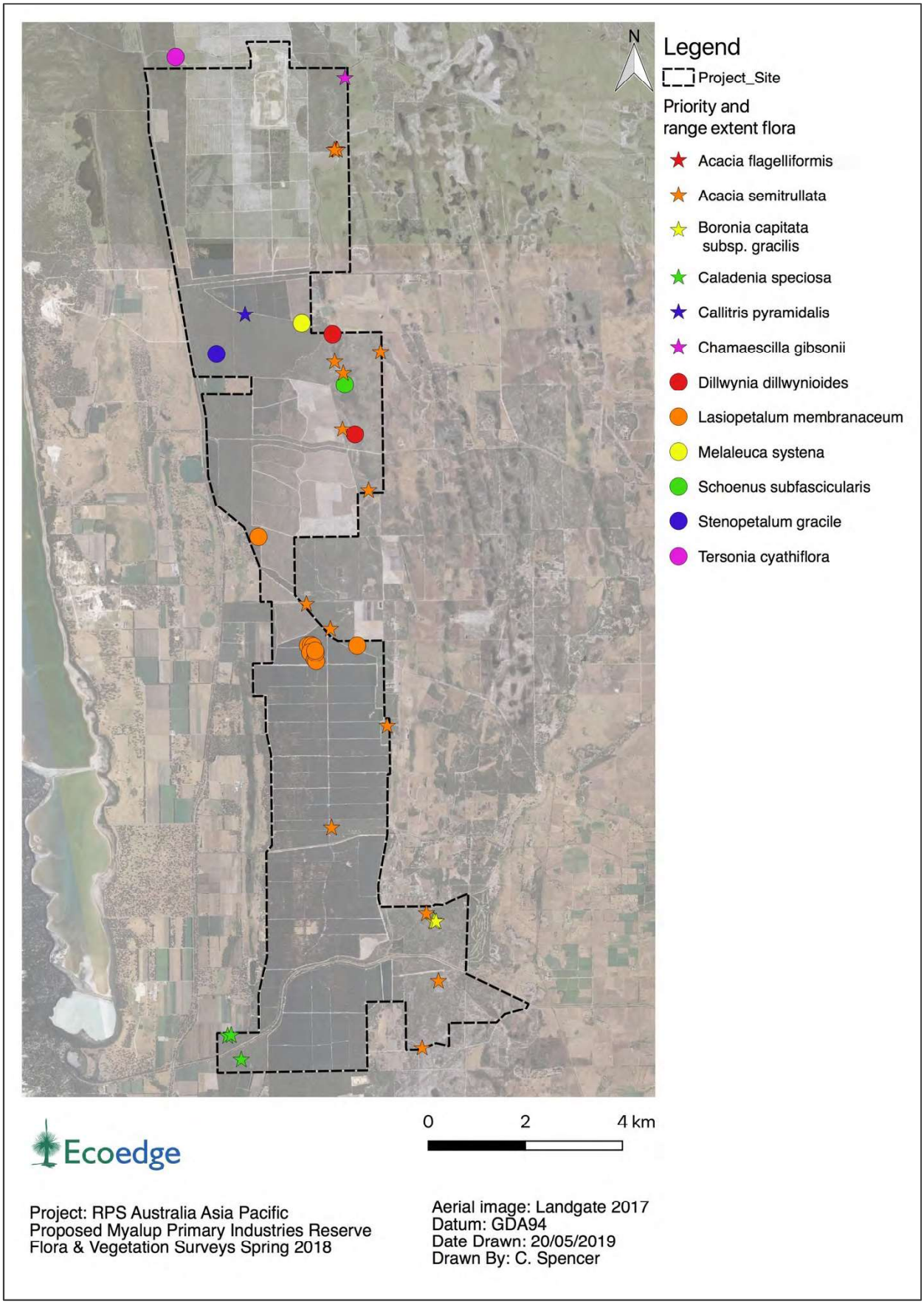

Figure 12. Priority and Range Extent Flora.

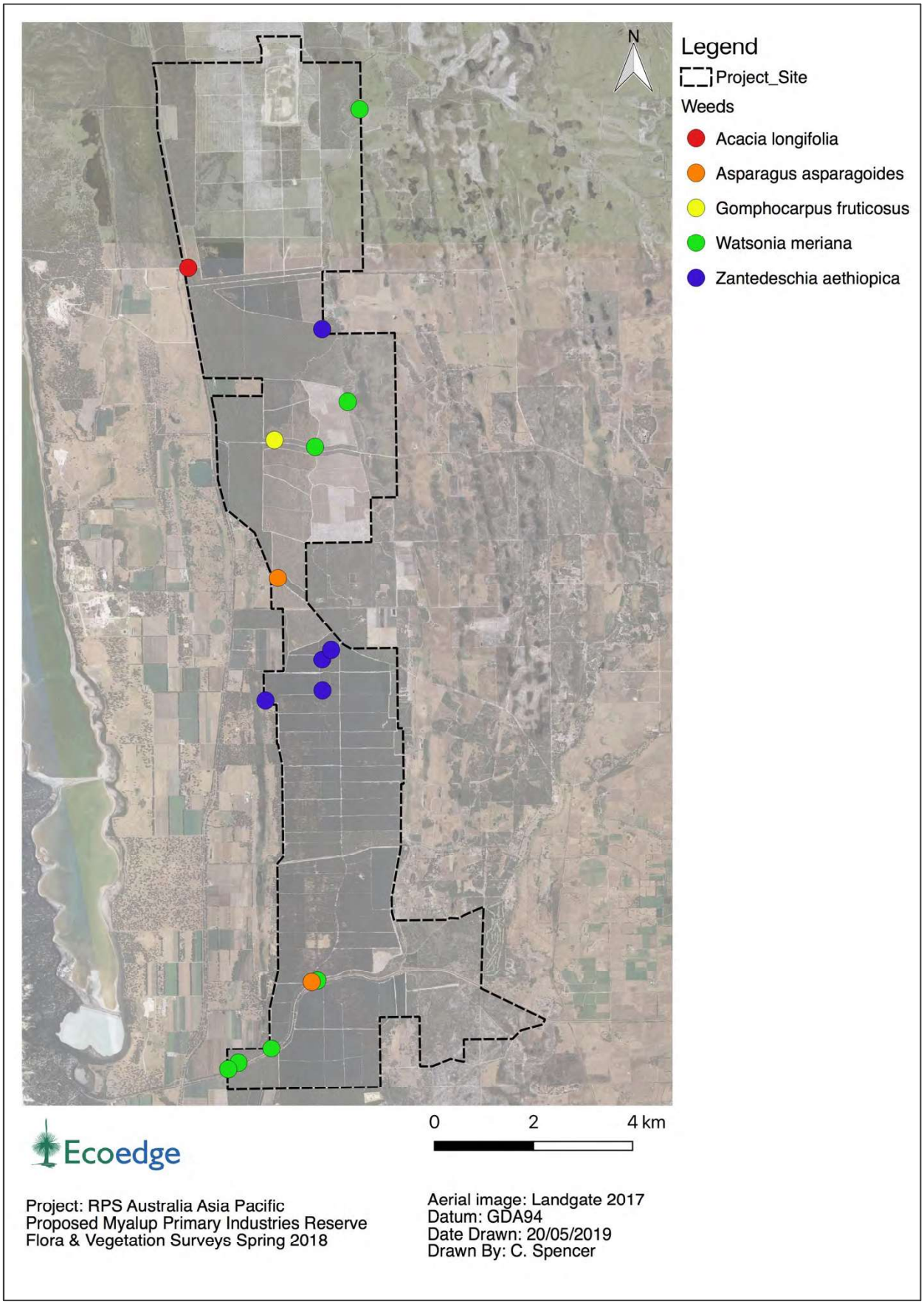

Figure 13. Dominant declared pest plants and environmental weeds.

3.4 Vegetation Units

Ten vegetation units were identified and mapped within the Project Area. These are divided into three main groups; Group A, Jarrah-*Banksia attenuata* open forest or woodland, with several other trees as co-dominants (three vegetation units); Group B, Tuart-*Banksia attenuata* open forest, with several other trees as co-dominants (three vegetation units); and Group C, the wetland group, divided into four floristically diverse vegetation units.

The vegetation units are listed in **Table 13** with the corresponding inferred Gibson *et al.* (1994) FCT listed where possible. Vegetation unit C4 was not able to be assigned to a FCT, mainly because of the paucity of native understorey species (hence a floristic quadrat was not installed in this unit), but also because there does not appear to be a corresponding FCT in the report by Gibson *et al*. (1994) (**Figure 15**).

The area of each of the units together with the State and Federal (in brackets) conservation status of the FCTs is also shown in **Table 12.** A fuller description of the vegetation units, along with representative photos is provided in **Appendix 12**. The distribution of vegetation units within the Project Area is shown in **Figure 14**.

Assignment of each of the 31 Project Area floristic quadrats to the relevant vegetation units is shown in **Appendix 13**.

Table 13. Description and status of vegetation units within the Project Area (excluding completely degraded areas and pine plantation).

Unit	Description	Inferred corresponding FCT	Cons. Status	Extent (ha)
A1	Jarrah-*Banksia attenuata-Agonis flexuosa* open forest on grey or grey-brown sand on slopes	21a[9]	P3 (EN)	329.21
A2	Marri-Jarrah-*Banksia attenuata* open forest on grey-brown or yellow-brown sands on slopes	21a	P3 (EN)	73.86
A3	Jarrah-*Banksia attenuata-Xylomelum occidentale* open forest or woodland on grey sand on gentle slopes	21a	P3 (EN)	250.54
B1	Jarrah-(Tuart)-*Agonis flexuosa-Banksia attenuata* open forest on yellow brown sand on gentle slopes	25[10]	P3 (EN)	348.27
B2	Tuart-Jarrah-*Agonis flexuosa-Banksia attenuata* open forest on grey-brown or yellow-brown sand on gentle slopes	25	P3 (EN)	318.59
B3	Tuart-*Banksia attenuata-B. grandis* open forest on shallow limestone outcrop or yellow-brown sand over limestone	25	P3 (EN)	97.68
C1	Jarrah-(Marri)-*Banksia ilicifolia* or *Melaleuca preissiana* woodland/open woodland on grey-brown sand on lower slopes or flats	5		283.07
C2	*Melaleuca preissiana* woodland/open woodland on grey-brown sand on flats	5		124.54
C3	*Melaleuca rhaphiophylla* or *M. preissiana* with *Eucalyptus rudis* woodland or mixed shrubland on grey-brown sand over clay in seasonally inundated basins	12		180.01
C4	Marri-*Eucalyptus rudis-Melaleuca rhaphiophylla* open forest in elongated valleys on Tamala limestone			45.15
	Total			**2,051.01**

[9] Part of the 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' priority ecological community.

[10] Part of the 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' priority ecological community.

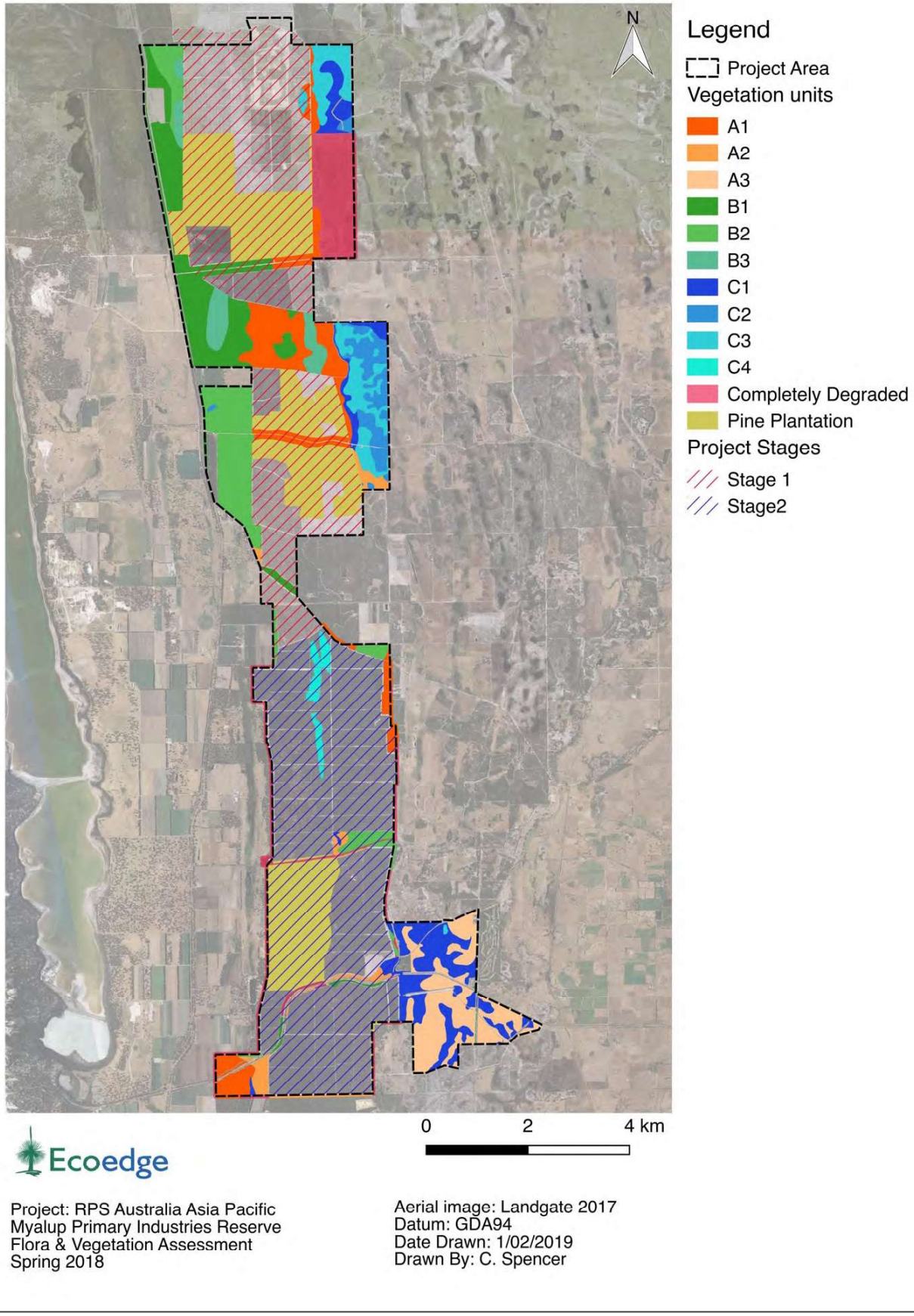

Figure 14. Vegetation units mapped for the Project Area.

3.5 Multivariate Analysis

The floristic quadrat data from the Project Area was compared to a dataset of quadrats from Gibson *et al*. (1994) using multivariate analysis (MVA) (ref. **section 2.4**). The objective of the MVA was to determine which Gibson *et al.* (1994) floristic community types (FCTs) the Project Area quadrats were most similar to. The MVA produced a dendrogram which was too large to include in the body of this report, however sections of the dendrogram together with further discussion of the MVA results are provided in **Appendix 9** to show the relationships of the Myalup quadrats to the Gibson *et al*. (1994) FCTs. The MVA comparison demonstrated that the 31 Project Area quadrats could be ascribed to one of four FCTs. These are described below and mapped in **Figure 15**.

3.5.1 Central *Banksia attenuata - Eucalyptus marginata* woodlands (FCT 21a)

Based on the results of the MVA, vegetation units A1, A2 and A3 were inferred to correspond with FCT 21a (**Figure 15**). Although FCT 21a itself is not a State-listed PEC it is included with in the Priority 3 ecological community 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region'. It is also part of the Federally-listed TEC 'Banksia Woodlands of the Swan Coastal Plain', which has a classification of 'Endangered'.

3.5.2 Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands (FCT 25)

Vegetation units B1, B2 and B3 are inferred to be FCT 25 (Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands), based on the MVA of Myalup quadrats, and using supplementary information from the floristic relevés (**Figure 15**). FCT 25 is a State-listed P3 ecological community and also forms part of the Federally-listed TEC 'Banksia Woodlands of the Swan Coastal Plain', which has a classification of 'Endangered'.

FCT 25 is State-listed as a Priority 3 ecological community and is also part of the proposed Federally-listed TEC 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' (DotEE, 2017). Because *Banksia attenuata* is an important understorey component of the Tuart forest in the Myalup area, this vegetation also forms part of the Federally-listed TEC 'Banksia Woodlands of the Swan Coastal Plain' (DotEE, 2016).

3.5.3 Mixed Shrub damplands (FCT 5)

Based on the results of the MVA, vegetation units C1 and C2 were inferred to be FCT 5 ('Mixed Shrub damplands') (**Figure 15**). In the northern part of the Project Area, unit C1 usually forms a transition zone between unit A1 and the deeper wetland unit C3. In Guthrie block in the south-east of the Project Area, unit C1 occurs in shallow basins with unit A3 occupying the low Bassendean Dune ridges. This FCT was considered 'well-reserved' and 'low risk' by Gibson *et al*. (1994). Gibson *et al*. (1994) stated that the FCT had no consistent overstorey, and this is certainly the case with the Myalup quadrats, with Jarrah being a co-dominant in four of the quadrats, *Melaleuca preissiana*, co-dominant in three, and *Nuytsia floribunda* in two.

3.5.4 *Melaleuca teretifolia*/*Astartea* shrublands (FCT 12)

Based on the MVA and information from relevés, the vegetation of the deeper wetlands is inferred to belong to FCT 12 (*Melaleuca teretifolia*/*Astartea* shrublands) (**Figure 15**). However, because FCT 12 and FCT 11 (Wet forests and woodlands) are quite similar (Gibson *et al*, 1994, p. 40), it is likely that if more quadrats were placed within the wetland vegetation that some of them would be assigned as FCT 11. Both FCT 11 and FCT 12 were considered 'well-reserved' and 'low risk' by Gibson *et al*. (1994). However, the authors of this report state that the wetlands were their most heterogenous group, and as more data became available more groups would emerge and a better understanding of intra and inter-relationships between community groups would be possible. Another potential outcome of more surveys being carried out in wetlands on the Swan Coastal Plain south of Perth is that a better understanding of their conservation status and the risks to them could be made.

Structurally this wetland vegetation, which predominantly occurs in Lyons block, ranges from woodland to open woodland of *Melaleuca preissiana* or *M. rhaphiophylla* over a shrubland dominated by taxa such as *Acacia saligna*, *Aotus gracillima*, *Astartea scoparia*, *Boronia dichotoma*, *Calothamnus lateralis*, *Euchilopsis linearis* and *Kunzea glabrescens* to sedgelands dominated by *Lepidosperma longitudinale*. Some of the lower parts of unit C3 appear to have standing water in them for two or three months, or more in wetter years. Groundwater studies indicate that these wetlands are mainly recharged by groundwater flow from the Yanget Mound on the Harvey Flats to the east (Commander, 2013).

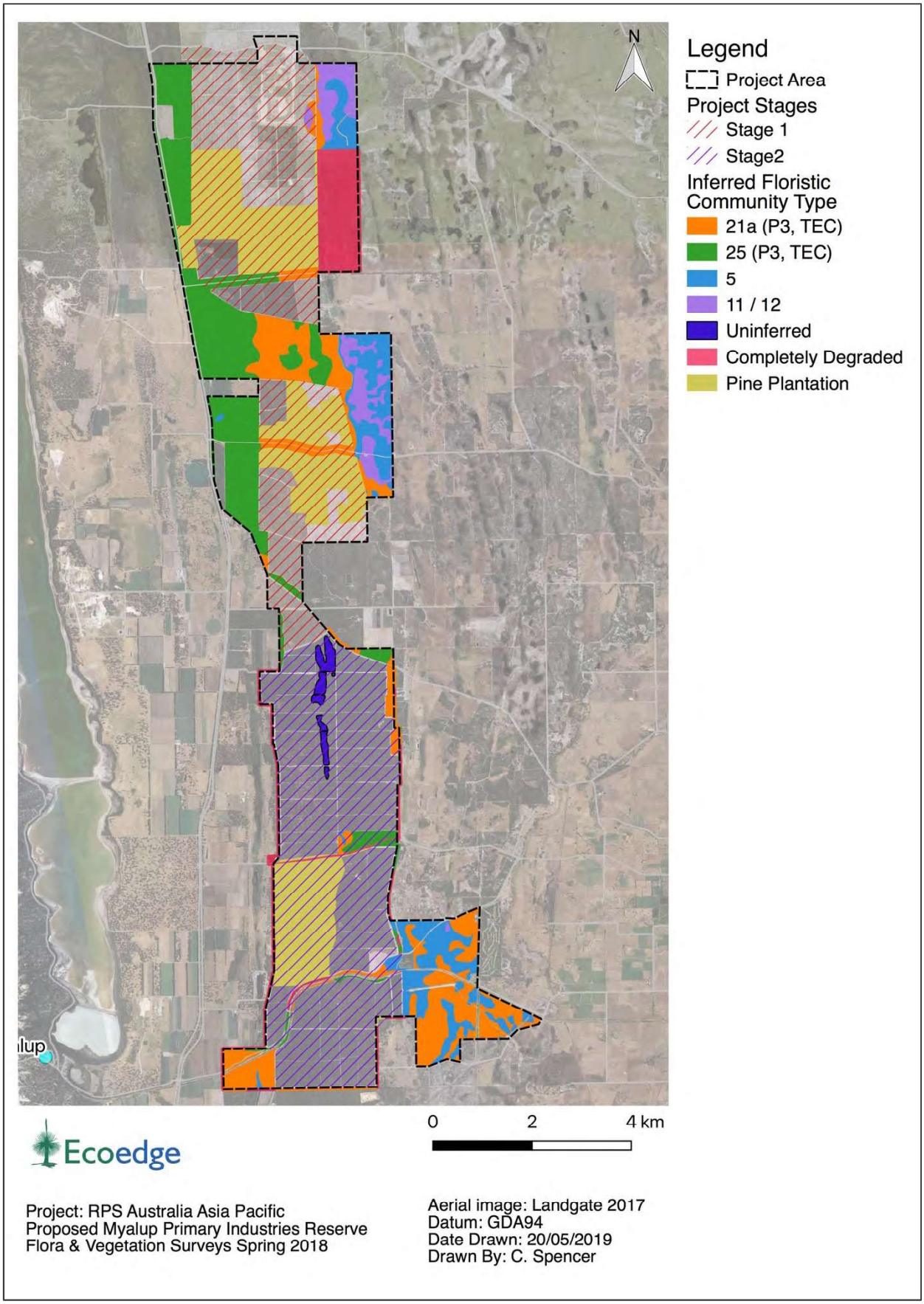

Figure 15. Inferred floristic community types of the Project Area.

3.6 Vegetation Condition

Vegetation condition varied widely within the Project Area, from 'Excellent' to 'Completely Degraded'. Just over half of the Project Area (ca 1,730 ha) was in 'Excellent' or 'Very Good' condition. Approximately a third of the Project Area was pine plantation, or land previously planted to pines (**Figure 15** and **Figure 18**). Some of the cutover pine plantation has native species scattered through it that had germinated or grown-on since the pines were harvested, but none of these could be classed as approaching 'Good' condition (**Figure 16**).

Figure 16. View of area previously planted to pines showing some regeneration of native species amongst a dominant introduced flora.

The effects of '*Phytophthora* dieback' caused by the pathogen *Phytophthora* sp. was evident in some of the native vegetation, particularly in vegetation units A3 and C1, which are situated on Bassendean sands. Dieback disease coupled with too-frequent fire has led to a large part of the native vegetation in Guthrie forest block in the south-east of the Project Area being degraded through loss of susceptible species. Notably, *Banksia attenuata* and *B. ilicifolia*, two of the previously dominant taxa, have virtually disappeared from much of this vegetation. Dieback disease is also active along a track leading north and south of Riverdale Road in the eastern part of Lyons Forest Block (**Figure 17**). In susceptible vegetation, *Phytophthora* dieback causes a progressive degradation of the vegetation through loss of plant species and change in vegetation structure and loss of cover. In recently affected vegetation, vegetation may still be classed as 'Very Good', but in older diseased areas the category may be 'Good', or even 'Degraded'.

The wildfire that swept through the northern part of the Project Area in January 2016 caused major changes in much of the affected vegetation, some of them short-term, and some of them with longer-term consequences. A short-term consequence is the change in

structure of much of the vegetation, with dense growth of species such as *Acacia pulchella* which are stimulated to germinate by fire. In addition, some large trees had all of their foliage killed by the fire and are regenerating from lignotubers or epicormic growth.

A longer-term consequence of the fire is an increase in the prevalence of herbaceous weeds of agricultural origin, particularly along the eastern boundary of Lyons and Guthrie blocks.

The Harvey River diversion drain and several other drains flowing into the Project Area have been conduits of agricultural weeds, and some serious environmental weeds such as **Watsonia meriana* have spread into the adjacent bushland.

Figure 17. A Dieback infestation just north of Riverdale Road – most of the *Banksia attenuata* have been killed and a *B. ilicifolia* is shown on the left, dying of the disease.

The extent of vegetation within each condition class is shown in **Table 14**, and vegetation condition is mapped in **Figure 18**.

Table 14. Summary of vegetation condition classes within the Project Area.

Vegetation Condition	Area (Ha)	%
Excellent	1322.21	38.3
Very Good	407.44	11.8
Good	277.98	8.1
Degraded	43.38	1.3
Completely Degraded	330.49	9.6
Pine Plantation	1,065.89	30.9
Total	**3,447.39**	**100.0**

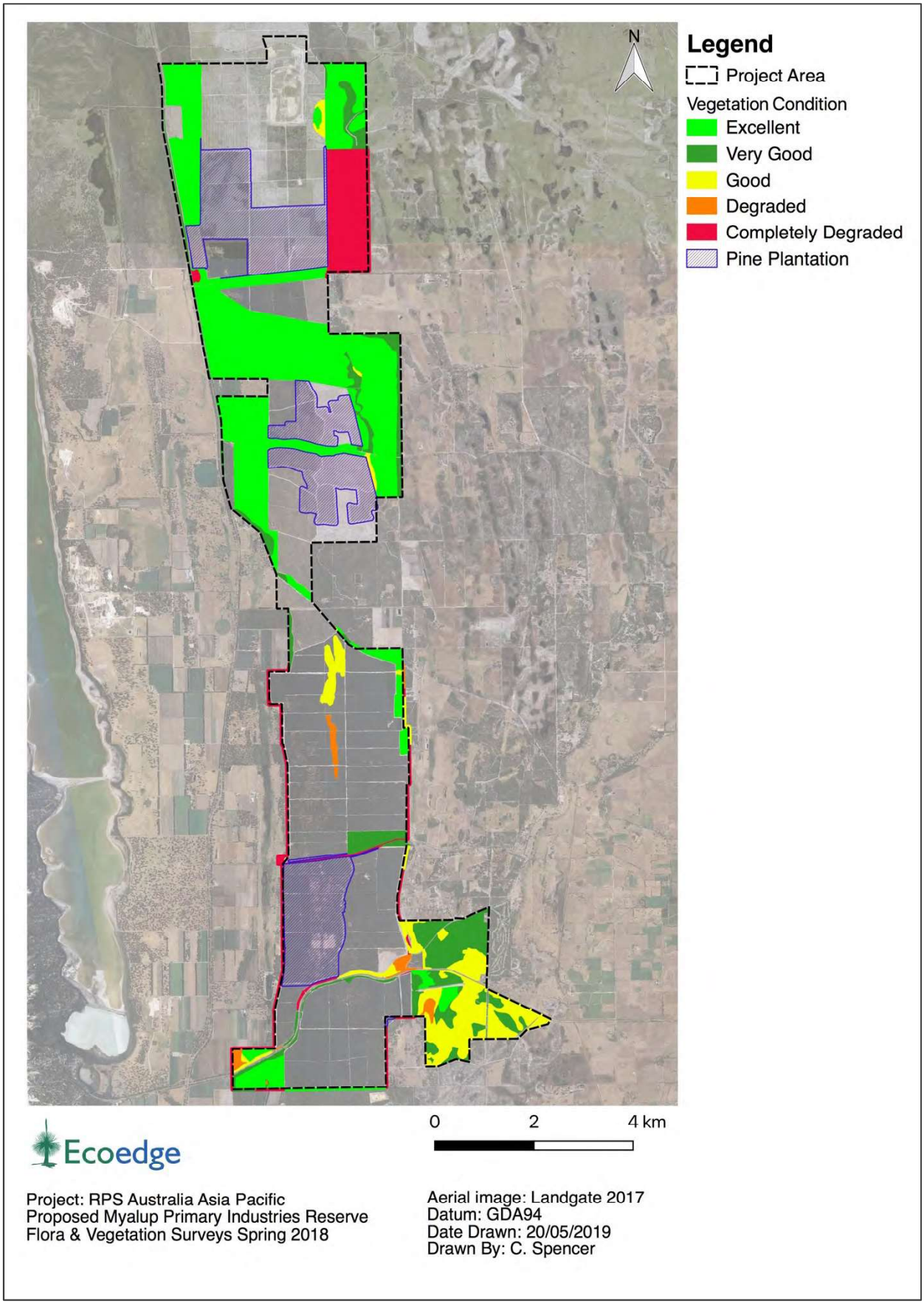

Figure 18. Condition of vegetation within the Project Area.

3.7 Groundwater Dependent Ecosystems

It is expected groundwater levels will substantially rise (1-3m), across the Project Area upon the removal of the pine plantations and fall by a similar or greater amount on their replacement with horticulture (LandCorp, 2018). Modelling also indicates that aquifer recharge associated with the proposed irrigation project may raise watertable levels near the infiltration sites such that wetland vegetation at the base of the Spearwood dune system, could potentially experience waterlogging beyond its tolerance (DWER, 2018).

As referred to in **Section 1.7**, above, there are several Conservation category wetlands within the Project Area, in the eastern parts of Lyons and Guthrie forest blocks (**Figure 9**). Because the vegetation they contain is primarily groundwater dependent they are at risk from changed hydrological regimes. Common overstorey species within these such as *Eucalyptus rudis*, *Banksia littoralis*, *Melaleuca rhaphiophylla* and *M. preissiana* and shrubs such as *Astartea scoparia*, *Melaleuca viminea* and *M. teretifolia* are all groundwater dependent (VCSRG, 2011).

4 Discussion

4.1 Significance of the Flora

Floristic diversity within the Project Area was about average for the Swan Coastal Plain. There was an average of just over forty species in the 31 floristic quadrats (with a maximum of 59 taxa), and over half of them had species numbers in the range 45-60 which is the range in which 44% of the 509 quadrats of Gibson *et al.* (1994) fell. The 356 native flora taxa identified within the Project Area compared favourably with the 324 native taxa found in a similar sized area to the south, in the Kemerton area.

Although no Threatened flora were found during the Targeted or Reconnaissance searches, it is possible that thorough surveys of the swamps along the eastern side of the Project Area would lead to the discovery of the endangered orchids *Diuris drummondii* and *D. purdiei*. Suitable habitat occurs for both rare orchids in the eastern part of Lyons block. Vegetation unit C3, especially, provides good potential habitat for these Threatened species. *Pterostylis frenchii*, a Priority 2 orchid known from the Project Area, was surveyed for at the appropriate time, but it is likely that the spring was too dry for this taxon to send up flowering stems.

Five of the seven Priority flora in the Project Area are associated with wetland or dampland vegetation in the eastern part of the Project Area. Accordingly, they are somewhat at risk from the effects of long-term changes in the hydrology of their habitats. *Acacia semitrullata* (P4) is one of the more common species in the C1 vegetation unit, and the populations extend over hundreds of hectares. *Acacia flagelliformis* (P4), although only found at one location, is also likely to be quite common within the C1 vegetation unit in Lyons block. Likewise, *Boronia capitata* subsp. *gracilis* (P3), appears to be relatively common in the C1 vegetation unit in south-eastern Guthrie block. The other two priority species, *Chamaescilla gibsonii* (P2) and *Dillwynia dillwynioides* (P3) are probably less common, but a targeted survey of all the appropriate habitat would be required to confirm this. Dense regrowth as a result of the 2016 wildfire has made parts of the wetland impenetrable, and surveys for these or other potential Threatened flora in large parts of eastern Lyons block would be very difficult.

As discussed in **Section 3.2**, the native vegetation in the Project Area provides habitat for six range-end taxa and it is likely that it provides a transition-zone between some mid-Swan Coastal Plain flora and taxa with a more southern centre of distribution. In addition, vegetation in Lyons Forest Block in the Project Area forms a connecting corridor between the species-rich wetland vegetation in Yalgorup National Park west of Forrest Highway (near Ellis Road) and the wetlands on the eastern side of the Mandurah-Eaton Ridge north and south of Riverdale Road. The importance of the eastern Lyons Forest Block wetlands will be discussed further in **Section 4.2**.

As mentioned above, the vegetation of the Project Area is the location of at least six southern range-end species on the Swan Coastal Plain. It is likely that a more through survey of the wetlands of eastern Lyons forest block than was allowed for in the scope of this project would result in more range-end or range extension taxa. Accordingly, it is important to preserve the integrity of the wetland vegetation, particularly in eastern Lyons block, because it is habitat to several priority and range-end taxa.

4.2 Significance of the Vegetation

4.2.1 Local context

The vegetation is locally significant because of the relatively large size of several patches, one in central Lyons block is over 600 ha, and south-eastern Guthrie block is of similar size, although the vegetation there is not in as good condition. Large size means that the vegetation is more likely to maintain its integrity, particularly on Spearwood soils where the effects of *Phytophthora* disease are generally not a factor. In addition, the vegetation of the southern part of Lyons Forest Block provides a corridor linking wetland vegetation in Yalgorup National Park with the wetlands of the Riverdale Nature Reserve and Harvey Flats east of the Mandurah-Eaton Ridge.

4.2.2 Regional context

The Project Area is regionally valuable because of its range of vegetation communities (tall Tuart open forest to sedgelands), its representation of Tuart open forest and Jarrah-*Banksia attenuata* open forest, much of it in Excellent condition, and the diversity of its wetlands, which are the location of most the Project Area's priority and range-end taxa. The mixture of Tuart and Jarrah-*Banksia attenuata* woodlands in Lyons block between Bagieau and Riverdale Roads is a particularly good example, and also links the wetlands of Yalgorup National Park with those of the Harvey Flats. Each of these broad vegetation types are addressed below, with regard to their regional significance.

<u>Tuart open forest</u>

Approximately 770 ha of vegetation types dominated or co-dominated by Tuart (B1, B2 and B3) occur within the Project Area, most of it in Very Good or Excellent condition. The Project Area also contains a substantial area of Tuart (*Eucalyptus gomphocephala*) forest, most of it in 'undisturbed' condition as mapped in the Tuart Atlas (DCLM, 2003). Climate variability and change, hydrology, altered fire regimes, invasion of weeds, and repeated attack by insect wood borers are important threatening processes to the Tuart forests and woodlands of the Swan Coastal Plain (Tuart Response Group, 2002; DotEE, 2017).

Jarrah-*Banksia attenuata* open forest

Much of the Project Area vegetation where *Banksia attenuata* is co-dominant or mid-storey species under Jarrah, Marri and Tuart occurs on Spearwood soils, which are alkaline in nature. While this species is very susceptible to disease caused by *Phytophthora* sp. on Bassendean sand it tends to be resistant on Spearwood sand (Glevan Consulting, 2009). So, while the disease may be present in the relatively alkaline Spearwood soils it usually fails to express as a disease. Therefore, while dieback disease is causing deaths of *B. attenuata* and other susceptible taxa in the vegetation on Bassendean sand and on the more leached (grey-brown rather than yellow-brown) Spearwood sand in the eastern part of the Project Area, abutting the wetlands, over most of the Project Area there is no sign of disease in *B. attenuata* or other potentially susceptible species and it is likely that these areas will remain disease-free.

Wetlands

As mentioned in **Section 1.2**, the Project Area is dominated by the high aeolian limestone dunes (Tamala limestone) of the Mandurah-Eaton Ridge. To the west of this ridge are the vegetated wetlands of the Yalgorup National Park east of Lake Clifton, which near Ellis Road contain a threatened ecological community as well several Threatened and Priority taxa. East of the ridge, Lyons Forest Block near Johnston Road and near Riverdale Road contains the remains of a once much more extensive wetland that this survey has found to be mainly in Excellent condition. Examination of aerial photography demonstrates that this was once part of a chain of wetlands stretching south from the Harvey Estuary. North of Johnston Road and south of Crampton Road much of this wetland chain has been cleared for agriculture or plantations. Therefore, the remnants in the eastern part of Lyons Forest Block of this once much more extensive chain of wetlands are particularly important for their conservation value.

4.2.3 FCTs – State significance

Most natural vegetation in the Project Area belongs to one of two Priority 3 ecological communities referred to by their floristic community type name applied by Gibson *et al*. (1994), these being FCT 21a (Central *Banksia attenuata - Eucalyptus marginata* woodlands) and FCT 25 (Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands). PECs are not specifically protected under the *Wildlife Conservation Act 1950* or *CALM Act 1984* but are taken into consideration as potential TECs with regard to any proposed management action.

FCT 21a (Central *Banksia attenuata - Eucalyptus marginata* woodlands

Almost a third of the remnant native vegetation of Good or better condition within the Project Area (i.e. vegetation units A1, A2 and A3) has been inferred to be FCT 21a (**Figure 15**). This determination is strongly supported by the results of the MVA. Whilst FCT 21a is not a priority ecological community *per se*, it meets the definition of the 'Banksia dominated

woodlands of the Swan Coastal Plain IBRA region' PEC, which is categorised as Priority 3 (iii). Communities within this category are:

> *'communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.'* (DEC, 2013).

As discussed in **sub-section 4.2.2**, above, much of the Jarrah-*Banksia attenuata* open forest or woodland within the Project Area occurs on relatively alkaline Spearwood soils where disease caused by *Phytophthora* ('dieback') generally does not cause deaths in susceptible species, even if it is present. However, within vegetation unit A1 in the eastern parts of the Project Area in Lyons block (on Spearwood S2c Phase soils), and particularly in unit A3 in the south-eastern part of Guthrie block (on Bassendean B1 Phase soils) dieback disease has caused extensive deaths of *B. attenuata* and other susceptible species.

Given the extent of dieback-affected areas on the Swan Coastal Plain within communities where Banksia species are co-dominants (Government of W.A., 2009; DotEE, 2016) the large area (>1,000 ha) of Jarrah-Tuart-Banksia open forest within the Project Area on 'dieback-resistant' Spearwood soil is of Statewide significance.

Tuart dominated open forest

Vegetation units B1, B2 and B3 are inferred to belong to FCT 25 (southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands), which is part of the 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' PEC (Priority 3(iii)) (**Figure 15**). The MVA supports this inference. As stated above (**sub-section 3.5.2**), the presence of *Banksia attenuata* as a mid-storey species throughout most of vegetation units B1, B2 and B3 means that these units also belong to the 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' PEC.

Based on the total area of units B1, B2 and B3 there is approximately 770 ha of Tuart forest within the Project Area. This comprises approximately 14% of the total area of Tuart woodlands or forests in conservation reserves[11] (DotEE, 2017), which indicates the Statewide significance of the Tuart forest in the Project Area.

4.2.4 Commonwealth significance

The Federally-listed Threatened ecological community (Banksia Woodlands of the Swan Coastal Plain) is present within the Project Area. This TEC corresponds to the State-listed PEC 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region'. The Banksia Woodlands of the Swan Coastal Plain TEC has the threat category of 'Endangered'; it was

[11] Almost all the Tuart forest in the Project Area occurs in Lyons State Forest Block which is a proposed national park.

listed as a Threatened community because of three main processes which endanger the community:

- Clearing: the ecological community has undergone a decline of about 60 per cent in its extent
- Fragmentation: almost all the ecological community that remains occurs as highly fragmented patches less than 10 ha in size, with the median patch size now being only 1.6 hectares.
- Loss of Integrity: it has experienced a severe reduction in its community integrity due to the combined effects of substantial clearing and fragmentation, dieback diseases (e.g. *Phytophthora* root rot fungal disease), invasive weeds and feral animals, changes to fire regimes, hydrological degradation (including changes to groundwater levels), climate change, and other disturbances to remaining patches.

As discussed in **sub-section 4.2.2**, above, much of the vegetation in the Project Area that is subsumed within this Federally-listed TEC occurs on Spearwood soils which are 'resistant' to the growth and spread of *Phytophthora* dieback disease and is therefore likely to remain unaffected by it. Vegetation units A1, A2 and B1, B2, and B3, specifically, are substantially unaffected by the disease and will probably remain clear of it. In addition, much of the vegetation in at Myalup where *Banksia attenuata* is a component is in quite large fragments, which means they are more likely to retain their integrity. The largest of these in the western part of Lyons block, between Bagieau and Riverdale roads totals more than 370 ha. There are two other large patches of vegetation where *B. attenuata* is an important component within the Project Area, one in the south-eastern part of Lyons block, north of Crampton Road (> 200 ha), and another in the western portion of Guthrie block (> 50 ha).

The south-eastern part of Guthrie block (which has soils favourable for the growth and spread of dieback disease) also has substantial areas of Banksia woodland, with more than 100 ha of it in Very Good condition, but much of the rest has been degraded by dieback and too-frequent fire. There are active 'dieback fronts' within south-east Guthrie block which are spreading into the uninfested areas.

In summary, the areas of open forest and woodland in the Project Area where *B. attenuata* is an important component and which are on Spearwood soils are of sufficient size and condition to be considered Nationally-significant occurrences of the community.

As discussed in **sub-sections 3.5.2** and **4.2.3**, above, the 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' community is a Level 3 PEC in Western Australia. It has been evaluated by the Commonwealth, but not yet listed as TEC. Nevertheless, where it contains *Banksia attenuata* as an important component, which is virtually all the areas where it occurs in the Project Area, it is included in the 'Banksia Woodlands of the Swan Coastal Plain' TEC listing. Most of the approximately 770 ha of Tuart-dominated vegetation

in the Project Area is in excellent condition, and as such it represents a Nationally-important occurrence of this community.

4.2.5 Vegetation complexes

Six vegetation complexes occur within the DAA: the Bassendean Complex-Central and South, the Cottesloe Complex-Central and South, the Karrakatta Complex-Central and South, the Serpentine River Complex, the Vasse Complex and the Yoongarillup Complex (**Figure 5**).

The extents remaining of the Bassendean Complex-Central and South, the Karrakatta Complex-Central and South and Serpentine Complex are below the Commonwealth 30% retention target, with less than 10% of the pre-European extent of the Serpentine River complex remaining. These complexes are also relatively poorly represented in DBCA managed lands. The extents remaining of the other three complexes only just exceed the 30% threshold (**Table 4**).

The Serpentine River complex is located in the SE portion of the DAA outside of the Project Area. This area also has a number of other high conservation values; parts of it comprise ESAs associated with Conservation category wetlands (**Figure 9**) and it contains two Federally protected TECs: SCP09 Dense shrublands on clay flats and Banksia Woodlands of the Swan Coastal Plain (**Figure 6**).

This area falls outside of the Project Area, so it is unlikely to be directly impacted by the Project, however indirect impacts such as increased fertiliser use, or increased extraction of groundwater for irrigation may indirectly impact this area, (see **Section 4.2.6**).

4.2.6 Conservation Category Wetlands

A number of Conservation category wetlands (CCW) occur within the boundary of both the DAA and the Project Area.

In the Project Area the CCWs are located in the NE corner and central-east (Lyons block) and SE corner (Guthrie block) within remnant vegetation associated with the Bassendean Dune System (**Figure 9**). Most of these wetlands are buffered from potential project area activities by an existing band of remnant native vegetation. This band varies in width between 50 m to 115 m. There are however some parts where the boundary of the CCW crosses over and is immediately adjacent to cleared land within the Project Area. These are in the NE and central-east parts of the Project Area, within Lyons block (**Figure 9**). This makes these areas particularly vulnerable to impacts from potential horticultural activities which may occur adjacent to them.

Outside of the Project Area, the CCWs are located in the NW on the western side of the Forrest Highway within the boundary of the Yalgorup National Park, and in the east within the predominantly cleared agricultural lands.

For the most part, the CCW in the Yalgorup National Park is buffered by a band of remnant native vegetation within both the Project Area and within the National Park. The vegetated buffer is narrowest in the southern portion of the CCW where there is no remnant vegetation buffer in the Project Area. The buffer, including the Forrest Highway and bushland within the National Park, is about 180 m wide at this point (**Figure 9**).

The CCWs located within the mostly cleared agricultural land in the eastern part of the DAA have their closest western edge boundary located approximately 600 m to the east of the Project Area Boundary. These wetlands are surrounded by Multiple Use wetland with some Resource Enhancement wetlands in better condition bushland. One of these wetlands occurs within the boundary of the Riverdale Nature Reserve (**Figure 9**).

Conservation category wetlands are regarded as ESAs and are specially protected under the *Environmental Protection Act 1986* (EP Act). It is therefore recommended that, where possible, the horticultural precinct is designed to ensure that direct and indirect impacts to these areas are avoided or minimised. Impacts to these wetlands arising from the project may present constraints to the proposal. Examples of direct impacts include vegetation clearing and examples of indirect impacts include: alteration of wetland hydrology from increased ground water extraction, or exchange of deep-rooted perennial pine trees to shallow-rooted annual crops; nutrient enrichment from fertilisers; herbicide and pesticide drift and weed invasion. The most significant of these impacts is likely to be altered wetland hydrology. Predicting the scale of this impact is beyond the scope of this report.

Measures to limit or prevent impacts to the CCWs include the creation of wetland buffers incorporating roads and fire access ways and the maintenance of existing buffers in a good condition. It is also recommended that a study is undertaken to determine potential impacts of the proposal on the hydrology of all CCWs within the DAA.

There is a north-south band of wetlands occurring within bushland fragments in the northern part of the Stage two Project Area, south of Crampton Road. These are not part of the Geomorphic Wetland Mapping. Parts of these are in Good to Very Good condition and their values are discussed in **Section 4.2**, above. Based on the results of this survey there is a case for evaluating them with a view to adding them to the geomorphic wetland dataset as Conservation category wetlands.

4.2.7 Environmentally Sensitive Areas

There are several ESAs within the DAA and Project Area (**Figure 11**). These are associated with the CCWs discussed in **Sections 1.7** and **4.2.6**, and the precincts of the Yalgorup National Park, Crampton Nature Reserve, Riverdale Nature Reserve and Byrd Nature Reserve (**Figure 2**). ESAs are afforded special protection under the EP Act and exemptions to clearing under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply in these areas.

4.2.8 Regional Ecological Linkages

Eight ecological linkage axis lines are mapped within the DAA and Project Area (Molloy *et al*., 2009). Most of the remnant bushland within this area is classified as having the two highest proximity ratings because of their <100 m proximity to the axis lines and neighbouring parcels of bushland. The most substantial linkage runs SE from the Yalgorup National Park and then south through the SE corner of the DAA. It is up to 1.7 km in width. Another much narrower and fragmented linkage runs north – south along the western boundary of the Project Area (**Figure 10**).

These ecological linkages were determined based on remnant native vegetation, not on exotic or planted vegetation. It is understood that the proposed horticultural precinct is based around the use of existing cleared areas and existing pine plantations. If this is the case the proposal is unlikely to have a significant impact on the mapped regional ecological linkages. It may however be possible to bolster linkages by the careful planning and design of the horticultural precinct for example by the planting of native vegetation shelter belts or wind breaks between existing parcels of bushland.

5 Recommendations

- Populations of Priority Flora and their associated vegetation be retained;
- Development within the Project Area does not negatively impact on the biological values of regional ecological linkages;
- Priority ecological communities should be given priority for retention, wherever possible;
- Conservation category wetlands and Resource Enhancement wetlands are retained with appropriate dryland buffers;
- Where possible, remnant vegetation is retained and impacts to all of the represented vegetation complexes mapped for the DAA and Project Area are minimised;
- Special attention is given to minimising potential impacts to the area containing the Serpentine River complex, and that intensive horticultural practices that may be located within the Project Area are situated away from this area and that the band of native vegetation in the Project Area which provides a buffer to this area is maintained in a good condition. The ongoing management of the Byrd Nature reserve in this area by the DBCA is also important to preservation this area; and
- Further surveys are carried out in the wetlands in the eastern part of Lyons Forest Block to determine whether any threatened flora occur there, and to gain a greater understanding of the wetland vegetation, particularly in relation to the occurrences of groundwater-dependent species.

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Appendix.

Appendix 1. Categories of Threatened Ecological Communities under the EPBC Act (DotEE, 2018a).

Category	Definition
Critically endangered	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

EPBC Act Protected Matters Report

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

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

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

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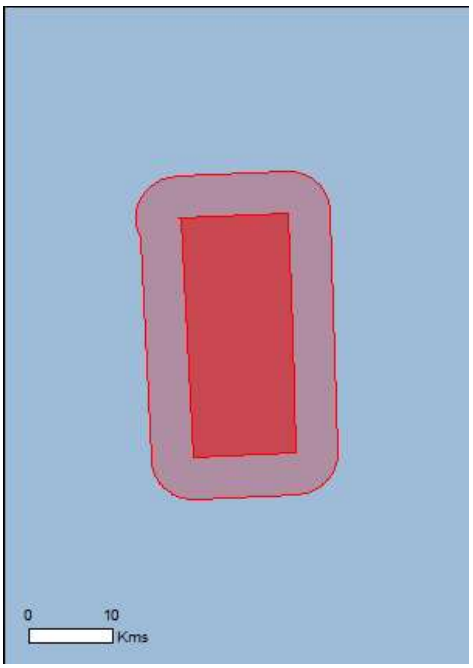

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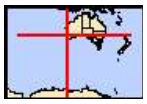

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	63
Listed Migratory Species:	63

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	92
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	11
Regional Forest Agreements:	1
Invasive Species:	28
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Peel-yalgorup system	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community likely to occur within area
Thrombolite (microbialite) Community of a Coastal Brackish Lake (Lake Clifton)	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area

Name	Status	Type of Presence
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Fish		
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Caladenia procera Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area
Synaphea sp. Pinjarra Plain (A.S. George 17182) [86878]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area

Name	Threatened	Type of Presence
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area

Name	Threatened	Type of Presence
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Breeding known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area

Name	Status	Type of Presence
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Buller	WA
Byrd Swamp	WA
Crampton	WA
Harvey Flats	WA
NTWA Bushland covenant (0004)	WA
NTWA Bushland covenant (0095)	WA
Riverdale	WA
Unnamed WA01086	WA
Unnamed WA49730	WA
Wellard	WA
Yalgorup	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus		
Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis		
Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Benger Swamp	WA
Yalgorup Lakes System	WA

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.900918 115.695401,-32.896306 115.814877,-33.112821 115.823117,-33.117422 115.71188,-32.900918 115.699521,-32.900918 115.695401

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix 3. Definitions of Threatened and Priority List flora under the WC Act (DPaW, 2017).

Conservation code	Category
T	Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the *Wildlife Conservation Act 1950*. 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 (CR, EN, VU, EX). A species that is listed as Threatened and assessed as 'Critically Endangered' would therefore have its status written as T (CR).
P1	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Appendix 4. Categories of Threatened Species under the EPBC Act (DotEE, 2018c).

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it 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)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

NatureMap
Mapping Western Australia's biodiversity

Myalup NatureMap Cons Sig Spp_20km_230818

Created By Guest user on 23/08/2018

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Rectangle'
Extent 115° 41' 18" E, 115° 48' 34" E, 33° 08' 03" S, 32° 53' 25" S

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	3373	*Acacia horridula*		P3	
2.	3537	*Acacia semitrullata*		P4	
3.	43000	*Alyogyne sp. Rockingham (G.J. Keighery 14463)*		P2	Y
4.	38480	*Austrostipa bronwenae*		T	
5.	20026	*Blennospora doliiformis*		P3	
6.	11612	*Boronia capitata subsp. gracilis*		P3	
7.	16633	*Boronia juncea subsp. juncea*		P1	
8.	13862	*Caladenia speciosa*		P4	
9.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
10.	11657	*Conostylis pauciflora subsp. pauciflora*		P4	
11.	16245	*Cyathochaeta teretifolia*		P3	
12.	3863	*Dillwynia dillwynioides*		P3	
13.	10796	*Diuris drummondii (Tall Donkey Orchid)*		T	
14.	12938	*Diuris micrantha*		T	
15.	1637	*Diuris purdiei (Purdie's Donkey Orchid)*		T	
16.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
17.	13635	*Drakaea micrantha*		T	
18.	34216	*Galium leptogonium*		P3	
19.	35502	*Hakea oligoneura*		P4	
20.	6168	*Haloragis aculeolata*		P2	
21.	6178	*Haloragis scoparia*		P1	
22.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
23.	5038	*Lasiopetalum membranaceum*		P3	
24.	5237	*Pimelea calcicola*		P3	
25.	31731	*Pterostylis frenchii*		P2	
26.	20348	*Sphaerolobium calcicola*		P3	
27.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
28.	13127	*Stylidium maritimum*		P3	
29.	25800	*Stylidium paludicola*		P3	
30.	48297	*Styphelia filifolia*		P3	

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

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

Appendix 6. Details of Floristic Quadrats.

Quadrat: ACCE01

Northing: 6336664.20	Easting: 385656.60	Landscape Position: Plain
Soil: Grey-brown sand	Litter:	Condition: Very Good
Comments: Burnt January 2016.		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	1	*Kunzea glabrescens*	3
Aotus procumbens	1	*Lagenophora huegelii*	1
Asteridea pulverulenta	1	*Laxmannia squarrosa*	1
Banksia attenuata	3	*Leporella fimbriata*	1
Bossiaea eriocarpa	2	*Leucopogon glabellus*	2
Burchardia congesta	1	*Lomandra caespitosa*	1
Caladenia flava	1	*Lomandra hermaphrodita*	1
Chamaescilla corymbosa	1	*Lomandra sericea*	1
Conostylis setigera	1	*Lyginia imberbis*	1
Drosera pallida	1	*Macrozamia riedlei*	1
Eucalyptus marginata	1	*Melaleuca thymoides*	1
Gastrolobium capitatum	1	*Ornithopus compressus*	1
Gompholobium tomentosum	1	*Patersonia occidentalis*	1
Hibbertia hypericoides	3	*Platysace filiformis*	1
Hibbertia racemosa	1	*Pyrorchis nigricans*	1
Hovea trisperma	1	*Stirlingia latifolia*	4
**Hypochaeris glabra*	1	*Stylidium piliferum*	1
Hypolaena exsulca	1	*Trachymene pilosa*	1
Isolepis marginata	1	**Ursinia anthemoides*	1
Isotropis cuneifolia	1	*Waitzia suaveolens*	1
Jacksonia furcellata	1	*Xanthorrhoea brunonis*	1

Quadrat: BOON01

Northing: 6336401.11	Easting: 382689.91	Landscape Position: Plain
Soil: Yellow-brown sand	Litter:	Condition: Excellent
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Asteridea pulverulenta	1	*Lagenophora huegelii*	1
Banksia attenuata	4	*Lepidosperma squamatum*	1
Billardiera variifolia	1	*Leucopogon propinquus*	1
Bossiaea eriocarpa	1	*Lomandra caespitosa*	1
**Briza maxima*	1	*Lomandra hermaphrodita*	1
Caladenia discoidea	1	*Lomandra sericea*	1
Caladenia longicauda	1	*Loxocarya sp. P414*	1
Calytrix fraseri	1	*Macrozamia riedlei*	1
Chamaescilla corymbosa	2	*Melaleuca thymoides*	1
Conostylis setigera	3	*Patersonia occidentalis*	1
Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)	1	*Petrophile linearis*	1
Dampiera linearis	1	*Philotheca spicata*	1
Dasypogon bromeliifolius	4	*Phlebocarya ciliata*	1
Dichopogon capillipes	1	*Platysace filiformis*	1
Drosera pallida	1	*Pterostylis* sp. crinkled leaf (G.J. Keighery 13426)	1
Drosera porrecta	1	*Pyrorchis nigricans*	2
Elythranthera brunonis	1	*Sowerbaea laxiflora*	1
Eucalyptus marginata	3	*Stirlingia latifolia*	2
Hibbertia hypericoides	3	*Stylidium androsaceum*	1
Hibbertia racemosa	1	*Stylidium brunonianum*	1
**Hypochaeris glabra*	2	*Stylidium piliferum*	1
Hypolaena exsulca	1	*Trachymene pilosa*	1
Isotropis cuneifolia	1	**Wahlenbergia capensis*	1
Kunzea glabrescens	1		

Quadrat: BOON02

Northing: 6336295.88	Easting: 382625.75	Landscape Position: Plain
Soil: Yellow-brown sand	Litter: 90%	Condition: Excellent
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Banksia attenuata	3	*Lomandra sericea*	2
Banksia ilicifolia	1	*Lyginia imberbis*	1
Bossiaea eriocarpa	1	*Macrozamia riedlei*	2
Brachyloma preissii	1	*Melaleuca thymoides*	1
**Briza maxima*	3	*Philotheca spicata*	1
Caladenia flava	1	*Phlebocarya ciliata*	1
Caladenia longicauda	1	*Platysace filiformis*	1
Chamaescilla corymbosa	2	*Stirlingia latifolia*	3
Corymbia calophylla	2	*Stylidium brunonianum*	1
Dasypogon bromeliifolius	3	*Tetratheca hirsuta*	1
Drosera porrecta	2	*Trachymene pilosa*	1
Eucalyptus marginata	2	**Wahlenbergia capensis*	1
Hibbertia hypericoides	4		
Hibbertia racemosa	1		
**Hypochaeris glabra*	2		
Hypolaena exsulca	1		
Lagenophora huegelii	2		
Lepidosperma squamatum	1		
Leucopogon propinquus	1		
Lomandra caespitosa	1		
Lomandra hermaphrodita	1		

Quadrat: BOON03

Northing: 6336108.13	Easting: 382531.78	Landscape Position: Plain
Soil: Yellow-brown sand	Litter: 80%	Condition: Very Good
Comments: No evidence of *Phytophthora cinnamomi*		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	1	*Lepidosperma squamatum*	1
Banksia attenuata	4	*Leucopogon propinquus*	1
Banksia grandis	2	*Lomandra hermaphrodita*	1
Banksia ilicifolia	1	*Lomandra micrantha*	1
Brachyloma preissii	1	*Lomandra sericea*	1
**Briza maxima*	1	*Lyginia imberbis*	1
Burchardia congesta	1	*Macrozamia riedlei*	2
Chamaescilla corymbosa	1	*Microlaena stipoides*	1
Conostylis setigera	1	***Nuytsia floribunda***	1
Corymbia calophylla	2	*Petrophile linearis*	1
Dampiera linearis	1	*Platysace filiformis*	1
Dasypogon bromeliifolius	2	*Pterostylis recurva*	1
Dichopogon capillipes	1	*Pyrorchis nigricans*	1
Drosera porrecta	1	*Stirlingia latifolia*	3
Eucalyptus marginata	2	*Tetraria octandra*	1
Hibbertia racemosa	1	*Thelymitra cornicina*	1
Hovea trisperma	1	*Thysanotus manglesianus*	1
**Hypochaeris glabra*	1	*Trachymene pilosa*	1
Kennedia prostrata	1	*Xanthorrhoea preissii*	2
Lagenophora huegelii	1		

Quadrat: CENT01

Northing: 6351446.38	Easting: 383160.46	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter: 40%	Condition: Excellent
Comments: No evidence of *Phytophthora cinnamomi*		

LATIN NAME	COVER	LATIN NAME	COVER
**Aira caryophyllea*	1	*Lagenophora huegelii*	2
Asteridea pulverulenta	1	*Leucopogon propinquus*	2
Austrostipa compressa	1	*Levenhookia pusilla*	1
Banksia attenuata	3	*Lomandra hermaphrodita*	1
**Briza maxima*	3	*Lomandra sericea*	1
**Briza minor*	1	*Macrozamia riedlei*	2
Burchardia congesta	1	*Microlaena stipoides*	1
Caladenia flava	1	*Patersonia occidentalis*	1
Centrolepis drummondiana	1	*Petrophile linearis*	1
Desmocladus flexuosus	1	*Phyllangium paradoxum*	1
Drosera erythrorhiza	1	*Poranthera microphylla*	1
Drosera glanduligera	1	*Pterostylis recurva*	1
Drosera porrecta	2	*Pyrorchis nigricans*	1
Eucalyptus gomphocephala	1	*Quinetia urvillei*	1
Eucalyptus marginata	3	*Sowerbaea laxiflora*	1
Hardenbergia comptoniana	1	*Spyridium globulosum*	1
Hibbertia hypericoides	4	*Stylidium piliferum*	2
Homalosciadium homalocarpum	1	**Ursinia anthemoides*	1
Hypocalymma robustum	1	**Wahlenbergia capensis*	1
**Hypochaeris glabra*	2	*Waitzia suaveolens*	1
Isotropis cuneifolia	2	*Xanthosia huegelii*	2

Quadrat: CENT02

Northing: 6350930.78	Easting: 384024.31	Landscape Position: Lower slope
Soil: Grey-brown sand	Litter: 10%	Condition: Very Good
Comments: Burnt in January 2016		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	2	*Leucopogon oxycedrus*	1
Acacia pulchella	2	*Leucopogon propinquus*	3
Adenanthos meisneri	1	*Lomandra caespitosa*	1
**Aira caryophyllea*	1	*Lomandra sericea*	1
Asteridea pulverulenta	1	*Lyginia imberbis*	1
Bossiaea eriocarpa	2	*Melaleuca thymoides*	2
**Briza minor*	1	*Monotaxis occidentalis*	1
Caladenia flava	1	***Nuytsia floribunda***	1
Centrolepis drummondiana	1	*Platysace filiformis*	2
Chamaescilla corymbosa	1	*Platytheca galioides*	1
Conostylis setigera	1	*Quinetia urvillei*	1
Dasypogon bromeliifolius	3	*Rhodanthe citrina*	2
Drosera porrecta	1	*Stylidium brunonianum*	2
Eucalyptus marginata	2	**Ursinia anthemoides*	2
Gompholobium tomentosum	1	*Xanthorrhoea brunonis*	4
Hibbertia hypericoides	2		
Homalosciadium homalocarpum	1		
**Hypochaeris glabra*	4		
Hypolaena exsulca	1		
Lepidosperma pubisquameum	1		

Quadrat: CENT03

Northing: 6350930.78	Easting: 384024.31	Landscape Position: Lower slope
Soil: Grey-brown sand	Litter: <5%	Condition: Excellent
Comments: Burnt in January 2016. Seasonally damp, adjacent to seasonally inundated sedgeland		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	2	*Lepidosperma pubisquameum*	2
Acacia semitrullata	2	*Leucopogon australis*	2
Acacia stenoptera	1	*Lomandra caespitosa*	1
Adenanthos obovatus	2	***Melaleuca preissiana***	1
Bossiaea eriocarpa	2	*Melaleuca thymoides*	2
Burchardia congesta	1	*Monotaxis occidentalis*	1
Caladenia flava	2	*Philotheca spicata*	1
Dampiera pedunculata	1	*Platysace filiformis*	2
Dasypogon bromeliifolius	4	*Pultenaea reticulata*	1
Drosera paleacea	1	*Stylidium brunonianum*	2
Drosera erythrorhiza	2	*Stylidium diversifolium*	1
Eucalyptus marginata	3	*Stylidium piliferum*	1
Gompholobium tomentosum	2	*Trachymene pilosa*	1
Hypocalymma angustifolium	1	*Ornduffia albiflora*	1
Isolepis cernua var. *setiformis*	1	*Xanthorrhoea brunonis*	4
Isolepis marginata	1		
Jacksonia furcellata	1		
Johnsonia acaulis	1		
Kunzea glabrescens	3		
Laxmannia squarrosa	1		

Quadrat: CENT04

Northing: 6350458.82	Easting: 382045.23	Landscape Position: Mid-slope
Soil: Yellow-brown sand	Litter: 80%	Condition: Good
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Agonis flexuosa	1	*Lomandra caespitosa*	1
**Aira caryophyllea*	2	*Lomandra micrantha*	3
Banksia attenuata	2	**Lysimachia arvensis* var. *caerulea*	1
**Briza maxima*	2	*Macrozamia riedlei*	2
Caladenia flava	2	**Oxalis pes-caprae*	1
Centrolepis drummondiana	1	*Persoonia saccata*	1
Chamaescilla corymbosa	2	**Petrorhagia dubia*	1
Daucus glochidiatus	1	*Phyllanthus calycinus*	1
Daviesia divaricata	1	*Pyrorchis nigricans*	1
Drosera erythrorhiza	1	**Sonchus oleraceus*	1
Drosera porrecta	2	*Sowerbaea laxiflora*	1
Eucalyptus gomphocephala	3	*Stackhousia monogyna*	3
Eucalyptus marginata	1	*Trachymene pilosa*	1
Gompholobium tomentosum	1	**Trifolium campestre* var. *campestre*	1
Hardenbergia comptoniana	1	*Xanthosia huegelii*	1
**Heliophila pusilla*	1		
Hibbertia racemosa	1		
Hydrocotyle alata	1		
**Hypochaeris glabra*	3		
Lagenophora huegelii	1		
Leucopogon propinquus	2		

Quadrat: CRAM01

Northing: 6345107.14	Easting: 384060.90	Landscape Position: Upper slope
Soil: Grey-brown sand	Litter: 30%	Condition: Excellent
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	4	*Hovea trisperma*	1
Acacia semitrullata	1	*Hypocalymma robustum*	1
Aira caryophyllea	1	*Hypochaeris glabra*	2
Asteridea pulverulenta	1	*Ixiolaena viscosa*	1
Banksia attenuata	3	*Lepidosperma pubisquameum*	2
Bossiaea eriocarpa	1	*Leucopogon propinquus*	1
Briza maxima	1	*Lomandra hermaphrodita*	1
Caladenia flava	1	*Lomandra sericea*	1
Calytrix sp.	1	*Lyginia barbata*	1
Centrolepis drummondiana	1	*Macrozamia riedlei*	1
Chamaescilla corymbosa	1	*Millotia tenuifolia* var. *tenuifolia*	1
Conostephium pendulum	1	*Patersonia occidentalis*	2
Dasypogon bromeliifolius	2	*Phyllangium paradoxum*	1
Drosera erythrorhiza	1	*Platysace filiformis*	2
Drosera porrecta	2	*Pyrorchis nigricans*	1
Elythranthera brunonis	1	*Stylidium brunonianum*	1
Eucalyptus marginata	2	*Stylidium diversifolium*	1
Hibbertia hypericoides	4	*Trachymene pilosa*	1
Hibbertia racemosa	1	*Wahlenbergia capensis*	1
Homalosciadium homalocarpum	1	*Xanthorrhoea brunonis*	1

Quadrat: EAST01

Northing: 6342787.72	Easting: 385154.88	Landscape Position: Mid-slope
Soil: Light grey sand	Litter: 90%	Condition: Very Good
Comments: Long unburnt		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Isotropis cuneifolia*	1
Agonis flexuosa	1	*Lagenophora huegelii*	2
Banksia attenuata	4	*Lepidosperma squamatum*	1
Bossiaea eriocarpa	1	*Lomandra caespitosa*	1
**Briza maxima*	4	*Lomandra hermaphrodita*	1
Caladenia flava	1	*Lomandra nigricans*	1
Chamaescilla corymbosa	2	*Lomandra sericea*	1
Conostephium pendulum	1	*Lyginia barbata*	1
Conostylis setigera	1	*Patersonia occidentalis*	2
Dasypogon bromeliifolius	3	*Philotheca spicata*	1
Desmocladus flexuosus	1	*Platysace filiformis*	1
Dianella revoluta var. *divaricata*	1	*Poranthera microphylla*	1
Drosera porrecta	1	*Pterostylis vittata*	1
Eucalyptus marginata	2	*Pyrorchis nigricans*	1
Gompholobium tomentosum	1	*Stylidium brunonianum*	1
Hardenbergia comptoniana	1	*Stylidium diversifolium*	1
Hibbertia hypericoides	3	*Stylidium schoenoides*	1
Hovea trisperma	1	*Thysanotus manglesianus*	1
Hypocalymma robustum	1	*Trachymene pilosa*	1
**Hypochaeris glabra*	2	*Xanthorrhoea brunonis*	1

Quadrat: EAST02

Northing: 6343605.29	Easting: 385040.98	Landscape Position: Mid-slope
Soil: Grey sand	Litter: 80%	Condition: Excellent
Comments: Long unburnt		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	1	*Hovea stricta*	1
Agonis flexuosa	3	**Hypochaeris glabra*	2
Banksia attenuata	3	*Hypolaena exsulca*	1
Billardiera variifolia	1	*Isotropis cuneifolia*	1
Bossiaea eriocarpa	1	*Lagenophora huegelii*	1
**Briza maxima*	1	*Lomandra caespitosa*	1
Burchardia congesta	1	*Lomandra hermaphrodita*	1
Caladenia flava	1	*Lomandra sericea*	1
Chamaescilla corymbosa	1	*Lyginia imberbis*	1
Conostephium pendulum	1	*Macrozamia riedlei*	1
Conostylis aculeata	1	*Petrophile linearis*	1
Conostylis setigera	1	*Philotheca spicata*	1
Dampiera linearis	1	*Phlebocarya ciliata*	1
Dasypogon bromeliifolius	3	*Platysace filiformis*	2
Daucus glochidiatus	1	*Poranthera microphylla*	1
Drosera porrecta	2	*Pterostylis vittata*	1
Eucalyptus gomphocephala	2	*Pyrorchis nigricans*	2
Eucalyptus marginata	2	*Stylidium brunonianum*	1
Gompholobium tomentosum	1	*Thysanotus manglesianus*	1
Hardenbergia comptoniana	1	*Trachymene pilosa*	1
Hibbertia hypericoides	4	**Ursinia anthemoides*	1
Hibbertia racemosa	1	**Wahlenbergia capensis*	1
Homalosciadium homalocarpum	1	*Xanthorrhoea brunonis*	1

Quadrat: FORE01

Northing: 6343605.29	Easting: 385040.98	Landscape Position: Lower-slope
Soil: Yellow-brown sand	Litter: 80%	Condition: Very Good
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Hibbertia vaginata*	1
Acacia semitrullata	1	*Homalosciadium homalocarpum*	1
Adenanthos meisneri	1	*Hovea stricta*	1
Asteridea pulverulenta	1	*Hypocalymma robustum*	1
Banksia attenuata	4	**Hypochaeris glabra*	2
Bossiaea eriocarpa	1	*Jacksonia furcellata*	1
Brachyloma preissii	1	*Lagenophora huegelii*	1
**Briza maxima*	2	*Lepidosperma squamatum*	1
Caladenia flava	1	*Lomandra hermaphrodita*	1
Caladenia longicauda	1	*Lomandra sericea*	1
Chamaescilla corymbosa	3	*Lomandra suaveolens*	2
Conostylis aculeata	1	*Lyginia imberbis*	1
Conostylis setigera	1	*Macrozamia riedlei*	1
Corymbia calophylla	1	*Melaleuca thymoides*	1
Dampiera linearis	2	*Microlaena stipoides*	1
Dasypogon bromeliifolius	2	***Nuytsia floribunda***	1
Dichopogon capillipes	3	*Phlebocarya ciliata*	3
Drosera erythrorhiza	1	*Platysace filiformis*	1
Drosera pallida	1	*Pterostylis vittata*	1
Drosera porrecta	1	*Pyrorchis nigricans*	1
Eucalyptus marginata	1	*Sowerbaea laxiflora*	1
Hardenbergia comptoniana	1	*Stylidium brunonianum*	2
Hibbertia hypericoides	2	*Thysanotus manglesianus*	1

Quadrat: FORE02

Northing: 6340908.83	Easting: 385152.52	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter:	Condition: Very Good
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia applanata	1	***Eucalyptus marginata***	2
Agonis flexuosa	2	**Geranium dissectum*	1
**Aira caryophyllea*	1	*Gompholobium tomentosum*	1
Astroloma ciliatum	1	*Hardenbergia comptoniana*	1
Astroloma pallidum	1	**Heliophila pusilla*	1
Banksia attenuata	1	*Hovea trisperma*	1
Bossiaea eriocarpa	1	*Isotropis cuneifolia*	1
Brachyloma preissii	1	*Lagenophora huegelii*	1
**Briza maxima*	3	*Lepidosperma squamatum*	1
Burchardia congesta	1	*Leucopogon propinquus*	2
Caesia micrantha	1	*Linum marginale*	1
Caladenia flava	1	*Loxocarya cinerea*	1
Clematis pubescens	1	**Lysimachia arvensis* var. *caerulea*	1
Conostylis aculeata	1	*Microlaena stipoides*	1
Corynotheca micrantha	1	*Opercularia hispidula*	1
Dampiera linearis	1	**Oxalis pes-caprae*	2
Daucus glochidiatus	1	**Pelargonium capitatum*	1
Daviesia divaricata	2	*Persoonia saccata*	1
Desmocladus flexuosus	1	*Petrophile linearis*	1
Dichopogon capillipes	3	*Phyllanthus calycinus*	1
Diuris corymbosa	1	*Pithocarpa cordata*	1
Drosera erythrorhiza	1	*Sowerbaea laxiflora*	1
Ehrharta calycina	1	*Tetraria octandra*	1
Eucalyptus gomphocephala	3	**Trifolium campestre* var. *campestre*	1

Quadrat: FORE03

Northing: 6339094.99	Easting: 385204.67	Landscape Position: Lower slope
Soil: Grey sand	Litter: 100%	Condition: Good
Comments: Probably affected by *Phytophthora cinnamomi* disease		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia saligna	1	*Luzula meridionalis*	1
Agonis flexuosa	2	*Macrozamia riedlei*	1
**Briza maxima*	2	*Microlaena stipoides*	1
**Briza minor*	1	**Oxalis pes-caprae*	1
Chamaescilla corymbosa	1	*Patersonia occidentalis*	1
Corymbia calophylla	4	*Stylidium schoenoides*	1
Desmocladus flexuosus	2	**Watsonia meriana*	1
Diuris corymbosa	1		
Drosera pallida	1		
**Ehrharta calycina*	1		
**Ehrharta longiflora*	1		
Eucalyptus marginata	1		
Hardenbergia comptoniana	1		
Hibbertia hypericoides	1		
Hibbertia racemosa	1		
**Hypochaeris glabra*	1		
Kennedia prostrata	1		
Kunzea glabrescens	1		
Lepidosperma pubisquameum	1		
Lepidosperma squamatum	2		

Quadrat: JOHN01

Northing: 6355477.04	Easting: 383625.60	Landscape Position: Lower slope
Soil: Grey sand	Litter: 50%	Condition: Excellent
Comments: Burnt in January 2016		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia applanata	1	*Hardenbergia comptoniana*	1
Acacia extensa	1	*Hibbertia hypericoides*	1
Acacia pulchella	3	*Hypochaeris glabra*	1
Adenanthos meisneri	1	*Hypolaena exsulca*	1
Agonis flexuosa	1	*Isotropis cuneifolia*	1
Banksia attenuata	1	*Kennedia prostrata*	3
Billardiera variifolia	1	*Lagenophora huegelii*	2
Bossiaea eriocarpa	1	*Laxmannia squarrosa*	1
**Briza maxima*	1	*Lepidosperma pubisquameum*	1
Burchardia congesta	1	*Leucopogon propinquus*	1
Caladenia flava	1	*Lomandra hermaphrodita*	1
Chamaescilla corymbosa	1	*Monotaxis occidentalis*	1
Conostylis serrulata	1	*Orianthera serpyllifolia*	1
Corymbia calophylla	4	*Patersonia occidentalis*	1
Dasypogon bromeliifolius	4	*Philotheca spicata*	1
Desmocladus flexuosus	1	*Platysace filiformis*	3
Drosera erythrorhiza	1	*Pyrorchis nigricans*	1
Drosera pallida	1	*Stirlingia latifolia*	2
Drosera porrecta	2	*Trachymene pilosa*	2
Eucalyptus marginata	2	*Xanthorrhoea brunonis*	1
Gompholobium tomentosum	2	*Xanthosia huegelii*	2

Quadrat: JOHN02

Northing: 6355477.04	Easting: 383625.60	Landscape Position: Lower slope
Soil: Grey sand	Litter: <5%	Condition: Very Good
Comments: Burnt in January 2016. Seasonally damp.		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	4	*Kunzea glabrescens*	1
**Aira caryophyllea*	1	*Lepidosperma pubisquameum*	1
Austrostipa compressa	1	*Leporella fimbriata*	1
Burchardia congesta	1	*Leucopogon oxycedrus*	1
Caladenia longicauda	1	*Lomandra caespitosa*	1
Centrolepis drummondiana	1	*Lomandra hermaphrodita*	1
Chamaescilla corymbosa	1	*Lomandra nigricans*	1
Conostylis serrulata	1	*Lomandra suaveolens*	1
Dasypogon bromeliifolius	4	*Lyginia imberbis*	1
Desmocladus flexuosus	1	*Melaleuca thymoides*	1
Drosera paleacea	1	*Millotia tenuifolia* var. *tenuifolia*	1
Drosera erythrorhiza	2	*Monotaxis occidentalis*	1
Drosera glanduligera	1	*Patersonia occidentalis*	1
Drosera pallida	1	*Phlebocarya ciliata*	2
Drosera porrecta	2	*Phyllangium paradoxum*	1
Eucalyptus marginata	2	*Podotheca angustifolia*	1
Gastrolobium capitatum	3	*Poranthera microphylla*	1
Gompholobium tomentosum	2	*Quinetia urvillei*	1
Hardenbergia comptoniana	1	*Rhodanthe citrina*	1
Hibbertia hypericoides	2	*Stylidium piliferum*	1
**Hypochaeris glabra*	3	*Trachymene pilosa*	2
Hypolaena exsulca	1	**Ursinia anthemoides*	2
Isolepis marginata	1	*Xanthorrhoea gracilis*	2
Kennedia prostrata	1		

Quadrat: JOHN03

Northing: 6354980.15	Easting: 384207.83	Landscape Position: Plain
Soil: Grey sand	Litter: <5%	Condition: Good
Comments: Burnt in January 2016. Seasonally damp. Probably affected by *P. cinnamomi*		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia flagelliformis	2	*Kunzea glabrescens*	2
Acacia pulchella	2	*Lepidosperma longitudinale*	1
Acacia semitrullata	2	*Lyginia imberbis*	1
Adenanthos obovatus	2	***Melaleuca preissiana***	2
**Aira caryophyllea*	1	***Nuytsia floribunda***	1
Arctotheca calendula	2	**Ornithopus compressus*	2
**Bellardia latifolia*	1	*Patersonia occidentalis*	1
**Briza minor*	1	*Phyllangium paradoxum*	1
Centrolepis drummondiana	1	*Quinetia urvillei*	1
Chamaescilla corymbosa	1	*Trachymene pilosa*	1
Conostylis aculeata	2	**Trifolium hirtum*	1
Dasypogon bromeliifolius	4	**Ursinia anthemoides*	2
Drosera glanduligera	1	**Vulpia bromoides*	1
**Ehrharta calycina*	1	*Xanthorrhoea gracilis*	3
**Erodium cicutarium*	2		
Gompholobium tomentosum	1		
Hakea varia	1		
Homalosciadium homalocarpum	1		
**Hypochaeris glabra*	4		
Isolepis marginata	1		

Quadrat: JOHN04

Northing: 6354980.15	Easting: 384207.83	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter: 40%	Condition: Very Good
Comments: Burnt in January 2016.		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	2	*Lepidosperma squamatum*	1
Agonis flexuosa	3	*Leucopogon propinquus*	1
**Aira caryophyllea*	1	*Lomandra micrantha*	1
Austrostipa flavescens	1	*Lomandra sericea*	1
**Avena barbata*	1	*Lomandra suaveolens*	1
Banksia nivea subsp. *nivea*	1	**Lotus angustissimus*	1
**Briza maxima*	1	**Lysimachia arvensis* var. *caerulea*	1
**Briza minor*	1	*Macrozamia riedlei*	1
Caladenia flava	1	**Petrorhagia dubia*	1
Calandrinia liniflora	1	*Phyllangium paradoxum*	1
Conostylis aculeata	1	*Phyllanthus calycinus*	2
Corynotheca micrantha	1	*Pithocarpa cordata*	1
Crassula colorata var. *colorata*	1	**Poa annua*	1
Desmocladus flexuosus	1	*Pyrorchis nigricans*	1
Dianella revoluta var. *divaricata*	1	*Rhodanthe citrina*	1
Drosera porrecta	1	*Scaevola canescens*	1
**Ehrharta longiflora*	2	*Schoenus grandiflorus*	1
Eucalyptus marginata	3	**Silene gallica*	1
Gompholobium tomentosum	2	*Sowerbaea laxiflora*	3
Haemodorum laxum	1	*Stackhousia pubescens*	2
Hardenbergia comptoniana	2	*Synaphea spinulosa*	1
Hibbertia hypericoides	1	*Tersonia cyathiflora*	2
Hybanthus calycinus	1	*Tetraria octandra*	1
Hypocalymma robustum	1	*Thysanotus arenarius*	1
**Hypochaeris glabra*	2	*Thysanotus manglesianus*	1
Isolepis marginata	1	*Trachymene pilosa*	1
Isotropis cuneifolia	2	*Tricoryne elatior*	2

Ixiolaena viscosa	1	**Trifolium campestre* var. *campestre*	1
Kennedia prostrata	2	**Zantedeschia aethiopica*	1

Quadrat: RIVE01

Northing: 6348941.25	Easting: 384201.13	Landscape Position: Upper slope
Soil: Grey sand	Litter: 40%	Condition: Excellent
Comments: Burnt in January 2016.		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	2	*Hibbertia racemosa*	1
Acacia pulchella	3	*Homalosciadium homalocarpum*	1
Agonis flexuosa	1	*Hovea trisperma*	1
**Aira caryophyllea*	1	*Hydrocotyle callicarpa*	1
Allocasuarina humilis	1	*Hypocalymma robustum*	1
Banksia attenuata	2	**Hypochaeris glabra*	1
Bossiaea eriocarpa	1	*Isolepis cernua* var. *setiformis*	1
Burchardia congesta	1	*Kennedia prostrata*	1
Caladenia flava	1	*Kunzea glabrescens*	2
Cassytha racemosa	1	*Lagenophora huegelii*	1
Conostephium pendulum	1	*Leucopogon propinquus*	1
Conostylis setigera	1	*Lyginia imberbis*	1
Crassula exserta	1	*Macrozamia riedlei*	1
Dasypogon bromeliifolius	2	*Melaleuca thymoides*	1
Daucus glochidiatus	1	*Millotia tenuifolia* var. *tenuifolia*	1
Drosera erythrorhiza	1	*Petrophile linearis*	1
Drosera pallida	1	*Platysace filiformis*	1
Drosera porrecta	1	*Senecio diaschides*	1
Eucalyptus marginata	2	*Stirlingia latifolia*	4
Gompholobium tomentosum	1	*Stylidium brunonianum*	1
Hardenbergia comptoniana	1	*Trachymene pilosa*	1
Hibbertia hypericoides	2	*Xanthosia huegelii*	1

Quadrat: RIVE02

Northing: 6348919.83	Easting: 383617.62	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter: 30%	Condition: Very Good
Comments: Burnt in January 2016.		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	2	*Hypocalymma robustum*	1
Agonis flexuosa	1	*Hypochaeris glabra*	2
**Aira caryophyllea*	1	*Jacksonia furcellata*	1
Banksia attenuata	3	*Lagenophora huegelii*	2
Bossiaea eriocarpa	2	*Lepidosperma squamatum*	1
Briza maxima	2	*Leucopogon propinquus*	1
Briza minor	1	*Lomandra hermaphrodita*	1
Burchardia congesta	1	*Lomandra sericea*	1
Caladenia flava	1	*Loxocarya cinerea*	1
Chamaescilla corymbosa	1	*Macrozamia riedlei*	2
Conostylis aculeata	1	*Melaleuca thymoides*	1
Conostylis setigera	1	*Millotia tenuifolia* var. *tenuifolia*	1
Corymbia calophylla	1	**Petrorhagia dubia*	1
Crassula exserta	1	*Philotheca spicata*	2
Dasypogon bromeliifolius	1	*Platysace filiformis*	2
Drosera erythrorhiza	2	*Stylidium piliferum*	1
Drosera porrecta	1	*Trachymene pilosa*	1
Eucalyptus marginata	1	**Trifolium campestre* var. *campestre*	1
Gompholobium tomentosum	1	**Ursinia anthemoides*	1
Hardenbergia comptoniana	1	*Waitzia suaveolens*	1
Hibbertia hypericoides	4	*Xanthorrhoea brunonis*	1
Hibbertia racemosa	2	*Xanthorrhoea preissii*	1
Homalosciadium homalocarpum	1		

Quadrat: RIVE03

Northing: 6349259.38	Easting: 382399.03	Landscape Position: Mid-slope
Soil: Yellow-brown sand	Litter: 50%	Condition: Good
Comments: In shallow swale		

LATIN NAME	COVER	LATIN NAME	COVER
Agonis flexuosa	3	*Leucopogon propinquus*	1
**Briza maxima*	1	*Lomandra caespitosa*	1
Burchardia congesta	1	*Lomandra integra*	1
Caladenia flava	1	*Lomandra sericea*	1
Chamaescilla corymbosa	2	*Lomandra suaveolens*	1
Conostephium pendulum	1	*Macrozamia riedlei*	2
Conostylis aculeata	1	*Microlaena stipoides*	1
Corymbia calophylla	3	*Opercularia echinocephala*	1
Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)	1	*Oxalis corniculata*	1
Dasypogon bromeliifolius	1	*Patersonia occidentalis*	1
Daucus glochidiatus	1	*Phyllanthus calycinus*	2
Desmocladus flexuosus	1	*Sowerbaea laxiflora*	1
Drosera porrecta	1	*Tetraria octandra*	1
Eucalyptus gomphocephala	1	**Trifolium campestre* var. *campestre*	1
Eucalyptus marginata	2		
Hardenbergia comptoniana	1		
Hibbertia hypericoides	1		
Hibbertia racemosa	1		
Isotropis cuneifolia	2		
Lagenophora huegelii	2		

Quadrat: SOLA01

Northing: 6354383.51	Easting: 381057.48	Landscape Position: Mid-slope
Soil: Yellow-brown sand	Litter: 20%	Condition: Very Good
Comments: Small amount of limestone on surface. Burnt in January 2016		

LATIN NAME	COVER	LATIN NAME	COVER
Agonis flexuosa	2	*Leucopogon propinquus*	1
**Aira caryophyllea*	1	*Lomandra micrantha*	2
**Arctotheca calendula*	1	*Lomandra sericea*	1
Banksia attenuata	1	*Lomandra suaveolens*	1
Banksia dallanneyi	1	*Luzula meridionalis*	1
Banksia grandis	1	*Lysimachia arvensis* var. *caerulea*	1
**Briza maxima*	1	*Macrozamia riedlei*	1
**Briza minor*	1	*Olearia rudis*	1
Daviesia physodes	1	*Ornithopus compressus*	1
Desmocladus flexuosus	3	*Patersonia occidentalis*	1
Dichopogon capillipes	2	**Petrorhagia dubia*	2
Drosera erythrorhiza	1	*Phyllanthus calycinus*	2
Drosera pallida	1	*Pimelea rosea* subsp. *rosea*	1
Eremaea pauciflora	3	*Podolepis lessonii*	1
Eucalyptus gomphocephala	2	*Podotheca angustifolia*	1
Eucalyptus marginata	3	*Poranthera microphylla*	1
Gompholobium tomentosum	2	*Quinetia urvillei*	1
Hakea ruscifolia	2	*Schoenus curvifolius*	1
Hardenbergia comptoniana	1	*Senecio pinnatifolius*	2
Hibbertia hypericoides	3	*Sowerbaea laxiflora*	1
Hibbertia racemosa	1	*Stackhousia monogyna*	2
Hypocalymma robustum	1	*Tetraria octandra*	1
Hypochaeris glabra	4	*Tricoryne elatior*	1
Isotropis cuneifolia	1	**Trifolium campestre* var. *campestre*	4
Kennedia prostrata	3	**Ursinia anthemoides*	2
Lagenophora huegelii	2		

Quadrat: SOLA02

Northing: 6352293.52	Easting: 381314.09	Landscape Position: Mid-slope
Soil: Yellow-brown sand	Litter: 30%	Condition: Very Good
Comments: Burnt in January 2016		

LATIN NAME	COVER	LATIN NAME	COVER
Agonis flexuosa	3	*Lomandra micrantha*	1
Banksia attenuata	2	*Lomandra sericea*	1
**Briza maxima*	1	*Lomandra suaveolens*	1
Caladenia flava	1	*Luzula meridionalis*	1
Chamaescilla corymbosa	1	**Lysimachia arvensis* var. *caerulea*	1
Cyrtostylis huegelii	1	*Macrozamia riedlei*	1
Daucus glochidiatus	1	*Olearia rudis*	1
Desmocladus flexuosus	2	**Ornithopus compressus*	2
Drosera porrecta	1	*Petrorhagia dubia*	2
Eucalyptus marginata	2	*Phyllanthus calycinus*	3
**Gomphocarpus fruticosus*	1	*Senecio diaschides*	1
Hardenbergia comptoniana	1	*Stackhousia monogyna*	3
Hibbertia racemosa	1	*Tetrarrhena laevis*	1
**Hypochaeris glabra*	3	*Tetraria octandra*	1
Isolepis marginata	1	*Thelymitra crinita*	1
Isotropis cuneifolia	1	*Trachymene pilosa*	1
Lagenophora huegelii	2	*Xanthosia huegelii*	4
Lepidosperma squamatum	1		
Leucopogon propinquus	1		
Lomandra caespitosa	1		

Quadrat: SOLA03

Northing: 6352357.43 Easting: 382129.21 Landscape Position: Mid-slope

Soil: Yellow-brown sand Litter: 30% Condition: Very Good

Comments: Burnt in January 2016

LATIN NAME	COVER	LATIN NAME	COVER
**Aira caryophyllea*	1	*Hybanthus calycinus*	1
Asteridea pulverulenta	1	*Hypocalymma robustum*	1
Banksia attenuata	1	**Hypochaeris glabra*	3
**Briza maxima*	1	*Isolepis marginata*	1
**Briza minor*	1	*Isotropis cuneifolia*	1
Caladenia flava	1	*Kunzea glabrescens*	2
Centrolepis drummondiana	1	*Lagenophora huegelii*	2
Chamaescilla corymbosa	2	*Leucopogon propinquus*	1
Clematis pubescens	1	*Lomandra micrantha*	1
Corynotheca micrantha	2	*Lomandra suaveolens*	1
Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)	1	*Loxocarya cinerea*	1
Desmocladus fasciculatus	1	*Macrozamia riedlei*	2
Desmocladus flexuosus	1	*Microlaena stipoides*	2
Drosera erythrorhiza	1	**Ornithopus compressus*	1
Drosera porrecta	1	*Petrophile linearis*	1
Eucalyptus gomphocephala	2	*Podotheca angustifolia*	1
Eucalyptus marginata	1	*Poranthera microphylla*	1
Gompholobium tomentosum	1	*Rhodanthe citrina*	1
Hakea lissocarpha	1	*Sowerbaea laxiflora*	1
Hardenbergia comptoniana	1	*Trachymene pilosa*	1
**Heliophila pusilla*	1	**Ursinia anthemoides*	2
Hibbertia hypericoides	4	*Xanthosia huegelii*	4
Hibbertia racemosa	1		

Quadrat: SWAM01

Northing: 6347963.85	Easting: 384848.85	Landscape Position: Basin
Soil: Dark-grey loamy sand	Litter: <5%	Condition: Excellent
Comments: Seasonally damp		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Leucopogon oxycedrus*	1
Acacia semitrullata	2	*Lomandra caespitosa*	2
Adenanthos meisneri	1	*Lyginia imberbis*	1
Adenanthos obovatus	2	*Lysinema pentapetalum*	1
Centrolepis drummondiana	1	***Melaleuca preissiana***	1
Dampiera linearis	1	*Monotaxis occidentalis*	1
Dasypogon bromeliifolius	3	*Pericalymma ellipticum*	1
Drosera paleacea	1	*Phyllangium paradoxum*	1
Elythranthera brunonis	1	*Pimelea angustifolia*	1
Euchilopsis linearis	3	*Rhodanthe citrina*	1
Hibbertia vaginata	2	*Schoenus efoliatus*	1
Hypocalymma angustifolium	4	**Silene gallica*	1
Hypochaeris glabra	2	*Siloxerus humifusus*	1
Hypolaena exsulca	1	*Stylidium repens*	2
Isolepis marginata	1	*Trachymene pilosa*	1
Johnsonia acaulis	1	**Ursinia anthemoides*	1
Kunzea glabrescens	2	*Xanthorrhoea gracilis*	3
Laxmannia squarrosa	1		
Lepidosperma "small, swamp"	1		
Lepidosperma pubisquameum	2		

Quadrat: SWAM02

Northing: 6349117.64	Easting: 384566.57	Landscape Position: Basin
Soil: Dark-grey sand	Litter: <5%	Condition: Very Good
Comments: Seasonally damp, partly inundated in spring		

LATIN NAME	COVER
**Arctotheca calendula*	1
**Briza maxima*	2
Cotula coronopifolia	1
**Cotula turbinata*	1
Crassula decumbens	1
Hibbertia stellaris	3
Hypolaena exsulca	2
Kunzea glabrescens	3
Lepidosperma longitudinale	4
Lepidosperma aff. *squamatum*	1
**Lotus angustissimus*	1
Lyginia imberbis	1
Pericalymma ellipticum	1
Petrophile linearis	1
Dillwynia dillwynioides	2
**Vellereophyton dealbatum*	1
Ornduffia albiflora	1

Quadrat: SWAM03

Northing: 6349722.34	Easting: 384353.60	Landscape Position: Lower slope
Soil: Grey sand	Litter: 20%	Condition: Excellent
Comments: Possibly affected by *Phytophthora cinnamomi* disease		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia extensa	2	*Lepidosperma pubisquameum*	1
Acacia pulchella	3	*Lomandra caespitosa*	1
Agonis flexuosa	1	*Lomandra hermaphrodita*	1
**Aira caryophyllea*	1	*Melaleuca thymoides*	1
Bossiaea eriocarpa	3	*Monotaxis occidentalis*	1
Brachyscome iberidifolia	1	**Ornithopus compressus*	1
Burchardia congesta	1	*Patersonia occidentalis*	1
Caladenia flava	1	*Philotheca spicata*	2
Centrolepis drummondiana	1	*Platysace filiformis*	2
Conostylis setigera	2	*Podotheca chrysantha*	1
Corymbia calophylla	1	*Quinetia urvillei*	1
Crassula colorata var. *colorata*	1	*Rhodanthe citrina*	1
Dasypogon bromeliifolius	3	*Stylidium brunonianum*	1
Drosera porrecta	1	*Trachymene pilosa*	1
Eucalyptus marginata	1	*Waitzia suaveolens*	1
Gompholobium tomentosum	2	*Xanthorrhoea preissii*	3
Homalosciadium homalocarpum	1	*Xanthosia huegelii*	1
Hypochaeris glabra	1		
Isolepis marginata	1		
Kunzea glabrescens	4		

Quadrat: SWAM04

Northing: 6351189.22	Easting: 384105.86	Landscape Position: Basin
Soil: Grey sandy clay	Litter:	Condition: Excellent
Comments: Ephemeral wetland		

LATIN NAME	COVER
Acacia pulchella	2
Adenanthos obovatus	1
Aotus gracillima	4
Boronia dichotoma	1
Calothamnus lateralis	1
Euchilopsis linearis	1
Hibbertia stellaris	2
Hypocalymma angustifolium	1
Hypolaena exsulca	1
Kunzea glabrescens	4
Lepidosperma longitudinale	1
Leptocarpus laxus	1
Lotus angustissimus	1
Lyginia imberbis	1
Melaleuca preissiana	2
Dillwynia dillwynioides	1
Schoenus efoliatus	1
Stylidium brunonianum	1

Quadrat: VINE01

Northing: 6352520.38	Easting: 383569.12	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter: 30%	Condition: Excellent
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Lomandra caespitosa*	1
Agonis flexuosa	1	*Lomandra hermaphrodita*	1
Banksia attenuata	3	*Lomandra nigricans*	1
Bossiaea eriocarpa	1	*Lomandra sericea*	1
**Briza maxima*	1	*Lyginia imberbis*	1
Burchardia congesta	1	*Macrozamia riedlei*	1
Daucus glochidiatus	1	*Melaleuca thymoides*	1
Desmocladus flexuosus	1	*Millotia tenuifolia* var. *tenuifolia*	1
Drosera paleacea	1	**Ornithopus compressus*	1
Drosera pallida	1	*Patersonia occidentalis*	1
Drosera porrecta	1	*Petrophile linearis*	1
Eucalyptus marginata	3	*Philotheca spicata*	1
Gompholobium tomentosum	1	*Phyllangium paradoxum*	1
Hemiandra pungens	1	*Platysace filiformis*	1
Hibbertia hypericoides	1	*Poranthera microphylla*	1
Hibbertia racemosa	1	*Pterostylis recurva*	1
Hovea stricta	1	*Pyrorchis nigricans*	1
Hypocalymma robustum	1	*Stylidium brunonianum*	1
**Hypochaeris glabra*	1	*Stylidium diversifolium*	1
Hypolaena exsulca	1	*Stylidium schoenoides*	1
Isotropis cuneifolia	1	*Trachymene pilosa*	1
Lagenophora huegelii	1	*Waitzia suaveolens*	1
Lepidosperma squamatum	1	*Xanthosia huegelii*	1
Leporella fimbriata	1	***Xylomelum occidentale***	2

Quadrat: VINE02

Northing: 6352479.66	Easting: 383080.41	Landscape Position: Mid-slope
Soil: Yellow-brown sand	Litter: 80%	Condition: Very Good
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Lomandra caespitosa*	1
Agonis flexuosa	1	*Lomandra hermaphrodita*	1
Aira caryophyllea	1	*Lomandra nigricans*	1
Banksia attenuata	4	*Lomandra sericea*	1
Bossiaea eriocarpa	1	*Loxocarya cinerea*	1
**Briza minor*	1	*Luzula meridionalis*	1
Burchardia congesta	1	*Lyginia imberbis*	1
Caladenia flava	1	*Macrozamia riedlei*	2
Chamaescilla corymbosa	1	*Melaleuca thymoides*	1
Conostylis aculeata	1	*Microlaena stipoides*	1
Conostylis setigera	1	*Millotia tenuifolia* var. *tenuifolia*	1
Cryptostylis ovata	1	**Ornithopus compressus*	1
Daucus glochidiatus	1	*Petrophile linearis*	1
Drosera erythrorhiza	1	*Philotheca spicata*	1
Drosera porrecta	1	*Pterostylis recurva*	1
Elythranthera brunonis	1	*Pterostylis* sp. crinkled leaf (G.J. Keighery 13426)	1
Eucalyptus marginata	2	*Pyrorchis nigricans*	1
Gompholobium tomentosum	1	*Sowerbaea laxiflora*	1
Hardenbergia comptoniana	1	*Stylidium diversifolium*	1
Hibbertia hypericoides	4	*Stylidium schoenoides*	1
Hibbertia racemosa	1	*Trachymene pilosa*	1
Hypolaena exsulca	1	**Ursinia anthemoides*	1
Isotropis cuneifolia	1	*Xanthosia huegelii*	1
Lagenophora huegelii	1	***Xylomelum occidentale***	2
Leucopogon propinquus	1		

Quadrat: VINE03

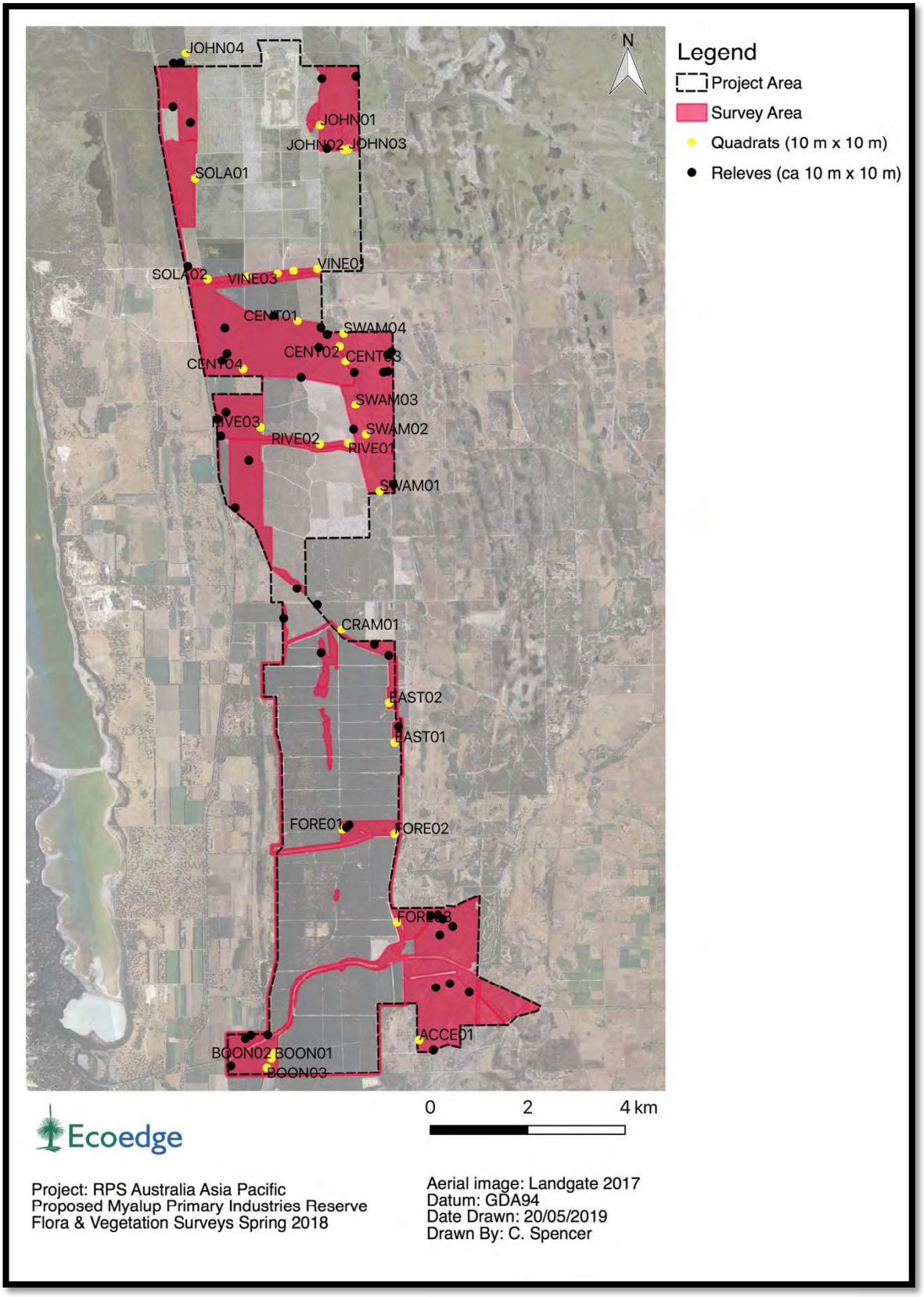
Northing: 6352422.34	Easting: 382754.94	Landscape Position: Upper slope
Soil: Yellow-brown sand	Litter: 30%	Condition: Very Good
Comments:		

LATIN NAME	COVER	LATIN NAME	COVER
Acacia pulchella	1	*Leucopogon propinquus*	1
Aira caryophyllea	1	*Lyginia imberbis*	1
Arctotheca calendula	1	**Lysimachia arvensis var. caerulea*	1
Asteridea pulverulenta	1	*Macrozamia riedlei*	1
Austrostipa compressa	1	*Microlaena stipoides*	2
Banksia attenuata	2	*Millotia tenuifolia* var. *tenuifolia*	1
**Briza maxima*	3	*Ornithopus compressus*	1
**Briza minor*	1	*Petrophile linearis*	1
Burchardia congesta	2	**Petrorhagia dubia*	2
Caladenia chapmanii	1	*Phyllangium paradoxum*	1
Centrolepis drummondiana	1	*Podotheca angustifolia*	1
Chamaescilla corymbosa	1	*Poranthera microphylla*	1
Conostylis aculeata	1	*Pyrorchis nigricans*	1
Daucus glochidiatus	1	**Silene gallica*	1
Drosera pallida	1	**Solanum nigrum*	1
Drosera porrecta	2	**Sonchus oleraceus*	1
Eucalyptus marginata	2	*Sowerbaea laxiflora*	1
Gompholobium tomentosum	2	*Stirlingia latifolia*	3
Hardenbergia comptoniana	1	*Stylidium brunonianum*	1
**Heliophila pusilla*	1	*Stylidium piliferum*	1
Hibbertia hypericoides	4	*Thysanotus manglesianus*	1
Homalosciadium homalocarpum	1	*Trachymene pilosa*	2
Hypocalymma robustum	1	**Ursinia anthemoides*	2
**Hypochaeris glabra*	3	*Waitzia suaveolens*	2
Isolepis marginata	1	*Xanthorrhoea brunonis*	1
Lagenophora huegelii	2	*Xylomelum occidentale*	2
Laxmannia squarrosa	1		

Appendix 7. Vegetation condition scale (EPA, 2016).

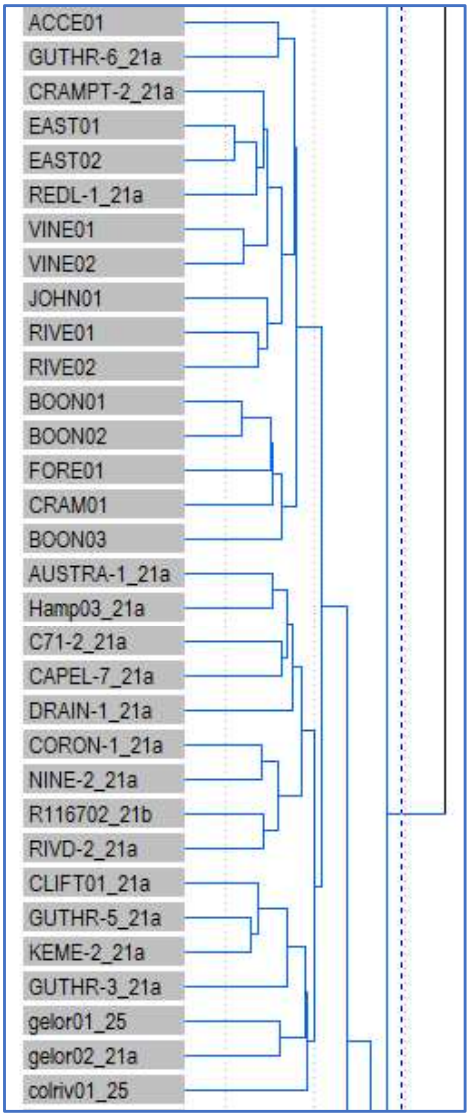
Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive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

Appendix 8. Map showing the locations of Gibson *et al.* (1994) quadrats used in the MVA.



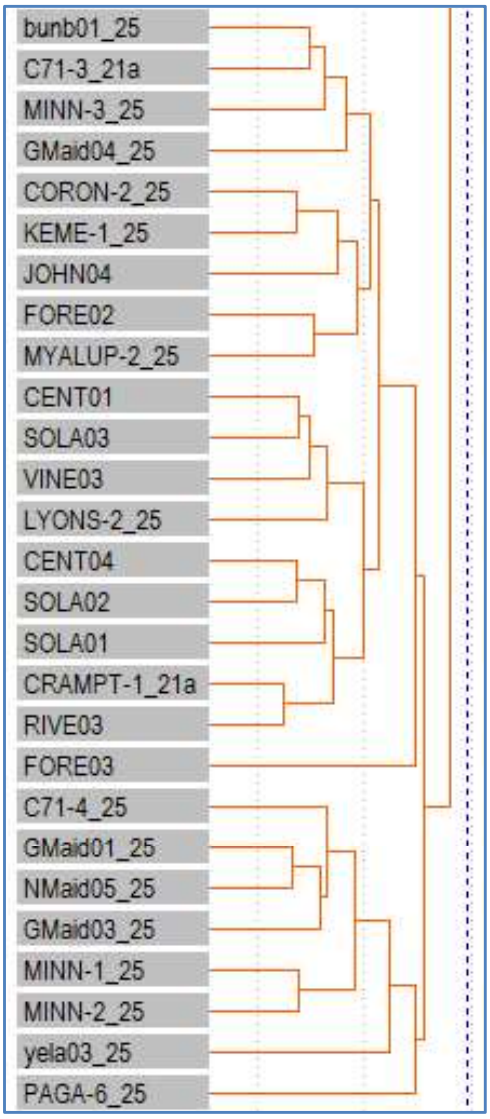
Appendix 9. Portions of the Dendrogram from the MVA

Figure 1. Portion of the MVA dendrogram showing the grouping of 13 of the Myalup quadrats with similar Gibson *et al*. (1994) quadrats mainly designated as FCT 21a.



Comments: Thirteen of the Project Area quadrats clustered with a group of Gibson *et al*. (1994) quadrats that were primarily FCT 21a (Central *Banksia attenuata* - *Eucalyptus marginata* woodlands). As would be expected the Myalup quadrats generally clustered with some Gibson *et al*. (1994) quadrats that are geographically close: Gibson *et al*. (1994) quadrats GUTHR-6 and CRAMPT-2 are both located adjacent to the Project Area. Based on the results of the MVA comparison with Gibson *et al*. (1994) quadrats, these 13 quadrats can be confidently ascribed to FCT 21a.

Figure 2. Portion of the MVA dendrogram showing the grouping of 10 of the Myalup quadrats with similar Gibson *et al*. (1994) quadrats mainly designated as FCT 25.



Comments: Ten of the Myalup quadrats clustered with a group of Gibson *et al*. (1994) quadrats that were primarily FCT 25 (Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands). There were also two Gibson *et al*. (1994) quadrats designated as FCT 21a, which demonstrates (because they cluster close together) that in some areas there is little floristically separating FCT 21a and FCT 25.

Figure 3. Portion of the MVA dendrogram showing the grouping of six of the Myalup quadrats with similar Gibson *et al*. (1994) quadrats mostly designated as FCT 5.

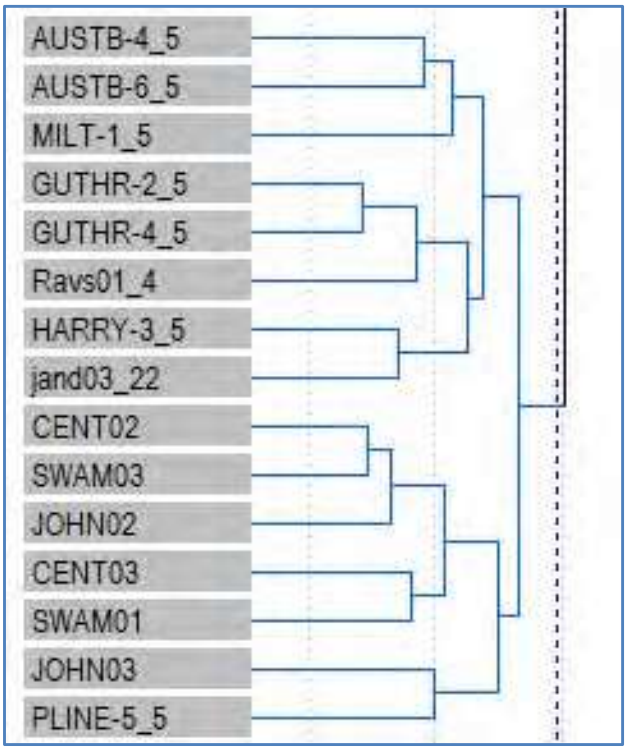
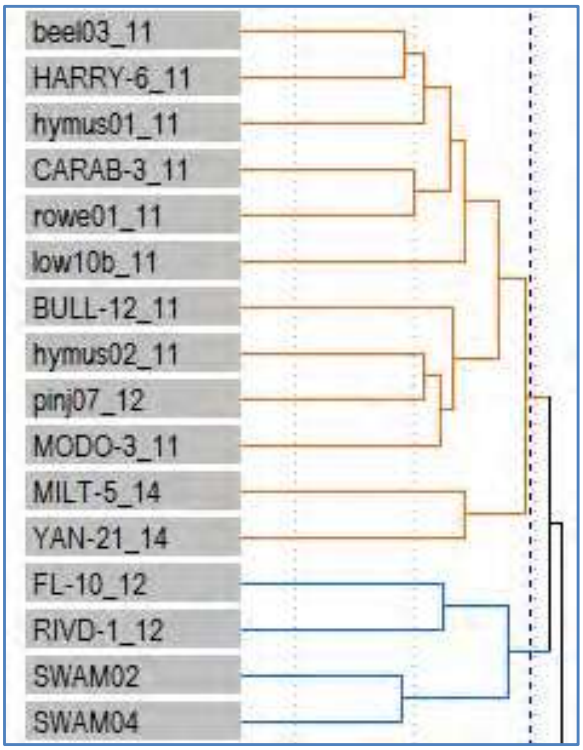


Figure 4. Portion of the MVA dendrogram showing the grouping of two of the Myalup quadrats with similar Gibson *et al*. (1994) quadrats designated as FCT 12.



Comments: The two Project Area quadrats situated in deeper wetlands clustered with two quadrats designated as FCT 12. Gibson *et al*. (1994) state that FCT 12 has a similar species composition to FCT 11 (Wet forests and woodlands), and this is confirmed in Figure 3 above. Floristic community type 12 was only represented by 5 quadrats in Gibson *et al*. (1994), and, was characterised by only 12 'frequent' or 'common' taxa.

Within the Project Area vegetation unit C3 is assigned to FCT 12, but based on the supplementary data from relevés, parts of it would most likely meet the criteria of FCT 11.

FAMILY_NAME	LATIN NAME	NATURALISED	CONSV_CODE
Aizoaceae	*Carpobrotus edulis*	*	
Anarthriaceae	*Anarthria laevis*		
Anarthriaceae	*Lyginia barbata*		
Anarthriaceae	*Lyginia imberbis*		
Apiaceae	*Actinotus glomeratus*		
Apiaceae	*Centella asiatica*		
Apiaceae	*Daucus glochidiatus*		
Apiaceae	*Homalosciadium homalocarpum*		
Apiaceae	*Platysace filiformis*		
Apiaceae	*Xanthosia huegelii*		
Apocynaceae	*Gomphocarpus fruticosus*	*	
Araceae	*Zantedeschia aethiopica*	*	
Araliaceae	*Hydrocotyle alata*		
Araliaceae	*Hydrocotyle callicarpa*		
Araliaceae	*Trachymene pilosa*		
Araliaceae	*Trachymene coerulea subsp. coerulea*		
Asparagaceae	*Asparagus asparagoides*	*	
Asparagaceae	*Chamaescilla corymbosa*		
Asparagaceae	*Chamaescilla gibsonii*		3
Asparagaceae	*Dichopogon capillipes*		
Asparagaceae	*Laxmannia minor*		
Asparagaceae	*Laxmannia squarrosa*		
Asparagaceae	*Lomandra caespitosa*		
Asparagaceae	*Lomandra hermaphrodita*		
Asparagaceae	*Lomandra integra*		
Asparagaceae	*Lomandra micrantha*		
Asparagaceae	*Lomandra nigricans*		
Asparagaceae	*Lomandra preissii*		
Asparagaceae	*Lomandra sericea*		
Asparagaceae	*Lomandra sonderi*		
Asparagaceae	*Lomandra suaveolens*		
Asparagaceae	*Sowerbaea laxiflora*		
Asparagaceae	*Thysanotus arenarius*		
Asparagaceae	*Thysanotus dichotomus*		
Asparagaceae	*Thysanotus manglesianus*		
Asparagaceae	*Thysanotus multiflorus*		
Asparagaceae	*Thysanotus patersonii*		
Asparagaceae	*Thysanotus tenellus*		
Asphodelaceae	*Asphodelus fistulosus*	*	
Asphodelaceae	*Trachyandra divaricata*	*	
Asteraceae	*Arctotheca calendula*	*	
Asteraceae	*Asteridea pulverulenta*		
Asteraceae	*Brachyscome iberidifolia*		
Asteraceae	*Carduus pycnocephalus*	*	
Asteraceae	*Conyza sumatrensis*	*	
Asteraceae	*Cotula coronopifolia*	*	
Asteraceae	*Cotula turbinata*	*	
Asteraceae	*Craspedia* sp. Yalgorup National Park (G.J. Keighery 14449)		
Asteraceae	*Dittrichia graveolens*	*	

Asteraceae	*Hypochaeris glabra*	*	
Asteraceae	*Hypochaeris radicata*	*	
Asteraceae	*Ixiolaena viscosa*		
Asteraceae	*Lagenophora huegelii*		
Asteraceae	*Millotia myosotidifolia*		
Asteraceae	*Millotia tenuifolia* var. *tenuifolia*		
Asteraceae	*Olearia axillaris*		
Asteraceae	*Olearia rudis*		
Asteraceae	*Osteospermum ecklonis*	*	
Asteraceae	*Pithocarpa cordata*		
Asteraceae	*Podolepis lessonii*		
Asteraceae	*Podotheca angustifolia*		
Asteraceae	*Podotheca chrysantha*		
Asteraceae	*Pseudognaphalium luteoalbum*		
Asteraceae	*Quinetia urvillei*		
Asteraceae	*Rhodanthe citrina*		
Asteraceae	*Rytidosperma pilosum*		
Asteraceae	*Senecio diaschides*		
Asteraceae	*Senecio hispidulus*		
Asteraceae	*Senecio pinnatifolius v* ar. *latilobus*		
Asteraceae	*Senecio quadridentatus*		
Asteraceae	*Siloxerus humifusus*		
Asteraceae	*Siloxerus filifolius*		
Asteraceae	*Sonchus oleraceus*	*	
Asteraceae	*Ursinia anthemoides*	*	
Asteraceae	*Vellereophyton dealbatum*	*	
Asteraceae	*Waitzia suaveolens*		
Brassicaceae	*Brassica tournefortii*	*	
Brassicaceae	*Heliophila pusilla*	*	
Brassicaceae	*Raphanus raphanistrum*	*	
Brassicaceae	*Sisymbrium orientale*		
Brassicaceae	*Stenopetalum gracile*		
Campanulaceae	*Isotoma hypocrateriformis*		
Campanulaceae	*Lobelia anceps*		
Campanulaceae	*Lobelia tenuior*		
Campanulaceae	*Monopsis debilis*	*	
Campanulaceae	*Wahlenbergia capensis*	*	
Campanulaceae	*Wahlenbergia preissii*		
Caryophyllaceae	*Cerastium glomeratum*	*	
Caryophyllaceae	*Minuartia mediterranea*	*	
Caryophyllaceae	*Petrorhagia dubia*	*	
Caryophyllaceae	*Silene gallica*	*	
Casuarinaceae	*Allocasuarina humilis*		
Celastraceae	*Stackhousia monogyna*		
Celastraceae	*Tripterococcus brunonis*		
Centrolepidaceae	*Aphelia cyperoides*		
Centrolepidaceae	*Centrolepis aristata*		
Centrolepidaceae	*Centrolepis drummondiana*		
Chenopodiaceae	*Rhagodia baccata*		
Colchicaceae	*Burchardia congesta*		

Colchicaceae	*Burchardia multiflora*		
Commelinaceae	*Cartonema philydroides*		
Crassulaceae	*Crassula colorata var. colorata*		
Crassulaceae	*Crassula decumbens*		
Crassulaceae	*Crassula exserta*		
Crassulaceae	*Crassula glomerata*	*	
Cupressaceae	*Callitris pyramidalis*		
Cyperaceae	*Baumea articulata*		
Cyperaceae	*Baumea juncea*		
Cyperaceae	*Cyathochaeta avenacea*		
Cyperaceae	*Evandra pauciflora*		
Cyperaceae	*Ficinia nodosa*		
Cyperaceae	*Gahnia trifida*		
Cyperaceae	*Isolepis marginata*		
Cyperaceae	*Isolepis prolifera*	*	
Cyperaceae	*Isolepis cernua* var. *setiformis*		
Cyperaceae	*Lepidosperma* "small, swamp"		
Cyperaceae	*Lepidosperma gladiatum*		
Cyperaceae	*Lepidosperma gracile*		
Cyperaceae	*Lepidosperma leptostachyum*		
Cyperaceae	*Lepidosperma longitudinale*		
Cyperaceae	*Lepidosperma pubisquameum*		
Cyperaceae	*Lepidosperma pubisquameum*		
Cyperaceae	*Lepidosperma squamatum*		
Cyperaceae	*Schoenus curvifolius*		
Cyperaceae	*Schoenus efoliatus*		
Cyperaceae	*Schoenus grandiflorus*		
Cyperaceae	*Schoenus subfascicularis*		
Cyperaceae	*Tetraria octandra*		
Cyperaceae	Unidentified sedge 1		
Cyperaceae	Unidentified sedge 2		
Dasypogonaceae	*Dasypogon bromeliifolius*		
Dennstaedtiaceae	*Pteridium esculentum*		
Dilleniaceae	*Hibbertia cuneiformis*		
Dilleniaceae	*Hibbertia hypericoides*		
Dilleniaceae	*Hibbertia racemosa*		
Dilleniaceae	*Hibbertia spicata*		
Dilleniaceae	*Hibbertia stellaris*		
Dilleniaceae	*Hibbertia vaginata*		
Droseraceae	*Drosera aff. paleacea*		
Droseraceae	*Drosera erythrorhiza*		
Droseraceae	*Drosera gigantea*		
Droseraceae	*Drosera glanduligera*		
Droseraceae	*Drosera huegelii*		
Droseraceae	*Drosera macrantha*		
Droseraceae	*Drosera menziesii* subsp. *penicillaris*		
Droseraceae	*Drosera pallida*		
Droseraceae	*Drosera porrecta*		
Droseraceae	*Drosera stolonifera*		
Elaeocarpaceae	*Platytheca galioides*		

Elaeocarpaceae	*Tetratheca hispidissima*		
Elaeocarpaceae	*Tetratheca hirsuta subsp. viminea*		
Ericaceae	*Astroloma ciliatum*		
Ericaceae	*Astroloma pallidum*		
Ericaceae	*Brachyloma preissii*		
Ericaceae	*Conostephium pendulum*		
Ericaceae	*Conostephium preissii*		
Ericaceae	*Leucopogon* "hairy, reflexed lvs"		
Ericaceae	*Leucopogon australis*		
Ericaceae	*Leucopogon conostephioides*		
Ericaceae	*Leucopogon glabellus*		
Ericaceae	*Leucopogon oxycedrus*		
Ericaceae	*Leucopogon parviflorus*		
Ericaceae	*Leucopogon polymorphus*		
Ericaceae	*Leucopogon polymorphus*		
Ericaceae	*Leucopogon propinquus*		
Ericaceae	*Leucopogon racemulosus*		
Ericaceae	*Leucopogon sprengelioides*		
Ericaceae	*Lysinema pentapetalum*		
Euphorbiaceae	*Euphorbia peplus*	*	
Euphorbiaceae	*Euphorbia terracina*	*	
Euphorbiaceae	*Euphorbia lathyris*	*	
Euphorbiaceae	*Monotaxis occidentalis*		
Fabaceae	*Acacia applanata*		
Fabaceae	*Acacia cyclops*		
Fabaceae	*Acacia extensa*		
Fabaceae	*Acacia flagelliformis*		4
Fabaceae	*Acacia huegelii*		
Fabaceae	*Acacia longifolia*	*	
Fabaceae	*Acacia paradoxa*	*	
Fabaceae	*Acacia pulchella*		
Fabaceae	*Acacia saligna*		
Fabaceae	*Acacia semitrullata*		4
Fabaceae	*Acacia stenoptera*		
Fabaceae	*Acacia willdenowiana*		
Fabaceae	*Aotus gracillima*		
Fabaceae	*Aotus procumbens*		
Fabaceae	*Bossiaea eriocarpa*		
Fabaceae	*Callistachys lanceolata*		
Fabaceae	*Chamaecytisus palmensis*	*	
Fabaceae	*Daviesia divaricata*		
Fabaceae	*Daviesia physodes*		
Fabaceae	*Dillwynia dillwynioides*		3
Fabaceae	*Euchilopsis linearis*		
Fabaceae	*Gastrolobium capitatum*		
Fabaceae	*Gompholobium capitatum*		
Fabaceae	*Gompholobium confertum*		
Fabaceae	*Gompholobium polymorphum*		
Fabaceae	*Gompholobium scabrum*		
Fabaceae	*Gompholobium tomentosum*		

Fabaceae	*Hardenbergia comptoniana*		
Fabaceae	*Hovea pungens*		
Fabaceae	*Hovea stricta*		
Fabaceae	*Hovea trisperma*		
Fabaceae	*Isotropis cuneifolia*		
Fabaceae	*Jacksonia furcellata*		
Fabaceae	*Jacksonia sternbergiana*		
Fabaceae	*Kennedia prostrata*		
Fabaceae	*Latrobea tenella*		
Fabaceae	*Lotus angustissimus*	*	
Fabaceae	*Lotus subbiflorus*	*	
Fabaceae	*Lupinus angustifolius*	*	
Fabaceae	*Lupinus luteus*	*	
Fabaceae	*Ornithopus compressus*	*	
Fabaceae	*Ornithopus pinnatus*	*	
Fabaceae	*Pultenaea reticulata*		
Fabaceae	*Templetonia retusa*		
Fabaceae	*Trifolium angustifolium*	*	
Fabaceae	*Trifolium campestre* var. *campestre*	*	
Fabaceae	*Trifolium dubium*	*	
Fabaceae	*Trifolium hirtum*	*	
Geraniaceae	*Erodium cicutarium*	*	
Geraniaceae	*Geranium dissectum*	*	
Geraniaceae	*Geranium molle*	*	
Geraniaceae	*Geranium retrorsum*		
Geraniaceae	*Geranium solanderi*		
Geraniaceae	*Pelargonium capitatum*	*	
Goodeniaceae	*Dampiera linearis*		
Goodeniaceae	*Dampiera pedunculata*		
Goodeniaceae	*Dampiera trigona*		
Goodeniaceae	*Scaevola calliptera*		
Goodeniaceae	*Scaevola canescens*		
Goodeniaceae	*Scaevola repens* var. *repens*		
Gyrostemonaceae	*Tersonia cyathiflora*		
Haemodoraceae	*Anigozanthos humilis*		
Haemodoraceae	*Anigozanthos manglesii*		
Haemodoraceae	*Conostylis aculeata subsp. aculeata*		
Haemodoraceae	*Conostylis aculeata subsp. preissii*		
Haemodoraceae	*Conostylis candicans*		
Haemodoraceae	*Conostylis pauciflora*		
Haemodoraceae	*Conostylis setigera*		
Haemodoraceae	*Haemodorum laxum*		
Haemodoraceae	*Tribonanthes australis*		
Haloragaceae	*Gonocarpus pithyoides*		
Haloragaceae	*Meionectes brownii*		
Hemerocallidaceae	*Agrostocrinum hirsutum*		
Hemerocallidaceae	*Caesia micrantha*		
Hemerocallidaceae	*Corynotheca micrantha*		
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*		
Hemerocallidaceae	*Johnsonia acaulis*		

Hemerocallidaceae	*Tricoryne elatior*		
Iridaceae	*Patersonia juncea*		
Iridaceae	*Patersonia occidentalis*		
Iridaceae	*Romulea rosea*	*	
Iridaceae	*Watsonia meriana*	*	
Juncaceae	*Juncus articulatus*	*	
Juncaceae	*Juncus microcephalus*	*	
Juncaceae	*Juncus pallidus*		
Juncaceae	*Luzula meridionalis*		
Lamiaceae	*Hemiandra linearis*		
Lamiaceae	*Hemiandra pungens*		
Lauraceae	*Cassytha pomiformis*		
Lauraceae	*Cassytha racemosa*		
Linaceae	*Linum marginale*		
Loganiaceae	*Logania vaginalis*		
Loganiaceae	*Orianthera serpyllifolia* subsp. *angustifolia*		
Loganiaceae	*Phyllangium paradoxum*		
Loranthaceae	*Nuytsia floribunda*		
Malvaceae	*Lasiopetalum membranaceum*		3
Myrtaceae	*Agonis flexuosa*		
Myrtaceae	*Astartea scoparia*		
Myrtaceae	*Calothamnus lateralis*		
Myrtaceae	*Calytrix flavescens*		
Myrtaceae	*Calytrix fraseri*		
Myrtaceae	*Corymbia calophylla*		
Myrtaceae	*Eremaea pauciflora*		
Myrtaceae	*Eucalyptus decipiens*		
Myrtaceae	*Eucalyptus gomphocephala*		
Myrtaceae	*Eucalyptus marginata* subsp. *marginata*		
Myrtaceae	*Eucalyptus rudis*		
Myrtaceae	*Hypocalymma angustifolium*		
Myrtaceae	*Hypocalymma ericifolium*		
Myrtaceae	*Hypocalymma robustum*		
Myrtaceae	*Kunzea glabrescens*		
Myrtaceae	*Melaleuca lateritia*		
Myrtaceae	*Melaleuca preissiana*		
Myrtaceae	*Melaleuca rhaphiophylla*		
Myrtaceae	*Melaleuca systena*		
Myrtaceae	*Melaleuca teretifolia*		
Myrtaceae	*Melaleuca thymoides*		
Myrtaceae	*Melaleuca trichophylla*		
Myrtaceae	*Melaleuca viminea*		
Myrtaceae	*Pericalymma ellipticum*		
Orchidaceae	*Caladenia arenicola*		
Orchidaceae	*Caladenia chapmanii*		
Orchidaceae	*Caladenia discoidea*		
Orchidaceae	*Caladenia flava*		
Orchidaceae	*Caladenia georgei*		
Orchidaceae	*Caladenia latifolia*		
Orchidaceae	*Caladenia longicauda*		

Orchidaceae	*Caladenia marginata*		
Orchidaceae	*Caladenia nobilis*		
Orchidaceae	*Caladenia speciosa*		4
Orchidaceae	*Cryptostylis ovata*		
Orchidaceae	*Cyrtostylis huegelii*		
Orchidaceae	*Disa bracteata*	*	
Orchidaceae	*Diuris corymbosa*		
Orchidaceae	*Drakaea glyptodon*		
Orchidaceae	*Elythranthera brunonis*		
Orchidaceae	*Elythranthera emarginata*		
Orchidaceae	*Leporella fimbriata*		
Orchidaceae	*Microtis media subsp. media*		
Orchidaceae	*Prasophyllum brownii*		
Orchidaceae	*Pterostylis aspera*		
Orchidaceae	*Pterostylis barbata*		
Orchidaceae	*Pterostylis concava*		
Orchidaceae	*Pterostylis recurva*		
Orchidaceae	*Pterostylis sanguinea*		
Orchidaceae	*Pterostylis* sp. 'coastal clubbed sepals'		
Orchidaceae	*Pterostylis vittata*		
Orchidaceae	*Pterostylis sp.* crinkled leaf (G.J. Keighery 13426)		
Orchidaceae	*Pyrorchis nigricans*		
Orchidaceae	*Thelymitra antennifera*		
Orchidaceae	*Thelymitra benthamiana*		
Orchidaceae	*Thelymitra cornicina*		
Orchidaceae	*Thelymitra crinita*		
Orchidaceae	*Thelymitra fuscolutea*		
Orchidaceae	*Thelymitra macrophylla*		
Orobanchaceae	*Bartsia trixago*	*	
Orobanchaceae	*Orobanche minor*	*	
Orobanchaceae	*Parentucellia latifolia*	*	
Oxalidaceae	*Oxalis corniculata*	*	
Oxalidaceae	*Oxalis glabra*	*	
Oxalidaceae	*Oxalis perennans*		
Oxalidaceae	*Oxalis pes-caprae*	*	
Papaveraceae	*Fumaria capreolata*	*	
Phyllanthaceae	*Phyllanthus calycinus*		
Phyllanthaceae	*Poranthera microphylla*		
Phytolaccaceae	*Phytolacca octandra*	*	
Pittosporaceae	*Billardiera variifolia*		
Poaceae	*Aira caryophyllea*	*	
Poaceae	*Austrostipa campylachne*		
Poaceae	*Austrostipa compressa*		
Poaceae	*Austrostipa flavescens*		
Poaceae	*Austrostipa hemipogon*		
Poaceae	*Austrostipa mollis*		
Poaceae	*Avena barbata*	*	
Poaceae	*Avena fatua*	*	
Poaceae	*Avena sativa*		
Poaceae	*Briza maxima*	*	

Poaceae	*Briza minor*	*	
Poaceae	*Bromus diandrus*	*	
Poaceae	*Ehrharta calycina*	*	
Poaceae	*Ehrharta longiflora*	*	
Poaceae	*Eragrostis curvula*	*	
Poaceae	*Hyparrhenia hirta*	*	
Poaceae	*Microlaena stipoides*		
Poaceae	*Poa annua*	*	
Poaceae	*Poa drummondiana*		
Poaceae	*Poa porphyroclados*		
Poaceae	*Polypogon monspeliensis*	*	
Poaceae	*Rytidosperma occidentale*		
Poaceae	*Rytidosperma setaceum*		
Poaceae	*Vulpia bromoides*	*	
Poaceae	*Vulpia myuros*	*	
Polygalaceae	*Comesperma confertum*		
Polygalaceae	*Comesperma virgatum*		
Polygonaceae	"*Persicaria* -like" taxon		
Polygonaceae	*Persicaria decipiens*		
Polygonaceae	*Rumex obtusifolius*	*	
Portulacaceae	*Calandrinia liniflora*		
Primulaceae	*Lysimachia arvensis*	*	
Proteaceae	*Adenanthos meisneri*		
Proteaceae	*Adenanthos obovatus*		
Proteaceae	*Banksia attenuata*		
Proteaceae	*Banksia dallanneyi*		
Proteaceae	*Banksia grandis*		
Proteaceae	*Banksia ilicifolia*		
Proteaceae	*Banksia littoralis*		
Proteaceae	*Banksia nivea* subsp. *nivea*		
Proteaceae	*Conospermum stoechadis*		
Proteaceae	*Grevillea manglesioides*		Planted?
Proteaceae	*Hakea lissocarpha*		
Proteaceae	*Hakea prostrata*		
Proteaceae	*Hakea ruscifolia*		
Proteaceae	*Hakea trifurcata*		
Proteaceae	*Hakea varia*		
Proteaceae	*Persoonia longifolia*		
Proteaceae	*Persoonia saccata*		
Proteaceae	*Petrophile linearis*		
Proteaceae	*Stirlingia latifolia*		
Proteaceae	*Synaphea spinulosa*		
Proteaceae	*Xylomelum occidentale*		
Ranunculaceae	*Clematis pubescens*		
Ranunculaceae	*Ranunculus colonorum*		
Restionaceae	*Desmocladus fasciculatus*		
Restionaceae	*Desmocladus flexuosus*		
Restionaceae	*Hypolaena exsulca*		
Restionaceae	*Hypolaena pubescens*		
Restionaceae	*Leptocarpus roycei*		

Restionaceae	*Loxocarya cinerea*		
Rhamnaceae	*Spyridium globulosum*		
Rubiaceae	*Galium murale*	*	
Rubiaceae	*Opercularia apiciflora*		
Rubiaceae	*Opercularia echinocephala*		
Rubiaceae	*Opercularia hispidula*		
Rubiaceae	*Opercularia vaginata*		
Rutaceae	*Boronia capitata* subsp. *gracilis*		3
Rutaceae	*Boronia dichotoma*		
Rutaceae	*Boronia ramosa*		
Rutaceae	*Philotheca spicata*		
Santalaceae	*Leptomeria cunninghamii*		
Santalaceae	*Leptomeria empetriformis*		
Scrophulariaceae	*Dischisma arenarium*	*	
Scrophulariaceae	*Dischisma capitatum*	*	
Scrophulariaceae	*Verbascum virgatum*	*	
Solanaceae	*Solanum linnaeanum*	*	
Solanaceae	*Solanum nigrum*	*	
Solanaceae	*Solanum symonii*		
Solanaceae	*Solanum symonii*		
Stylidiaceae	*Levenhookia pusilla*		
Stylidiaceae	*Levenhookia stipitata*		
Stylidiaceae	*Stylidium adnatum*		
Stylidiaceae	*Stylidium amoenum*		
Stylidiaceae	*Stylidium androsaceum*		
Stylidiaceae	*Stylidium brunonianum*		
Stylidiaceae	*Stylidium ciliatum*		
Stylidiaceae	*Stylidium diversifolium*		
Stylidiaceae	*Stylidium junceum*		
Stylidiaceae	*Stylidium piliferum*		
Stylidiaceae	*Stylidium repens*		
Stylidiaceae	*Stylidium schoenoides*		
Thymelaeaceae	*Pimelea angustifolia*		
Thymelaeaceae	*Pimelea ciliata*		
Thymelaeaceae	*Pimelea rosea* subsp. *rosea*		
Urticaceae	*Parietaria debilis*		
Violaceae	*Hybanthus calycinus*		
Violaceae	*Hybanthus floribundus*		
Xanthorrhoeaceae	*Xanthorrhoea brunonis*		
Xanthorrhoeaceae	*Xanthorrhoea preissii*		
Zamiaceae	*Macrozamia riedlei*		

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Acacia flagelliformis **TPFL Pop. No:**

OBSERVATION DATE: 17/08/2018 **CONSERVATION STATUS:** P4 New population ☒

OBSERVER/S: Russell Smith & Colin Spencer **PHONE:** 0447809124

ROLE: Botanists **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

550 along dirt track, east of East Road, Lyons forest block, Myalup

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6354986

Long / Easting: 384199

ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☒ Partial survey ☐ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method:
(Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	100			100
Dead				

Area of pop (m²): 300

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: **Sheet No.:** **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☒
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☒
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☒
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Melaleuca preissiana woodland
2.
3.
4.

ASSOCIATED SPECIES:
other species include Acacia semitrullata, Hypocalymma angustifolium, Adenanthos obovatus

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☒ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: _____

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: ___2016__ **Fire Intensity:** High ☒ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.) _____

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: Russell Smith Role: Botanist__ Signed: _____ Date: 23/01/2019

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

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TAXON: Acacia semitrullata **TPFL Pop. No:**

OBSERVATION DATE: 16/08/2018 **CONSERVATION STATUS:** P4 New population ☐

OBSERVER/S: Russell Smith & Colin Spencer **PHONE:**

ROLE: botanists **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

550 along dirt track, east of East Road, Lyons forest block, Myalup

Reserve No:

DBCA DISTRICT: **LGA:** Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6354986

Long / Easting: 384199

ZONE: 50

METHOD USED:
GPS ☐ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m^2:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: (Refer to field manual for list)

WHAT COUNTED: Plants ☒ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive	100s			100s
Dead				

Area of pop (m²): 25000

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: **Sheet No.:** **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☒
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☒
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☒
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Melaleuca preissiana woodland
2.
3.
4.

ASSOCIATED SPECIES:
other species include Acacia flagelliformis, Hypocalymma angustifolium, Adenanthos obovatus

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

This species occurs over 100s of hectares east of the Myalup pine plantation within State forest 16.

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: R. Smith____ Role: __botanist__ Signed: _____ Date: 23/01/2019

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

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TAXON: Boronia capitata subsp. gracilis **TPFL Pop. No:**

OBSERVATION DATE: 24/10/2018 **CONSERVATION STATUS:** P3 New population ☒

OBSERVER/S: Russell Smith **PHONE:** 0447809124

ROLE: botanist **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

300 m south of the junction of Thornton Drive with Myalup Beach Road, State Forest 16

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:
GDA94 / MGA94 ☐
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☒ UTMs ☐

Lat / Northing: 6339093

Long / Easting: 386188

ZONE: 50

METHOD USED:
GPS ☐ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☒ Count method:
(Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	200			200
Dead				

Area of pop (m²): 1000

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☒ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
• Phytophthora infestation nearby			
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: **Sheet No.:** **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3 August 2017

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Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☒
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☐
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Melaleuca preissiana woodland
2.
3.
4.

ASSOCIATED SPECIES:
Pultenaea reticulata, Dasypogon bromellifolius, Hypocalymma angustifolium

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: _____

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: R. Smith Role: botanist Signed: _____ Date: 23/01/2019

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

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Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: Caladenia speciosa **TPFL Pop. No:**

OBSERVATION DATE: 26/10/2018 **CONSERVATION STATUS:** P4 New population ☒

OBSERVER/S: Russell Smith & Colin Spencer **PHONE:** 0447809124

ROLE: botanist **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

State Forest 16, about 1.25 km east of Forrest Hwy along Myalup Beach Road, 200 m north of the road.

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6336716

Long / Easting: 381944

ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m^2:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: (Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive	3			3
Dead				

Area of pop (m²):

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: %

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by: **Sheet No.:** **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☒
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☒
Yellow ☒
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☒
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus marginata- Banksia attenuata open forest
2.
3.
4.

ASSOCIATED SPECIES:
Persoonia longifolia, Agonis flexuosa, Dichopogon capillipes, Caesia micrantha,

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: _____

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: R. Smith Role: botanist_____ Signed: _____ Date: 23/01/2018

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

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TAXON: Chamescilla gibsonii **TPFL Pop. No:**

OBSERVATION DATE: 12/10/2018 **CONSERVATION STATUS:** P3 New population ☒

OBSERVER/S: Russell Smith & Colin Spencer **PHONE:**

ROLE: botanist **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

Just west of track/firebreak, 540 m south of Johnston Road, Lyons Forest Block

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6356473

Long / Easting: 384361

ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☒ Partial survey ☐ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m^2:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: (Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	5			5
Dead				

Area of pop (m²): 10

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: 100%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

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Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.3 August 2017

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Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☒
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☒
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☐
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Eucalyptus rudis, Melaleuca preissiana woodland
2.
3.
4.

ASSOCIATED SPECIES:
Acacia saligna, Banksia littoralis

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _Jan_____ Year: 2016 **Fire Intensity:** High ☒ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☒ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: R. Smith_____ Role: __botanist_____ Signed: _____ Date: 23/01/2019

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TAXON: Dillwynia dillwynioides **TPFL Pop. No:**

OBSERVATION DATE: 12/10/2018 **CONSERVATION STATUS:** P3 New population ☒

OBSERVER/S: Rusell Smith & Colin Spencer **PHONE:**

ROLE: botanists **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

Approx. 1.67 km south of Bagieau Road, Lyons forest block

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:

GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)

DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6351189

Long / Easting: 384106

ZONE: 50

METHOD USED:

GPS ☒ Differential GPS ☐ Map ☐

No. satellites: _____ Map used: _____

Boundary polygon captured: ☐ Map scale: _____

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey ☒ Partial survey ☐ Full survey ☐ Area observed (m²): _____

EFFORT: Time spent surveying (minutes): _____ No. of minutes spent / 100 m^2: _____

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: _____ (Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive	1			1
Dead				

Area of pop (m²): _____

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. _____ Size _____ Data attached ☐ Total area of quadrats (m²): _____

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒

Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: _____%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

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Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☒

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☒
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Melaleuca preissiana open woodland
2.
3.
4.

ASSOCIATED SPECIES:
Adenathos obovatus, Calothamnus lateralis, Euchilopsis linearis

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT:

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: Russell Smith Role: botanist Signed: _____ Date: 23/01/2019

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TAXON: Dillwynia dillwynioides **TPFL Pop. No:**

OBSERVATION DATE: 12/10/2018 **CONSERVATION STATUS:** P3 New population ☒

OBSERVER/S: Rusell Smith & Colin Spencer **PHONE:**

ROLE: botanists **ORGANISATION:** Ecoedge

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place):

345m along unnamed track north of Riverdale Road, Lyons State forest block

Reserve No:

DBCA DISTRICT: **LGA:** Harvey Land manager present: ☐

DATUM:
GDA94 / MGA94 ☒
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☒

Lat / Northing: 6349118

Long / Easting: 384566

ZONE: 50

METHOD USED:
GPS ☒ Differential GPS ☐ Map ☐

No. satellites: Map used:

Boundary polygon captured: ☐ Map scale:

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☒	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other:

AREA ASSESSMENT: Edge survey ☐ Partial survey ☒ Full survey ☐ Area observed (m²):

EFFORT: Time spent surveying (minutes): No. of minutes spent / 100 m²:

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: (Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	5			5
Dead				

Area of pop (m²): 100

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. Size Data attached ☐ Total area of quadrats (m²):

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☒
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: 100%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

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GOVERNMENT OF WESTERN AUSTRALIA

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HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☒

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☒
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☒
Grey ☒
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☒
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. Sedgeland
2.
3.
4.

ASSOCIATED SPECIES:
Lepidosperma longitudinale, Lepidosperma aff. squamatum, Hibbertia stellaris, Hypolaena exsulca

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☒ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: _____

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☒ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☒ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☒ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: Russell Smith Role: botanist_____ Signed: _____ Date: 23/01/2019

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Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at http://dpaw.wa.gov.au/ under *Standard Report Forms*

TAXON: _____ **TPFL Pop. No:** _____

OBSERVATION DATE: ___/___/___ **CONSERVATION STATUS:** _____ New population ☐

OBSERVER/S: _____ **PHONE:** _____

ROLE: **ORGANISATION:**

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:** _____

Reserve No: _____

DBCA DISTRICT: _____ **LGA:** _____ Land manager present: ☐

DATUM:
GDA94 / MGA94 ☐
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs ☐

Lat / Northing: _____

Long / Easting: _____

ZONE: _____

METHOD USED:
GPS ☐ Differential GPS ☐ Map ☐

No. satellites: _____ Map used: _____

Boundary polygon captured: ☐ Map scale: _____

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey ☐ Partial survey ☐ Full survey ☐ Area observed (m²): _____

EFFORT: Time spent surveying (minutes): _____ No. of minutes spent / 100 m^2: _____

POP'N COUNT ACCURACY: Actual ☐ Extrapolation ☐ Estimate ☐ Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants ☐ Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:	**Mature:**	**Juveniles:**	**Seedlings:**	**Totals:**
Alive				
Dead				

Area of pop (m²): _____

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. _____ Size _____ Data attached ☐ Total area of quadrats (m²): _____

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ Vegetative ☐ Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: _____%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT: _____

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Branch** DBCA,

Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of Biodiversity, Conservation and Attractions

Threatened and Priority Flora Report Form

Version 1.3 August 2017

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland ☐

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% ☐
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam ☐
Loam ☐
Clay loam ☐
Light clay ☐
Peat ☐
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☐
Grey ☐
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated ☐
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (Mesomelaena tetragona)

1. _____
2. _____
3. _____
4. _____

ASSOCIATED SPECIES: _____

Other (non-dominant) spp _____

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: _____

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.) _____

DRF PERMIT/ LICENCE No: Note if only observing plants (i.e. no specimens or plant matieral is taken) then no permit/licence is required. For further information on permit and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under licence/permit should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other:

Submitter of Record: _____ Role: _____ Signed: _____ Date: / /

Please return completed form to **Species And Communities Branch** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Branch.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Appendix 12. Photographs of Vegetation Units mapped within the Project Area.

Vegetation unit A1

(Quadrats ACCE01, VINE01, VINE02, CRAM01, RIVE01, RIVE02, EAST01, EAST02, JOHN01)

Open forest of *Eucalyptus marginata* (occasionally with *E. gomphocephala* or *Corymbia calophylla*) over woodland of *Agonis flexuosa* and *Banksia attenuata* over open shrubland of *Acacia pulchella*, *Bossiaea eriocarpa*, *Dasypogon bromeliifolius, Gompholobium tomentosum*, *Hardenbergia comptoniana*, *Hibbertia hypericoides*, *H. racemosa*, *Hypocalymma robustum*, *Macrozamia riedlei*, *Melaleuca thymoides*, and *Philotheca spicata* over open herbland of *Burchardia congesta*, *Caladenia flava*, *Chamaescilla corymbosa*, *Conostylis setigera*, *Daucus glochidiatus*, *Drosera porrecta, D. erythrorhiza*, **Hypochaeris glabra*, *Isotropis cuneifolia*, *Lomandra caespitosa*, *L. hermaphrodita*, *L. sericea*, *Millotia tenuifolia* var. *tenuifolia*, *Platysace filiformis*, *Poranthera microphylla*, *Pyrorchis nigricans*, *Trachymene pilosa* and very open grassland of **Aira* spp. and **Briza maxima* on grey or grey-brown sand on slopes.

Vegetation unit A2

(Quadrats BOON01, BOON02, BOON03, FORE01 W1260, W1634, W205, W191, W1914, W197)

Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over open woodland of *Banksia attenuata* (and occasionally *B. ilicifolia*) over occasional tall shrubs of *Kunzea glabrescens* over open shrubland of *Bossiaea eriocarpa*, *Brachyloma preissii*, *Dasypogon bromeliifolius*, *Leucopogon propinquus/racemulosus*, *Hibbertia hypericoides*, *H. racemosa*, (*Jacksonia sternbergiana*),*Macrozamia riedlei*, *Melaleuca thymoides* and *Stirlingia latifolia* over open herbland of *Chamaescilla corymbosa*, *Conostylis setigera*, *Dampiera linearis*, *Drosera pallida*, *Dichopogon capillipes*, **Hypochaeris glabra*, *Lomandra hermaphrodita*, *L. sericea*, *Lyginia imberbis*, *Phlebocarya ciliata*, *Platysace filiformis*, *Pyrorchis nigricans* and *Sowerbaea laxiflora* and very open grassland of **Briza maxima* and very open sedgeland of *Lepidosperma squamatum* on grey-brown or yellow-brown sands on slopes.

Vegetation unit A3
(Quadrats W148, W1557, W879, W1847, W1849)

Open forest of *Eucalyptus marginata* (and sometimes *Corymbia calophylla*) over woodland of *Banksia attenuata* and *Xylomelum occidentale* over open tall shrubland of *Kunzea glabrescens* over open shrubland of *Acacia extensa*, (*Acacia semitrullata*, *Allocasuarina humilis*), *Conostephium pendulum*, *Gompholobium tomentosum*, (*Hemiandra pungens*), *Hibbertia hypericoides*, (*Jacksonia furcellata*), *Leucopogon propinquus*, *Macrozamia riedlei*, *Petrophile linearis* and *Stirlingia latifolia* over herbland of *Burchardia congesta*, *Drosera porrecta*, *Pyrorchis nigricans* and *Stylidium brunonianum* on grey sand on gentle slopes.

Vegetation unit B1

(Quadrats CENT01, SOLA03, VINE03, CENT04, SOLA02, JOHN04, SOLA01, W1538)

Open forest of *Eucalyptus marginata* often with *E. gomphocephala* over woodland of *Agonis flexuosa* and *Banksia attenuata* over occasional tall shrubs of *Kunzea glabrescens* shrubland of *Gompholobium tomentosum*, *Hibbertia hypericoides*, *H. racemosa*, *Hypocalymma robustum*, *Leucopogon propinquus*/*racemulosus*, *Macrozamia riedlei* and *Petrophile linearis* over herbland of *Asteridea pulverulenta*, *Burchardia congesta*, *Centrolepis drummondiana*, *Drosera porrecta*, *Homalosciadium homalocarpum*, *Lagenophora huegelii*, *Sowerbaea laxiflora* and *Trachymene pilosa* and very open grassland of **Aira caryophyllea*, **Briza maxima* and *Microlaena stipoides* on yellow brown sand on gentle slopes.

Vegetation unit B2

(Quadrats CENT04, SOLA02, SOLA01, RIVE03, W1595, W1205, JOHN04, W882, W883, FORE02, RIVE03, W1607, W1619, W1616, W1205, W1605, W202, W204, W1859, W1913, W1595, FORE03)

Open forest of *Eucalyptus gomphocephala* and *E. marginata* (and sometimes *Corymbia calophylla*) over woodland of *Agonis flexuosa* and *Banksia attenuata* over shrubland of (*Acacia pulchella*), *Gompholobium tomentosum*, *Hardenbergia comptoniana*, *Hibbertia hypericoides*, *Hypocalymma robustum*, *Leucopogon propinquus*, *Macrozamia riedlei*, *Phyllanthus calycinus* and (occasionally) *Xanthorrhoea preissii* over herbland of *Caladenia flava*, *Conostylis aculeata*, *Drosera porrecta*, **Hypochaeris glabra*, *Isotropis cuneifolia*, *Lagenophora huegelii*, *Lomandra caespitosa*, *L. micrantha*, *L. sericea*, *L. suaveolens*, *Sowerbaea laxiflora*, *Stackhousia monogyna* and *Tricoryne elatior* and open sedgeland of *Desmocladus flexuosus*, *Lepidosperma squamatum* and *Tetraria octandra* on grey-brown or yellow-brown sand on gentle slopes. (*E. gomphocephala* is sometimes not present).

Vegetation unit B3

(Quadrats W1197, W1208, W880, W1537, W1547, W109)

Very open forest of *Eucalyptus gomphocephala* over woodland of *Banksia attenuata* and *B. grandis*, and sometimes with *Eucalyptus decipiens* mallee over tall open shrubland of *Spyridium globulosum* and *Xanthorrhoea preissii* over shrubland of *Acacia pulchella*, *Banksia dallanneyi*, *Clematis pubescens*, *Hibbertia hypericoides*, *Hypocalymma robustum*, *Leucopogon propinquus/racemulosus*, (*Melaleuca trichophylla*, *Olearia rudis*) over herbland of *Burchardia congesta*, *Daucus glochidiatus*, *Lagenophora huegelii* and *Sowerbaea laxiflora* on shallow limestone outcrop or yellow-brown sand over limestone.

Vegetation unit C1

(Quadrats CENT02, SWAM03, JOHN02, CENT03, JOHN03, W866, W143, W1853, W118, W1259, W194, W1833, W1825)

Woodland to very open woodland of *Eucalyptus marginata* (and occasionally *Corymbia calophylla* or *Banksia ilicifolia*) or *Melaleuca preissiana* (in wetter areas) over tall open shrubland of *Kunzea glabrescens* or *Xanthorrhoea preissii* over shrubland of *Acacia pulchella*, *A. semitrullata*, (*Adenanthos meisneri*), *Dasypogon bromeliifolius, Gompholobium tomentosum*, *Hypocalymma angustifolium*, *Melaleuca thymoides*, (*Pultenaea reticulata*) and *Xanthorrhoea brunonis* over open sedgeland of *Hypolaena exsulca* and *Lyginia imberbis* and open herbland of *Centrolepis drummondiana*, *Chamaescilla corymbosa*, *Isolepis marginata*, *Lomandra caespitosa*, *Patersonia occidentalis*, *Platysace filiformis*, *Quinetia urvillei*, *Stylidium brunonianum*, *Trachymene pilosa* and **Ursinia anthemoides* on grey-brown sand on lower slopes or flats. (A variable unit according to depth to the regional watertable).

Vegetation unit C2

(Quadrats SWAM01, W1824, W876, W1250, W1837, W872, W873, W1829, W1540, W1623)

Open woodland, very open woodland or shrubland of *Melaleuca preissiana* (and sometimes *Eucalyptus rudis* or *Nuytsia floribunda*) over open tall shrubs of *Acacia extensa*, (*A. pulchella*, *A. saligna*, *A. semitrullata*), *Aotus gracillima*, *Kunzea glabrescens* and *Xanthorrhoea preissii* or *X. brunonis* over shrubland of *Acacia pulchella*, *Adenanthos obovatus*, *Dasypogon bromeliifolius*, *Euchilopsis linearis*, *Hibbertia stellaris, H. vaginata*, (*Hypocalymma angustifolium*, *Pericalymma ellipticum*, *Philotheca spicata*) over very open herbland of **Ornithopus* spp., *Rhodanthe citrina*, *Stylidium junceum, S. piliferum* and open sedgeland of *Hypolaena exsulca*, *Lepidosperma squamatum*, *Lyginia imberbis* and *Schoenus efoliatus* on grey-brown sand on flats. (A variable unit, with species composition determined by degree of waterlogging, some inundation occurs in winter in lower-lying areas).

Vegetation unit C3
(Quadrats SWAMP02, SWAM04, W877, W1497, W2131)

Woodland to open woodland of *Melaleuca rhaphiophylla* or *M. preissiana* (sometimes with emergent *Eucalyptus rudis*) over shrubland to tall shrubland of (*Acacia saligna*), *Aotus gracillima*, *Astartea scoparia*, *Calothamnus lateralis*, *Hibbertia stellaris*, (*Kunzea glabrescens*), *Melaleuca lateritia*, *M. teretifolia*, *Pimelea angustifolia* and (*Xanthorrhoea preissii*) over sedgeland of (*Cyathochaeta avenacea*, *Gahnia trifida*), *Lepidosperma longitudinale*, *Leptocarpus laxus* and *Schoenus efoliatus*, with the twiner *Cassytha racemosa* on grey-brown sand over clay in seasonally inundated basins. (Variable according to the length of inundation and depth of water, in some places sedges may be dominant).

Vegetation unit C4
(Quadrats W1587, W1588, W2105)

Open forest of *Corymbia calophylla* and *Eucalyptus rudis* (or *Melaleuca rhaphiophylla* in lower areas) over woodland of *Melaleuca preissiana* (and sometimes *Banksia littoralis* and *Callistachys lanceolata*) over variable understorey that may include the sedges *Baumea juncea*, *Lepidosperma gladiatum* and *L. longitudinale* in lower areas, or herbaceous species such as *Centella asiatica*, *Dampiera trigona*, *Opercularia hispidula*, *Pteridium esculentum* and **Zantedeschia aethiopica* the grass *Microlaena stipoides* in valleys on Tamala limestone ridges

Appendix 13. Assignment of Floristic Quadrats to Vegetation Units.

NORTHING	EASTING	NAME	VEGUNIT
6336664.21	385656.60	ACCE01	A1
6345107.14	384060.90	CRAM01	A1
6342787.72	385154.89	EAST01	A1
6343605.29	385040.99	EAST02	A1
6355477.04	383625.61	JOHN01	A1
6348941.25	384201.13	RIVE01	A1
6348919.83	383617.62	RIVE02	A1
6352520.38	383569.12	VINE01	A1
6352479.66	383080.41	VINE02	A1
6336401.11	382689.92	BOON01	A2
6336295.88	382625.76	BOON02	A2
6336108.14	382531.78	BOON03	A2
6340999.61	384084.14	FORE01	A2
6351446.38	383160.46	CENT01	B1
6350458.83	382045.23	CENT04	B1
6356956.48	380870.70	JOHN04	B1
6354383.52	381057.48	SOLA01	B1
6352293.52	381314.09	SOLA02	B1
6352357.43	382129.22	SOLA03	B1
6352422.35	382754.95	VINE03	B1
6340908.84	385152.52	FORE02	B2
6339095.00	385204.68	FORE03	B2
6349259.39	382399.03	RIVE03	B2
6350930.79	384024.32	CENT02	C1
6350622.99	384148.23	CENT03	C1
6354957.33	384115.81	JOHN02	C1
6354980.15	384207.83	JOHN03	C1
6349722.35	384353.61	SWAM03	C1
6347963.86	384848.85	SWAM01	C2
6349117.64	384566.58	SWAM02	C3
6351189.22	384105.86	SWAM04	C3