Spring Flora and Vegetation Assessment

Lot 101 Wallcliffe Road, Prevelly

Project No: EP18-128(01)

Prepared for Wallcliffe House Pty Ltd
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Executive Summary

Wallcliffe House Pty Ltd engaged Emerge Associates to undertake a spring flora and vegetation survey within Lot 101 Wallcliffe Road in Prevelly (referred to herein as 'the site'). The site, which is approximately 5.31 ha in size, is bound by Wallcliffe Road to the east, rural residential lots to the north-east, the Margaret River to the north and west and a nature reserve to the south.

A botanist and an environmental consultant from Emerge Associates visited the site on 19 November 2018 and undertook a detailed flora and vegetation survey. During the survey an assessment was made on the type, condition and values of vegetation across the site and the adjacent areas of remnant vegetation to the north west, west and south (the site including adjacent areas of remnant native vegetation are herein referred to as 'the survey area').

Outcomes of the survey include:

- Non-native vegetation is present across 4 ha of the site.
- Remnant native vegetation is present across 1.3 ha of the site in varying levels of condition.
- A total of 66 native and 51 non-native (weed) species were recorded in the survey area.
- One individual of the priority four species *Banksia sessilis* var. *cordata* was recorded in the south-eastern corner of the site adjacent to the driveway.
- No other threatened or priority flora species were recorded or are considered likely to occur within the site.
- The native vegetation within the survey area was classified into five plant communities: **AfW**, **CcAfW**, **MrLOF**, **AfSgHcW** and **MhBvTrS** that are present in 'very good', 'good', 'degraded', and 'completely degraded' condition.
- No threatened ecological communities (TECs) or priority ecological communities (PECs) were recorded within or are likely to occur within the site. There is a possibility that Wallcliffe Cave or any caves within the Wallcliffe Cliffs could potentially contain one of the aquatic root mat TECs.
- The site and surrounds are mapped as two Registered Aboriginal Sites, contain unique geological features and are adjacent to the Margaret River. As such the native vegetation within the site is likely to be locally and/or regionally significant.
- Large *Agonis flexuosa* (peppermint) and *Corymbia calophylla* (marri) trees within the site may be locally and/or regionally significant due to their habitat value for endangered western ring-tailed possum and black cockatoo species respectively.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
DBCA	Department of Biodiversity, Conservation and Attractions
DoW	Department of Water (now DWER)
DWER	Department of Water and Environmental Regulation
DPaW	Department of Parks and Wildlife (now DBCA)
The Shire	The Shire of Augusta-Margaret River
WALGA	Western Australia Local Government Association

Table A2: Abbreviations – General terms

General terms	
ESA	Environmentally sensitive area
IBRA	Interim Biogeographic Regionalisation of Australia
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
T	Threatened
TEC	Threatened ecological community

Table A3: Abbreviations –Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*

Table A4: Abbreviations – planning

Planning terms	
LPS	Local planning scheme

Table A5: Abbreviations – units of measurement

Units of measurement	
cm	Centimetre
ha	Hectare
m	Metre
m^2	Square metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

1 Introduction

1.1 Project background

Wallcliffe House Pty Ltd (Wallcliffe House) intends to develop Wallcliffe House, located at Lot 101 Wallcliffe Road in Prevelly for tourism purposes. This lot (referred to herein as 'the site') is located approximately 8 kilometres (km) south-east of Margaret River township within the Shire of Augusta Margaret River (the Shire) and is zoned 'tourism' under the Shires *Town Planning Scheme* (TPS) *No 1*.

The site is approximately 5.31 hectares (ha) in size and is bound by Wallcliffe Road to the east, rural residential lots to the north-east, the Margaret River to the north-west and a nature reserve to the south. The location and extent of the site is shown in **Figure 1**. In order to provide contextual vegetation information for the wider area, the areas in the surrounding reserves were also assessed. The site and these surrounding areas are collectively referred to as the 'survey area', and occupy 11.26 ha, which is also shown on **Figure 1**.

1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Wallcliffe House to provide environmental consultancy services to support the development of the site. The purpose of this survey is to provide sufficient information on the flora and vegetation values within the site to inform this process.

The scope of work was specifically to undertake a spring flora and vegetation assessment to the standard required of a detailed survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

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

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- Compilation of a comprehensive list of flora species recorded as part of the field survey.
- Mapping of plant communities and vegetation condition.
- Identification of conservation significant flora and vegetation.
- Documentation of the desktop assessment, survey methodology and results into a report.

2 Background

2.1 Environmental context

2.1.1 Climate

Climate has a strong influence on the types of vegetation that grow in a region and the life cycles of the flora present. It is therefore critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The south west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters. In Mediterranean type climates some flora species will typically spend part of their life-cycle as either underground storage organs or as seed. This is an adaptation to unfavourable environmental conditions such as excessive heat and drought that occur over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter when favourable conditions return and are most visible during spring, which is the flowering period for a majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south west of WA.

An average of 957.6 millimetres (mm) of rainfall is recorded annually from the Witchcliffe weather station, which is the closest weather station, located approximately 11.7 km from Prevelly. The majority of this rainfall is received between the months of May and August. Mean maximum temperatures range from 16.4^{o}C in July to 27.1^{o}C in February, while mean minimum temperatures range from 8.2^{o}C in July and August to 14.4^{o}C in February (BoM 2018).

A total of 874.6 mm of rain was recorded from May to October 2018 (BOM 2019) indicating sufficient seasonal rainfall occurred at the site to promote the growth of flora species prior to this survey.

2.1.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site lies in the Jarrah Forest bioregion and within the Southern Jarrah Forest subregion, as defined by the *Interim Biogeographic Regionalisation of Australia* (IBRA) (Environment Australia 2000). The Southern Jarrah Forest subregion extends from Collie in the north to Yallingup in the west and Albany in the south east. This subregion comprises the southern part of the Darling Plateau, where it broadens and slopes gently to the southern coastline, being dissected by multiple rivers (Beard 1990). Broadly, the soils within the Southern Jarrah Forest subregion comprise laterite gravels but clay/loam soils occur in the eastern portion where the Plateau is flatter and drainage is poor (DEC 2002). The north-western portion of the Southern Jarrah Forest subregion comprises a combination of limestone and granites as it lies on the northern tip of the Leeuwin-Naturaliste Ridge.

The Department of Primary Industries and Regional Development (DPIRD) has compiled data from various surveys to produce a soil landscape mapping dataset for Western Australia (DPIRD 2018), which places the site within the 'Gracetown low slopes Phase' soil landscape. This is described as comprising 'low slopes (gradients 5-10%) with deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands)'.

The south western portion of the site contains the eastern most portion (approximately 25 m) of the Wallcliffe Cliffs. The Wallcliffe Cliffs comprise tall limestone cliffs which continue west for 235 m into the nature reserve to the south and west (as discussed below in **Section 2.3.2**). There are a number of caverns, overhangs and caves within the cliffs. The cliffs have been identified as having a diversity of significant geological and landscape attributes (Shire of Augusta-Margaret River 2018). A separate cave is present close to the south of the site within the nature reserve, and approximately 150 m from the Wallcliffe Cliffs (Shire of Augusta-Margaret River 2018).

2.1.3 Topography

The elevation of the site ranges from 2m in relation to the Australian height datum (mAHD) along the western boundary adjacent to Margaret River to 12 mAHD at its northern extent, 22 mAHD in the south west near the Wallcliffe Cliffs and 64 mAHD at the south eastern extent (DPIRD 1999).

2.1.4 Hydrology and wetlands

Wetlands include "areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries" (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al*. 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017c)
- *A Directory of Important Wetlands in Australia* (DBCA 2018).

No Ramsar or listed 'important wetlands' are located near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows no wetland or water related features in the site. However, the major, perennial watercourse (Margaret River) is present adjacent to the western boundary of the site.

2.1.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. The south-west of Western Australia is internationally recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types. The Southern Jarrah Forest is characterised as mainly containing *Eucalyptus marginata* (jarrah) forest on lateritic soils of the Plateau and on the loam soils of the valleys, with *Corymbia calophylla* (marri) – *Eucalyptus wandoo* (wandoo) woodland on the drier laterite-free soils (Beard 1990).

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Beard *et al.* (2013) mapping shows the majority of the site as comprising vegetation association 'Boranup_1109'. This association is described as '*Agonis* shrubland / *Boronia* mixed shrubland' (Beard *et al.* 2013). 'Boranup_1109' association has 96.02% of its pre-European extent remaining within the Southern Jarrah Forest with 52.08% protected for conservation purposes

(Government of Western Australia 2018). A small portion in the northern portion of the site is mapped as 'Boranup_3' which is described as 'open forest or woodland of *Eucalyptus marginata* and *Corymbia calophylla*'. 'Boranup_3' association has 67.21% of its pre-European extent remaining on the within the Southern Jarrah Forest with 16.11% protected for conservation purposes (Government of Western Australia 2018). The areas of each mapped vegetation association are shown in **Plate 1**.

Plate 1: Regional vegetation association mapping (Beard et al. 2013) showing the small portion of the site mapped as presenting the 'Boranup_3' association.

Studies have indicated that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent (Miles 2001). The national objectives and targets for biodiversity conservation established an objective of retaining 30% of the original extent of each vegetation complex (Environment Australia 2001). The percentage protected for conservation of the 'Boranup_1109' association is above the 30% retention objective but the 'Boranup_3' association falls below this retention objective.

2.1.6 Historic land management

The site is the location of Wallcliffe House, which was one of the original homesteads and farms built by the Bussell family with construction of the building commenced in 1858. The site was home to a number of large sandstone buildings and ancillary buildings, as well as, a significant exotic garden (and dairy). A review of publicly available historical images from 2004 onwards shows that the majority of the site was cleared of native vegetation prior to 2004 and the site was used for residential and tourism purposes (WALIA 2018).

Fire scars are visible from between 2007-2009 (affecting the south eastern portion of the site and adjacent land) and 2011 (with the majority of vegetation within the site and adjacent area affected during the Margaret River bushfire). Wallcliffe House and a number of its ancillary buildings were also destroyed during the 2011 bushfire.

2.2 Significant flora and vegetation

2.2.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment and Energy.

In Western Australia flora species may also be classed as 'threatened' under the Biodiversity *Conservation Act 2016* (BC Act). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Threatened flora species listed under the EPBC Act and/or BC Act are assigned a conservation status according to their national extent.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. Whilst priority species are not afforded direct statutory protection, they are considered during State approval processes. Further information on threatened and priority species and their categories is provided in **Appendix A**.

A search was conducted for threatened and priority flora within a 10 km radius of the site using the *Protected Matters Search Tool* (DoEE 2019a), *NatureMap* (DPaW 2017b) and DBCA's threatened and priority flora database (reference no. 10-1218FL). Eleven threatened and 12 priority flora species were identified as potentially occurring in the wider local area as listed in **Table 1**. None of these species were mapped as occurring within the site.

Of the flora species potentially occurring in the local area, only those with habitat preferences of sandy, limestone soils and low lying, wet soils were deemed likely to occur in the site.

On this basis three threatened flora species and eight priority flora species were identified as having potential to occur within the site (shaded green in **Table 1**).

Table 1: Significant flora species known or likely to occur within 10 km of the site

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
Caladenia lodgeana	T	CE	P	Black loam	Oct	Unlikely
Calectasia cyanea	T	CE	P	Heathland on white sand or laterite gravel over laterite.	Jun-Oct	Unlikely
Banksia nivea subsp. *Uliginosa*	T	E	P	Sandy clay, gravel.	Aug-Sep	Unlikely
Caladenia excelsa	T	E	P	White, grey or bown sand, sandy loam.	Sep-Oct	Possible
Caladenia hoffmanii	T	E	P	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Aug-Oct	Possible
Caladenia huegelii	T	E	P	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Unlikely
Gastrolobium papilio	T	E	P	Sandy clay over ironstone and laterite. Flat plains.	Oct-Dec	Unlikely
Lambertia echinata subsp. *Occidentalis*	T	E	P	White sandy soils over laterite, orange/brown-red clay over ironstone. Flats to foothills, winter-wet sites.	Feb or Apr or Dec	Possible
Sphenotoma drummondii	T	E	P	Stony or shallow soils over granite or quartzite.	Sep-Dec	Unlikely
Banksia squarrosa subsp. *Argillacea*	T	V	P	White/grey sand, gravelly clay or loam.	Jun-Nov	Unlikely
Drakaea micrantha	T	V	P	Open sandy patches often adjacent to winter-wet swamps.	September to early October	Unlikely
Synaphea macrophylla	P1	-	P	Gravelly loam.	Oct	Unlikely
Synaphea sp. Redgate Road (J. Scott 16)	P1	-	P	Grey clay, litter. Winter-wet areas, wet areas along road verges and ditches.	-	Unlikely
Amperea micrantha	P2	-	P	Sandy soils.	Oct-Nov	Possible
Acacia inops	P3	-	P	Black peaty sand, clay. Swamps, creeks.	Sep-early Nov	Unlikely
Gastrolobium formosum	P3	-	P	Clay loam. Along river banks or in swamps.	Nov	Possible
Pultenaea pinifolia	P3	-	P	Loam or clay. Floodplains, swampy areas.	Oct-Nov	Possible

Table1: Significant flora species known or likely to occur within 10 km of the site (cont.)

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
Stylidium lowrieanum	P3	-	P	Sand or sandy loam over limestone. Eucalypt or Agonis woodland, forest, scrub.	Oct-Nov	Possible
Acacia tayloriana	P4	-	P	Grey or yellow/orange sandy soils, lateritic gravel, clay loam. Winter-wet areas.	Jan	Unlikely
Banksia sessilis var. *cordata*	P4	-	P	White/grey sand. Coastal limestone.	Jul-Oct	Possible
Eucalyptus marginata x *megacarpa*	P4	-	P	Sandy loam. Interdunal areas.	-	Possible
Franklandia triaristata	P4	-	P	White or grey sand.	Aug-Oct	Possible
Gahnia sclerioides	P4	-	P	Loam, sandy soils. Moist shaded situations.		Possible

Note: T=threatened, CE=critically endangered, E=endangered, V=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual. Species considered to potentially occur within the site are shaded green.

2.2.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DoEE 2017b). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment and Energy.

TECs will be listed within Western Australia under Section 27(1) and 33 of the BC Act and under the Biodiversity Conservation Regulations (BC Regulations). Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

A plant community that is under consideration for listing as a TEC in Western Australia, but does not yet meet survey criteria or has not been adequately defined, may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes. Further information on categories of TECs and PECs is provided in **Appendix A**.

Known locations of TECs and PECs within 10 km of the site were searched for using the *Protected Matters Search Tool* (DoEE 2019) and DBCA's threatened and priority ecological communities' database (reference no. 17-0122018). These search results indicate no TECs or PECs are known to occur within the site, but that two TECs and one PEC occur within 10 km of the site as listed in **Table 2**.

Table 2: TECs and PECs known to occur within 10 km of the site.

Code	Community name	TEC/ PEC	Level of significance	
			State	EPBC Act
CAVES LEEUWIN02	Aquatic Root Mat Community Number 2 of Caves of the Leeuwin Naturaliste Ridge	TEC	Critically Endangered	Endangered
CAVES LEEUWIN04	Aquatic Root Mat Community Number 4 of Caves of the Leeuwin Naturaliste Ridge	TEC	Critically Endangered	Endangered
Melaleuca lanceolata forests	*Melaleuca lanceolata* forests, Leeuwin Naturaliste Ridge	PEC	Priority 2	-

*Communities considered to be potentially present within the site shaded green.

2.2.3 Local and regional significance

Flora species and ecological communities may be significant for a number of reasons irrespective of whether they have special protection under policy or legislation.

Six key reasons that vegetation within the site may be significant are listed below:

- The site and surrounds contribute to Registered Aboriginal Heritage Sites. These include Registered Aboriginal Site 5848 – Cliffs at Wallcliffe and Registered Aboriginal Site 4495 – Margaret River. Both are Mythological sites, and Site 5848 is also an Artefacts/Scatter and Rockshelter site (DPLH 2019).
- The site contains the eastern most portion of the Wallcliffe Cliffs. Within the Cliffs there is a diversity of geological, biological and landscape attributes that enhance its significance, interest and value as a natural feature worthy of protection (Shire of Augusta-Margaret River 2018).
- The site is listed on the State Heritage Register.
- The site is directly adjacent to the Margaret River waterway.
- The site is directly adjacent to Reserve 41545, which is an A-Class nature reserve to the south and west as shown in **Figure 2**.
- The vegetation within the site has potential value as habitat for threatened or priority fauna species including, in particular, western ring-tailed possum, Carnaby's black cockatoo, Baudin's black cockatoo and the forest red-tailed black cockatoo, which are listed under the EPBC Act and BC Act.

Weeds

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to the Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2019), of which many are also listed under the BAM Act. Further information on categories of declared pests is provided in **Appendix A.**

Due to historical disturbance weed species are expected to be present at the site.

2.3 Land use considerations

A range of legislation, regulations and polices are relevant to the evaluation of vegetation in Western Australia. Key considerations applicable to the site are described below and also shown in **Figure 2**.

2.3.1 DBCA managed or legislated lands

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2017a) and *Lands of Interest* (DBCA 2017b) datasets. The *Legislated Lands and Waters* (DBCA 2017a) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2017b) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Planning, Lands and Heritage (DPLH) as the responsible agency.

The land to the west of the Margaret River (and including the portion of the river to the south west of the site) and south of Wallcliffe Road to the south east of the site comprises the Leeuwin-Naturaliste National Park (R8428) (DBCA 2017a). These are shown on **Figure 2**.

2.3.2 Shire managed conservation reserves

The land directly to the south of the site is vested with the Shire of Augusta-Margaret River as an A-class nature reserve R41545 (Wallcliffe Reserve) (Shire of Augusta-Margaret River 2018), as shown on **Figure 2**. Wallcliffe Reserve contains the majority of the Wallcliffe Cliffs, as discussed in **Section 2.1.2**. There are a number of caverns, overhangs and caves within the cliffs. Due to increased degradation from recreational use and its Aboriginal significance, public access to the cliff caves was prohibited in 2018 (Shire of Augusta-Margaret River 2018).

A separate cave is known to be present close to the south of the site within Wallcliffe Reserve, and approximately 150 m from the Wallcliffe Cliffs (Shire of Augusta-Margaret River 2018). However, the exact location of the cave is not known. This cave was previously accessed for tourism but this cave was gated to prevent access following the preparation of the *Wallcliffe Cave Management Plan (2002-2012)* (Shire of Augusta-Margaret River 2002).

2.3.3 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding significant, threatened or scheduled flora, vegetation communities or ecosystems. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply. However, exemptions under Schedule 6 of the EP Act still apply, including any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

One ESA is located directly to the south of the site and on the adjacent side of the Margaret River. This ESA is very large and extends to the north, south-west and south-east of the site over approximately 2518 square kilometers (km^2) area and is shown in **Figure 2**.

2.3.4 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improve the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. Three regional ecological linkage (Nos 107, 108 and 109) meet to the west of the site within the Margaret River and extend to the north and south of the site along the coast, and to the north east of the site, along the path of the Margaret River heading inland. The locations of these linkages are shown in **Figure 2**.

2.4 Previous flora surveys

No previous flora and vegetation surveys are known to have been undertaken within the site.

3 Methods

3.1 Field survey

One botanist and an environmental consultant from Emerge visited the site on 19 November 2018 to conduct the flora and vegetation assessment.

3.1.1 Vegetation

The site and survey area were traversed on foot and the composition and condition of vegetation was recorded. Searches were conducted for threatened and priority flora species with potential to occur in the site, with a particularly focus on identifying areas of suitable habitat within the site.

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m quadrats, relevés and photo points. The quadrats were established using fence droppers bound by measuring tape. The relevés were completed over an equivalent 10 x 10 m area without the use of physical markers and were included to provide a more rapid sample of patches of vegetation outside of the site boundary. The photo points were included to show specific site features at a particular location.

A total of 11 locations were sampled, comprised of four quadrats, four relevés and three photo points. The position of each sample location was recorded with a hand-held GPS unit, as shown in **Figure 3** and **Figure 4**.

The data recorded within the samples included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)
- biological information (vegetation structure and condition, foliage projective cover' (FPC), degree of disturbance and species present).

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

All plant specimens collected during the field survey were dried, pressed and then named in accordance with requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the survey area. The condition of the vegetation was assessed using methods from Keighery (1994), with the condition scale outlined in **Table 3**.

Table 3: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

3.2 Mapping and data analysis

3.2.1 Plant community identification and description

The local plant communities within the survey area were identified from the sample data collected during the field survey.

Once a group was defined from the cluster analysis, the vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were then mapped on aerial photography (1:3,500) from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography (1:3,500) based on the locations and notes recorded during the field survey to define areas with differing condition.

3.2.2 Threatened and priority ecological communities

The plant communities were compared to the TEC and PECs located within 10 km of the site (as listed in **Table 2**).

Areas of native vegetation potentially representing a TEC were assessed against the characteristics provided in the following documents:

- *Commonwealth Listing Advice on Aquatic root mat communities 1, 2, 3 and 4 in caves of the Leeuwin Naturaliste Ridge* (Endangered Species Scientific Subcommittee 2000).

3.2.3 Species accumulation curve

A species accumulation curve was plotted from sample data by generating a trendline (log) in Microsoft Excel. The trendline was forecast to locate the asymptote of the curve (the point at which the curve flattens), which provides an indication of amount of sampling that would be required before it can be assumed few species remain undetected. PRIMER v6 also offers a range of estimators to predict minimum species richness (Clarke and Gorley 2006). Both the Jacknife1 and Chao2 non-parametric estimators are reported, as these are known to perform well in comparison to simulated and real data sets and are also recommended for small sample sizes (Gotelli and Colwell 2011). Comparison between actual and estimated species accumulation assists in evaluating the adequacy of sampling effort.

3.3 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 4**.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context.
	Minor limitation	There is no publicly available regional flora survey dataset available for the south-west region that would allow for statistical analysis to determine the presence or absence of conservation significant vegetation types. As such the plant communities identified were compared to the TECs and PECs within the wider local area based on the species presence, soils, landforms and location information available.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by a qualified botanist with eight years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 16 years' experience in environmental science in Western Australia.
Suitability of timing	No limitation	The survey was conducted in November and thus within the main flowering season. High rainfall was recorded from May to October 2018 in the months preceding the site visit. Therefore it is likely that many plant species would have been in flower and/or visible at the time of survey. The degraded nature of most of the site limits the potential habitat for native geophytic plants such as orchids and the majority of threatened and priority flora species with potential to occur are perennial species. The survey timing was considered adequate to allow the detection of species for which seasonal timing is critical.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (cont.)

Constraint	Degree of limitation	Details
Temporal coverage	Minor limitation	Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited once in late November 2018. Although only sampled once, the site data was considered conclusive as it was collected in the spring main flowering period and much of the vegetation within the site is non-native. However, the survey does not meet the full requirements of a 'detailed' survey. In order for the survey to be considered a 'detailed' survey a second visit in a different season is required.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	Minor limitation	All parts of the site could be accessed as required (with the exception of the areas in close proximity to the derelict buildings, which contained no remnant native vegetation). Wallcliffe Cave, which occurs close to the southern boundary of the site, is gated and thus was also not accessed. The survey area included adjacent vegetation providing contextual information for the native vegetation within the site.
Sampling intensity	No limitation	A total of 117 species were recorded, of which 104 were recorded from 11 sample locations and 13 were recorded opportunistically. Minimum species richness within survey area is estimated at between 149 (Jacknife1) and 158 (Chao2). (refer species accumulation curve and estimates shown in **Plate 12**). This indicates that between 74 and 79% of the estimated 149-158 species were recorded. Considering the completely degraded nature of the majority of the site and the time spent sampling and searching the remnant vegetation within the site itself, the presence of additional species is more likely to be within the portions of the survey area outside of the site. This is particularly likely for the vegetation to the south of the site within Wallcliffe Reserve. Thus the survey effort was considered to be adequate to prepare a representative species inventory for the site.
Influence of disturbance	Minor limitation	Time since fire is eight to ten years as interpreted form aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident over most of the site. The disturbance history of the site was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 General site conditions

The site is predominantly cleared of native vegetation or parkland cleared with remnant *Agonis flexuosus* (peppermint) trees over managed grasses (**Plate 2**). Planted non-native vegetation was present surrounding the building remains in the centre of the site (**Plate 3**).

Small sections of disturbed native vegetation subject to some plantings, ground disturbance and weed management are present within the site. A boardwalk is present along the south western boundary of the site adjacent to Margaret River and running underneath the limestone cliffs (**Plate 4**). Portions of the boardwalk were burnt in 2011. A landscaped, rocky stream was historically built in the south western portion of the site using limestone blocks (**Plate 5**), at the time of the survey there was no water present and no evidence that this water feature is still in use. The most intact vegetation exists along the west of the site adjacent to the Margaret River and to the south of the site.

Plate 2: Cleared and parkland cleared areas of the site including Wallcliffe House.

Plate 3: Cultivated gardens through the centre of the site surrounding Wallcliffe House.

Plate 4: Base of limestone cliffs and boardwalk present in the south western corner of the site.

Plate 5: Landscaped rocky creek present within the south western portion of the site, with native species throughout.

4.2 Flora

A total of 66 native and 51 non-native (weed) species were recorded within the survey area during the field survey, representing 53 families and 101 genera. The dominant families containing native taxa were Fabaceae (eight native taxa and five weed taxa), Myrtaceae (eight native taxa and two weed taxa) and Cyperaceae (five native taxa). The most common genera were *Melaleuca* (with four taxa) and *Acacia* and *Lepidosperma* with three taxa each. The family containing the most taxa was Poaceae (two native and 11 non-native species) and Fabaceae. Of the species recorded 104 were recorded in sample locations and 13 were recorded opportunistically. A complete species list is provided in **Appendix B** and sampled data in **Appendix C**. This species list does not document all exotic planted species present within the site (given the extensive planted gardens), but does include those planted species recorded within areas of remnant native vegetation.

4.2.1 Threatened and priority flora

One priority 4 (P4) species, *Banksia sessilis* var. *cordata*, was recorded in the site. One individual of the species was recorded adjacent to the driveway in the eastern portion of the site, as shown on **Figure 4**. No other threatened or priority flora species were recorded within the site.

4.2.2 Locally and regionally significant flora

No significant flora species were recorded within the site.

4.2.3 Declared pests

Two species, **Zantedeschia aethiopica* (arum lily) and **Asparagus asparagoides* (bridal creeper) were recorded within the site that are listed as declared pests (C3) pursuant to the BAM Act.

Bridal creeper is also listed as a 'weed of national significance' (WoNS).

4.3 Vegetation

4.3.1 Plant communities

Four native plant communities were identified within the site. Plant community **AfW** exists in the south-western corner and a patch in the centre of the site and extends over 0.63 ha. Plant community **MrLOF** is located along the edges of the Margaret River to the west of the site and extends over 0.11 ha. Plant community **CcAfW** was located to the north of the site close to the Margaret River. This community extends over 0.05 ha of the site and extends to the north of the site. Plant community **MhBvTrS** is located to the south west of the site and extends over 0.16 ha. Plant community **AfSgHcW** is present to the south east of the site and extends over 0.33 ha. The remainder of the site (4 ha) contains modified vegetation with bare soil, scattered native trees over pasture grasses or planted vegetation.

A description and the area of each plant community (within the site and also within the adjacent survey area) is provided in **Table 5** and representative photographs of each are provided in **Plate 6** to **Plate 11**. The location of each plant community is shown in **Figure 3**.

Table 5: Plant communities identified within the survey area

Plant community	Description	Area (ha)	
		Site	Additional survey area
AfW	Woodland of Agonis flexuosus over open shrubland of *Rhagodia baccata* subsp. *baccata*, *Olearia axillaris* and *Hibbertia cuneiformis* over open mixed forbland and open to closed grassland of weeds (**Plate 6**).	0.63	0.21
AfSgHcW	Woodland of *Agonis flexuosus* over shrubland of *Spyridium globulosum, Hibbertia cuneiformis, Templetonia retusa* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa over low shrubland of Phyllanthus calycinus* over forbland of *Tricoryne elatior and Thysanotus arenarius Austrostipa flavescens* (**Plate 7**).	0.33	2.45
CcAfW	Woodland of *Corymbia calophylla* and *Agonis flexuosus* over shrubland of *Spyridium globulosum, Pteridium esculentum, Rhagodia baccata* subsp. *baccata* and *Exocarpos sparteus* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over weeds (**Plate 8**).	0.05	0.42
MhBvTrCS	Low open woodland of *Agonis flexuosus* (resprouting) with closed shrubland of *Melaleuca huegelii, Beyeria viscosa, Acacia cyclops, Diplolaena dampieri, Dodonaea aptera* and *Spyridium globulosum with vineland of Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over open forbland of *Tricoryne elatior*, **Petrorhagia dubia and Thysanotus arenarius,* sparse sedgeland of *Lepidosperma* spp. and sparse grassland of *Austrostipa flavescens* and **Lagurus ovatus* (**Plate 9**).	0.16	1.96
MrLOF	Low open forest of *Melaleuca rhaphiophylla* over open to closed rush/sedgeland of *Juncus* spp. and *Baumea juncea* over sparse forbland of *Apium prostratum* var. *prostratum, Lobelia anceps, Samolus repens* var. *repens* and **Atriplex prostrata* (**Plate 10**).	0.11	0.79
Cleared/ planted	Modified vegetation comprising weeds with occasional native trees and planted vegetation (**Plate 11**)**.**	4.01	0.08

*Plate 6: Plant community **AfW** in degraded condition*

*Plate 7: Plant community **AfSgHcW** in good condition.*

*Plate 8: Plant community **CcAfW** in very good condition.*

*Plate 9: Plant community **MhBvTrS** in very good condition. Note fire killed/resprouting shrubs.*

*Plate 10: Plant community **MrLOF** in very good condition.*

Plate 11: Parkland cleared vegetation (left) and planted non-native landscaped gardens (right) in completely degraded condition.

4.3.2 Vegetation condition

The most intact native vegetation was located to the west along the edge of Margaret River (plant communities **MrLOF** and **CcAfW**) and in the south-western corner of the site (plant community **MhBvTrCS**). The **MrLOF** and **CcAfW** vegetation was mapped as being in very good condition as it retains the structure expected of a riparian wetland community and has moderate native species diversity. The **MhBvTrCS** vegetation in the south western portion of the site shows evidence of being significantly burnt in the 2011 fire. However as it comprises a dense shrubland of resprouting native coastal species with numerous understorey species and limited weed cover, it was also considered to be in very good condition. A portion of plant community **AfSgHcW** bordering the south eastern boundary of the site was also considered to be in very good condition. This area showed less severe evidence of fire.

Sections of plant communities **AfW** and **AfSgHcW** to the south and east of the site were mapped as being in good condition as they had higher weed cover.

A number of areas of the **AfW** vegetation consists of trees over scattered native shrubs and a high cover of pasture weeds (particularly to the south west of the site along Margaret River). This vegetation was mapped as being in degraded condition as it lacks understory structure and has low species diversity. Consequently the vegetation is effectively parkland cleared and rehabilitation would require intensive management.

Remaining areas in the site are in 'completely degraded' condition and consist of non-native species such as pasture grasses, and planted trees and shrubs. Tracks within the site were also mapped as being in 'completely degraded' condition.

The extent of vegetation by condition category within the site and also within the wider survey area is detailed in **Table 6** and shown in **Figure 4**.

Table 6: Vegetation condition categories within the site and survey area

Condition category (Keighery (1994))	Size (ha)	
	Site	Additional survey area
Pristine	0	0
Excellent	0	0
Very Good	0.28	4.26
Good	0.62	1.37
Degraded	0.39	0.21
Completely Degraded	4.01	0.08

4.3.3 Threatened and priority ecological communities

No TECs or PECs occur within the site. Wallcliffe Cave and the cliff caves in the south western portion of the site and survey area are not known to contain any aquatic root mat TEC. However, it is possible that aquatic root mat TECs occur to the south of the site.

4.3.4 Locally and regionally significant vegetation

A number of mature native trees (diameter at breast height larger than 500 mm) including *Corymbia calophylla* (marri) and peppermint are present in the site. Due to their number and size these trees have the potential to provide habitat for black cockatoos (especially Carnaby's black cockatoo) and western ring-tailed possum respectively, along with other ecological services.

4.4 Species richness and sampling adequacy

A total of 104 species were recorded from 11 samples. A species accumulation curve derived from sample data is presented in **Plate 12**. After eleven samples the curve is still increasing and has not reached its asymptote. This indicates that a proportion of species likely remain undetected by sampling.

Species richness was estimated in PRIMER v6 to be between 149 (Jacknife1) and 158 (Chao2). Based on the trend of the species accumulation curve approximately 30 to 40 samples would be required to capture that many species. Including the 13 additional species recorded opportunistically, a total of 117 species was recorded in the survey area. This indicates that between 74 and 79% of the estimated 149-158 species were recorded. Considering the completely degraded nature of the majority of the site and the time spent sampling and searching the remnant vegetation within the site itself, the presence of additional species is more likely to be within the portions of the survey area outside of the site. This is particularly likely for the vegetation to the south of the site within Wallcliffe Reserve. Thus the survey effort was considered to be adequate to prepare a representative species inventory for the site.

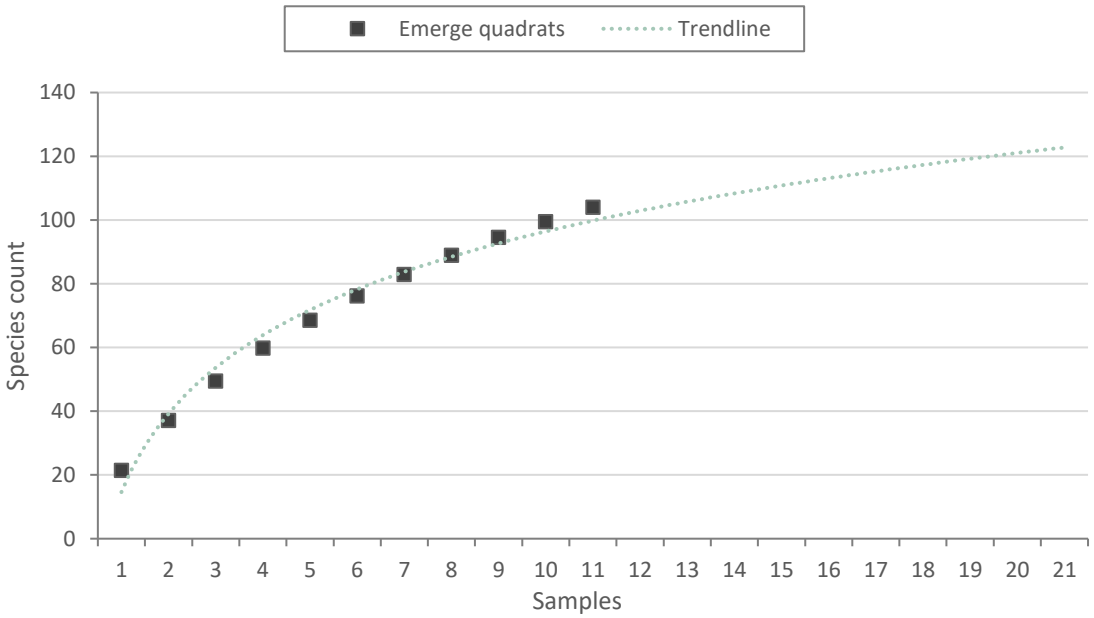

Plate 12: Species accumulation curve derived from sample data (y = 35.522ln(x) + 14.619 R^2 = 0.9816).

5 Discussion

The vegetation within the site has been subject to significant past disturbance and is largely in completely degraded condition. The central portion of the site contain the fenced remains of the buildings that were damaged in the 2011 fire. These are surrounded by maintained cultivated gardens dominated by exotic species. Approximately four hectares of the site is cleared or comprises non-native vegetation. The 1.3 ha of native vegetation remaining within as well as areas adjacent to the site shows varying levels of disturbance, including fire damage, partial clearing and weed invasion.

The **AfW** vegetation was located in a number of pockets within the site. These areas have all been subject to some disturbance, both from historical clearing and the 2011 fire. The north-eastern patch is in degraded condition and has been subject to plantings of local native and exotic species. This area is also subject to weed control. The south western pockets of the **AfW** vegetation range from degraded to good condition. The area directly south west of the site was mapped as being in degraded condition due to high grass weed loads and limited native understorey species. The **AfW** vegetation within the south western portion of the site is mapped as being in good condition as they contained less weed cover and had a number of native understorey species present. A landscaped, rocky stream was historically built in this area using limestone blocks, at the time of the survey there was no water present and no evidence that this water feature is still in use. This area was still considered to be in good condition due to the native species present and low weed cover, but showed evidence of historic modification.

The most intact native vegetation exists along the south-western, western and south eastern periphery of the site and extending outside of the site boundary. The vegetation along Margaret River comprises plant community **MrLOF** (with **CcAfW** at higher elevation at the northern extent of the site). These communities are relatively intact, riparian communities in very good condition, despite localised incursions of weed species in higher densities. The vegetation was subject to some disturbance during the 2011 fire but due to its proximity to the river was not extensively burnt.

Plant communities **AfSgHcW** and **MhBvTrS** extend to the south of the site, with small areas of each occurring within the site boundary. Based on the historical aerials, the vegetation to the south east of the site (plant community **AfSgHcW**) was burnt between 2007 and 2009. The vegetation present in the south west corner of the site (plant community **MhBvTrS**) was then subsequently burnt in 2011. Both communities are in the process of regenerating and contained high coverage of native species. The vegetation at the junction of the communities was burnt by both fires and consequently was more degraded with high weed cover. The two communities share numerous common species but showed differences in species composition and structure. **AfSgHcW** vegetation had a more intact canopy of peppermint trees. Within the **MhBvTrS** vegetation peppermint trees were more scattered and at the time of the survey were of a similar height to the dominant shrub species present (approximately two metres high). The **MhBvTrS** vegetation is located on limestone cliffs above the river with higher densities of outcropping limestone. As a result, the suite of species was slightly different to the **AfSgHcW** vegetation on sandier soil further east.

5.1 Threatened and priority flora

In the south-west of Western Australia, September to November is considered the optimal period for undertaking flora and vegetation surveys, with this period also extending into December the further south the site is located. This is when the majority of flora species are flowering and therefore easiest to detect and identify. In 2018 many species in the south-west were still in flower later than usual due to the higher (albeit average) rainfall compared to previous years and the late start to the flowering period (anecdotally, some species were nearly a month behind their typical flowering times).

The portion of the Margaret River adjacent to the site is estuarine and low level interaction with the ocean and intrusion of salt water is evident (Hanran-Smith and McKenzie 2018). The presence of *Juncus kraussii* subsp. *australiensis* confirms this. This is likely to limit those conservation significant species that have a preference for lower lying, moist habitats.

One individual of the priority flora species *Banksia sessilis* var. *cordata* (P4) was recorded in the south-eastern corner of the site alongside the driveway.

No other threatened or priority flora species were recorded within the site or adjacent portions of the survey area. The absence of the larger perennial species such as *Lambertia echinata* subsp. *occidentalis* and *Pultenaea pinifolia* was relatively easy to confirm. As it was to confirm that *Banksia sessilis* var. *cordata* was only present at the one identified location. However, due to their size, smaller geophytic species such as *Caladenia excelsa* and *C. hoffmanii* can be more difficult to detect. Considerable search effort was applied to the areas of remnant native vegetation present within the site itself therefore it is considered that further threatened and priority flora species are unlikely to occur within the site. Conservation significant species could occur within Wallcliffe Reserve to the south of the site which was not assessed in the same level of detail.

5.2 Threatened ecological communities

No TECs or PECs are considered to occur within the site.

The only TECs or PECs considered to potentially occur close to the site are aquatic root mat communities 1, 2, 3 and 4 in caves of the Leeuwin Naturaliste Ridge TECs. These TECs comprise four separate communities of aquatic invertebrates living in mats of fine tree rootlets associated with extensive growths of microscopic fungi in caves on the Leeuwin Naturaliste Ridge (ESSS 2000). The caves that contain the root mat communities occur in limestone on gneiss granites (English et al. 2000; ESSS 2000). The soil above the caves contains little water and growth of tree roots into the caves is promoted by the availability of permanent water in the cave streams and pools. Root mats are produced by *Eucalyptus diversicolor* (karri) in Easter Cave and Strongs Cave, marri in Calgardup cave and karri and peppermint in Kudjal Yolgah cave (ESSS 2000). The resulting root mats provide the primary food source for the aquatic root mat (Jasinska *et al.* 1996). The four communities are also differentiated by the invertebrate species composition and abundance and most species present are endemic to the one cave (J. 1996; ESSS 2000). As such, each community is considered to represent a separate TEC and all four communities were assessed as critically endangered (ESSS 2000). Despite new information showing a much larger extent of root mat communities, the communities still fit

criteria for critically endangered as documented within the *Interim Recovery Plan 2008-2013* (DEC 2008).

The nearest known occurrence of one of the aquatic root mat TECs is *Aquatic Root Mat Community Number 2 of Caves of the Leeuwin Naturaliste Ridge,* 9 km south of the site. This TEC occurs at Strongs Cave and the root mats are produced by karri. There are a number of caves present close to the site. These are present within the Wallcliffe Cliffs and also a separate cave 150 m south of the cliffs (referred to as Wallcliffe Cave). Due to increased degradation and Aboriginal cultural significance, public access to the cliff caves was prohibited in 2018 (Shire of Augusta-Margaret River 2018). Wallcliffe Cave was gated to prevent access in 2002. Whilst neither cave systems have been identified as containing aquatic root mat TECs previously, it is possible that these TECs occur within the area. Targeted surveys of the caves for root mats and the assemblages of invertebrate fauna would be required to determine the presence or absence of aquatic root mat TECs but are not likely to occur within the site itself.

5.3 Local and regional significance

The site and surrounds are mapped as two Registered Aboriginal Sites, contains unique geological features and abuts the Margaret River. As such the intact vegetation (that in good or better condition) within the area is likely to be locally and/or regionally significant and also contributes to regional ecological linkages.

Large peppermint and marri trees within the site may be locally and/or regionally significant due to their habitat value for endangered western ring-tailed possum and black cockatoo species respectively. However, further assessment by a fauna specialist is required to confirm these values.

6 Conclusions

The majority of vegetation within the site is highly disturbed and modified. Approximately four hectares of the site contains completely degraded, non-native vegetation. The remaining 1.3 ha of the site includes native vegetation that is largely present in degraded (0.39 ha) and good (0.62 ha) condition. However, the site contains approximately 0.28 ha of relatively intact native vegetation in very good condition.

One individual of the priority flora species *Banksia sessilis* var. *cordata* (P4) was recorded in the south-eastern corner of the site alongside the driveway. No other threatened or priority flora species were recorded or are considered likely to occur within the site.

No TECs or PECs were recorded within the site. There is a possibility that Wallcliffe Cave or caves within the Wallcliffe Cliffs to the west and south of the site could potentially contain one of the aquatic root mat TECs.

The intact vegetation in the southern portion of the site likely to be locally and/or regionally significant and contribute to the associated regional ecological linkages. The large peppermint and marri trees within the site may be locally and/or regionally significant due to their habitat potential for threatened western ring-tailed possum and black cockatoo species respectively.

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Figures

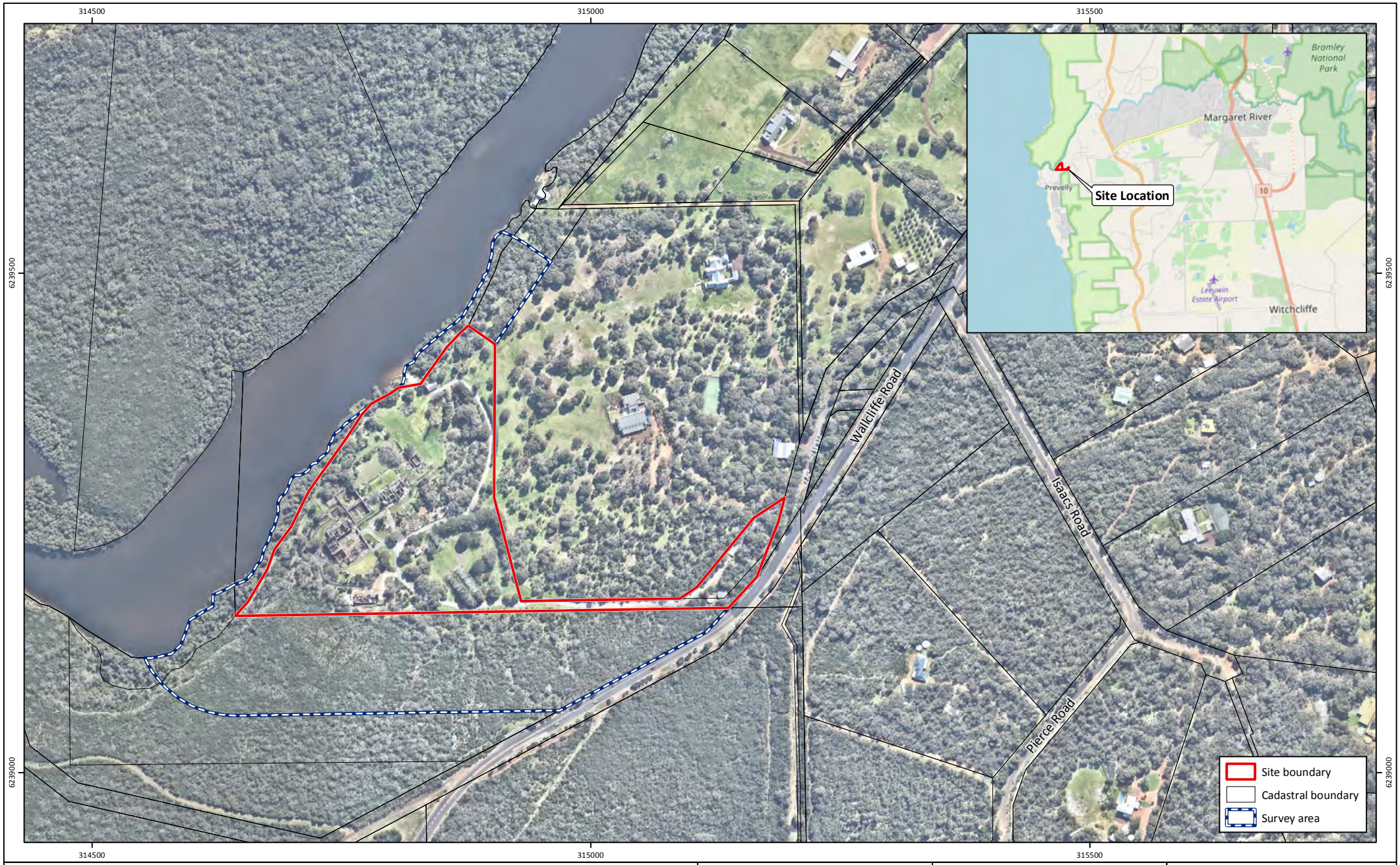

Figure 1: Site Location

Project: Spring Flora and Vegetation Assessment
Lot 101 Wallcliffe Road Amendment Support
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(01)--F01
Drawn: KNM
Date: 23/01/2019
Checked: SKP
Approved: TAA
Date: 11/02/2019

N

0 50 100 150
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

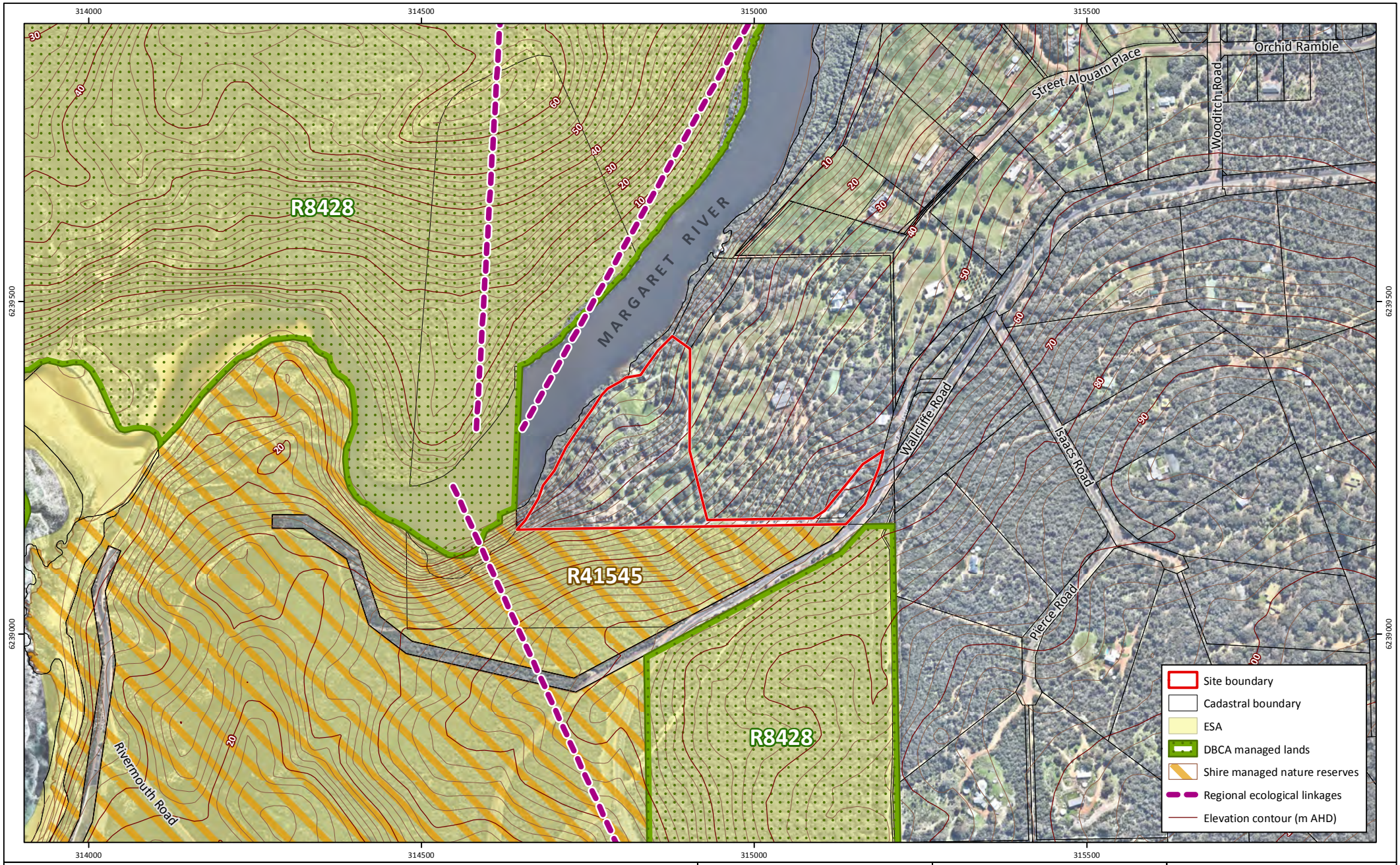

Figure 2: Environmental Features

Project:	Spring Flora and Vegetation Assessment Lot 101 Wallcliffe Road Amendment Support
Client:	Wallcliffe House Pty Ltd

Plan Number:
EP18-128(01)--F02

Drawn:	KNM
Date:	23/01/2019
Checked:	SKP
Approved:	TAA
Date:	11/02/2019

N

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Metres

Scale: 1:7,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

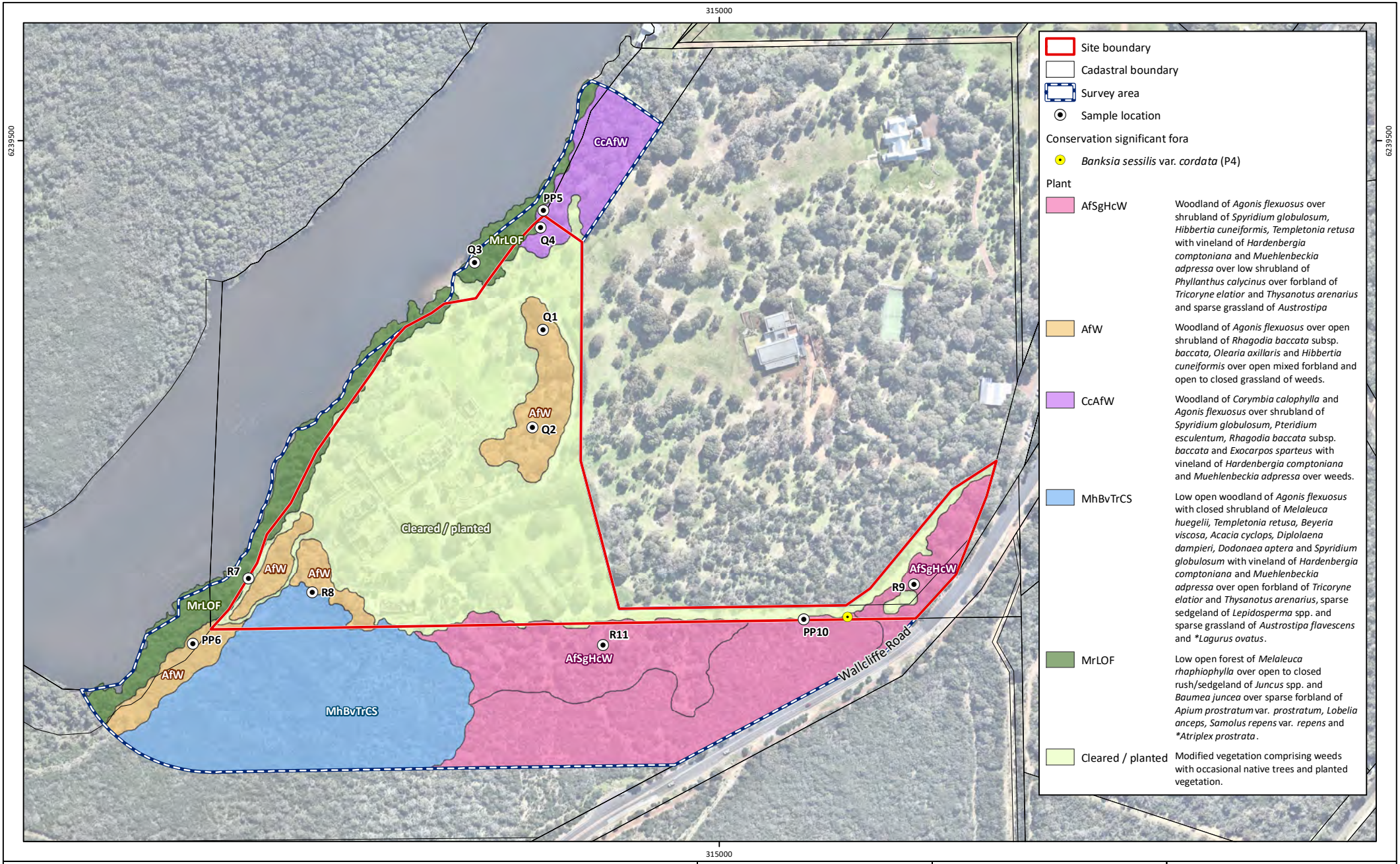

Figure 3: Plant Communities

Project: Spring Flora and Vegetation Assessment
Lot 101 Wallcliffe Road Amendment Support
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(01)--F03a
Drawn: GAR
Date: 29/11/2019
Checked: SKP
Approved: TAA
Date: 29/11/2019

N

0 50 100
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

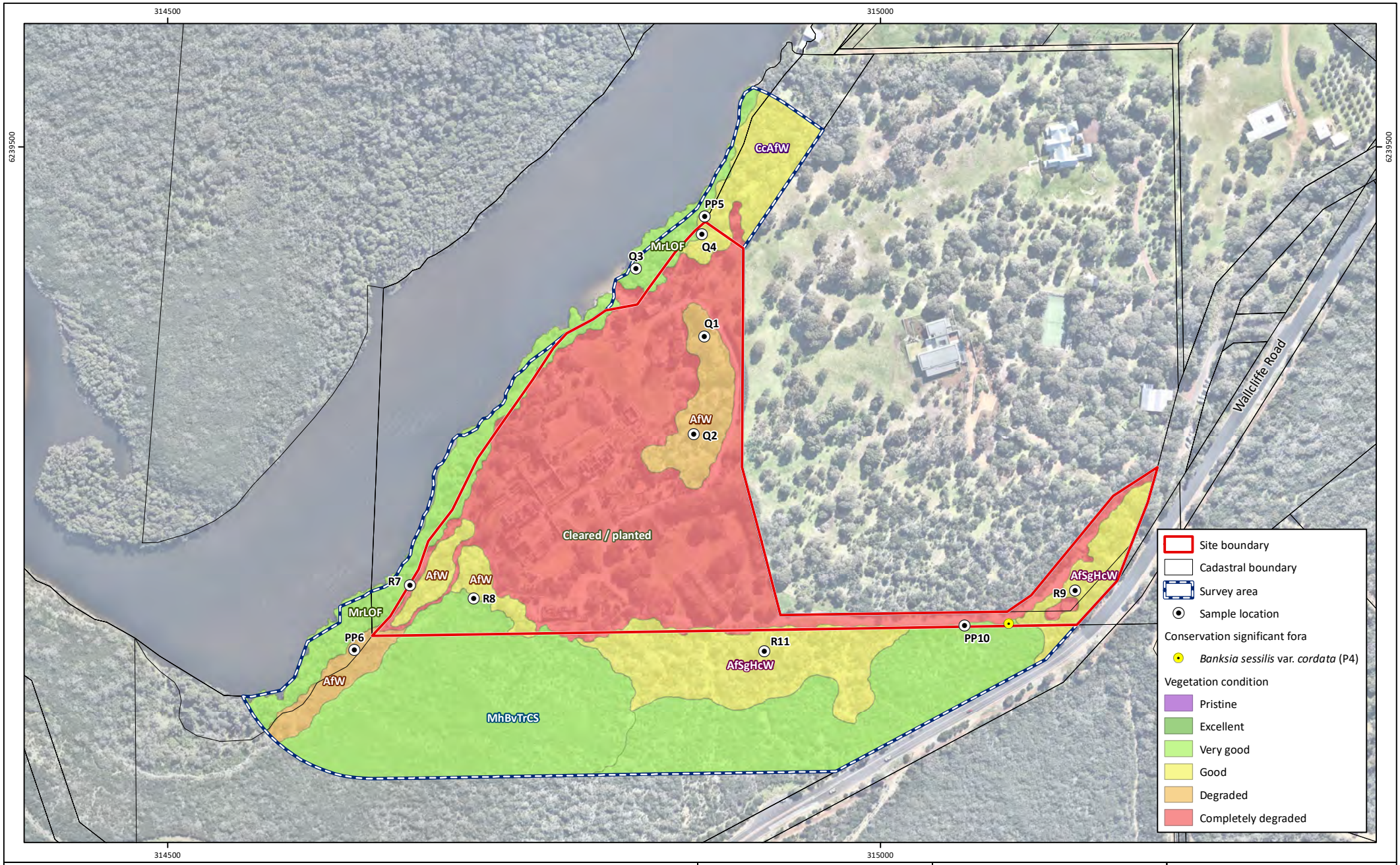

Figure 4: Vegetation Condition

Project:	Spring Flora and Vegetation Assessment Lot 101 Wallcliffe Road Amendment Support
Client:	Wallcliffe House Pty Ltd

Plan Number:
EP18-128(01)--F04a

Drawn:	GAR
Date:	29/11/2019
Checked:	SKP
Approved:	TAA
Date:	29/11/2019

N

0 50 100
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Additional Background Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Flora species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories according to their conservation status, as outlined in **Table 1**.

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done. The definition of threatened flora under the BC Act is provided in **Table 1**.

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018c). Priority flora species are considered during State approval processes. Priority flora categories and definitions are listed in **Table 1**.

Table 1: Definitions of conservation significant flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2018c)

Conservation code	Description
EX†	Threatened Flora – Presumed Extinct Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
T^†	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR^	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN^	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU^	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1	Priority One – Poorly Known Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Priority Two – Poorly Known Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey.
P3	Priority Three – Poorly Known Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey.
P4	Priority Four – Rare Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

^pursuant to the EPBC Act, †pursuant to the BC Act, on DBCA's *Priority Flora List*

Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are recognised as ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment and Energy. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment and Energy.

Within Western Australia TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs endorsed by the State Minister are published by DBCA (DBCA 2018b).

TECs are assigned to one of the categories outlined in **Table 2** according to their status (in relation to the level of threat). TECs are afforded direct statutory protection at a State level under the BC Act and BC Regulations. Ecological communities are listed under Section 27(1) and 33 of the BC Act. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009).

Conservation code	Description
PD	Presumably Totally Destroyed An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	Endangered An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	Vulnerable An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2009). Listed PECs are published by DBCA (DBCA 2017b).

Table 3: Categories of priority ecological communities (DEC 2009).

Priority code	Description
P1	Priority One Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	Priority Two Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Priority Three Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (i) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (ii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Priority Four Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	Priority Five Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016).

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016).

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016).

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 7**.

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 8**.

Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017a) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

References

General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2017b, *Priority Ecological Communities for Western Australia Version 27*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018b, *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment*, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018c, *Threatened and Priority Flora List 16 January 2018*, Perth.

Department of Environment and Conservation (DEC) 2007, *Protocol for proposing modifications to the Geomorphic Wetlands Swan Coastal Plain dataset*, Perth.

Department of Environment and Conservation (DEC) 2009, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

English, V. and Blyth, J. 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, ANCA National Reserves System Cooperative Program, Project Number N702, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

Online references

Department of Environment and Energy (DoEE) 2018, Weeds of National Significance, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

Department of Primary Industries and Regional Development (DPIRD) 2019, The Western Australian Organism List (WAOL), < https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

Appendix B

Species List

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Apiaceae		
		Apium prostratum var. *prostratum*
Amaryllidaceae		
	*	*Agapanthus praecox*
Araceae		
	D	*Zantedeschia aethiopica*
Asparagaceae		
		Acanthocarpus preissii
	D	*Asparagus asparagoides*
	*	*Liriope* sp.
		Lomandra ?micrantha subsp. *micrantha*
		Thysanotus arenarius
Asphodelaceae		
	*	*Trachyandra divaricata*
Asteraceae		
	*	*Arctotheca calendula*
	*	*Conyza sumatrensis*
	*	*Cotula coronopifolia*
	*	*Hypochaeris glabra*
		Olearia axillaris
	*	*Senecio elegans*
	*	*Senecio* sp.
	*	*?Sigesbeckia orientalis*
	*	*Sonchus oleraceus*
Brassicaceae		
		Stenopetalum robustum
Campanulaceae		
		Lobelia anceps
Caryophyllaceae		
	*	*Petrorhagia dubia*
	*	*Polycarpon tetraphyllum*
Casuarinaceae		
	*	*Allocasuarina* sp.

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Chenopodiaceae		
	*	*Atriplex prostrata*
		Rhagodia baccata subsp. *baccata*
		Threlkeldia diffusa
Convolvulaceae		
		Dichondra repens
Crassulaceae		
		Crassula colorata
Cyperaceae		
		Baumea juncea
		Isolepis sp.
		Lepidosperma gladiatum
		Lepidosperma longitudinale
		Lepidosperma squamatum
Dennstaedtiaceae		
		Pteridium esculentum
Dilleniaceae		
		Hibbertia cuneiformis
Ericaceae		
		Conostephium pendulum
Euphorbiaceae		
		Beyeria viscosa
	*	*Euphorbia terracina*
Fabaceae		
		Acacia cyclops
		Acacia littorea
		Acacia saligna
		Chorizema diversifolium
		Hardenbergia comptoniana
		Jacksonia horrida
		Kennedia prostrata
	*	*Lupinus cosentinii*
	*	*Melilotus indicus*
		Templetonia retusa
	*	*Trifolium campestre*
	*	*Trifolium glomeratum*
	*	*Vicia sativa*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Geraniaceae		
	*	*Pelargonium capitatum*
		Pelargonium littorale
Goodeniaceae		
		Scaevola nitida
Haemodoraceae		
		Anigozanthos sp.
		Conostylis aculeata subsp. *gracilis*
Hemerocallidaceae		
		Dianella revoluta
		Tricoryne elatior
Iridaceae		
	*	*Gladiolus caryophyllaceus*
		Patersonia occidentalis
Juncaceae		
		Juncus kraussii subsp. *australiensis*
		Juncus pallidus
Juncaginaceae		
		Cycnogeton lineare
Lauraceae		
		Cassytha pomiformis
Lythraceae		
	*	*Lythrum hyssopifolia*
Malvaceae		
	*	*Malva parviflora*
	*	*Modiola caroliniana*
		Thomasia triphylla
Myrtaceae		
		Agonis flexuosa
		Corymbia calophylla
		Corymbia ficifolia
		Eucalyptus megacarpa
	*	*Melaleuca armillaris*
		Melaleuca huegelii
	*	*Melaleuca quinquenervia*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Myrtaceae (cont.)		
		Melaleuca rhaphiophylla
Oleaceae		
	*	*Olea europaea*
Orchidaceae		
		Microtis media
Orobanchaceae		
	*	*Orobanche minor*
Oxalidaceae		
	*	*Oxalis* sp.
Papaveraceae		
	*	*Fumaria muralis* subsp. *muralis*
Phyllanthaceae		
		Phyllanthus calycinus
		Poranthera microphylla
Pittosporaceae		
		Billardiera heterophylla
Poaceae		
		Austrostipa flavescens
	*	*Avena barbata*
	*	*Avena fatua*
	*	*Briza maxima*
	*	*Bromus diandrus*
	*	*Cynodon dactylon*
	*	*Ehrharta erecta*
	*	*Ehrharta longiflora*
	*	*Ehrharta villosa*
	*	*Hyparrhenia hirta*
	*	*Lagurus ovatus*
		Poa porphyroclados
	*	Poaceae sp.
Polygalaceae		
		Comesperma confertum

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Polygonaceae		
		Muehlenbeckia adpressa
	*	*Rumex crispus*
Primulaceae		
	*	*Lysimachia arvensis*
		Samolus repens var. *repens*
Proteaceae		
	P4	*Banksia sessilis* var. *cordata*
		Hakea oleifolia
Ranunculaceae		
		Clematis pubescens
Restionaceae		
		Desmocladus flexuosus
Rhamnaceae		
		Spyridium globulosum
Rubiaceae		
	*	*Galium murale*
Rutaceae		
		Boronia alata
		Diplolaena dampieri
Salicaeae		
	*	*Salix babylonica*
Santalaceae		
		Exocarpos sparteus
Sapindaceae		
		Dodonaea aptera
Solanaceae		
	*	*Solanum laciniatum*
	*	*Solanum nigrum*
Thymelaeaceae		
		Pimelea rosea subsp. *rosea*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family	Species
Zamiaceae	
	Macrozamia riedlei

Appendix C

Sample Data

Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314876	NW corner northing:	6239367
Altitude (m):	12.64344	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	high - clearing, fire
Soil type/texture	sand/loam	Bare ground (%):	10
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	50% (leaves,twigs,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	70 to 100	<10	Planted native and exotic shrubs present within patch. Grass weeds recently sprayed and dying at the time of survey. Burnt 2011.
Mid:	10 to 30	1 to 2	
Ground layer 1:	0%	<0.5	
Ground layer 2:	0%	0	

Vegetation description

Low closed forest *Agonis flexuosa* over open shrubland *Rhagodia baccata* subsp. *baccata* and planted *Melaleuca huegelii* and *Hibbertia cuneifolia* over grassland of **Ehrharta longifolia* and **Lagurus ovatus* over forbland **Lysimachia arvensis* , **Zantedeschia aethiopica* , **Sonchus oleraceus* and **Galium murale* .

Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP,other Q1: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia littorea	opp
	Agonis flexuosa	70
	Apium prostratum var. prostratum	0.5
*	*Atriplex prostrata*	0.5
	Billardiera heterophylla	3
	Boronia alata	opp
	Corymbia ficifolia	opp
*	*Cotula coronopifolia*	0.5
*	*Ehrharta longiflora*	30
*	*Fumaria muralis subsp. muralis*	1
*	*Galium murale*	1
	Hibbertia cuneiformis	3
*	*Hypochaeris glabra*	0.5
	Juncus pallidus	opp
*	*Lagurus ovatus*	1
*	*Liriope sp.*	opp
*	*Lupinus cosentinii*	0.5
*	*Lysimachia arvensis*	3
*	*Lythrum hyssopifolia*	0.5
*	*Malva parviflora*	opp
	Melaleuca huegelii	3
*	*Olea europaea*	opp
	Olearia axillaris	opp
*	*Polycarpon tetraphyllum*	0.5
	Rhagodia baccata subsp. baccata	4
*	*Senecio elegans*	opp
*	*Solanum laciniatum*	opp
*	*Solanum nigrum*	1
*	*Sonchus oleraceus*	1
	Spyridium globulosum	opp
*	*Trifolium campestre*	1
*	*Trifolium glomeratum*	opp
*	*Zantedeschia aethiopica*	1

Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
Q2: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314869	NW corner northing:	6239299
Altitude (m):	13.622393	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	high - clearing, weeds, plantings, fire
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	10%, limestone	Soil colour:	brown/
Litter:	20% (leaves,twigs,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	30 to 70	<10	Planted native and exotic shrubs present within patch. Grass weeds recently sprayed and dying at the time of survey. Burnt 2011
Mid:	10 to 30	1 to 2	
Ground layer 1:	<10	<0.5	
Ground layer 2:	10 to 30	<0.5	

Vegetation description

Low open forest *Agonis flexuosa* over shrubland *Olearia axillaris, Boronia alata, Rhagodia baccata* subsp. *baccata* and *Solanum nigrum* over open grassland **Ehrharta longifolia* over forbland **Galium murale* , **Trifolium campestre* and **Polycarpon tetraphyllum.*

Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP,other Q2: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia saligna	opp
	Agonis flexuosa	40
*	*Allocasuarina sp.*	opp
	Billardiera heterophylla	1
	Boronia alata	2
*	*Conyza sumatrensis*	1
	Crassula colorata	opp
	Dichondra repens	1
*	*Ehrharta longiflora*	3
	Exocarpos sparteus	opp
*	*Fumaria muralis subsp. muralis*	opp
*	*Galium murale*	20
	Hibbertia cuneiformis	1
*	*Hypochaeris glabra*	1
	Isolepis sp.	0.5
	Juncus pallidus	2
*	*Lagurus ovatus*	opp
*	*Melaleuca quinquenervia*	opp
	Olearia axillaris	10
*	*Poaceae sp.*	1
*	*Polycarpon tetraphyllum*	5
	Rhagodia baccata subsp. baccata	4
*	*Salix sp.*	opp
*	*Senecio sp.*	1
*	*Solanum laciniatum*	opp
*	*Solanum nigrum*	4
*	*Sonchus oleraceus*	2
*	*Trifolium campestre*	2

Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q3: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314828.4955	NW corner northing:	6239414.684
Altitude (m):	-3.298827	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds
Soil type/texture	sand/ with organic layer	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	70% (bark,twigs,branches)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	70 to 100	<10
Mid:	-	-
Ground layer 1:	<10	<0.5
Ground layer 2:	<10	>0.5

Vegetation description

Low closed forest *Melaleuca rhaphiophylla* over low sparse herbland *Lobelia anceps* over sparse rushland *Juncus kraussii* subsp. *australis* and *Juncus pallidus.*

Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP Q3: Page 2 of 2

Species Data

* denotes non-native species

Status		Confirmed name	Cover (%)
	*	*?Sigesbeckia orientalis*	1
		Agonis flexuosa	3
		Apium prostratum var. prostratum	1
	*	*Atriplex prostrata*	2
		Juncus kraussii subsp. australiensis	1
		Juncus pallidus	2
		Lobelia anceps	3
	*	*Lysimachia arvensis*	2
		Melaleuca rhaphiophylla	60
	*	*Modiola caroliniana*	2
		Samolus repens	1
	*	*Zantedeschia aethiopica*	1

Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q4: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314874.5163	NW corner northing:	6239438.993
Altitude (m):	0.693734	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	low - low density weeds, adjacent clearing
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	25% (leaves,branches,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	10 to 30	<10
Mid:	30 to 70	1 to 2
Ground layer 1:	10 to 30	>0.5
Ground layer 2:	0%	0

Vegetation description

Low woodland *Corymbia caolphylla* and *Agonis flexuosa* over shrubland *Rhagodia baccata* subsp. *baccata* , *Exocarpos sparteus* , *Pteridium esculentum, Spyridium globulosum* with vineland of *Muehlenbeckia adpressa* over tall open sedgeland of *Lepidosperma* spp. and sparse forbland of **Lysimachia arvensis* and *Kennedia prostrata* .

Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP Q4: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Agonis flexuosa	10
	Billardiera heterophylla	1
*	*Bromus diandrus*	10
	Corymbia calophylla	20
	Exocarpos sparteus	3
	Hardenbergia comptoniana	4
	Hibbertia cuneiformis	1
	Kennedia prostrata	1
	Lepidosperma longitudinale	2
*	*Lysimachia arvensis*	2
	Muehlenbeckia adpressa	15
	Pteridium esculentum	3
	Rhagodia baccata subsp. baccata	5
*	*Solanum laciniatum*	2
	Spyridium globulosum	5
	Stenopetalum robustum	1
*	*Zantedeschia aethiopica*	8

Vegetation Sample Data

Sample Name: PP5

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
PP5: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	314876.6803	NW corner northing:	6239451.24
Altitude (m):	0.354714	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	saturated	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	Low - low density weeds, adjacent clearing
Soil type/texture	/ with organic layer	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	/
Litter:	10% (branches,,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	10 to 30	<10	Vegetation change to Melaleuca and Baumea from the upslope veg
Mid:	30 to 70	1 to 2	
Ground layer 1:	10 to 30	>0.5	
Ground layer 2:	0%	0	

Vegetation description

Low woodland *Melaleuca rhaphiophylla* and *Agonis flexuosa* over tall sedgeland *Baumea juncea* and *Lepidosperma gladiatum*

Vegetation Sample Data

Sample Name: PP5

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP5: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Baumea juncea
	Billardiera heterophylla
	Dianella revoluta
	Lepidosperma gladiatum
	Melaleuca rhaphiophylla
	Muehlenbeckia adpressa
	Rhagodia baccata subsp. baccata

Vegetation Sample Data

Sample Name: PP6

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
PP6: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	314630.8288	NW corner northing:	6239147.321
Altitude (m):	0.375583	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	lower slope
Time since fire:	> 5 yrs	Disturbance:	high - aggressive weeds
Soil type/texture	sand/	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	0% (,,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	10 to 30	<10	area to south of the site, with dense grass weeds. Burnt 2011.
Mid:	10 to 30	<1	
Ground layer 1:	30 to 70	>0.5	
Ground layer 2:	0%	0	

Vegetation description

Low woodland *Agonis flexuosa* and *Melaleuca rhaphiophylla* over tall open shrubland *Spyridium globulosum, Melaleuca huegelii* and *Rhagodia baccata* subsp. *baccata* with vineland *Muehlenbeckia adpressa , Clematis pubescens* and *Hardenbergia comptoniana* over tall closed grassland **Ehrharta erecta* and Poaceae spp.

Vegetation Sample Data

Sample Name: PP6

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP6: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Agonis flexuosa	
	Billardiera heterophylla	
	Clematis pubescens	
*	*Ehrharta erecta*	60
*	*Fumaria muralis subsp. muralis*	
	Hardenbergia comptoniana	
	Melaleuca huegelii	
	Melaleuca rhaphiophylla	
	Muehlenbeckia adpressa	
	Rhagodia baccata subsp. baccata	
*	*Rumex crispus*	
	Scaevola nitida	
	Spyridium globulosum	
*	*Zantedeschia aethiopica*	

Vegetation Sample Data

Sample Name: R7

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R7: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314669.8685	NW corner northing:	6239192.907
Altitude (m):	0.138893	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, adj clearing
Soil type/texture	sand/ with organic layer	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	30 to 70	<10
Mid:	0%	0
Ground layer 1:	0%	0
Ground layer 2:	0%	0

Vegetation description

Low open forest *Melaleuca rhaphiophylla* over sedge/rushland *Baumea juncea* and *Juncus* spp.over forbland *Apium prostratum* var. *prostratum, Pelargonium littorale* , **Rumex crispus* and *Cycnogeton lineare* and open grassland of grass weeds.

Vegetation Sample Data

Sample Name: R7

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R7: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Apium prostratum var. prostratum
*	*Atriplex prostrata*
	Baumea juncea
	Conostylis aculeata subsp. gracilis
	Cycnogeton lineare
*	*Cynodon dactylon*
	Dichondra repens
	Dodonaea aptera
	Juncus kraussii subsp. australiensis
	Juncus pallidus
	Lobelia anceps
	Melaleuca rhaphiophylla
	Pelargonium littorale
*	*Rumex crispus*
	Samolus repens

Vegetation Sample Data

Sample Name: R8

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R8: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314714.6094	NW corner northing:	6239183.354
Altitude (m):	10.093226	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	10
Rocks (%) and type:	20%, limestone	Soil colour:	brown/
Litter:	5% (twigs,branches,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	30 to 70	<10	Regenerating well post fire (2011). Weed cover limited
Mid:	30 to 70	1 to 2	
Ground layer 1:	10 to 30	<0.5	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over closed tall shrubland *Melaleuca huegelii, Beyeria viscosa, Spyridium globulosum, Diplolaena dampieri* and *Templetonia retusa* over low open forbland *Dianella revoluta, Acanthocarpus preissii, Thysanotus arenarius* and *Tricoryne elatior,* sparse sedgeland of *Lepidosperma squamatum* and *L. gladiatum* and sparse grassland of grass weeds.

Vegetation Sample Data

Sample Name: R8

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R8: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia cyclops
	Acacia littorea
	Acanthocarpus preissii
	Agonis flexuosa
*	*Asparagus asparagoides*
	Austrostipa flavescens
	Beyeria viscosa
	Billardiera heterophylla
*	*Briza maxima*
	Chorizema diversifolium
	Comesperma confertum
	Conostephium pendulum
	Dianella revoluta
	Diplolaena dampieri
	Exocarpos sparteus
	Hardenbergia comptoniana
	Hibbertia cuneiformis
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Lepidosperma squamatum
	Melaleuca huegelii
*	*Melilotus indicus*
	Muehlenbeckia adpressa
	Olearia axillaris
*	*Orobanche minor*
	Patersonia occidentalis
*	*Pelargonium capitatum*
*	*Petrorhagia dubia*
*	Poaceae sp.
	Scaevola nitida
	Spyridium globulosum
	Templetonia retusa
	Thysanotus arenarius
	Tricoryne elatior

Vegetation Sample Data

Sample Name: R9

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R9: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	315136.465	NW corner northing:	6239189.047
Altitude (m):	53.091671	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,leaves,)	Vegetation condition:	good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	
Mid:	0%	0	Weed cover 20%. Burnt 2009/?2011
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Hibbertia cuneiformis, Spyridium globulosum, Jacksonia horrida, Phyllanthus calycinus* and *Templetonia retusa* with vineland *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over grassland **Avena fatua, *Briza maxima* and *Austrostipa flavescens* and forbland *Conostylis aculeata* subsp. *gracilis* , **Euphorbia terracina, Tricoryne elatior* and **Zantedeschia aethiopica.*

Vegetation Sample Data

Sample Name: R9

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R9: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
*	*Arctotheca calendula*
*	*Asparagus asparagoides*
	Austrostipa flavescens
*	*Avena fatua*
	Beyeria viscosa
*	*Briza maxima*
	Conostylis aculeata subsp. gracilis
*	*Euphorbia terracina*
*	*Gladiolus caryophyllaceus*
	Hakea oleifolia
	Hardenbergia comptoniana
	Hibbertia cuneiformis
	Jacksonia horrida
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Muehlenbeckia adpressa
	Olearia axillaris
*	*Oxalis sp.*
	Patersonia occidentalis
*	*Pelargonium capitatum*
	Pelargonium littorale
	Phyllanthus calycinus
	Pimelea rosea subsp. rosea
	Poranthera microphylla
	Pteridium esculentum
	Spyridium globulosum
	Templetonia retusa
	Thysanotus arenarius
	Tricoryne elatior
*	*Zantedeschia aethiopica*

Vegetation Sample Data

Sample Name: PP10

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
PP10: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	315059.0224	NW corner northing:	6239164.458
Altitude (m):	46.429489	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,leaves,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	
Mid:	0%	0	rassy weeds c. 20% cover. Burnt 2009/?201
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Acacia littorea, Melaleuca huegelii, Beyeria viscosa, Macrozamia riedlei, Olearia axillaris, Phyllanthus calycinus* and *Templetonia retusa* over grassland **Avena barbata, *Lagurus ovatus, *Briza maxima* and *Austrostipa flavescens* and open forbland *Conostylis aculeata* subsp. *gracilis, Patersonia occidentalis* and *Thysanotus arenarius* .

Vegetation Sample Data

Sample Name: PP10

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP10: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
	Austrostipa flavescens
*	*Avena barbata*
P4	*Banksia sessilis var. cordata*
	Beyeria viscosa
*	*Briza maxima*
*	*Briza maxima*
	Cassytha pomiformis
	Conostylis aculeata subsp. gracilis
	Desmocladus flexuosus
	Eucalyptus megacarpa
*	*Hyparrhenia hirta*
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Lomandra ?micrantha subsp. micrantha
	Macrozamia riedlei
	Melaleuca huegelii
	Microtis media
	Olearia axillaris
	Patersonia occidentalis
	Phyllanthus calycinus
	Poa porphyroclados
	Templetonia retusa
	Thomasia triphylla
	Threlkeldia diffusa
	Thysanotus arenarius
	Xanthorrhoea preissii

Vegetation Sample Data

Sample Name: R11

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R11: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314918.412	NW corner northing:	6239146.4
Altitude (m):	31.452335	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	Sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	10% (twigs,leaves,)	Vegetation condition:	good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	Higher weed load (c. 30%) throughout area. Burnt 2009/2011
Mid:	0%	0	
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Beyeria viscosa, Hakea oleifolia, Spyridium globulosum, Phyllanthus calycinus* and *Templetonia retusa* over grassland **Avena barbata, *Lagurus ovatus* and **Briza maxima* and open forbland **Melilotus indicus, *Trachyandra divaricata and *Zantedeschia aethiopica* .

Vegetation Sample Data

Sample Name: R11

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R11: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
*	*Asparagus asparagoides*
*	*Avena barbata*
	Beyeria viscosa
	Boronia alata
*	*Briza maxima*
	Exocarpos sparteus
	Hakea oleifolia
	Hardenbergia comptoniana
	Hibbertia cuneiformis
*	*Lagurus ovatus*
	Melaleuca huegelii
*	*Melilotus indicus*
	Muehlenbeckia adpressa
	Phyllanthus calycinus
	Rhagodia baccata subsp. baccata
	Spyridium globulosum
	Templetonia retusa
*	*Trachyandra divaricata*
*	*Vicia sativa*
*	*Zantedeschia aethiopica*