COCKBURN SURF PARK

VEGETATION ASSESSMENT

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pgv ENVIRONMENTAL

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1 INTRODUCTION

Aventuur has been selected to construct a Surf Park on Lot 800 and Pt Lot 9001 Prinsep Road, Cockburn (Figure 1). The Surf Park development will occupy about 5.7ha (the site) (Figure 2).

The Surf Park is proposed to include a surfing lagoon, boutique hotel, health and wellness centre, offices, functions and event spaces, performance academy, beach club and restaurants.

The site is mostly covered in native vegetation. Construction of the Surf Park would remove all of the native vegetation. PGV Environmental was commissioned by Aventuur to undertake a vegetation assessment to provide information on the following:

- A description and map of the vegetation types;
- A description and map of the condition of the vegetation;
- An assessment of the conservation significance of the vegetation;
- An assessment of any Black Cockatoo habitat; and
- Determine whether a referral is required under the Commonwealth EPBC Act.

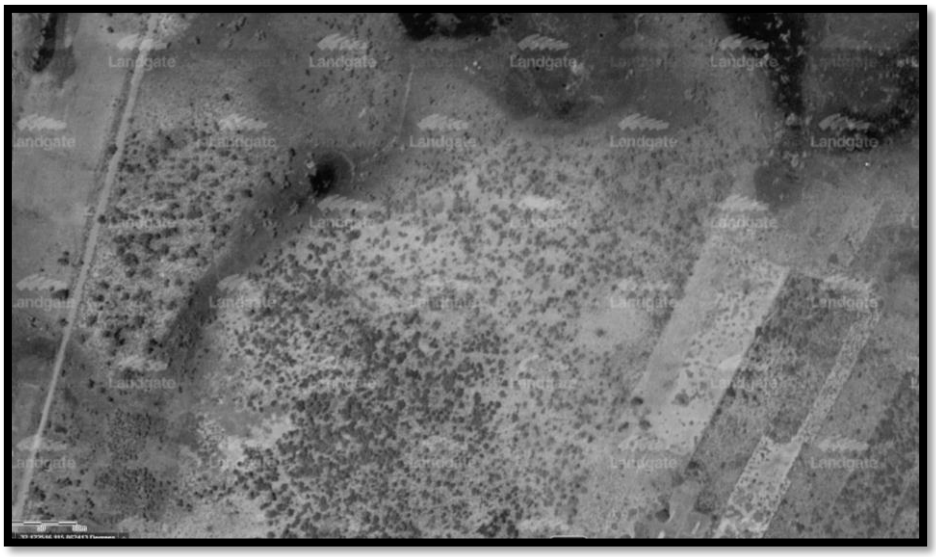
2 SITE DESCRIPTION

2.1 Land Use

2.1.1 Historical Land Use

The earliest available historic aerial photograph on-line from 1953 shows that the site is vegetated with varying levels of disturbance (Plate 1) (Landgate, 2022). Some areas to the east of the site appear to have been cleared for agricultural use.

Plate 1: Aerial Photograph 1953 (Landgate, 2022)

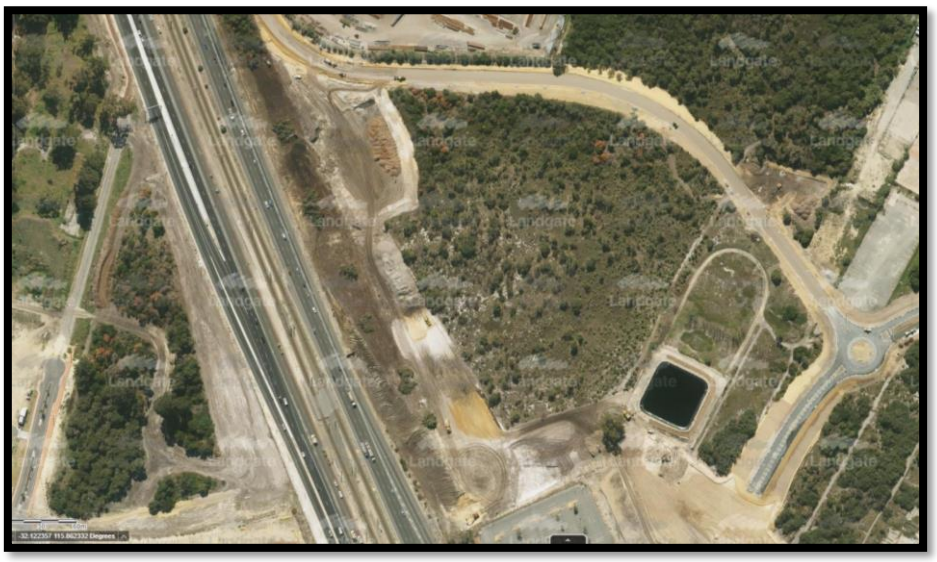


The aerial photograph from 1979 shows the trees on the site have been thinned out and the site partially cleared (Plate 2) (Landgate, 2022).

Plate 2: Aerial Photograph 1979 (Landgate, 2022)

The Freeway was constructed on the western side in 1989 and Prinsep Road on the northern boundary was constructed in 2020 (Plate 3). The road on the southeastern side was constructed in 2021.

Plate 3: Aerial Photograph May 2020 (Landgate, 2021)



2.1.2 Heritage

There are no Aboriginal Heritage Sites or Places mapped on the site (Appendix 3) (DPLH, 2022).

Heritage sites can be listed under the following lists/registers:

- World Heritage Sites;
- National Heritage Sites;
- Commonwealth Heritage Sites; and
- Sites on the Western Australian Heritage Council Register.

There are no listed Heritage Sites or Interim Heritage Sites on the site (National Map, 2022; Heritage Council of Western Australia, 2022; DAWE, 2022).

2.1.3 Current Land Use

The site is currently vegetated and not used.

2.2 Topography

The site slopes up from a low point of around 26m AHD at the northern end to 31m AHD at the southwestern end (Figure 2).

2.3 Wetlands

The northern end of the site is mapped as a wetland (blue colour on Plate 4). The wetland is identified as UFI 6652 and is classified as a Multiple Use Dampland. Damplands are seasonally waterlogged basins. Wetland UFI 6652 extends off-site, including to the north of Prinsep Road on Lot 802.

Plate 4: Wetland Mapping

2.4 Vegetation

2.4.1 Previous Survey

A previous survey of the site was undertaken by Focussed Vision Consulting for the City of Cockburn in 2016 and a follow up targeted survey in 2017 as part of a wider survey of the Cockburn Central East Local Structure Plan area (Focussed Vision Consulting, 2018). The initial flora and vegetation survey was a Level 1 (now called Reconnaissance) survey, however was undertaken in a lot of detail with a full species list compiled from spring surveys and a vegetation type and condition map prepared. The Targeted Survey is provided as Appendix 1.

Focussed Vision Consulting mapped four vegetation types on the surf park site as follows:

- BaEt – Banksia over *Eucalyptus todtiana* woodland
- BaXp – Banksia over *Xanthorrhoea preissii* woodland
- Xp – *Xanthorrhoea preissii* heath
- Mp – *Melaleuca preissiana* over **Acacia longifolia* woodland/swamp

The BaEt, BaXp and Xp vegetation types were considered by Focussed Vision Consulting to likely meet the requirement of the Commonwealth listed Banksia Woodlands of the Swan Coastal Plain TEC and recommended further assessment of patch size and quality to confirm this assessment.

Focussed Vision Consulting mapped the vegetation condition ranging from Degraded-Good up to Good-Very Good.

No Threatened or Priority plant species were recorded on the site.

2.4.2 Methodology

An assessment of the vegetation on the site was undertaken by Dr Paul van der Moezel of PGV Environmental initially on 30 September 2021 and again on 3 December 2021. The assessment included walking the site to describe vegetation type and condition. The boundary of the Banksia dominated vegetation was mapped with a hand-held GPS and with the assistance of a recent tree survey prepared by MNG surveyors.

Three quadrats were assessed in the Banksia vegetation type during the 3 December 2021 survey. The work had not been commissioned at the time of the 30 September survey.

The survey did not include a flora survey. The results of the Focussed Vision Consulting survey with regards to possible Threatened and Priority species occurring on the site are considered valid and are recent (spring survey 5 years old and targeted survey 4 years old).

2.4.3 Vegetation Type

Three vegetation types were described and mapped on the site as shown on Figure 3 and described in Table 1.

The vegetation types are very similar to those described for the site by Focussed Vision Consulting (2019). Focussed Vision Consulting included *Eucalyptus todtiana* in one of their vegetation types with *Banksia attenuata*. PGV Environmental recorded *Eucalyptus todtiana* on the site but considered it was not in great abundance to use in a vegetation type description. PGV Environmental also recorded more *Banksia menziesii* on the site than *B. attenuata* and therefore used both species in the vegetation type description rather than just *B. attenuata* used by Focussed Vision Consulting. The slight differences in terminology are a small technical difference and of no conservation consequence.

The portion of Lot 9001 included in the development footprint does not contain any native plants. Some Victorian Teatree and a Cape Lilac tree occur in this area.

Table 1: Vegetation Types on the Site

Vegetation Type	Description	Photograph
BmBa *Banksia menziesii/B. attenuata* Low open Woodland over *Xanthorrhoea preissii* Open Shrubland over *Phlebocarya ciliata* Open Low Heath	This is the most common vegetation type on the site occurring on the southern two-thirds of the site on dry, sandy upland soils. *Banksia menziesii* and *B. attenuata* were 4-6m high and 5-20% canopy cover. *Eucalyptus todtiana* and *Allocasuarina fraseriana* (Sheoak) are also tree species occurring in some areas. The understorey was low and often appeared very weedy with a high visual cover of Veldtgrass (*Ehrharta calycina*). However, beneath the Veldtgrass is an often dense cover of low shrubs particularly *Phlebocarya ciliata, Dasypogon bromeliifolius* and *Lyginia barbata*. Total area = 3.156ha	
Xp *Xanthorrhoea preissii* Shrubland over *Phlebocarya ciliata* Closed Low Heath	This vegetation type occurred on the eastern side of the site on dry, sandy soils. The area contained only a few *Allocasuarina fraseriana* (Sheoak) trees and no Banksia trees. *Xanthorrhoea preissi* and *X. brunonis* occurred up to 1m high and moderately dense over a dense ground cover of *Phlebocarya ciliata, Dasypogon bromeliifolius* and *Lyginia barbata.* Total area = 0.80ha	

Vegetation Type		Description	Photograph
Mp	*Melaleuca preissiana* Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Astartea affinis/ Hypocalymma angustifolium* Open Low Heath	This vegetation type occurs at the northern end of the site associated with a mapped Multiple Use wetland. *Melaleuca preissiana* (Paperbark) trees are 5-6m high and low density mixed with the introduced woody weed small tree *Acacia longifolia*. *Kunzea glabrescens* (Spearwood) is a common large shrub over an open understorey of native wetland species such as *Astartea affinis* and *Hypocalymma angustifolium* and abundant Veldtgrass (*Ehrharta longiflora*). Total area = 1.40ha	

2.4.4 Floristic Community Type

An assessment of the Floristic Community Type (FCT) was undertaken by comparing the species in the three quadrats sampled with the data in Table 12 in Gibson *et al.* (1994). Using this method, the BmBa Low Open Woodland vegetation type has the strongest correlation with FCT 23a 'Central *Banksia attenuata – Banksia menziesii* woodlands'. The Xp vegetation type did not have a quadrat. However, based on the very similar understorey species to the BmBa vegetation type, it is likely representative of FCT23a, even though there are no Banksia trees. A Floristic Community Type is identified by the combination of all species rather than one or two individual species. Therefore, even though the two Banksia species are absent, the FCT with their names in the title, can still apply.

The *Melaleuca preissiana* vegetation type is considered to be representative of FCT 4 '*Melaleuca preissiana* damplands'.

The result of the FCT assessment is very similar to the assessment by Focussed Vision Consulting for their vegetation types on the site. The only difference is one small area mapped by Focussed Vision Consulting as BaXp near the north-east corner of the site was assessed by them as FCT 21a 'Central *Banksia attenuata-Eucalyptus marginata* woodlands' rather than FCT 23a.

2.4.5 Vegetation Condition

The condition of the vegetation was assessed according to the system of Keighery as described in Bush Forever (Government of Western Australia, 2000) (Table 2).

The condition of the main vegetation type (BmBa – Banksia woodland) was rated in Good-Very Good condition (Figure 4). The abundance of Perennial Veldtgrass (*Ehrharta calycina*) and presence of other weed species including in some places Bridal Creeper (*Asparagus asparagoides*) prevented the vegetation from being rated as Excellent.

The area of *Xanthorrhoea preissii* Shrubland had an intact native understorey but lacked a tree cover. Examination of historic aerial photographs indicates that this area may have been cleared of trees in the past and has not regenerated. The Good rating reflects the change in structure due to the clearing of trees in the past.

The Paperbark wetland vegetation was rated in Degraded-Good condition. The low rating was due to the abundance of Sydney Wattle (*Acacia longifolia*) mixed with the Paperbark trees and a high cover of weeds in the understorey, mainly grassy weeds like *Ehrharta longiflora* (Annual Veldtgrass) and *Briza maxima* (Blowfly Grass).

The vegetation condition rating and map are similar to the condition rating and mapping by Focussed Vision Consulting for the site.

Table 2: Vegetation Condition Rating Scale.

Condition	Description
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.

Condition	Description
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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 are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Government of Western Australia, 2000.

2.5 Vegetation Significance

2.5.1 Ecological Community

At the level of Floristic Community Type (FCT) neither of the two FCTs assessed as being on the site, FCT 23a and FCT 4, are a Threatened or Priority Ecological Community at State level or Commonwealth level.

However, FCT 23a is part of the Banksia Woodlands of the Swan Coastal Plain TEC (Banksia Woodland TEC) which is listed under the EPBC Act. Not every area containing Banksia trees is automatically a part of the Banksia Woodland TEC. The area needs to meet certain criteria to qualify as the TEC. Further analysis of whether the vegetation on the site meets the definition of the Banksia Woodland TEC follows.

The *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (Commonwealth of Australia, 2016) (Conservation Advice) describes the Banksia Woodland TEC as:

> *The ecological community is a woodland associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range* (Commonwealth of Australia, 2016).

The vegetation type Xp - *Xanthorrhoea preissii* Shrubland over *Phlebocarya ciliata* Closed Low Heath, which adjoins the BmBa vegetation type, does not have any Banksia trees and examination of historic aerial photos shows the area has been lightly treed for many decades. The Xp vegetation type is considered buffer vegetation to the Banksia woodland and, according to the Banksia Woodland TEC Conservation Advice, a buffer "*is not part of the ecological community and is not formally protected as part of the matter of national significance*".

Table 3: Assessment of the Banksia Woodland of the Swan Coastal Plain TEC.

Feature	Characteristic	BmBa vegetation type
Banksia Species	The patch must include at least one of the following diagnostic species: • *Banksia attenuata* (Candlestick Banksia) • *Banksia menziesii* (Firewood Banksia) • *Banksia prionotes* (Acorn Banksia) • *Banksia ilicifolia* (Holly-Leaved Banksia).	Area mapped as BmBa contain both *Banksia attenuata* and *B. menziesii.*
Vegetation Structure	• A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall) typically dominated or codominated[3] by one or more of the *Banksia* species (*B. attenuata, B. menziesii, B. ilicifolia, B. prionotes*). • An emergent tree layer of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* (Sheoak) species may sometimes be present above the *Banksia* canopy. • An understorey that is often highly species-rich consists of: – A layer of sclerophyllous shrubs of various heights; and, – A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	*Banksia attenuata* and *B. menziesii* very common tree layer with *Eucalyptus todtiana* and *Allocasuarina fraseriana* occasionally present. Understorey not highly species rich but contain sclerophyllous shrubs of various heights as well as rushes, sedges and forbs.
Vegetation Condition	An area of Banksia woodland needs to be at least in Good condition to be considered the TEC.	Condition rated as Good-Very Good which is above the minimum condition category
Patch Size	The Banksia woodland TEC needs to meet a minimum 'patch' size depending on its condition to qualify as the TEC, as follows: • 'Pristine' – no minimum patch size • 'Excellent' – 0.5ha • 'Very Good' – 1ha • 'Good' – 2ha	Area of BmBa vegetation calculated at 3.156ha (tbc) (Figure 5). The area of Xp vegetation is contiguous with the BmBa type does not contain any Banksia trees and therefore is not part of the Banksia patch. The size of the BmBa vegetation type is larger than the minimum criteria of 2ha for Good condition vegetation.
Conclusion		**Meets the criteria for Banksia Woodlands of the Swan Coastal Plain TEC.**

2.5.2 Wetland

The wetland mapped in the northern part of the site corresponds very well to the Paperbark (Mp) vegetation type which is typically found in wetlands. Therefore, the boundary of the wetland is considered very accurate. The wetland is classified as a Multiple Use wetland. Multiple Use wetlands have very few ecological attributes and functions. The portion of wetland on the site contains a Paperbark woodland in Degraded to Good condition. The management category is likely to be at the upper end of Multiple Use but not as high to be rated in the higher categories of Resource Enhancement or Conservation. The portion of wetland UFI 6652 on Lot 802 to the north contains a much larger Paperbark woodland that covers most of the lot and is in Very Good condition.

2.5.3 Black Cockatoo Habitat

The Banksia trees on the site provide foraging habitat for Carnaby's and Baudin's Black Cockatoos. The few *Eucalyptus todtiana* and *Allocasuarina fraseriana* trees provide limited foraging habitat for Forest Red-tailed Black Cockatoos. All three Black Cockatoo species are listed under the EPBC Act.

No tall trees occur on the site that provide roosting or breeding habitat for any of the Black Cockatoo species.

The total area of foraging habitat on the site, represented by the BmBa vegetation type is shown in Figure 6 and calculated to be 3.156ha.

2.6 Fauna

2.6.1 Previous Survey

Focussed Vision Consulting (2017) undertook a Level 1 Fauna Survey (now known as a Basic Fauna Survey). The desktop component of the survey identified 143 native animals as potentially occurring in the area, three of which were Conservation Significant species being;

The species that are identified as possibly present on the site are:

- Carnaby's Black Cockatoo (*Calyptorhynchus* (*Zanda*) *latirostris*) (Endangered);
- Forest Red-tailed Black Cockatoos (*Calyptorhynchus* (*Zanda*) *banksii naso*) (Vulnerable);
- Rainbow Bee-eater (*Merops ornatus*) (Marine);
- Perth Slider, Lined Skink (*Lerista lineata*) (Priority 3); and
- Southern Brown Bandicoot, Quenda (*Isoodon fusciventer*) (Priority 4).

Additionally, habitat may occur for:

- Baudin's Black Cockatoo (*Calyptorhynchus* (*Zanda*) *baudinii*) (Endangered) which is increasingly being recorded on the Swan Coastal Plain; and
- Black-striped Snake (*Neelaps calonotos*) (Priority 3).

2.6.2 Fauna Habitat

There were three fauna habitats identified on the site by Focussed Vision Consulting (2017) as follows:

- Banksia Woodland habitat;
- Paperbark Woodland/Swamp habitat; and
- Open Degraded Areas habitat.

Fauna habitat can be assessed using a number of factors including, the size of the habitat, the level of habitat connectivity, availability of specific resources (eg. tree hollows) and overall vegetation quality. The habitat was assessed according to the following categories:

High Quality Fauna Habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.

Very Good Fauna Habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally affected by disturbance.

Good Fauna Habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.

Disturbed Fauna Habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

Highly Degraded Fauna Habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance. (Coffey Environments, 2009).

The habitat on the is considered to be Good Fauna habitat as the vegetation is disturbed but there is some connectivity to other habitat.

2.6.3 Biodiversity Value

It is not possible to assess the biodiversity value at a genetic level based on the information available, however due to the current development on the site the biodiversity value at the genetic level is highly likely to have been impacted by predation by cats and foxes.

3 EPBC ACT REFERRAL ADVICE

3.1 General

Any proposed Action that could lead to a significant impact on a Matter of National Environmental Significance (MNES) listed under the EPBC Act is required to be referred to the Commonwealth Department of Agriculture, Water and the Environment to determine whether it needs to be fully assessed or not.

The relevant MNES on the site are:

- 3.156ha of Black Cockatoo foraging habitat; and
- 3.156ha of Banksia Woodlands of the Swan Coastal Plain TEC

3.2 Banksia Woodland TEC

3.2.1 Referral

There are no specific referral guidelines for the Banksia Woodland TEC. The significance of an impact is determined by the EPBC Act Significant Impact Guidelines 1.1. The Banksia Woodland TEC is listed as an Endangered TEC. The Significant Impact Guidelines 1.1 list seven actions that are likely to have a significant impact on an Endangered ecological community. The first action is the 'reduction in the extent of an ecological community'. As there is no threshold to the amount of vegetation that can be cleared before it is considered significant, any clearing of Banksia Woodland TEC may have a significant impact.

The Surf Park development would result in the clearing of 3.156ha of Banksia Woodland TEC. On this basis, a Referral under the EPBC Act is recommended.

3.2.2 Banksia Woodland Regional Context

To ascertain the context of Banksia Woodland on the site compared to surrounding secure reserves within 12km an analysis of Bush Forever sites has been undertaken. The amount of Banksia Woodland TEC present in reserves is shown in Table 6 (Government of Western Australia, 2000). There is 2,089.5ha of Banksia Woodland TEC in Bush Forever sites within 12km in the surrounding area. The 3.156ha on site represents 0.15% of the amount within 12km. There are additional areas of remnant vegetation on sites that are not included in Bush Forever sites that also contain Banksia Woodland TEC but are not included in this calculation.

Table 6: Banksia Woodland TEC in Surrounding Bush Forever Sites (12km radius)

Site Number	Reserve Name	Inferred Area of Banksia Woodland (ha)	FCT
125	Holmes Street Bushland, Southern River/Huntingdale	Upland – 29.7	23a
244	North Lake and Bibra Lake, North Lake/Bibra Lake	Upland – 72	23a and 28
245	Ken Hurst Park, Leeming	Upland - 33	23a
253	Harrisdale Swamp and Adjacent Bushland, Forrestdale	Upland – 68.4	23a

Site Number	Reserve Name	Inferred Area of Banksia Woodland (ha)	FCT
262	Piarra Nature Reserve, Forrestdale	Upland – 21.8	21a and 21c
263	Banjup Bushland, Banjup	Upland – 32.9	21c, 22, 23a
267	Mandogalup Road Bushland, Hope Valley	95.9	25 with Banksia and 28
269	The Spectacles	Upland – 183	28
270	Sandy Lake and Adjacent Bushland, Anketell	Upland – 73.8	21a
336	Wireless Hill Park, Ardross	35.2	28
342	Anstey/Keane Dampland and Adjacent Bushland, Forrestdale	Uplands – 92.9	21c and 23a
344	Dennis De Young Reserve and Gibbs Road Swamp Bushland, Banjup/Forrestdale	Uplands – 94.4	21c and 22
345	Forrestdale Lake and Adjacent Bushland, Forrestdale	Upland – 93.5	21a and 21c
347	Wandi Nature Reserve and Anketell Road Bushland, Wandi/Oakford	Upland – 221.3	22 and 23a
348	Modong Nature Reserve and Adjacent Bushland, Oakford	Upland – 130.1	21c and 23a
388	Jandakot Airport, Jandakot	Upland – 241.6	21c, 22 and 23a
389	Acourt Road Bushland, Banjup	Upland – 170.9	21c, 22 and 23a
390	Fraser Road Bushland, Banjup	Upland – 126.6	23a
391	Thomsons Lake Nature Reserve and Adjacent Bushland, Beeliar	Upland – 33.7	28
392	Harry Waring Marsupial Reserve, Wattleup	Upland – 217.8	21a, 23a and 28
456	Nicholson Road Bushland, Langford/Thornlie	Upland – 7.1	23a
492	Lyon Road Bushland, Banjup	Upland – 13.9	21a, 21c and 23a
Total		**2,089.5**	

3.2.3 Banksia Woodland Significance of Impact

The impact of clearing the Banksia Woodland TEC has been analysed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (SEWPaC, 2006). The significance of an impact, according to the Significant Impact Guidelines depends on the sensitivity, value and quality of the environment and the intensity, duration, magnitude and geographic extent of the impacts. The significant impact criteria for listed flora and fauna species and ecological communities depend on the category of listing, eg. Endangered, Vulnerable or Migratory. The significant impact guidelines relevant to the Banksia Woodland TEC and analysis of proposed clearing for the Surf Park are set out below.

1. *Reduce the extent of an ecological community.*

Clearing of the site for the Surf Park will result in the removal of 3.156ha of the Banksia Woodland TEC. Contextually there are more than 2,000ha of Banksia Woodland in secure reserves in Bush

Forever sites within 12km so the proposed clearing represents 0.15% of the area that is in nearby secure reserves.

Impact: Known

2. *Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.*

The vegetation on site represents an isolated patch of a fragmented TEC, as a result of surrounding rural land uses. The site is not considered to be an important linkage across an already fragmented landscape

Impact: Unlikely

3. *Adversely affect habitat critical to the survival of an ecological community.*

The TEC on the site meets the key diagnostic characteristics and condition thresholds and therefore is considered to be critical habitat, however there are more than 2,000ha of larger, consolidated patches of the TEC that are better quality examples of the TEC within 12km that have a high level of protection.

Impact: Unlikely

4. *Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.*

Clearing on the site will be required to be undertaken in accordance with *Better Urban Water Management* guidelines (WAPC, 2008) and will require hydrological management procedures to be included as part of a Development Application such that any nearby water dependent ecosystems will not be impacted.

Impact: Unlikely

5. *Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.*

The area of TEC that could be directly impacted will not impact on the composition of any nearby areas of TEC. There will be no offsite impacts to areas of native vegetation such as dieback and changes to groundwater as these will be controlled by conditions of the Development Application to mitigate the risk.

Impact: Unlikely

6. *Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:*
    - *assisting invasive species, that are harmful to the listed ecological community, to become established, or*
    - *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.*

The clearing of the site will not increase any artificial pollutants that may impact on surrounding areas or other occurrences of the TEC. Weed spread from the clearing of the site is not likely to impact on other occurrences as none occur adjacent to the site.

Impact: Unlikely

7. *Interfere with the recovery of an ecological community.*

Section 5 of the Approved Conservation Advice discusses priority research and conservation actions and states: *It is more practical and cost-effective to maintain existing high quality remnants than to allow their degradation and then attempt rehabilitation of these or other areas*. The site is not considered to contain a high quality remnant as it has been completely cleared in the past. Clearing would not interfere with the recovery of other areas of the TEC.

Impact: Unlikely

3.3 Black Cockatoos

3.3.1 Referral

The *EPBC Act referral guidelines for three threatened Black Cockatoo species* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) contain thresholds over which any impact is likely to have a high risk of a significant impact. The thresholds for roosting and breeding habitat do not apply to the site as these do not exist. The threshold for foraging habitat is the clearing of more than 1ha of quality habitat. While the Referral Guidelines do not define 'quality', the Banksia trees are considered prime foraging species on the Swan Coastal Plain for Carnaby's and Baudin's Black Cockatoos and are therefore rated as quality. The *Eucalyptus todtiana* and *Allocasuarina fraseriana* trees on the site are too few to be rated as quality foraging habitat for Forest Red-tailed Black Cockatoos.

The proposed Surf Park development would result in the clearing of 3.156ha of low to moderate quality Banksia woodland foraging habitat and on this basis, a Referral under the EPBC Act is recommended.

3.3.2 Black Cockatoo Species

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Black Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp. It is nomadic, often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance of 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (DoE, 2014).

The site is inside the boundary of the modelled distribution for Carnaby's Black Cockatoos (SEWPaC, 2012). The site is shown as being within an unconfirmed breeding area but is not within a confirmed breeding area (National Map, 2022).

Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)

Baudin's Black Cockatoo is most common in the far south-west of Western Australia. It is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Black Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) woodlands where it feeds mainly on Marri seeds and various Proteaceous species (Johnstone, Johnstone and Kirkby, 2011).

The site is inside the modelled 'Known Foraging Area' distribution for Baudin's Black Cockatoos (SEWPaC, 2012).

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Forest Red-tailed Black Cockatoos are endemic to the humid to sub-humid south-west of Western Australia (SEWPaC, 2012). The range of Forest Red-tailed Black Cockatoos is bound by Gingin in the north to Mt Helena, Christmas Tree Well, West Dale, North Bannister, Mt Saddleback, Kojonup, Rocky Gully, upper King River and Green Range (east of Albany) (SEWPaC, 2012; DoE, 2014). It nests in tree hollows with a depth of 1-5m, that are predominately Marri, Jarrah and Karri (*E. diversicolor*) and it feeds primarily on the seeds of Marri and Jarrah (Johnstone, Johnstone and Kirkby, 2011).

The site is inside the modelled distribution for Forest Red-tailed Black Cockatoos (SEWPaC, 2012).

3.3.3 Habitat Survey

PGV Environmental undertook a Black Cockatoo habitat assessment on 3 March and 7 October 2021 in accordance with the *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) and the methodology that is outlined in the SPRAT Database for each of the Black Cockatoo species for Black Cockatoo Habitat Assessments.

The survey area was traversed on foot and information on Black Cockatoo foraging, roosting and breeding habitat was assessed. The extent, type and quality of the vegetation present, including the presence and extent of plants known to be used by Black Cockatoos was investigated.

3.3.4 Habitat definitions

Foraging Habitat

'Foraging habitat' for Black Cockatoos is determined from the plant species that are present in the survey area and evidence of feeding such as direct observation of birds or by chewed nuts and cones. Foraging plants utilised by each species of Black Cockatoo varies, with Carnaby's Black Cockatoo foraging on Eucalypts, pines and proteaceous species, whereas Forest Red-tailed Cockatoos prefer Eucalypts and Allocasuarina and many exotic species and Baudin's prefer mostly seeds of marri and jarrah, also Allocasuarina cones (SEWPaC, 2012).

Foraging habitat was identified by comparing the literature on plant species known to be foraged upon by black cockatoos against the vegetation within the site.

Roosting Habitat

'Roosting habitat' is usually evident due to the presence of Black Cockatoos in the survey area in the evening and early morning and if there are scats or moulted feathers under the roosting area. Black Cockatoos utilise a wide range of native and non-native trees, situated within a variety of land-use types. Roosting habitat is generally in tall (average of > 25 m) tree species that have relatively thick trunks (average DBH of 1 m) and medium foliage density (average of 50 %), and that are not too densely forested amongst other trees (average tree crown connectivity of 20 %) (Le Roux, 2017). Black cockatoos rely upon the availability of suitable night roosting sites in proximity to foraging resources, and particularly on access to water, which are usually within 2 km of the roost (SEWPaC, 2012).

Breeding Habitat

'Breeding habitat' is defined as trees of species known to support breeding within the range of the species which either have a suitable nest hollow OR have a DBH of 500mm or greater (SEWPaC, 2012). Past studies have found that on average hollow openings are 25 cm x 27 cm (Saunders *et al.,* 1982, Saunders and Dawson, 2017) and 30 cm x 34 cm (Johnstone *et al*., 2013). The height of a hollow entrance off the ground is on average 14.49 m (Johnstone *et al*., 2013). Nearly all hollows that are used for nesting by Black Cockatoos are located in the main trunk and have a vertical aspect (Johnstone *et al*., 2013, Saunders and Dawson, 2017). Black Cockatoos are large birds with shoulders that are about 100 mm wide, therefore they require hollows with an entrance bigger than this (as shown above they are typically much larger), but the internal dimensions (depth and floor base) need to be much larger in order for it to be suitable to lay eggs in and for adults to be able to move around.

Previous research has found for Carnaby's Black Cockatoo a mean depth of 1.2 m and a floor diameter of 40 cm is required in order for it to be suitable to lay eggs in and for adults to be able to move around (Johnstone *et al*., 2013, Saunders and Dawson 2017).

3.3.5 Foraging

The site contains four species that are recognised as foraging habitat for Black Cockatoos (Table 4). The site contains four species that are recognised as foraging habitat for Black Cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Valentine and Stock, 2008; Groom 2011; Johnstone *et al*., 2011; SEWPaC, 2012; Johnstone, *et al.*, 2013; Johnstone *et al*., 2016) as shown in Table 4. The total area of foraging habitat is 3.156ha.

Table 4: Foraging Species for Black Cockatoos

Species	Common Name	Carnaby's Black Cockatoo	Baudin's Black Cockatoo	Forest red-tailed Black Cockatoo
Allocasuarina fraseriana	Sheoak	None	Low	High
Banksia attenuata	Candlestick Banksia	High	High	None
Banksia menziesii	Firewood Banksia	High	High	None
Eucalyptus todtiana	Blackbutt	Moderate	Moderate	Moderate

The foraging habitat value was rated using the *Scoring system for the assessment of foraging value of vegetation for Black Cockatoos* (BCE, 2020) as Low to Moderate foraging value (as defined in the scoring system as *Woodland with tree banksias 5-10% projected foliage cover*), providing a site score

of 3. The site context score is 0 as the site is 0.035% of the surrounding habitat (as assessed in section 3.3.8) and the species density (stocking rate) is also 0 with no evidence of foraging on the site. The scoring system assigns a total score of 3 for the foraging habitat on the site.

3.3.6 Roosting

Black Cockatoos are known to roost overnight in tall trees including native and introduced eucalypts and pine trees generally in close proximity to a fresh water source. The site does not contain roosting habitat for Black Cockatoos and roosting has not been recorded on the site (DoP, 2011; Peck *et al.,* 2018; National Map, 2022). The nearest roosting sites are reported to be around 1.9km to the north-west, 1.8km to the south-west and 3.4km to the south-east (National Map, 2022).

3.3.7 Breeding

Black Cockatoos are known to breed in hollows of large eucalypts, including Jarrah, Tuart and Marri trees. The site is not known as a breeding site for Black Cockatoos (DoP, 2011; National Map, 2022).

The Black Cockatoo Referral Guidelines define trees of certain species with a DBH of 300 to 500mm or greater, dependent on the tree species, as breeding habitat regardless of the presence or not of hollows. The theory behind this definition is the concept that while the trees may not currently contain hollows, they are mature enough that in the next 50 years or so a hollow might form and be of use to Black Cockatoos for the purposes of breeding.

There are no trees on the site that meet the definition of breeding habitat or potential breeding habitat.

3.3.8 Regional Context

To assist in determining the significance of any impact on Black Cockatoo habitat on the site an assessment of Black Cockatoo habitat within the vicinity of the site was undertaken. There are at least 11 Bush Forever sites with 12km as shown in Table 5 and Figure 7. There is 9,105ha of habitat within 12km and 4,861ha (greater than 53%) of these are in Bush Forever. The proposed clearing represents 0.035% of the foraging habitat within 12km of the site.

Table 5: Surrounding Bush Forever Sites

Site Number	Reserve Name
125	Holmes Street Bushland, Southern River/Huntingdale
224	Canning River Regional Park and Adjacent Bushland, Riverton to Langford
244	North Lake and Bibra Lake, North Lake/Bibra Lake
245	Ken Hurst Park, Leeming
247	Manning Lake and Adjacent Bushland, Hamilton Hill/Spearwood
253	Harrisdale Swamp and Adjacent Bushland, Forrestdale
254	South Lake
256	Yangebup and Little Rush Lakes,Yangebup
262	Piarra Nature Reserve, Forrestdale
263	Banjup Bushland, Banjup
267	Mandogalup Road Bushland, Hope Valley
269	The Spectacles
270	Sandy Lake and Adjacent Bushland, Anketell
336	Wireless Hill Park, Ardross
337	Booragoon Lake, Booragoon

Site Number	Reserve Name
339	Piney Lake Reserve, Winthrop
342	Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
344	Dennis De Young Reserve and Gibbs Road Swamp Bushland, Banjup/Forrestdale
345	Forrestdale Lake and Adjacent Bushland, Forrestdale
347	Wandi Nature Reserve and Anketell Road Bushland, Wandi/Oakford
348	Modong Nature Reserve and Adjacent Bushland, Oakford
388	Jandakot Airport, Jandakot
389	Acourt Road Bushland, Banjup
390	Fraser Road Bushland, Banjup
391	Thomsons Lake Nature Reserve and Adjacent Bushland, Beeliar
392	Harry Waring Marsupial Reserve, Wattleup
393	Wattleup Lake and Adjacent Bushland, Wattleup/Mandogalup
456	Nicholson Road Bushland, Langford/Thornlie
492	Lyon Road Bushland, Banjup

3.3.9 EPBC Act Significant Impact Guidelines 1.1

According to the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013), the significance of the impact on Black Cockatoos depends on the sensitivity, value and quality of the environment and the intensity, duration, magnitude and geographic extent of the impacts. The category of listing (for example; Endangered, Vulnerable or Migratory) determines the significant impact criteria for listed flora and fauna species and ecological communities.

This assessment assumes all of the foraging and potential breeding trees on the site would be cleared for the surf park. Using this assumption, the clearing would result in approximately 3.156ha of foraging habitat for Carnaby's Black Cockatoos, Forest Red-tailed Black Cockatoos and Baudin's Black Cockatoos.

The following assessments are for the Carnaby's Black Cockatoo and Baudin's Black Cockatoo which are listed as Endangered and the Forest Red-tailed Black Cockatoo which is listed as Vulnerable.

Carnaby's and Baudin's Black Cockatoos

The impact on Carnaby's Black Cockatoos and Baudin's Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on an Endangered species and is shown below:

• *Lead to a long-term decrease in the size of a population*

There are no trees on the site to support breeding or roosting for Black Cockatoos. There are large areas (in excess of 9,000ha) within 12km consisting that contain large areas of foraging, roosting and potential breeding habitat. Therefore, clearing of the site will not result in this outcome.

• *Reduce the area of occupancy of the species*

Clearing of the site will not result in a reduction of any known breeding and roosting habitat. The clearing will result in a reduction of 3.156ha of Low to moderate value foraging habitat. Within 12km

of the site, however, there is more than 9,000ha of foraging habitat, of which more than 4,800ha is in formal reserves. Therefore clearing of the site will not result in this outcome.

• *Fragment an existing population into two or more populations*

Clearing of the site is unlikely to fragment the population of Carnaby's Black Cockatoos in the area into sub-populations due to the amount of ahbitat within 12 km of the site providing linkages between areas of Black Cockatoo habitat. Carnaby's Black Cockatoos and Baudin's Black Cockatoos can fly large distances between foraging areas. Clearing of the site will therefore not result in this outcome.

• *Adversely affect habitat critical to the survival of a species*

There is no breeding or roosting habitat for Carnaby's Black Cockatoos or Baudin's Black Cockatoos on the site. The 3.156ha of low to moderate value foraging habitat is not considered to be critical to the survival of the species due to the large amount of foraging and potential breeding habitat within 12km of the site. Clearing will result in a reduction in habitat by 0.035%, therefore clearing of the site would not result in this outcome.

• *Disrupt the breeding cycle of a population*

The site contained no breeding habitat or potential breeding habitat therefore clearing of the site would not result in this outcome.

• *Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Clearing of the site will not result in this outcome due to the large extent of Black Cockatoo habitat reserved within 12km of the site and the reduction in foraging habitat is less than 0.035%.

• *Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

Clearing of the site will not result in the establishment of an invasive species harmful to Carnaby's Black Cockatoos.

• *Introduce disease that may cause the species to decline*

Clearing of the site will not cause disease to be introduced therefore will not result in this outcome.

• *Interfere with the recovery of the species*

The Carnaby's Black Cockatoos that would utilise the site have access to greater than 9,000ha of habitat within 12km in reserves. Therefore, any clearing of habitat on the site would not interfere substantially with the recovery of the species.

The conclusion of this assessment in accordance with the criteria set out in the Significant Impact Guidelines 1.1 is that the proposed clearing will not have a significant impact on Carnaby's Black Cockatoos or Baudin's Black Cockatoos.

Forest Red-tailed Black Cockatoo

The impact on Forest Red-tailed Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on a Vulnerable species and is shown below:

• *Lead to a long-term decrease in the size of an important population of a species*

In the Significant Impact Guidelines 1.1 an important population is defined as "a population that is necessary for a species' long-term survival and recovery" and may be "key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species' range".

There was no evidence of breeding occurring on the site and the surrounding area contains greater than 9,000ha that provides large areas of foraging and breeding habitat for Cockatoos that utilise the site. Development of the site would therefore not result in this outcome.

• *Reduce the area of occupancy of an important population*

There are no trees on the site for Forest Red-tailed Black Cockatoos to breed in or roost on. Clearing of the site will reduce the area of foraging available by 3.156ha of foraging habitat, however there is greater than 9,000ha of foraging habitat within 12km of the site in surrounding reserves therefore clearing of the site would not result in this outcome.

• *Fragment an existing important population into two or more populations*

The large area of reserves containing habitat within 12km of the site that provide foraging and potential breeding habitat. Forest Red-tailed Black Cockatoos can fly large distances between foraging areas. Therefore, clearing of the site would not result in this outcome.

• *Adversely affect habitat critical to the survival of a species*

There is no breeding habitat for Forest Red-tailed Black Cockatoos breed on the site and there are large areas of foraging habitat within 12km of the site, as formal reserves, therefore the site is not considered critical to the survival of these species.

• *Disrupt the breeding cycle of an important population*

There are no trees on the site for Forest Red-tailed Black Cockatoos to breed in. Therefore clearing of the site would not result in this outcome.

• *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The large areas of foraging and breeding habitat located in reserves within 12km of the site would prevent the population from declining as a result of clearing of the site.

• *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Clearing the site will not result in invasive species being introduced, therefore would not result in this outcome.

• *Introduce disease that may cause the species to decline*

Clearing the site will not result in disease being introduced, therefore would not result in this outcome.

• *Interfere substantially with the recovery of the species*

The Forest Red-tailed Black Cockatoos that would utilise the site have access to an area greater than 9,000ha of Black Cockatoo habitat within 12km in reserves. Therefore, the clearing of 3.156ha of foraging habitat on the site would not interfere substantially with the recovery of these species.

In accordance with the criteria set out in the Significant Impact Guidelines 1.1 the conclusion of this assessment is that clearing the site would not have a significant impact on Forest Red-tailed Black Cockatoos.

4 CONCLUSIONS

The Vegetation Assessment of the proposed Cockburn Surf Park concludes the following:

- Native vegetation occurs on about 4.8ha of the site;
- Three native vegetation types were recorded, including Banksia Low Open Woodland and *Xanthorrhoea preissii* Shrubland on the dry, sandy parts of the site and *Melaleuca preissiana* Low Open Woodland on the low-lying northern part of the site;
- The condition of the vegetation ranged from Degraded-Good for the *Melaleuca preissiana* vegetation type to Good-Very Good for the Banksia woodland;
- The Banksia woodland and *Xanthorrhoea preissii* Shrubland vegetation types correspond to Floristic Community Type 23a 'Central *Banksia attenuata – Banksia menziesii* woodlands'. The *Melaleuca preissiana* vegetation type corresponds to FCT 4 '*Melaleuca preissiana* damplands';
- The two FCTs are not a Threatened or Priority Ecological Community at State or Commonwealth level. The Banksia woodland vegetation type was assessed as being part of the Banksia Woodlands of the Swan Coastal Plain TEC which is listed as Endangered under the EPBC Act. There is 3.156ha of Banksia Woodland TEC on the site;
- The *Melaleuca preissiana* vegetation type correlates well with a mapped wetland at the northern end of the site. The wetland is classified as a Multiple Use Dampland which extends off-site including on Lot 802 to the north. PGV Environmental considers the vegetation in the wetland is at the high end of the Multiple Use rating;
- Referral under the EPBC Act is recommended for the impact on 3.156ha of Banksia Woodland TEC;
- The impact on the Banksia Woodland TEC is not likely to be significant as the TEC is fragmented and degraded and there is more than 2,000 ha of the Banksia Woodland TEC within 12 km of the site with a level of protection through Bush Forever classification. The level of clearing equates to only 0.15% of the amount of Banksia woodland in secure reserves within 12km of the site;
- The Banksia woodland vegetation type contains foraging habitat for Carnaby's and Baudin's Black Cockatoos and limited foraging habitat for Forest Red-tailed Black Cockatoos. There is 3.156ha of low to moderate value foraging habitat on the site;
- The proposed development would result in the clearing of around 3.16ha of Black Cockatoo foraging habitat. Therefore, a Referral under the EPBC Act is recommended; and
- The impact to Black Cockatoos is not likely to be significant under the Significant Impact Guidelines due to the low to moderate value of the habitat and the regional context in which there is more than 9,000ha of Black Cockatoo Habitat.

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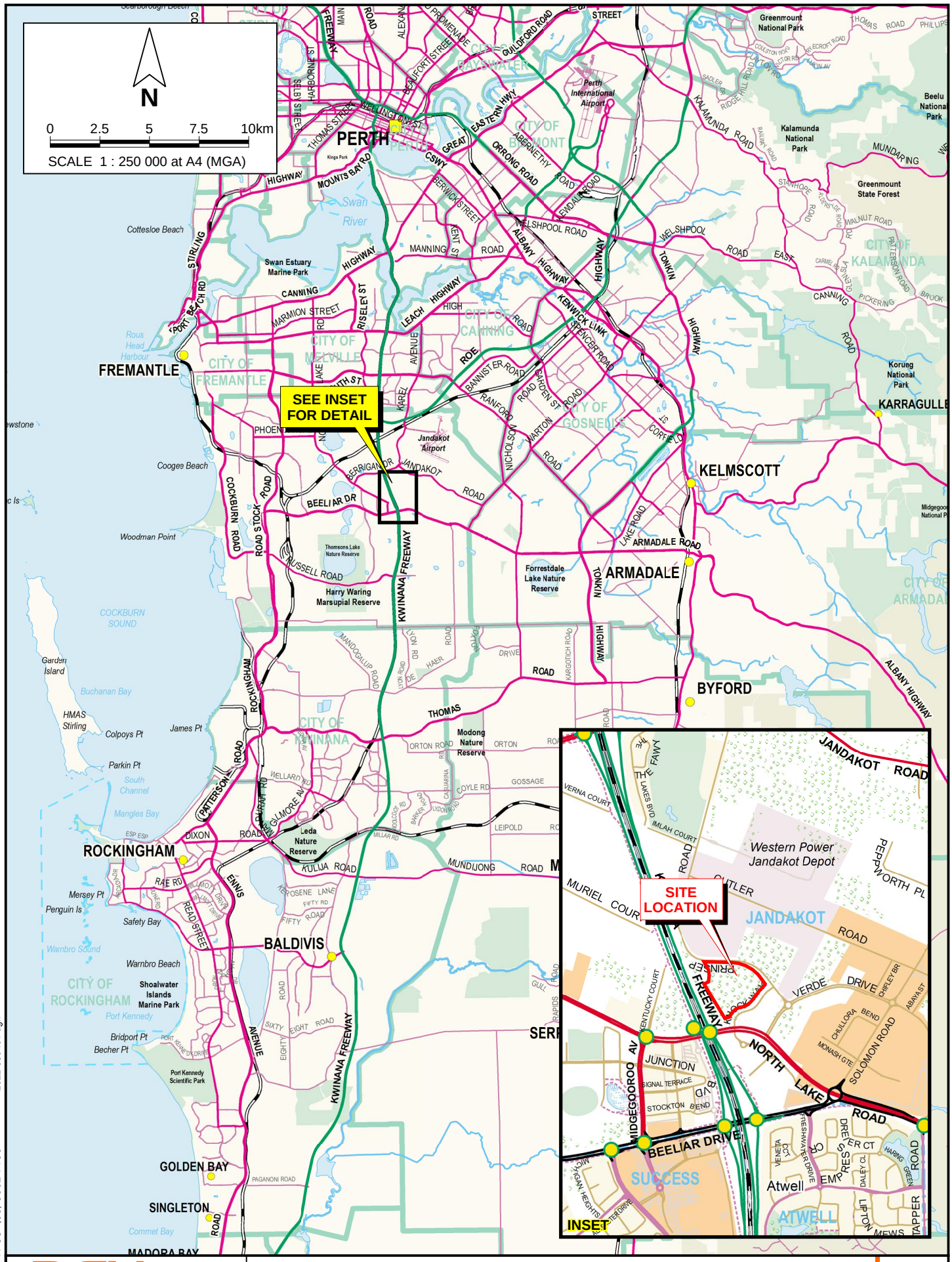
FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 2022-656-f01.dgn

pgv ENVIRONMENTAL

Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

Drawn: P. van der Moezel	Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656	Revision: A

SITE LOCATION

Figure 1

N

0 10 50 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Topographic Contour

CONTOUR SOURCE: Dept. of Agriculture, 2000.
CADASTRAL SOURCE: Landgate, February 2022.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown December 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2022-656-f02.dgn

pgv ENVIRONMENTAL

Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

Drawn: P. van der Moezel | Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656 | Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2

N

0 10 50 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Quadrat Location
- Vegetation Type Boundary
- Mp Vegetation Type

Vegetation Types

BmBa
Banksia menziesii/B. attenuata Low open Woodland over *Xanthorrhoea preissii* Open Shrubland over *Phlebocarya ciliata* Open Low Heath

Xp
Xanthorrhoea preissii Shrubland over *Phlebocarya ciliata* Closed Low Heath

Mp
Melaleuca preissiana Low Open Woodland over *Kunzea glabrescens* Tall Shrubland over *Astartea affinis/ Hypocalymma angustifolium* Open Low Heath

CADASTRAL SOURCE: Landgate, February 2022.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown December 2021.

pgv ENVIRONMENTAL

Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

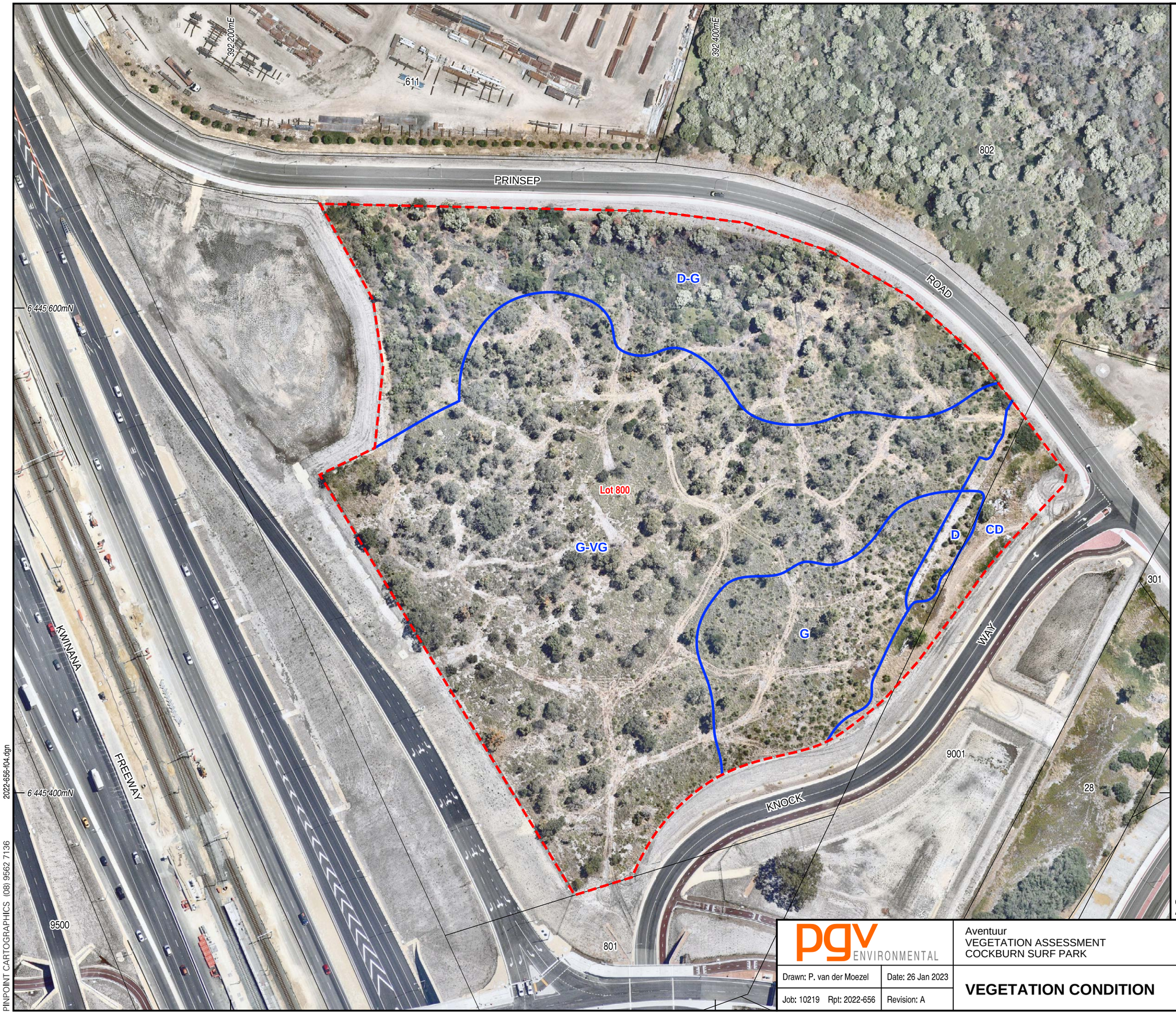
Drawn: P. van der Moezel | Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656 | Revision: A

VEGETATION TYPES

Figure 3

2022-656-f03.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136



N

0 10 50 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Vegetation Condition Boundary
- VG Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - 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.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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.

D - 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.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Cl - Cleared
No native vegetation remaining.

CADASTRAL SOURCE: Landgate, February 2022.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown December 2021.

pgv ENVIRONMENTAL

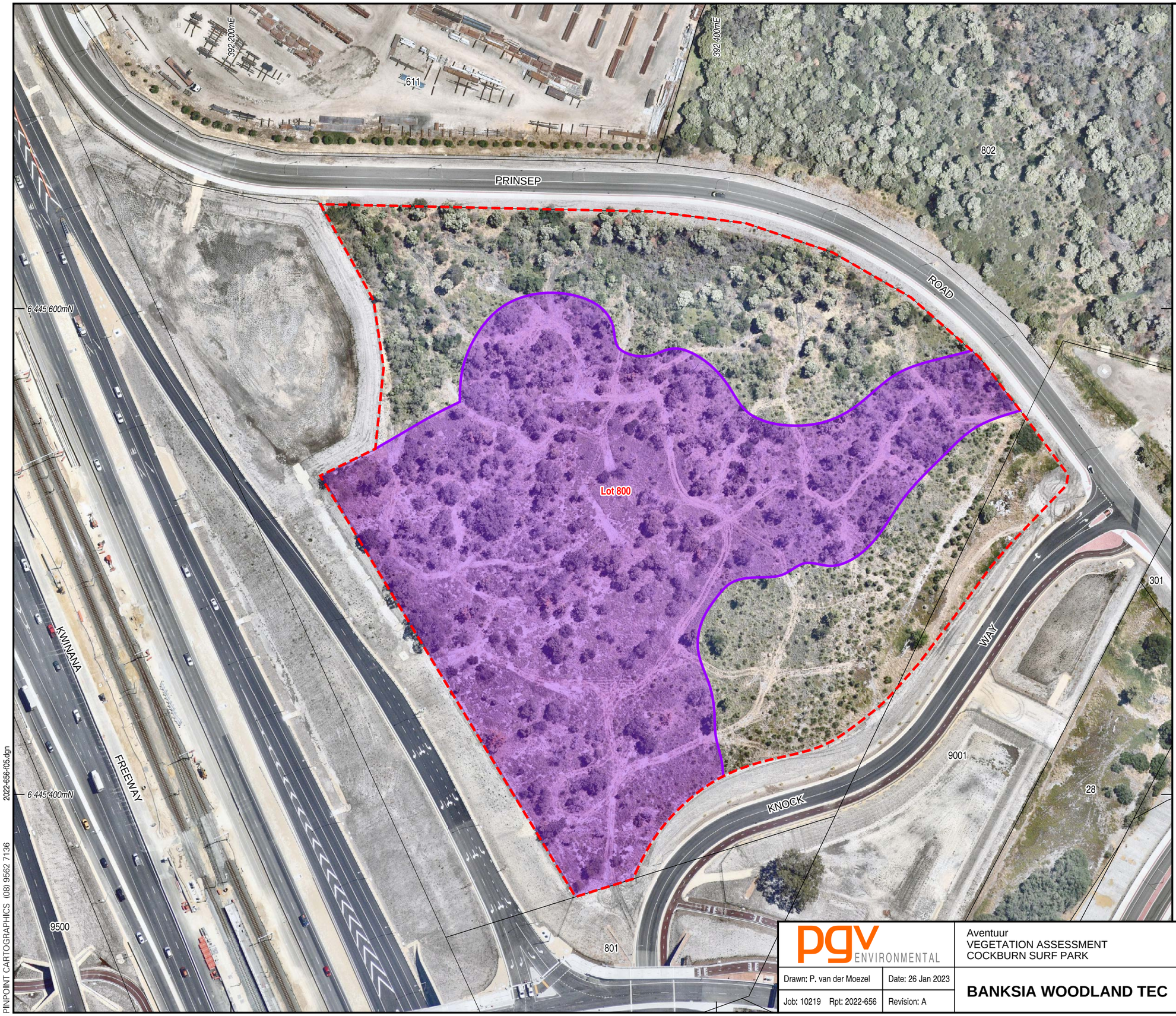
Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

Drawn: P. van der Moezel | Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656 | Revision: A

VEGETATION CONDITION

Figure 4

PINPOINT CARTOGRAPHICS (08) 9562 7136 2022-656-I04.dgn



N

0 10 50 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Banksia Woodland TEC

CADASTRAL SOURCE: Landgate, February 2022.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown December 2021.

pgv ENVIRONMENTAL

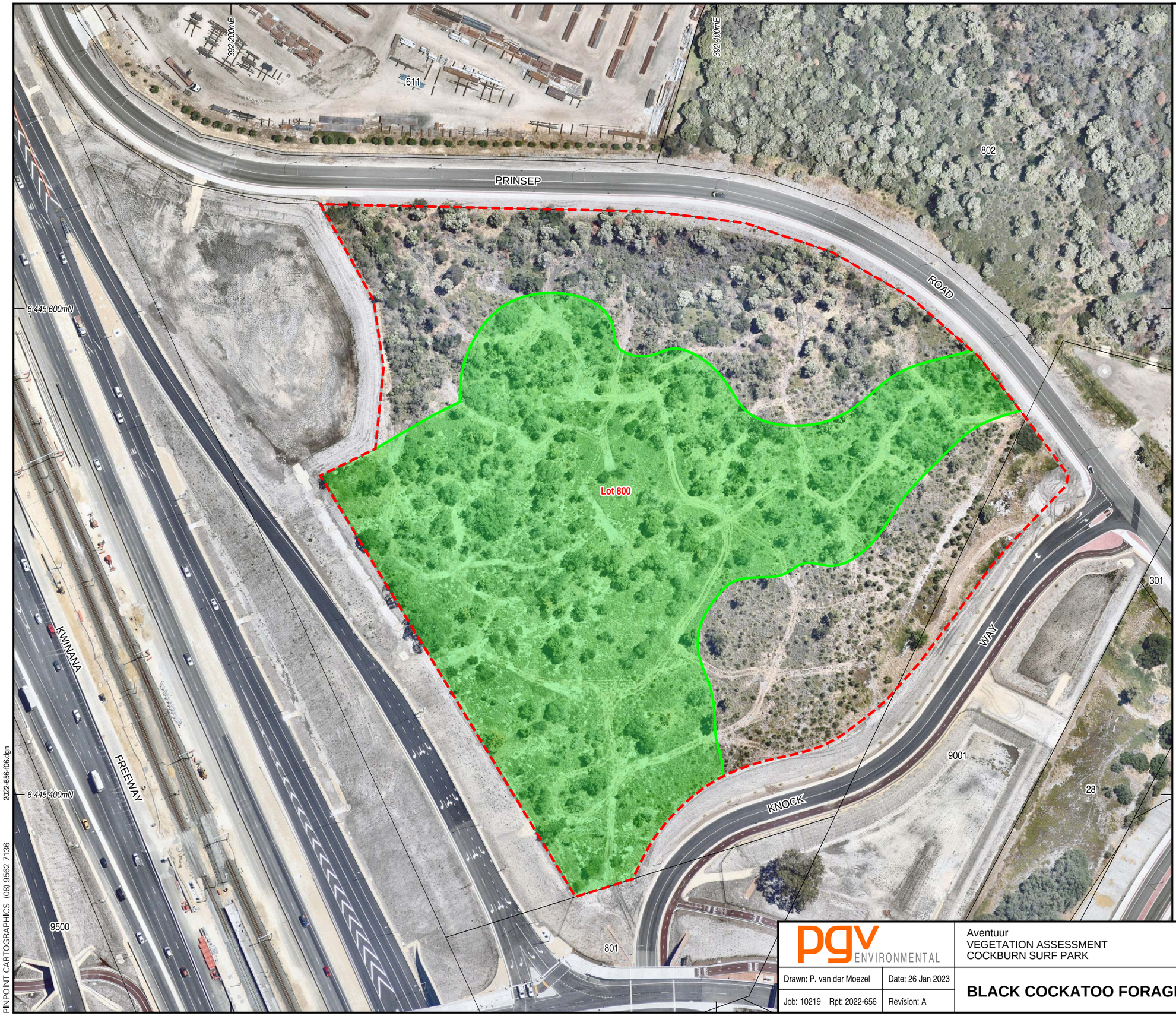
Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

Drawn: P. van der Moezel	Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656	Revision: A

BANKSIA WOODLAND TEC

Figure 5

PINPOINT CARTOGRAPHICS (08) 9562 7136 2022-656-05.dgn



N

0 10 50 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Black Cockatoo Foraging Habitat

CADASTRAL SOURCE: Landgate, February 2022.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown December 2021.

pgv ENVIRONMENTAL

Aventuur
VEGETATION ASSESSMENT
COCKBURN SURF PARK

Drawn: P. van der Moezel | Date: 26 Jan 2023
Job: 10219 Rpt: 2022-656 | Revision: A

BLACK COCKATOO FORAGING HABITAT

Figure 6

2022-656-f06.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

APPENDIX 1

Cockburn Central East Local Structure Plan (CCE LSP) Area, Targeted *Caladenia huegelii* Survey (Focused Vision, 2017)

COCKBURN CENTRAL EAST LOCAL STRUCTURE PLAN (CCE LSP) AREA, TARGETED CALADENIA HUEGELII SURVEY

JANUARY 2018

CITY OF COCKBURN

FOCUSED VISION consulting

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A	G. Martinez	K. Bauer-Simpson		05/10/2017
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EXECUTIVE SUMMARY

Focused Vision Consulting Pty Ltd (FVC) was commissioned during September 2017 by the City of Cockburn (the City) to undertake a targeted *Caladenia huegelii* survey within the Cockburn Central East Local Structure Plan (CCE LSP) area (study area).

A targeted survey of the study area was conducted by FVC on 27 September 2017. Two experienced botanists, Kellie Bauer-Simpson and Gabriela Martinez with an experienced field assistant, Will Bauer-Simpson, systematically assessed the suitable habitat areas of the study area for *Caladenia huegelii*. The searches were conducted via a series of parallel transects in accordance with the Department of the Environment (2013) Guidelines for Detecting Orchids Listed as 'Threatened'.

The timing of the survey (September) was considered optimal to conduct a targeted flora survey for *Caladenia huegelii*, and other Spider Orchid species such as *Caladenia longicauda* were also observed in flower during the survey.

Although a detailed search was carried out, no *Caladenia huegelii* plants were recorded.

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1 INTRODUCTION

1.1 BACKGROUND

Focused Vision Consulting (FVC) was commissioned during September 2017 by the City of Cockburn (the City) to undertake a targeted *Caladenia huegelii* survey within the Cockburn Central East Local Structure Plan (CCE LSP) area (study area). This work is following a spring flora, vegetation, fauna and habitat assessment completed by FVC during 2016. The results of that study identified that the site provides suitable habitat for the species, and therefore *Caladenia huegelii* may be present within the study area. The study area encompasses a number of Lots, totalling 31.21 ha as shown in **Figure 1**, much of which was included in the targeted search, depending on habitat suitability, also shown in **Figure 1**.

This report provides the results of the Targeted *Caladenia huegelii* survey undertaken within the study area during September 2017.

1.2 LOCATION

The study area is located approximately 20 km south of the Perth CBD, directly adjacent to the Kwinana Freeway on both the western and eastern sides. On the western side of the freeway, the area is bounded by Kentucky Court and North Lake Road. To the east of the freeway, the study area is comprised of numerous lots between Cutler Road and Knock Place, Cockburn Central (**Figure 1**).

1.3 SCOPE OF WORK

The scope included a targeted *Caladenia huegelii* survey. The tasks required to be carried out included:

- undertaking systematic traverses of the study area, within suitable habitat, to search for *Caladenia huegelii* plants, where (if) plants were observed, recording the:
    - GPS location of each individual *Caladenia huegelii* allowing an inventory of the number of plants/population size
    - vegetation type and condition at the recorded location
    - condition of plants/populations recorded
- the preparation of a report that summarises results and includes:
    - a discussion on the results, including identification and spatial mapping of all occurrences of *Caladenia huegelii* within the study area
    - identification of any potential environmental impacts and develop management recommendations for the protection of the Threatened flora species.

The survey was carried out in accordance with:

- Department of the Environment (2013) Guidelines for Detecting Orchids Listed as 'Threatened' under the *Environment and Biodiversity Conservation Act 1999* (EPBC Act).

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Figure 1 - Cockburn Central East Local Structure Plan Project Area

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2 EXISTING ENVIRONMENT

2.1 CLIMATE

The Swan Coastal Plain has a warm Mediterranean climate which is characterised by hot dry summers and cool to mild wet winters (Mitchell *et al.* 2002). Jandakot Airport (009172) is the closest meteorological recording station to Cockburn Central and has recorded an average annual rainfall of 823.5 mm (BoM 2017).

2.2 IBRA REGION

There are 89 recognised Interim Biogeographic Regionalisation for Australia (IBRA) regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (Commonwealth of Australia 2013). The study area lies within the Swan Coastal Plain IBRA region and, at a finer scale, within the Perth subregion (Mitchell *et al.* 2002).

2.3 GEOLOGY AND SOILS

The study area lies within the Bassendean Dune System which consists of very old leached sands to various depths (GHD 2015) and are the oldest of the three dunes systems occurring on the Swan Coastal Plain. Sands within this system contain very little silt or clay and very low levels of nutrient elements (ESWA 2016).

Soils within the study area are mapped as three sub units of the Bassendean System (Schoknecht *et. al.* 2004). They are described as:

- 212Bs_B1 - Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with pale yellow B horizon
- 212Bs_B2 – Flat to very gently undulating sandplain with well to moderate well drained deep bleached grey sands with a pale yellow B horizon or weak iron organic hardpan
- 212Bs_B4 – Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depth generally greater than 1.5 m by clay or less frequently a strong iron organic hardpan.

2.4 VEGETATION

The study area is located on the Swan Coastal Plain and has been broadly characterised by Beard (1990) as "e2Mb cbLi - Medium very sparse woodland; jarrah, with low woodland; Banksia and Casuarina (Association 1001)".

Vegetation of the Perth subregion comprises heath and/or Tuart (*Eucalyptus gomphocephala*) woodlands on limestone, Jarrah (*Eucalyptus marginata*) and *Banksia* woodlands on Quaternary marine dunes and Marri (*Corymbia calophylla*) on colluvial and alluvial sands (Mitchell *et al.* 2002).

Vegetation complexes within the study area have been defined by Heddle *et al.* (1980) and are based on vegetation in association with landforms and underlying geology. One vegetation complex Bassendean *complex – central and south* as described by Heddle *et al.* (1980) occurs within the study area. This complex ranges from woodlands of *Eucalyptus marginata, Allocasuarina* and *Banksia* on sand dunes to a low woodland of *Melaleuca* species, and sedge lands on the low-lying depressions and swamps.

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3 SPECIES PROFILE

3.1 CALADENIA HUEGELII

3.1.1 Conservation Significance

Caladenia huegelii was classified as Threatened (Declared Rare Flora – Extant) in November 1990 under the *Wildlife Conservation Act, 1950* (WC Act) and listed under Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice for Threatened Flora. It is a species of flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F (20) of the WC Act. *Caladenia huegelii* is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The species is also ranked Critically Endangered (CR) under World Conservation Union (IUCN 2001) criterion B2ab (i, ii, iii, iv) due to the severe fragmentation of populations and the continuing decline in the extent of its occurrence, area of occupancy, quality of habitat and number of locations.

3.1.2 Ecology, Habitat and Distribution

Caladenia huegelii grows up to 60 cm tall with a single erect, pale green, hairy leaf and one or two (rarely three) predominantly pale greenish-cream flowers 7-10 cm across, with variable suffusions, lines and spots of red-maroon. Floral odour is absent. The sepals end in slender light brown to yellow clubs. The large labellum is prominently two coloured with a pale greenish-cream base and a uniformly dark maroon recurved apex. The leaf is densely hirsute to 4 mm long. Leaves are visible from May to November. Flowering occurs from September to October, with not all adult plants producing a flower each year. Some plants have been recorded not to produce a leaf each year and remain as a dormant tuberoid below ground (Hopper and Brown 2001).

Correct identification of *Caladenia huegelii* can only be carried out when it is in flower as a range of *Caladenia* species produce similar leaves (DEC 2009).

The preferred habitat of *Caladenia huegelii* is well drained, deep sandy soils in areas of mixed woodland of Jarrah (*Eucalyptus marginata*), Candlestick Banksia (*Banksia attenuata*), Holly Banksia (*Banksia ilicifolia*) and Firewood Banksia (*Banksia menziesii*) with scattered Sheoak (*Allocasuarina fraseriana*) and Marri (*Corymbia calophylla*) over dense Blueboy (*Stirlingia latifolia*), Swan River Myrtle (*Hypocalymma robustum*), Yellow buttercups (*Hibbertia hypericoides*), Buttercups (*Hibbertia subvaginata*), Balga (*Xanthorrhoea preissii*), coastal jugflower (*Adenanthos cuneatus*) and *Conostylis* species (DEC 2009).

Caladenia huegelii is found in the Jarrah Forest and Swan Coastal Plain Bioregions of Western Australia. A review of available information on populations held by the Department of Biodiversity Conservation and Attractions (DBCA) in 2017 indicated that 41 known records of the species are held at the Western Australian Herbarium (DBCA 2017).

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4 METHODOLOGY

The areas of suitable habitat within the CCE LSP study area were determined based on previous vegetation mapping (FVC 2016). Suitable habitat was determined to encompass the two Banksia woodland units (BeEt and BaXp, as mapped by FVC (2016)) in better than degraded condition (Degraded to Good, or better). On a finer scale, some sections of the suitable habitat (Banksia woodland) were found to be either cleared since the 2016 spring survey, or not specifically suitable habitat for *Caladenia huegelii,* due to domination of dense stands of introduced Victorian Tea-tree (*Leptospermum laevigatum*). These areas were therefore not searched in detail (mostly impenetrable) and are presented in **Figure 2**.

A targeted flora survey of the suitable habitat areas within the, study area was carried out on 27 September 2017 during the optimal flowering period for *Caladenia huegelii*. The survey was conducted in accordance with the Department of the Environment (2013) Guidelines for Detecting Orchids Listed as 'Threatened'.

Two experienced FVC botanists, Kellie Bauer-Simpson and Gabriela Martinez and an experienced field assistant, Will Bauer-Simpson, systematically assessed the suitable habitat areas for the presence of *Caladenia huegelii* individuals. A series of parallel transects, spaced approximately 10 m apart were traversed for the search, to ensure all areas of suitable habitat was inspected. Where the habitat is in poorer condition, the spacing of traverses was made broader, as the occurrence of *Caladenia huegelii* was considered much less likely, since native understorey in these locations is greatly reduced, mostly due to weed domination.

Navigation of the sweeps were carried out using a combination of Garmin handheld Global Positioning System (GPS), tablets using the customized software program Mappt™ and magnetic compasses. The traverses made by field personnel for the searches are shown in **Figure 3**.

If individuals or suspected individuals of *Caladenia huegelii* flora were observed, the following data was to be recorded:

- GPS location of each individual plant allowing an inventory of the number of plants/population size
- vegetation type and condition at the recorded location
- condition of plants/populations recorded.

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Figure 2 - Study Areas

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Figure 3 - Search Traverses

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5 RESULTS

No flowering *Caladenia huegelii* individuals were observed or recorded during the survey September 2017 survery conducted within areas of suitable habitat within the CCE LSP study area.

Two *Caladenia* were observed during the survey; *Caladenia flava* and *Caladenia longicauda*. These two species are very common in the south-west of Western Australia and are of no conservation significance.

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6 DISCUSSION AND CONCLUSION

A targeted survey of the study area was conducted by FVC on 27 September 2017. Results from previous surveys conducted by FVC in 2016 identified two vegetation types within the study area, BeEt and BaXp, which provided suitable habitat for *Caladenia huegelii* and therefore were included in the targeted search as shown in **Figure 2**.

The timing of the survey (September) was considered optimal to conduct a targeted flora survey for *Caladenia huegelii* as other orchids such as the Spider Orchid species, *Caladenia longicauda* were also observed in flower during the survey.

Although a detailed survey was carried out within suitable habitat within the site, no *Caladenia. huegelii* plants were observed or recorded.

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APPENDIX 2

Quadrat Data

QUADRAT CC1

50 392347 E 6445466 N

Vegetation: *Banksia menziesii/B. attenuata* Low Open Woodland over *Phlebocarya ciliata/Lyginia barbata* Open Low Heath and **Ehrharta calycina* Grassland

Condition: Good

Soil Type: Grey sand

Landform: Flat

Date: 3.12.21

Recorder: Paul van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Banksia menziesii	4	5
Banksia attenuata	2	1
Adenanthos cygnorum	1.8	1
**Ehrharta calycina*	1	30
**Gladiolus caryophyllaceus*	0.7	<1
Hibbertia hypericoides	0.5	1
Arnocrinum preissii	0.5	<1
Phlebocarya ciliata	0.4	30
Burchardia congesta	0.4	<1
Patersonia occidentalis	0.4	<1
Lechenaultia floribunda	0.4	<1
Bossiaea eriocarpa	0.4	<1
Lyginia barbata	0.3	20
**Briza maxima*	0.3	5
**Ursinia anthemoides*	0.3	5
Dasypogon bromeliifolius	0.3	2
Pultenaea sp	0.3	<1

SPECIES	HEIGHT (m)	COVER (%)
**Sonchus oleraceus*	0.3	<1
Restio sp	0.4	<1
Dampiera linearis	0.2	1
Petrophile linearis	0.2	<1
**Carpobrotus edulis*	0.1	1
Laxmannia squarrosa	0.1	<1

* introduced species

QUADRAT CC2

50 392497 E 6445546 N

Vegetation: *Banksia menziesii/B. attenuata* Low Open Woodland over *Xanthorrhoea preissii* Shrubland over *Dasypogon bromeliifolius/Phlebocarya ciliata* Closed Low Heath
Condition: Very Good
Soil Type: Dark grey sand
Landform: Flat
Date: 3.12.21
Recorder: Paul van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Banksia menziesii	6	10
Banksia attenuata	6	5
Xanthorrhoea preissii	2	25
**Ehrharta calycina*	1	1
**Avena fatua*	0.7	<1
**Gladiolus caryophyllaceus*	0.7	<1
Burchardia congesta	0.5	<1
**Bromus diandrus*	0.4	1
**Sonchus oleraceus*	0.4	<1
Phlebocarya ciliata	0.3	70
Dasypogon bromeliifolius	0.3	25
Lomandra hermaphrodita	0.3	1
Bossiaea eriocarpa	0.3	<1
**Briza maxima*	0.2	<1
**Briza minor*	0.2	<1
**Asparagus asparagoides*	Climber	2

* introduced species

QUADRAT CC3

50 392308 E 6445540 N

Vegetation: *Banksia menziesii/B. attenuata* Low Open Woodland over *Xanthorrhoea preissii* Open Shrubland over *Phlebocarya ciliata* Open Low Heath
Condition: Good
Soil Type: grey sand
Landform: Gentle Slope
Date: 3.12.21
Recorder: Paul van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Banksia menziesii	6	20
Banksia attenuata	5	2
Xanthorrhoea preissii	1.4	4
Macrozamia riedlei	1.3	2
**Ehrharta calycina*	1.2	20
Anigozanthos manglesii	0.8	1
**Avena fatua*	0.6	<1
**Gladiolus caryophyllaceus*	0.5	<1
Gastrolobium capitatum	0.5	<1
Phlebocarya ciliata	0.4	20
Patersonia occidentalis	0.4	1
Dasypogon bromeliifolius	0.4	1
**Pelargonium capitatum*	0.4	1
Gompholobium tomentosum	0.4	<1
Bossiaea eriocarpa	0.4	<1
Burchardia congesta	0.4	<1

SPECIES	HEIGHT (m)	COVER (%)
**Briza maxima*	0.3	2
**Ursinia anthemoides*	0.3	1
Scholtzia involucrata	0.3	<1
Hibbertia subvaginata	0.3	<1
Restio sp	0.3	<1
Lomandra hermaphrodita	0.2	1
Caustis dioica	0.2	1
Petrophile linearis	0.2	<1
**Carpobrotus edulis*	0.1	2
Desmocladus flexuosus	0.1	1
Laxmannia squarrosa	0.1	<1
Conostylis aculeata	0.1	<1
**Romulea rosea*	0.1	<1

* introduced species